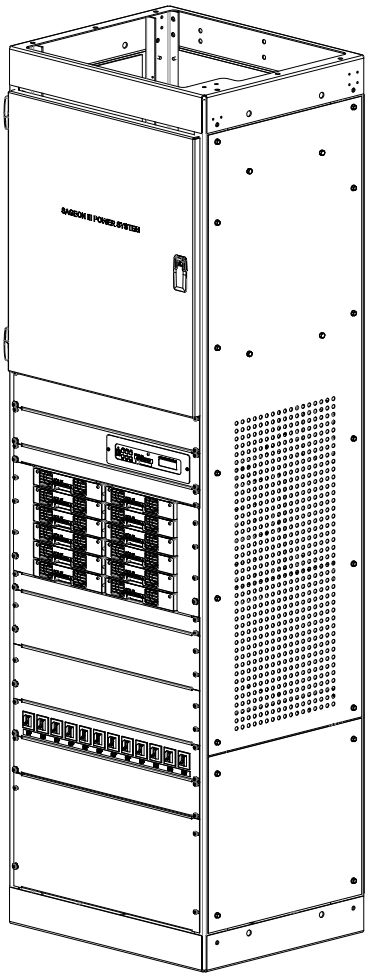
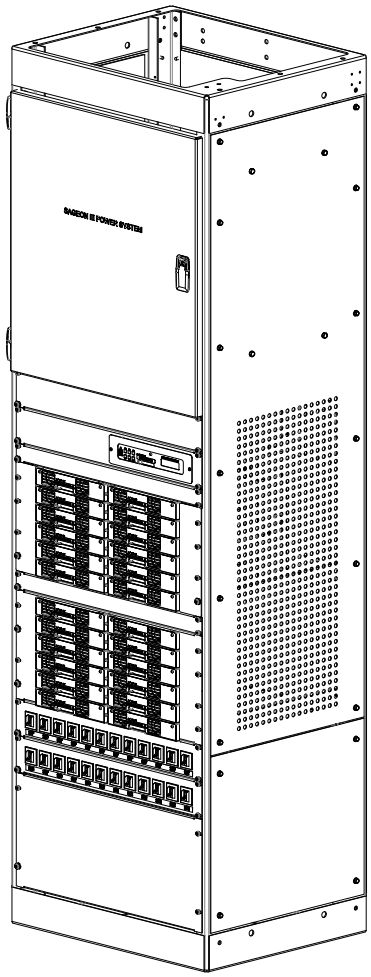
Sageon III™ Base System
Product Manual



600A



1200A

UNIPOWER, LLC
65 Industrial Park Road
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PM 990-8800-50, Issue 3

sageon3_base-man.pdf

Sageon III Power Plant Parts List

Descriptions	Part Numbers
Base System	
84" Welded Cabinet, Controller, LVBD w/by-pass switch, 600A Rectifier Shelf, Five(5) Customer Specified External Alarms	SAGEON3.A01
84" Welded Cabinet, Controller, 600A Rectifier Shelf, Five(5) Customer Specified External Alarms	SAGEON3.A02
Factory Installed Options	
No AC breakers (NO AC Breakers for the 600A Rectifier Shelf)	SAGEON3.B01
AC Breakers (Provides Twelve(12) 20A AC Breakers for the 600A Rectifier Shelf)	SAGEON3.B02
Rectifier Expansion (Addition 600A Rectifier Shelf to increase Total System Capacity to 1200A)	SAGEON3.B03
Rectifier Expansion w/Breakers (Include Rectifier Expansion Package B03 and Twenty-four(24) 20A AC Breakers)	SAGEON3.B04
Battery Expansion (Provides Interface Connections for Four(4) Battery Temperature Probes, Four(4) External Current Transducers)	SAGEON3.C01
Communication (Remote Communication Using TCP/IP SNMP)	SAGEON3.D01
Distribution Tiers & Ground Return/Battery Landing	
Tier 1 Group-A (AM1) Group-B (AM1), Ground Return; Eight(8) battery connections 3/8" on 1" C-C	SAGEON3.E01
Tier 1 Group-A (AM1) Group-B (AM1); Tier 2 Group-A (AM1) Group-B (AM1), Ground Return, Eight(8) battery connections 3/8" on 1" C-C	SAGEON3.E02
Tier 1 Group-A (AM1) Group-B (AM1); Tier 2 Group-A (GJ1) Group-B (GJ1), Ground Return, Eight(8) battery connections 3/8" on 1" C-C	SAGEON3.E03
Tier 1 Group-A (AM1) Group-B (AM1); Tier 2 Group-A (AM1) Group-B (AM1); Tier 3 Group-A (AM1) Group-B (AM1), Ground Return, Eight(8) battery connections 3/8" on 1" C-C	SAGEON3.E04
Tier 1 Group-A (AM1) Group-B (AM1); Tier 2 Group-A (AM1) Group-B (AM1); Tier 3 Group-A (GJ1) Group-B (GJ1), Ground Return, Eight(8) battery connections 3/8" on 1" C-C	SAGEON3.E05

RECEIVING INSTRUCTIONS & GENERAL EQUIPMENT INFORMATION

Please Note: For your protection, the following information and the product manual should be read and thoroughly understood before unpacking, installing, or using the equipment.

UNIPOWER, LLC presents all equipment to the delivering carrier securely packed and in perfect condition. Upon acceptance of the package from us, the delivering carrier assumed responsibility for its safe arrival to you. Once you receive the equipment, it is your responsibility to document any damage the carrier may have inflicted, and to file your claim promptly and accurately.

1. PACKAGE INSPECTION

1.1 Examine the shipping crate or carton for any visible damage: punctures, dents, and any other signs of possible internal damage.

1.2 Describe any damage or shortage on the receiving documents, and have the carrier sign their full name.

1.3 If your receiving freight bill notes that a Tip-N-Tell is attached to your freight, locate it. If the Tip-N-Tell arrow has turned even partially blue, this means the freight has been tipped in transport. Make sure the carrier notes this on your receipt before you sign for the freight.

2. EQUIPMENT INSPECTION

2.1 Within fifteen days, open the crate and inspect the contents for damages. While unpacking, be careful not to discard any equipment, parts, or manuals. If any damage is detected, call the delivering carrier to determine appropriate action. They may require an inspection.

***SAVE ALL SHIPPING MATERIAL FOR THE INSPECTOR TO SEE!**

2.2 After the inspection has been made, call UNIPOWER. We will determine if the equipment should be returned to our plant for repair, or if some other method would be more expeditious. If it is determined that the equipment should be returned to UNIPOWER, ask the delivering carrier to send the packages back to UNIPOWER at the delivering carrier's expense.

2.3 If repair is necessary, we will invoice you for the repair so that you may submit the bill to the delivering carrier with your claim form.

2.4 It is your responsibility to file a claim with the delivering carrier. Failure to properly file a claim for shipping damages may void warranty service for any physical damages later reported for repair.

3. HANDLING

Equipment can be universally heavy or top-heavy. Use adequate humanpower or equipment for handling. Until the equipment is securely mounted, be careful to prevent the equipment from being accidentally tipped over.

4. NAMEPLATE

Each piece of UNIPOWER equipment is identified by a part number on the nameplate. Please refer to this number in all correspondence with UNIPOWER.

5. INITIAL SETTINGS

All equipment is shipped from our production area *fully checked and adjusted*. Do not make any adjustments until you have referred to the technical reference or product manual.

6. SPARE PARTS

To minimize downtime during installation or operation, we suggest you purchase spare fuses, circuit boards and other recommended components as listed on the Recommended Spare Parts List in the back of the product manual. If nothing else, we strongly recommend stocking spare fuses for all systems.

ISSUE HISTORY

Issue	Page(s)/ Sections Altered	Description	Approved/ Date
3	All	Updated manual with UNIPOWER logo & verbiage. See ECN 20082 (WD 2/17/15)	DBW 2/19/15

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Throughout the remainder of this manual, "UNIPOWER" will mean "UNIPOWER, LLC."

PERSONNEL REQUIREMENTS

Installation, setup, operation, and servicing of this equipment should be performed by qualified persons thoroughly familiar with this Product Manual and Applicable Local and National Codes. A copy of this manual is included with the equipment shipment.

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1.0 INTRODUCTION

This Product Manual describes installation, operation, and servicing of UNIPOWER Sageon III Base Systems. The Sageon III Base System is available as a -48V, seven foot high system in two ratings: the 600-ampere and 1200-ampere (max). A view of the system is provided on the cover of this manual and in Figure 1-1 (below).

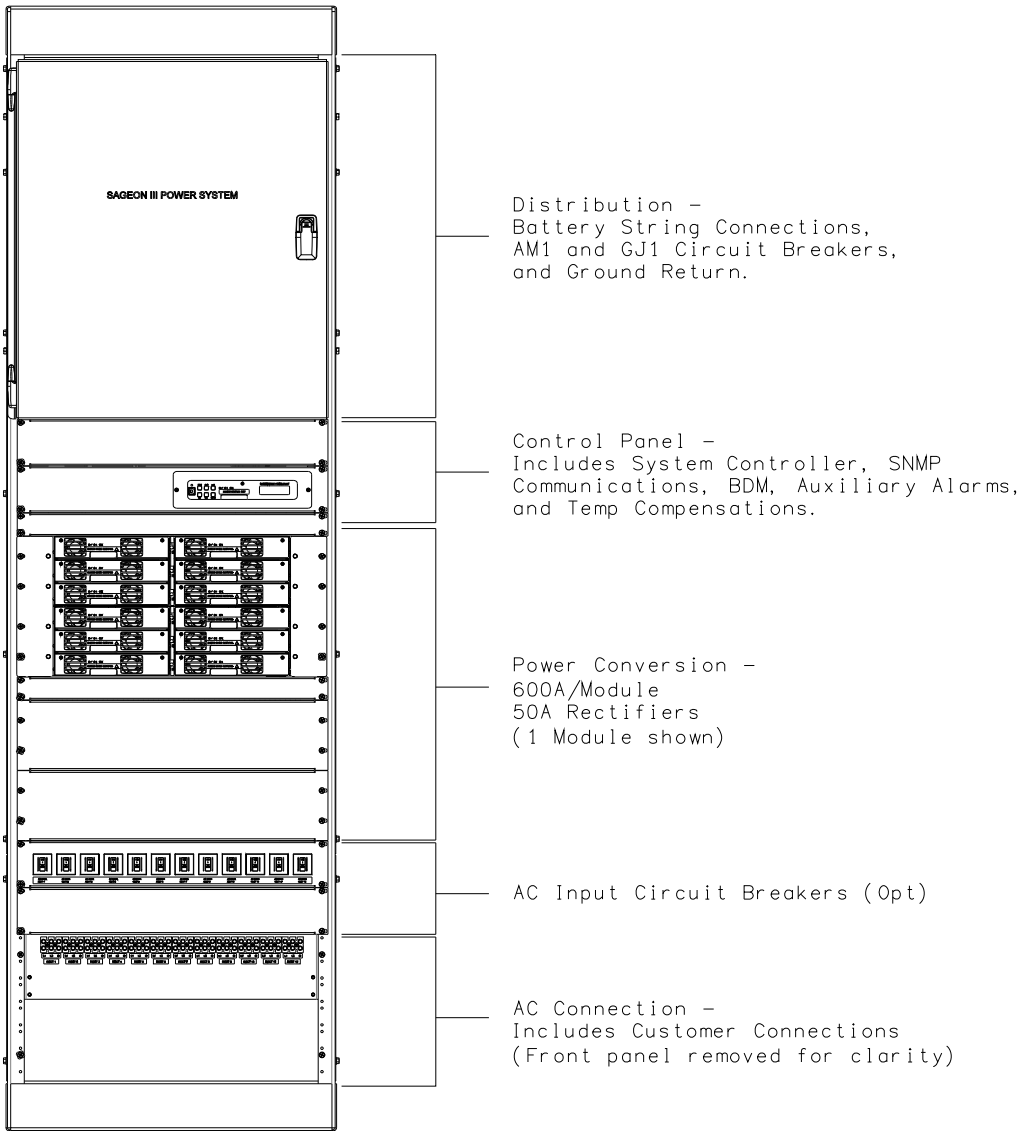


FIGURE 1-1 SAGEON III BASE SYSTEM

This manual contains text of descriptions, procedures, and supporting illustrations in reference to the Sageon III Base System. It includes the front matter and chapters 1 through 9.

1.1 PRODUCT DESCRIPTION

The Sageon III Base System is intended for Cellular, PCS, and other applications that demand stable, reliable, high current, DC operating power. Sageon III can supply the voltage and currents shown in the following table.

Sageon Cabinet	Rack Height	Plant Output Voltage	Plant Output Current (max)
7-foot Tower, Figure 1-1	7 Feet (213.36 cm)	-48 Vdc	600A
		-48 Vdc	1200A (max)

As indicated above, the Power System is divided into two areas: distribution and power conversion. The system is shown in Figure 1-1. It provides 12 power conversion positions at 600A or 24 power conversion positions at 1200A for rectifiers and 6 distribution groups (in 3 distribution tiers) with a user-specified quantity of AM1 circuit breakers, & GJ1 circuit breakers..

Power Conversion

Plug-in rectifier models are available in –48V. It employs modular switched-mode rectifier technology for highly efficient, low cost, reliable operation. Each –48V rectifier can source up to 50A. The quantity of rectifiers is determined by the user to accommodate the application. A maximum of 24 rectifiers can be installed in a unit.

Distribution

A unit can include up to 60, 5-100A AM1 circuit breakers. Up to 8, 100-450A GJ1 circuit breakers can be installed, however, each group of 4 GJ1 type breakers reduces the available AM1 positions by 10.

Circuit breaker and fuse kits are ordered separately to accommodate the application. For AM1 type breakers, the load supply and return connections use two-hole wire lugs for 1/4" studs (5/8" center-to-center). The supply cable is bolted to a distribution assembly that has two 1/4-20 studs and the return connection is bolted to the return bus bar that also has 1/4" studs.

Where higher current GJ1 type breakers are specified, the load supply connection is a 3/8" ring lug bolted directly to the breaker terminal. The return connection is bolted to the return bus bar using a two-hole lug for 3/8" bolts (1" center-to-center).

Battery Strings

Battery charge and battery return can facilitate eight sets of 2-hole lug wiring for 3/8 inch diameter studs on 1 inch centers.

Operator Panel

Mounted in the system is a modular, hot-swappable controller which includes a high-resolution 2-line digital display for monitoring of the Sageon III Base System output current and voltage. Six push buttons are available for operating the Sageon III Base System, selecting display information, and for changing editable parameters. A complete System configuration can be created at the operator panel. Three System status LEDs are provided.

Communications

PC-based configuration and monitoring is available with the UNIPOWER SageView™ software. SageView is a tool to exchange configurations and operating data between the Sageon III Base System and the PC on which SageView is running. Local PC access is provided through a supplied USB-B connector on the front panel of the controller using the SageView software.

Remote PC access across an Ethernet network is also standard. The PC must be running SageView software and have a unique IP address on the network. An Ethernet RJ-45 jack is provided for connecting to your company’s

intranet or to the Internet. A unique IP address is required for each Sageon III Base System. Remote access is also available via an SNMP/Ethernet board.

Alarms

Activation of customer-supplied alarm annunciators is accommodated by form-C relays. The relay state is user selectable between normal mode (normally de-energized) and failsafe mode (Normally energized). These relays provide for external annunciation of the alarms and are fully user configurable. Refer to SageView help for configuring these relays.

Block Diagram Description

A simplified block diagram of a 48V Sageon III Base System is shown in Figure 1-2. Single-phase or three-phase power is supplied from the user's AC electrical service panel.

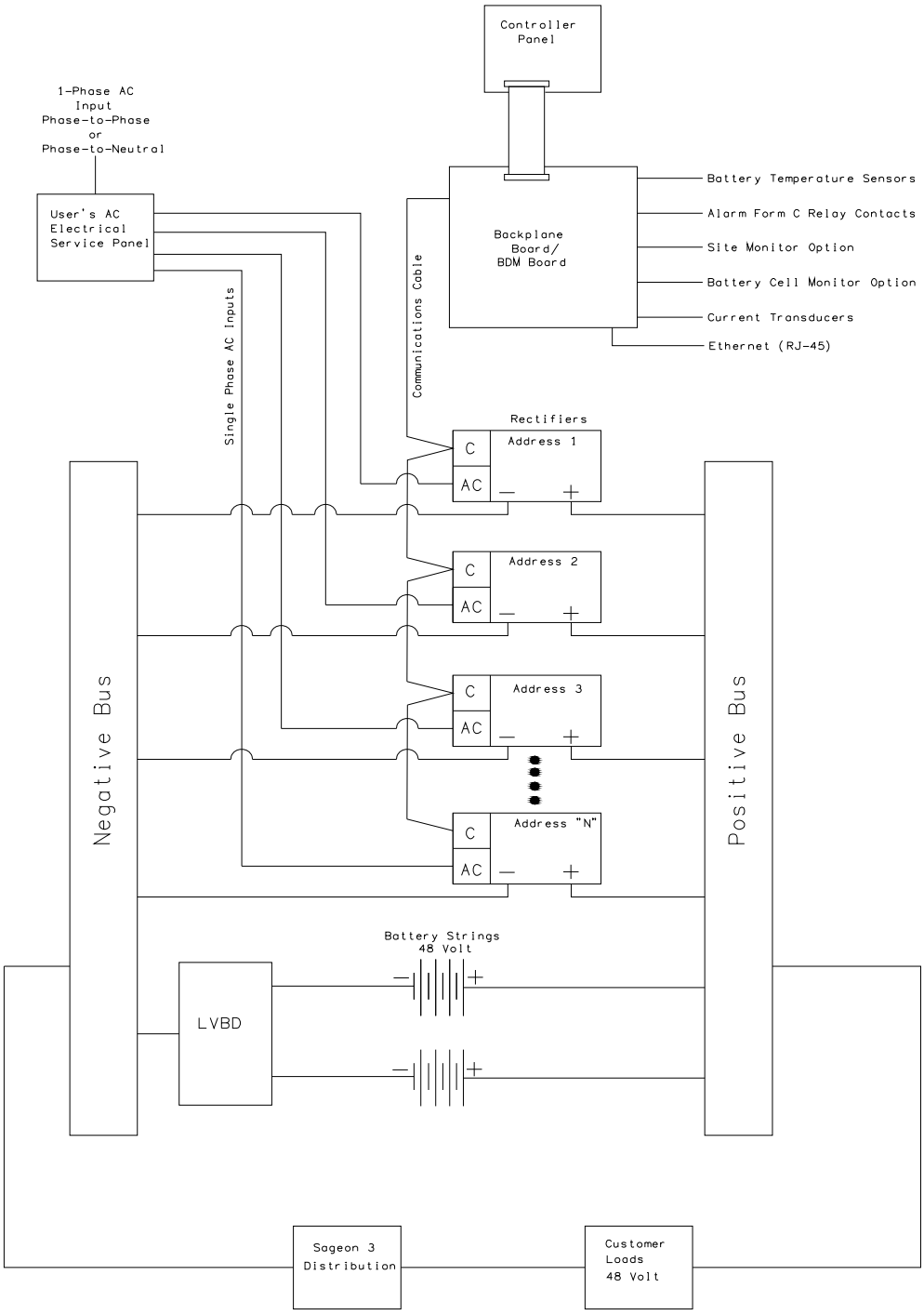


FIGURE 1-2 SIMPLIFIED BLOCK DIAGRAM, -48V POWER SYSTEM

The LVBD trip voltage is set using the operator panel push buttons and menus. An LVBD bypass switch is provided. This switch bypasses (i.e. defeats) the SCU LVD in case of SCU maintenance, upgrading, or failure.

The Sageon III Base System operation can be monitored at the operator panel on the front of the Sageon III Base System, at a PC connected to the operator panel, or at a PC connected to the Sageon III Base System over an Ethernet network. The Sageon III Base System configuration can be performed from the operator panel or at a PC.

Printed circuit boards below distribution area contain terminals for user connections to alarm relays, battery temperature compensation sensors, communications, and other internal and external functions. In addition, most signals destined for the SCU are routed first to the BDM board or backplane board.

The operator panel provides user access to the configuration and monitoring capabilities of the SCU. For security, a parameter lock feature is included and PC access can require a password. A PC that is to be connected to the Sageon III Base System must have the optional SageView software installed and operating.

1.2 SPECIFICATIONS

This section contains physical, environmental, and electrical specifications for the Power system and its major assemblies.

1.2.1 Power system Physical Specifications

Dimension	7-foot Tower
Width	24.46" (62.1 cm)
Depth	21.48" (54.6 cm)
Height	84" (213.4 cm)
Weight	Contact the factory

Dimension	Rectifier
Width	8.5" (215.90 mm)
Depth	10” (254 mm)
Height	1 RU
Weight	5.1 lbs (2.3 kg)

IMPORTANT: The Power system is shipped without Rectifiers installed. Consequently, the plant is top heavy and can topple if mishandled. Refer to Section 2.4 Moving and Anchoring the Power system before attempting to move the Power system.

1.2.2 Power system Environmental Specifications

Temperature

Operating..... -25° to +70°C (-15° to +158°F)

Sustained Full Power..... -25° to +50°C (-15° to +122°F)

Storage..... -40° to +85°C (-40° to +185°F)

Shipping and Handling

Power system ..... Shipped fully assembled on a skid designed to withstand the shock and vibration normally encountered in shipping and handling

Rectifier Modules..... Encased in protective foam and shipped in individual boxes

Humidity..... 0 to 95% non-condensing

Note

When operating the Power System in an extremely low humidity environment (<10%), additional site ESD (Electrostatic Discharge) mitigation is recommended. The installation of ESD conductive floor covering or coating per ANSI EOS/ESD S7.1 and use of dissipative foot straps per ANSI EOS/ESD S9.1 whenever servicing the equipment is recommended. The use of an anti-static wrist strap per EOS/ESD S1.0 Wrist Straps is always recommended and is mandatory whenever servicing the Power System in an extremely low humidity condition.

Altitude ..... 9,800 feet (3,000m); Contact the factory for derating above specification
Heat Dissipation ..... 1070 BTU/Hr. maximum @ full load, per Rectifiers
Cooling
- Distribution ..... Convection cooling
- Rectifier Modules..... Fan forced air, front to back with built-in over temperature power limiting

Audible Noise..... 66dB for a fully loaded plant per NEBS GR-63-CORE

1.2.3 Power system Electrical Specifications

Input

AC Power Input..... See Section 1.3.8 Rectifier Specifications for voltage and current
Battery Strings..... 4 maximum
Battery String Connections..... 8 pairs of 3/8" studs (1" center-to-center) for 2-hole lugs

Output

Plant Power Output (max)..... 1200A at 48 Vdc; 1000A at 56 Vdc
Distribution
- Power system, Total..... 1200A maximum
- Individual Group, AM1 ..... 1000A maximum
- Individual Group, GJ1 ..... 1200A maximum

1.2.4 General Specifications

Battery Temperature Compensation..... Adjustable 0.1 to 6 mV/°C/cell

1.2.5 Bus Specifications

Bus Structure Amperage Rating..... Per American National Standards Institute's Telecommunications Protection Specifications (ANSI T1.311-1991) ampere tables
Charge Bus Voltage Drop ..... 0.05V maximum
Discharge Voltage Drop..... 0.25V maximum

1.2.6 EMC Specifications

Emissions:

Category	Tested To	Class
Harmonics	IEC 61000-3-2; EN61000-3-2; AS/NZS 61000-3-2	A
Conducted RF – AC Port	CISPR 22 (1997); EN55022 (1998); AS/NZS 3548 (1997)	B
Conducted RF – DC Port	CISPR 22 (1997	A
Radiated RF	CISPR 22 (1997); EN55022 (1998); AS/NZS 3548 (1997)	B

Immunity:

Category	Tested To	Criterion
Electrostatic Discharge (ESD)	IEC 61000-4-2; EN 61000-4-2 (Air 8 kV, Contact 6 kV	 A
Radiated RF	IEC 61000-4-3; EN 61000-4-3 (10V/m, 80-1000 MHz, 1 kHz 80% AM) (10V/m, 1-2 GHz, 1 kHz 80% AM)	 A
Electrical Fast Transient (EFT)	IEC 61000-4-4; EN 61000-4-4 (1 kV on AC lines) (1 kV on DC lines) (0.5 kV on signal lines – indoor)	 A A
Category	**Tested To**	**Criterion**
Surge Protection	ANSI C62.41-1991 category B3 – AC lines (Combination Wave 6 kV/3 kA; Ring Wave 6 kV/500A) IEC 61000-4-5; EN 61000-4-5: (Impulse) (6 kV/3 kA Common Mode [CM] on AC lines) (6 kV/3 kA Differential Mode [DM] on AC lines) (0.5 kV/0.25 kA CM & DM on DC lines) IEC 61000-4-12; EN 61000-4-12: (Ring Wave) (6 kV/500A, 100 kHz CM & DM on AC lines) (2 kV CM, 1 kV DM on DC lines)	 A B A A A
Conducted RF	IEC 61000-4-6; EN 61000-4-6 (3V on AC, load and comms lines)	A
Voltage Dip, Interruptions	IEC 61000-4-11; EN 61000-4-11 (Level: 100% dip for 10 ms) (Level: 30% dip for 500 ms) (Level: 100% dropout for 5s)	 B A B

1.2.7 Rectifier Specifications

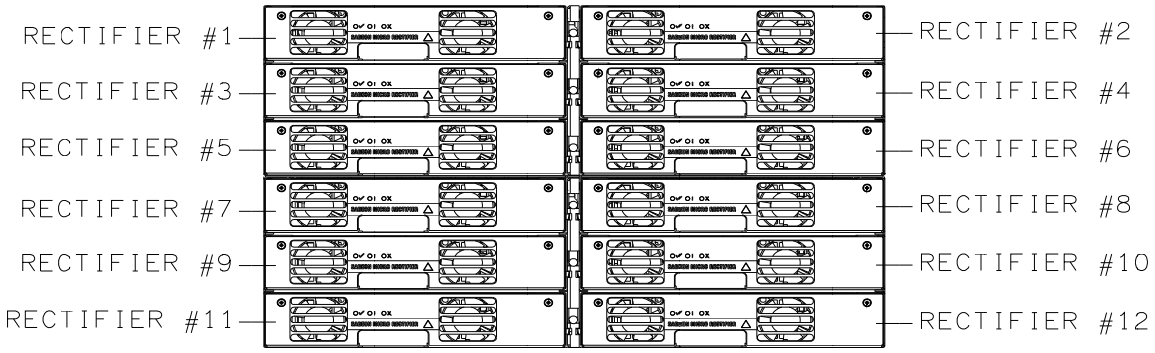


FIGURE 1-3 600A PLANT

FIGURE 1-4 1200A PLANT

Input: 48V Rectifiers

Rated Input
- Range, Nominal ..... 208-240 Vac
- Range, Tolerance ..... 185-275 Vac
- Connection ..... Single phase; Phase-to-Phase or Phase-to-Neutral
- Current ..... 13.1 @ 208 Vac; 11.3 @ 240; 16A max @ 120V or below
- Frequency..... 45-66 Hz

Extended Input (with output de-rating)
- Low ..... 85-185 Vac
- High ..... 275-285 Vac

Guaranteed Start ..... 90 Vac
Soft Start..... 8 seconds ramp-up to full load
Efficiency ..... Greater than 90% @ >50% load, 230 Vac input, 25°C (77°F)
Power Factor..... Greater than 0.98 at 50% to 100% of rated load
Protection

Internal Protective Devices	Double Fused (input)
External Protective Device	Thermal circuit breaker (input)
Fully Protected	440 Vac, indefinitely
Over-Voltage Shutdown	300 Vac
Under-Voltage Shutdown	85 Vac
Service	Hot swappable (i.e. Can be installed in or removed from an operating Sageon III Base System)

Output, 48V Rectifiers

Float Voltage	
Nominal	54.2 Vdc
Range	42-58 Vdc
Equalize Voltage	45-59.9 Vdc
Current Limit	10% to 110% of rated output
Temperature Derating	25A @ 158°F (70°C)

Output Rectifiers

Power Limit	Foldback current limiting
Static Regulation	
Line	Better than +/-0.05%
Load	Better than +/-0.05%
Dynamic Regulation	+/-2% for 10% to 90% to 10% step load change +/-1% of final value within 1 ms of step change +/-0.2% for a 25% step change in AC input voltage
Electrical Noise	<0.96 mV RMS Psophometrically weighted
Wide-Band Noise	<10 mV RMS (10 kHz-100 MHz)
Peak-to-Peak Ripple	<100 mV (10 kHz-100 MHz)
Load Sharing	<+/-5% of full scale with active current sharing from SCU
Protection	
Internal	Fuse
Over Current	Can sustain a short circuit at output terminals indefinitely
Temperature	Gradual reduction of power limit if heatsink temperature exceed preset limit

SCU programmable

Battery menu	Float and equalize voltages
Rectifier menu	Current limit, high and low voltage alarm limits, HVSD, and HVSD reset

1.2.8 Safety Specifications

The following were used as guidelines in the specifications of all components and wiring, with particular attention to safety ratings and OI-28 flammability requirements.

- Underwriters Laboratory Standards of Safety (UL 60950)
- Bellcore Network Equipment-Building System (GR-1089-CORE)

1.3 ABBREVIATIONS AND ACRONYMS

ABBREVIATION, ACRONYM OR SYMBOL	MEANING
ANSI	American National Standards Institute
AWG	American wire gauge
BATT	Battery
CEV	controlled environment vault
CM	circular mils
DIP	dual in-line package
EMC	electromagnetic compliance (or compatibility)
EMI	electromagnetic interference
ESD	electrostatic discharge
FA	fuse and breaker alarm
HVA	normally energized high voltage alarm
IEC	International Electrical Commission
IEEE	Institute of Electrical and Electronic Engineers
LED	light emitting diode
LSD	least significant digit
LVA	low voltage alarm
LVD	low voltage disconnect
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
PCB	printed circuit board
REC/RECT	Rectifier (see SMR)
RBOC	Regional Bell Operating Company
RFA	rectifier failure alarm
SBM	Sageon™ Battery Monitor
SSM	Sageon™ Site Monitor
SCU	Sageon™ Control Unit
SMR	Switch-Mode Rectifier (see REC/RECT)
UBC	Uniform Building Code
UL	Underwriters Laboratory
UPS	Uninterruptible Power System

1.4 REFERENCE PUBLICATIONS

DOCUMENT NUMBER	TITLE
ANSI C 39.1	Requirements for Electrical Analog Indicating Instruments
ANSI T1.311-1991	DC Power Systems - Telecommunications Environment Protection
ANSI/IEEE C 62.41-1980	IEEE Guide for Surge Voltages in Low-Voltage AC Power Circuits, ANSI
IEC 801-2	IEC Electromagnetic Compatibility for Industrial-Process Measurement and Control Equipment, October 1987
NEC 1993	NEC Handbook 1993, National Fire Protection Association
No Number	OI-28 Standards
No Number	Central Office Telecommunications Equipment Engineering Standards, December 1984
PUB 77350	U S West Telecommunications Equipment Installation & Removal Guidelines, May 1990
PE-7-1985	Communications Type Battery Chargers, NEMA/ANSI
STD 487-1980	IEEE Guide For The Protection of Wire-Line Communications Facilities Serving Electrical Power Stations
TR-EOP-000151	Bellcore Generic Requirements for 24-, 48-, 130-, & 140-Volt Central Office Power system Rectifiers, May 1985
TR-EOP-000154	Bellcore Generic Requirements for 24-, 48-, 130-, & 140-Volt Central Office Power system Control and Distribution, May 1985
TR-NWT-000063	Bellcore Network Equipment-Building System Generic Equipment Requirements, Issue 4, July 1991
TR-TSY-000078	Bellcore Generic Physical Design Requirements for Telecommunication Products and Equipment
UL489	UL Molded Case Circuit Breaker Enclosures, May 1984

1.4.1 Monitoring Specifications

Operator panel voltage and current ..... 2-line digital display
Operator panel accuracy
- Voltage accuracy..... 0.50% +/- least significant digit
- Current accuracy 1%

System status ..... Green, yellow, and red LEDs
Local Communications..... USB (SageView required)
Remote Communications ..... Ethernet/SNMP

1.4.2 Alarm Specifications

Each of following alarms is annunciated by a lighted LED on the operator panel and by a relay state change. Relay contact output terminals are on the alarm PCB in the distribution.

A. User Alarm Annunciation
Five user programmable relays. One form C contacts rated 1A resistive @ 24Vdc, 0.5A resistive @ 48Vdc.

B. Rectifier Front Panel
Three status LEDs (Green, Amber, and Red) are located on the Rectifier front panel.

C. Battery Current Temperature
Battery Temperature Sensor Input..... Compensation and alarm annunciation, 1ambient, 1-4 battery
Battery Current Transducer Input..... 1-4 battery strings; accuracy 1%

User connections ..... No. 6 screw terminals; lugless compression type

D. Sageon Battery Monitor

Battery strings	4 maximum
Battery voltage	75V maximum
Cells (single cell or monoblock)	24 maximum per SBM board
Cell voltage	2V, 4V, 6V or 12V (maximum input 3.33V, 6.66V, 10V, and 20V respectively)
Accuracy	+/-10mV at 0°C to 40°C
Resolution	5mV per cell (2V, 4V, and 6V ranges) 10mV per cell (12V range)
Sampling interval	1-60 minutes
SBM boards	4 maximum
Interconnection	16-conductor ribbon cable; 30 feet (10m) maximum length

E. Site Monitor

Analog inputs	8
Signal range	0-5V
Input protection	Over-voltage and reverse polarity
Signal scaling and alarm levels	Scale factor and low and high alarm thresholds are user programmable at operator panel
Digital inputs	12
Signal source	Voltage free contacts
Logic of digital input	User defined from operator panel
Control outputs	4
Output signal source	Voltage free form C relay contact; 1A @ 30 Vdc

1.5 PRODUCT SUPPORT

Product support can be obtained using the following addresses and telephone numbers.

UNIPOWER, LLC
65 Industrial Park Road, Dunlap, TN 37327

Customer Service, Voice: (800) 440-3504
Customer Service, Fax: (423) 949-3647
Field Service: (800) 299-3907
Web site –
http://www.unipowerco.com

When contacting UNIPOWER, please be prepared to provide:

1. The Power system part number and serial number - see the equipment nameplate
2. Your company's name and address
3. Your name and title
4. The reason for the contact
5. If there is a problem with Power system operation:
    - Is the problem intermittent or continuous?
    - What actions were being performed prior to the appearance of the problem?
    - What actions have been taken since the problem occurred?

2.0 INSTALLATION

This chapter describes installing a Sageon™ III Power system. If questions or problems arise during installation, please refer to Section 1.6 Product Support and contact a UNIPOWER Field Service technician for assistance.

The Power system is factory assembled and tested. GJ1 circuit breakers specified on the order are factory installed. AM1 circuit breakers specified on the order are shipped in protective packaging for on-site installation. Rectifiers specified on the order are shipped in separate, protective packages for on-site installation.

The Power system is designed for top-entry of distribution and battery cabling. AC input cabling can enter the plant through any lower side/rear panels or through the bottom of the plant when the plant is located on an elevated floor. All cabling is user-supplied.

WARNING

Electrical shock hazard

Hazardous voltage can cause death or serious injury.

Remove power from all wires and terminals before working on equipment.

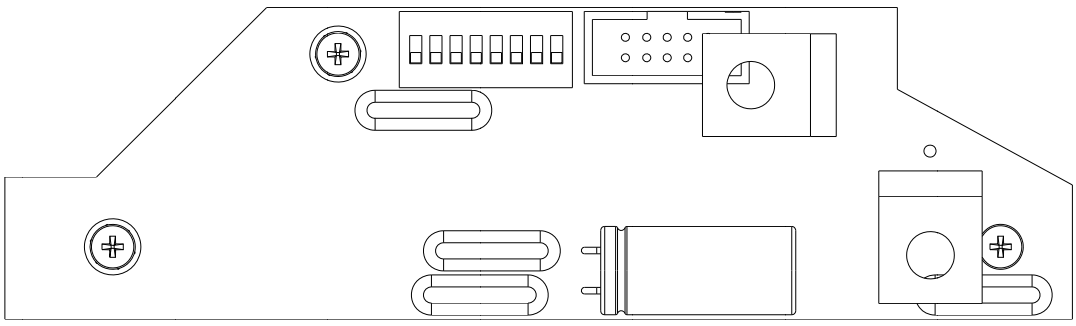
IMPORTANT: All wiring must meet the National Electrical Code and other applicable industry and local codes.

The Breaker/Fuse Layout label on the inside of the door to the distribution area lists all distribution positions. The label provides space for you to write breaker/fuse current rating and part number. Label entries should be completed before beginning the installation to help ensure that the correct breaker/fuse is inserted in each position.

Rectifier Position Address

Each rectifier position is factory-assigned a unique, sequential address within the Sageon III Base System. The System operator uses this address when configuring and operating the System to identify and access a specific Rectifier. The AC Backplane board at each rectifier position has one DIP switch on which the address is set. See the illustration below.

IMPORTANT: Do not change the factory-set switches. If inadvertently changed, go to Section 6.6 for a procedure to set the switches to the proper address.



Opening the Distribution Area Door

During installation, it will be necessary to open the distribution area door to install load supply and return cables, battery cables, and alarm wires. Lift the paddle surrounding the key lock, rotate it 90 degrees, and open the door. Keys are tied just inside the door.

2.1 INSTALLATION SUMMARY

A typical installation sequence is provided below. References to appropriate sections in this manual are included.

1. Review the list of user-supplied tools and accessories in Section 2.2.
2. Select a location for the Power system. See Section 2.3.
3. Select battery, AC input, and distribution wire sizes based on current and length of run. See Section 2.2.
4. Move the Power system and accompanying assemblies to the selected location. Anchor the Power system to the floor. See Section 2.4.
5. Install AC input wiring between the user's AC electrical service panel and the Power system. See Section 2.5.
6. Connect the AC input wiring to AC terminals in bottom section. See Section 2.5.4.
7. Install battery cabling. See Section 2.6.
8. Route and connect supply and return cabling to customer's loads. See Section 2.7.
9. Connect external alarm annunciators. See Section 2.8.
10. Input/Connect options: Battery Temperature Sensors, Battery Current Transducers, Sageon Battery Monitor, Site Monitor, and communications (SNMP). See Sections 2.9 through 2.13.
11. Install Rectifiers. See Section 2.14.
12. Commission the plant. See Chapter 3 Commissioning and Chapter 4 Configuration and Operation.

2.2 REFERENCE MATERIAL

This section contains lists, tables, and methods that are referenced in subsequent procedures. Three subsections comprise the Reference Material section.

- Tools and Accessories – Read the included list for a preview of the user-supplied items that will be referenced during the installation and servicing procedures.
- Selecting and Sizing DC Power Cables – Proper cable sizing is critical to system performance. This section provides a formula and table that simplify cable selection.
- Torque Specifications – The torque specification table in this subsection is referenced in procedures that include hardware.

2.2.1 Tools And Accessories

To install the Sageon III Base System, the following user-supplied items should be available.

- Equipment to move Power system to installation site
- Floor anchors to secure the Power system
- Conduit and/or overhead wire racks for cabling
- Standard insulated installation tools (e.g. hand tools, socket set, cable cutters, cable insulation strippers)

- Torque wrench to ensure correct tightening of hardware; see Table 2-2 for torque specifications
- Electrical service panel circuit breakers
- Digital Voltmeter with: 4-1/2 digit display
- Cables and lugs; appropriate crimping tools:

  AM1 Circuit Breaker Distribution uses Two-hole lugs for 1/4" threaded studs (5/8" center-to-center) and GJ1 Circuit Breaker Distribution uses Single hole lugs for 3/8" bolt.

  Return bus uses Two-hole lugs for 1/4" threaded studs (5/8" a center-to-center) and two-hole lugs for 3/8" threaded studs (1" center-to-center).

  Battery Charge and Discharge Buses use Two-hole lugs for 3/8" threaded studs (1" center-to-center).
- Conduit, conduit connectors, and conduit bending tools
- Anti-Static Service Kit with static dissipative mat and wrist strap for handling electronic circuit boards (e.g. Interface Board) (available from electronic supply sources)

2.2.2 Selecting and Sizing DC Power Cables

Protective circuits, overall system performance, and safety depend on the proper sizing of DC cables for current and acceptable DC voltage drop. The minimum size allowable is the larger of the wire size per the National Electrical Code or the calculated wire size.

Use the following method to determine the wire size.

1. Calculate the minimum area in circular mils (CM) required for copper wire using the following formula:

$$CM = \frac{22.2 \times I \times L}{V}$$

where:
CM = minimum area of circular mils in the cable
I = maximum current (in amps)
L = one-way cable length (in feet)
V = allowable loop voltage drop (in volts)

Example: Assume a maximum output current of 100 amperes, an allowable loop voltage drop of 0.25 volts, and a distance of 50 feet between the Power system and the load.

I = 100 amperes
L = 50 feet
V = 0.25 volts

$$CM = \frac{(22.2)(100)(50)}{(0.25)}$$

CM = 440,000 circular mils

2. After calculating the minimum area in circular mils, select the proper copper wire size from Table 2-1; always choosing the next larger wire size if the area rating falls between values. For the above example, select 500 MCM wire.

3. Determine the minimum wire size for ampacity according to the code authority having jurisdiction in your location.
4. Select the larger of the sizes calculated for voltage drop or ampacity.

TABLE 2-1 WIRE SIZING

SIZE AWG NO.	AREA IN CM	CURRENT CARRYING CAPACITY*		DIA BARE COND INCHES	RHW DIA OVER INS INCHES	RHW BEND RADIUS INCHES
		OPEN AIR	ENCLOSED			
14	4,110	15	15	0.064	0.19	0.95
12	6,530	20	20	0.081	0.21	1.05
10	10,380	30	30	0.102	0.24	1.20
8	16,510	45	45	0.146	0.31	1.55
6	26,250	70	65	0.184	0.40	2.00
4	41,740	100	85	0.232	0.45	2.25
2	66,370	135	115	0.292	0.51	2.55
1/0	105,500	185	150	0.373	0.63	3.15
2/0	133,100	210	175	0.418	0.68	3.40
4/0	211,600	300	230	0.528	0.78	3.90
350 MCM	350,000	425	310	0.681	0.98	4.90
500 MCM	500,000	525	380	0.814	1.12	5.60
750 MCM	750,000	660	475	0.998	1.34	6.70

* Data based on NEC Handbook 2011, Table 310-17 adjusted for 50°C (122°F) ambient temperature.

2.2.3 Torque Specifications

Proper plant performance requires that the hardware employed during installation be tightened securely but not over tightened. Use a torque wrench to ensure that hardware is tightened to the specification provided in Table 2-2.

TABLE 2-2 TORQUE SPECIFICATIONS, STEEL FASTENERS

Bolt Size	Inch/Pounds	Foot/Pounds	Newton-Meters
4-40	4.5	0.375	0.51
4-48	5.4	0.450	0.61
6-32	9.0	0.750	1.02
6-40	10.8	0.900	1.22
8-32	17.1	1.425	1.93
8-36	18.0	1.500	2.03
10-24	24.3	0.025	2.75
10-32	27.9	2.325	3.15
1/4-20	59.4	4.950	6.71
1/4-28	70.2	5.850	7.93
5/16-18	118.8	9.9	13.42
5/16-24	129.6	10.8	14.64
3/8-16	216.0	18.0	24.40
3/8-24	248.4	20.7	28.07
7/16-14	324.0	27.0	36.61
7/16-20	378.0	31.5	42.71
1/2-13	540.0	45.0	61.01
1/2-20	594.0	49.5	67.11
9/16-12	756.0	63.0	85.42
9/16-18	864.0	72.0	98.62

2.3 SELECTING A LOCATION

Install the Power system in a location that provides the following.

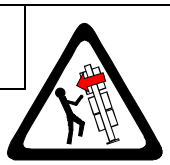
- Access to a source of reliable, stable, electrically clean AC power
- A dry, well ventilated room that meets the conditions stated in Section 1.2.2 Power system Environmental Specifications
- Sufficient access for plant installation and servicing (refer to NEC and local codes)
- Sufficient ceiling height to permit use of overhead cable trays and conduit for AC input cables and DC load supply and return cables
- A level, flat floor capable of supporting the weight of the Power system and accepting bolts or other user-supplied hardware to securely anchor the plant
- A pest and varmint free area

2.4 MOVING AND ANCHORING THE POWER SYSTEM

The Power system is heavy (up to 1,000 lbs (453 kg)) and it is top heavy. An improperly handled Power system can topple. Proper handling equipment is required to transport the plant. The unit dimensions are given in Figure 2-1. Figure 2-2 shows the Power system base and the floor mounting hole pattern.

Floor Mounting: The Power system must be permanently anchored. Install one anchor in each floor corner. Mounting slots are provided in each corner to allow for ease of anchoring. Mark and drill holes where shown in Figure 2-2. UNIPOWER offers several seismic zone hardware kits.

WARNING

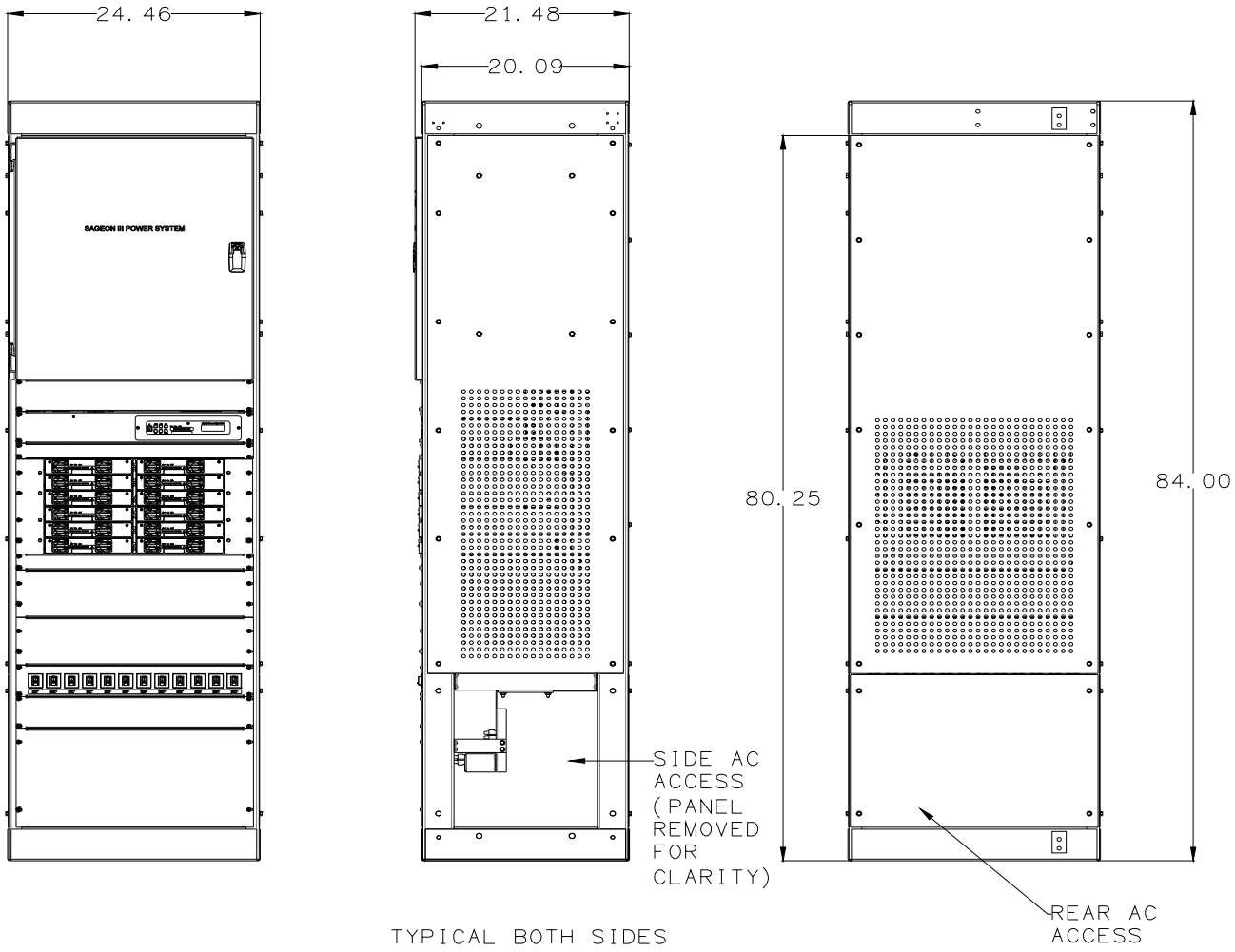


Tip Over/Crush Hazard

Power system tip over can cause death or serious injury.

Keep the Power system vertical.

Power system is heavy and also top heavy. Use a forklift or other equipment to move or transport the Power system.



Caution: Do not block rear panel grille. A blocked grille will limit the flow of cooling air and can result in equipment overheating and failure. Minimum clearance behind and to the sides of the plant must be 2" (5 cm).

FIGURE 2-1 POWER SYSTEM DIMENSIONS

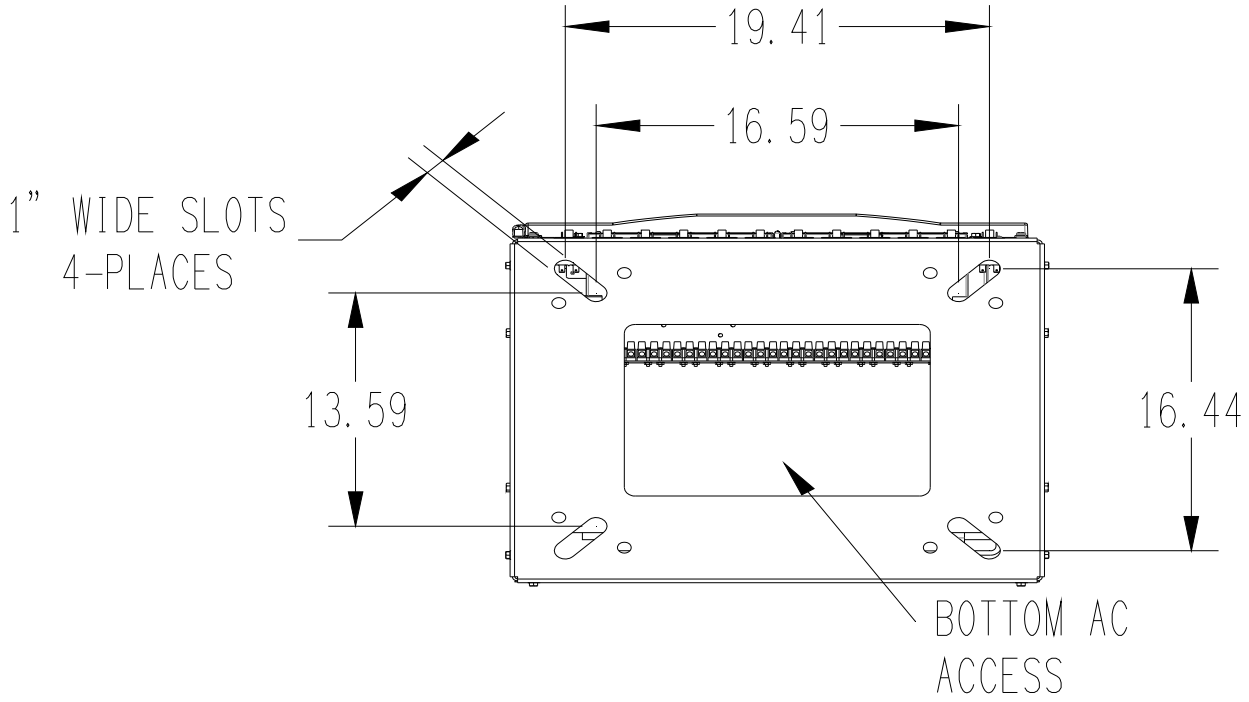


FIGURE 2-2 PLANT BASE

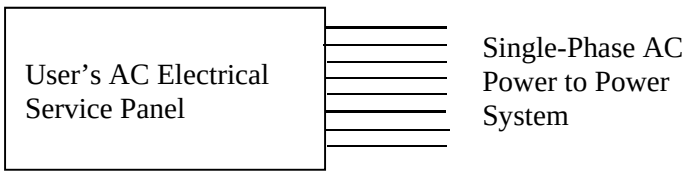
Caution: Do not block rear panel grille. A blocked grille will limit the flow of cooling air and can result in equipment overheating and failure. Minimum clearance behind the Plant is 2" (5 cm).

To move and mechanically secure the Power system:

1. Prepare the installation site. Install floor anchors (see Figure 2-2 for mounting pattern) as needed.
2. Carefully transport the Power system to the installation site. If possible, protective wrapping should remain in place until the move is completed.
   - Since the plant is shipped bolted to a skid, a forklift is typically used for transport to the installation site.
   - A lift point is provided in each rack corner, near the top, for an overhead crane or other lifting equipment.
   - Be careful not to bend or otherwise damage the side and rear panels.
   - Be careful not to mar or otherwise damage the front bezels.
3. Set the Power system in place.
4. Securely fasten the Power system to the floor.

2.5 CONNECTING AC POWER TO THE POWER SYSTEM

Connect single-phase power, through a circuit breaker, to each input in plant. See Section 1.2.7 Rectifier Specifications for voltage and current requirements. See section 3.4 for more on connections.



A ground is required with the AC power connections for safety and for limiting EMI/RFI emissions.

Plant Rack:

Ground the Power system rack to the site's central frame ground applicable in accordance with codes and the customer's standard practice. Unthreaded holes for bolting an earth/safety ground wire to the rack are provided in the top and bottom, both on rear. Remove the paint from a small area (e.g. 1.5 in/3.8 cm diameter) around the selected holes and through-bolt the ground wire lug to the rack.

Return Bus:

Connect the plant return bus to the site's central office ground. Select a cable size applicable in accordance with codes and the customer's standard practice. The minimum cable size must be capable of carrying the fault current from any installed device. Since this is typically a high current connection, secure the wire lug to a 3/8" stud on the return bus (battery) or bolt the wire lug to 3/8" through hole on the return bus (loads). The return buses within the plant are electrically connected. See Figure 2-3 for bus locations.

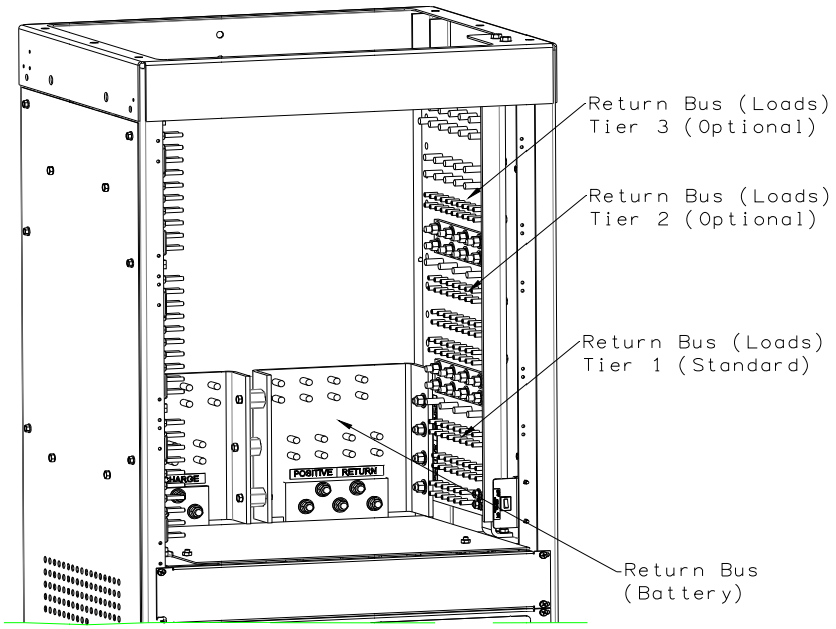


FIGURE 2-3 RETURN BUS LOCATIONS

2.5.1 Lightning and Transient Suppression

Rectifiers contain basic transient suppression in the form of Metal Oxide Varistors (MOVs). MOVs are installed from L1 to L2, L1 to earth, and L2 to earth. They are sized to provide protection from line transients in an industrial environment according to ANSI C62.41-1991 for Class B3 equipment and IEC 61000-4-5.

Supplementary transient protection is needed in a more severe environment with, for example, a high incidence of lightning strikes (indirect or direct) and/or severe switching transients beyond the levels indicated in the above standards. Install higher rated suppression devices to the AC electrical service where appropriate.

2.5.2 User's AC Electrical Service Panel

The AC electrical service panel and wiring from the service panel to the Power system is supplied by the user.

1. Electrical shock hazard – Remove power from all involved wires and terminals before proceeding.
2. Determine the number of AC breaker positions needed. Allow one breaker position for each Rectifier to be installed in the Power system. Alternatively, up to two Rectifiers can be fed from one breaker provided the breaker and wiring meet local and national electrical code requirements. Power system terminals will accept 6-12 AWG (13.6-3.3 mm^2).
3. Run the needed quantity of AC power cables from the service panel to the Power system.

   Label each breaker position and both ends of each AC power cable with the Power system number and rectifier position address to which it will be connected (e.g. P1R1 = Power system 1, Rectifier position address 1). Rectifier positions are numbered from top to bottom as shown below.

Rectifier Section

Rectifier 1	Rectifier 2
Rectifier 3	Rectifier 4
↓	↓
↓	↓
Rectifier "n-1"	Rectifier "n"

4. At each breaker position in the AC panel, install a delayed-trip circuit breaker for each cable. Refer to Table 2-3 for breaker recommendation.
5. Ensure that all circuit breakers are in the Off position.
6. Connect the power cables to the service panel.

TABLE 2-3 CIRCUIT BREAKER SELECTION, AC POWER

Rectifiers Powered	Breaker Rating
1	20A
2	40A

2.5.3 AC Cabling

This section describes connecting the AC input cables within the Power system. An AC input cable can enter the plant several ways:

- Through either the lower section side panel or lower rear panel of the cabinet.
- Upward through the open base of the rack.

For each ordered Rectifier, connect an AC input cable to the AC termination block located in the lower section of the unit.

IMPORTANT: Do not change the factory-set rectifier position address. The address is set on the AC Backplane board.

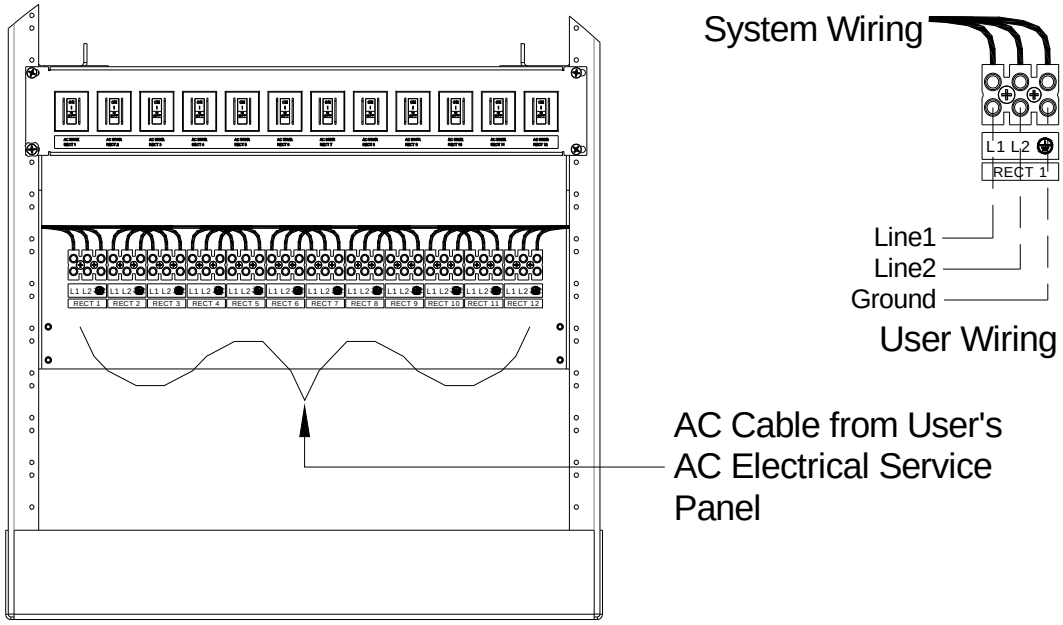


FIGURE 2-4 AC INPUT CABLING WITH RECTIFIER ON/OFF OPTION

2.6 CONNECTING BATTERY CABLES

Routing the stiff, heavy gauge battery cables is difficult. Two people may be needed. Exercise **extreme caution** to avoid a short circuit across the battery terminals.

WARNING

Arcing hazard

Arcing can cause equipment damage, load interruptions, and personal injury.

Remove watch and jewelry. Use insulated tools and extreme caution when working with a battery string.

Carefully insulate unterminated battery cable ends.

At the Power system, battery cables connect to the battery charge bus and return bus. Three battery charge and battery return bus options are available to facilitate 2-hole lug wiring: 3/8 inch diameter studs on 1 inch centers for a single tier, 3/8 inch diameter studs on 1.75 inch centers for a single tier and 3/8 inch diameter studs on 1.75 inch centers for three tiers.

Installing the Battery Cables:

This procedure includes the installation of up to four optional battery current transducers. Transducer mounting and wiring information is found in Section 2.10. Ignore references to transducers in the following procedure if not part of your installation.

If the installation includes a battery disconnect switch, modify the procedure accordingly.

1. Determine the correct battery cable size and shortest cable run. See Section 2.2.2 Selecting and Sizing DC Power Cables. The top of the distribution section is open for easy access when routing battery cables between

the battery string and the Power system battery charge bus and return bus. See Figure 2-5 for the location of the battery charge bus and battery return bus within the plant.

2. Mount the optional battery current transducer(s) and connect the transducer cable(s) between the transducer and the Power system as indicated in Section 2.10. Be sure that a transducer's battery cable opening is large enough for the selected cable diameter and the number of cables.

3. Run cables between the plant and battery string 1. Route either battery cable (+ or -) through the optional battery current transducer; all battery cables routed through a transducer must be the same polarity. Transducers are marked, typically with an arrow, to indicate current direction. (See section 2.10)

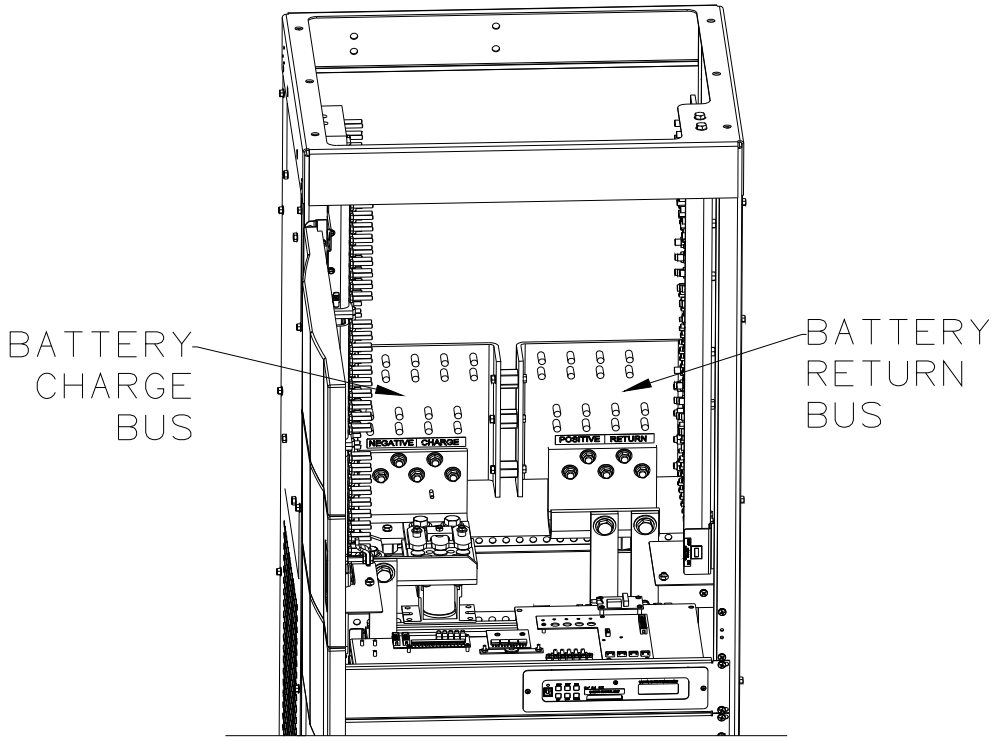


FIGURE 2-5 BATTERY CHARGE BUS AND BATTERY RETURN BUS LOCATIONS

4. At the Power system, install appropriate lugs on cables.

CAUTION

   a) Secure the negative cable to the battery charge bus.

   b) Secure the positive cable to the battery return bus.

NOTE: See table 2-2 for torque specifications.

5. At the battery string, appropriate battery lugs/terminals/clamps. Confirm polarity and connect the wires to the battery string terminals.

6. Repeat the above steps for each battery string to be connected.

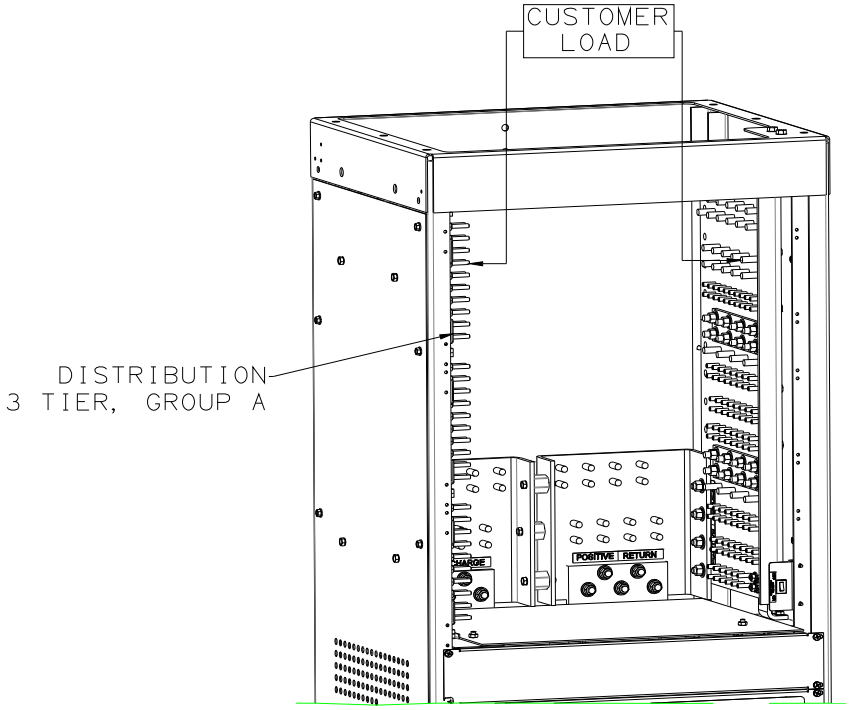
2.7 CONNECTING CUSTOMER LOADS

Supply and return cables are connected between customer loads and Power system distribution. Interconnecting cables and lugs are supplied by the user. Refer to Section 2.2.1 Tools and Accessories for lug requirements. Refer to Section 2.2.2 Selecting and Sizing DC Power Cables for cable sizing.

Note: To field install additional distribution refer to Chapter 7 Distribution Option Kit Installation. To field install additional fuses or circuit breakers in the present distribution refer to Chapter 8 Circuit Breaker and Fuse Kit Installation.

Route supply and return cables from the Power system to the loads in overhead racks or cable trays. The plant cables drop from the overhead racks through the open top of the plant.

Connect the return cables to the return bus (loads), the vertical bus to the right side of the distribution area. Connect the supply cables to either a distribution assembly (for AM1 type breakers) or a GJ1 type breaker output terminal. A typical load connection is shown in Figure 2-6.



Note: Other tiers and groups are cabled similarly. Connect all load returns to the return bus.

FIGURE 2-6 LOAD SUPPLY AND RETURN CABLING

Distribution is organized by Tier (1-3), Group (A & B) and position (1-10). See Figure 2-7. The Breaker/Fuse Layout label on the rear of the distribution area door is for recording breaker/fuse current rating and part number.

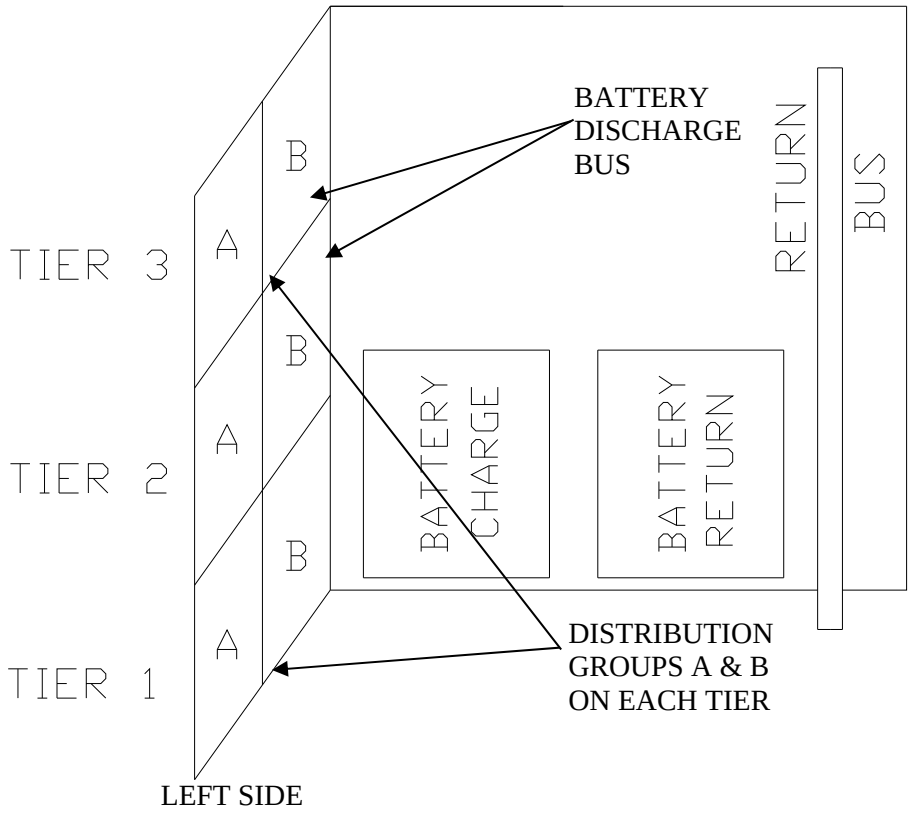


FIGURE 2-7 DISTRIBUTION GROUP IDENTITIES AND LOCATIONS

Distribution Group Orientation:

Orientation of a group determines the routing of the supply cables. Figure 2-8 shows the orientation of AM1 distribution assemblies, using their output studs (circled) as points of reference. Groups A & B are always oriented as shown.

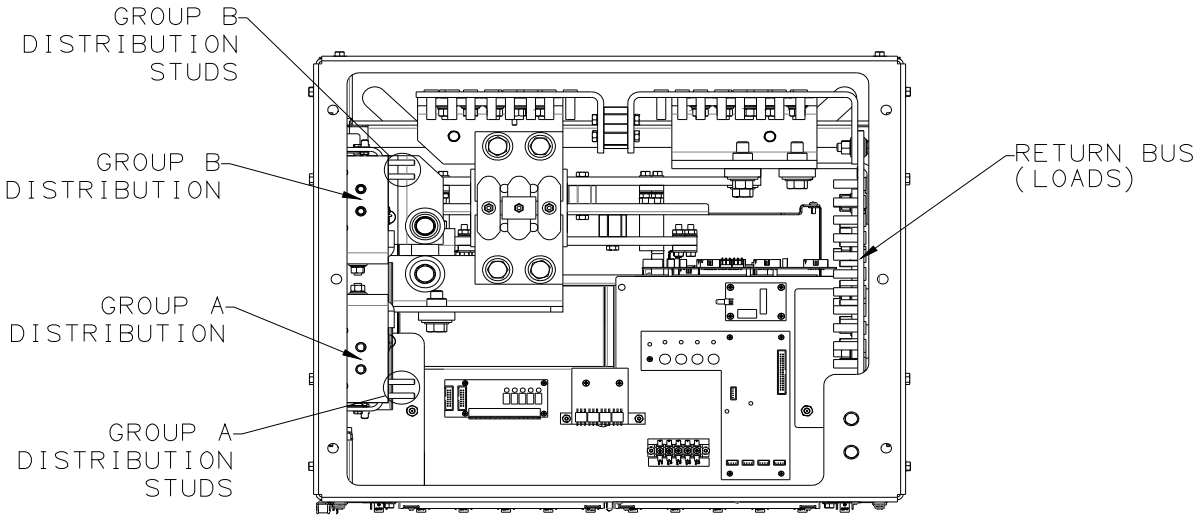


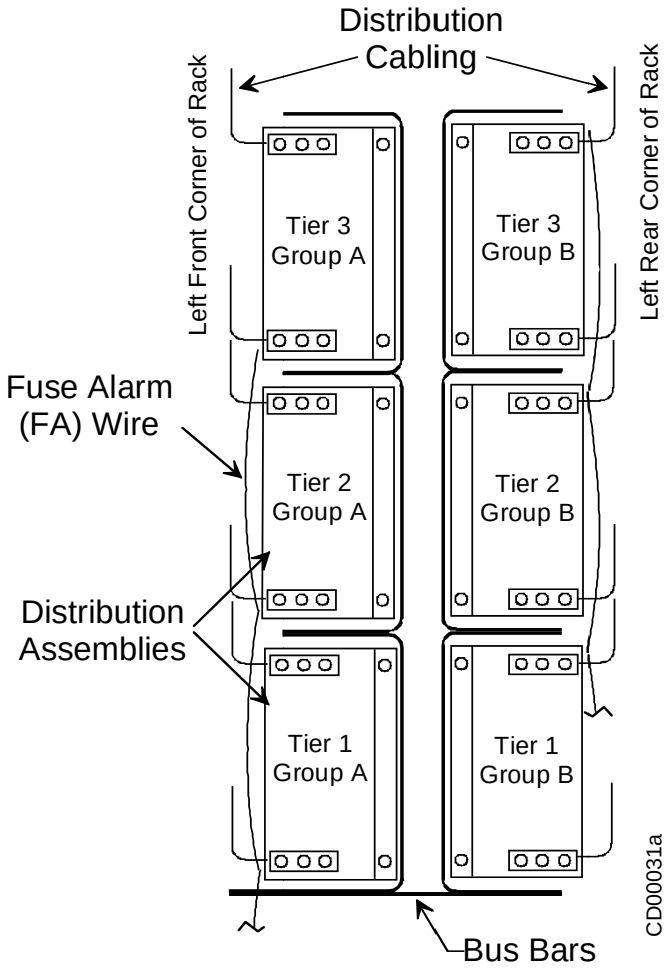
FIGURE 2-8 DISTRIBUTION AREA, TOP VIEW, AM1 TYPE BREAKER DIST. SHOWN

2.7.1 Load Return Cables

Terminate all load return cables at the return bus (loads) shown in Figure 2-6. This bus is located on the right of the distribution area and consists of up to three vertically mounted plates. The plates have pairs of 1/4" and 3/8" threaded studs for 2-hole lugging. Use the 1/4" studs for lower current loads protected with AM1 type breakers. The 3/8" studs are for higher current loads protected by GJ1 type breakers.

2.7.2 Load Supply Cables, AM1 Type Breaker Distribution

Connect customer load supply cabling in order by Tier, Group, and position number as shown on the Breaker/Fuse Layout label on the inside of the distribution area door. Cables are routed toward the nearest rack corner and then upward, as shown in Figure 2-9.



Distribution, Rack Left Side

FIGURE 2-9 DISTRIBUTION CABLE ROUTING

1. Select a starting point, Tier 1, Group A Position 1 is recommended. Use appropriate lugs on the load supply and return cables.
2. Dress the cable as shown in Figure 2-9, toward the front or rear of the rack according to the orientation of the distribution assembly. Dress the cable away from rack assembly hardware to avoid possible chafing of the cable insulation.

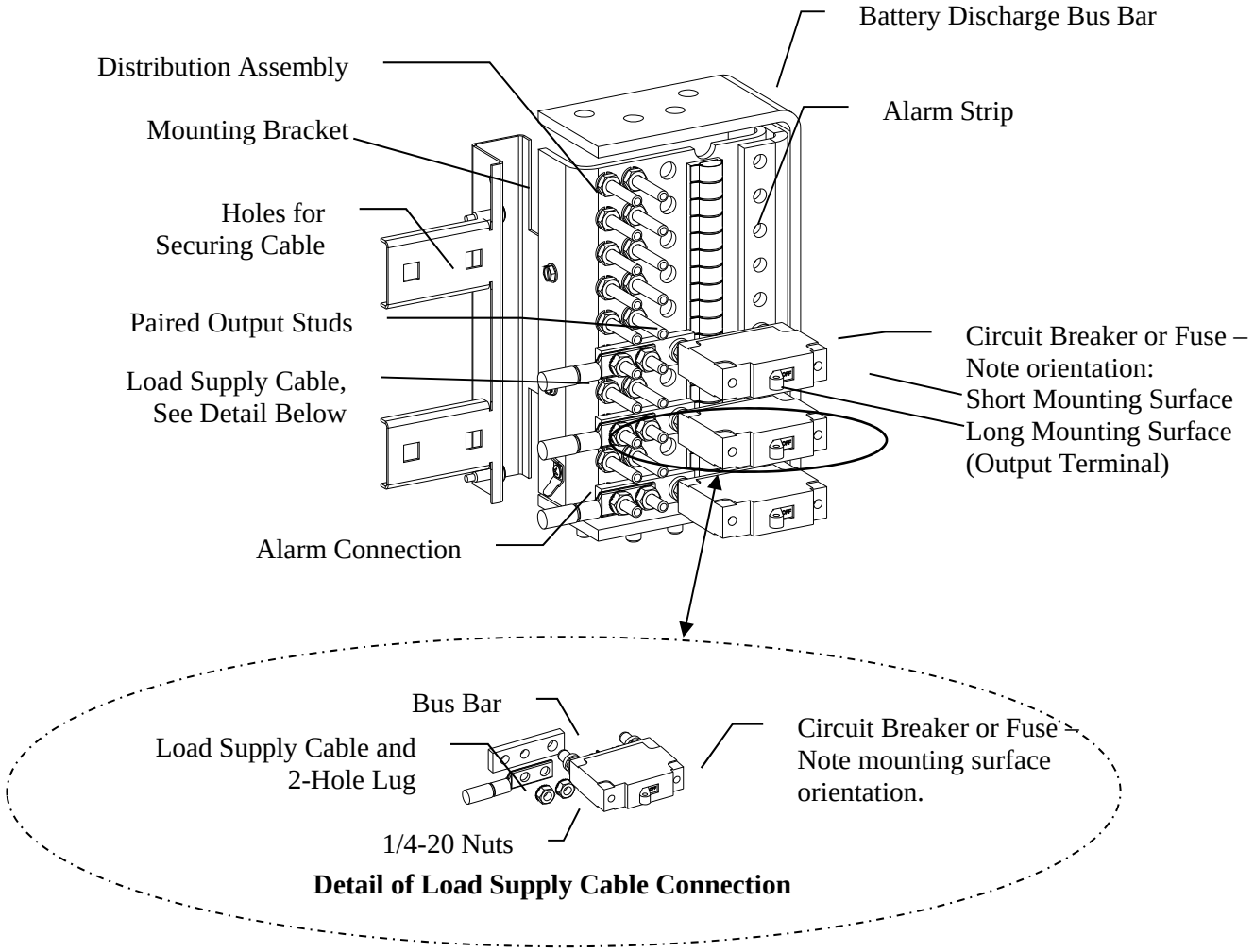


FIGURE 2-10 AM1 TYPE DISTRIBUTION LUGGING

3. Move to Group A, Position 2 and repeat the above steps. Repeat the steps until all positions in Tier 1, Group A are cabled.
4. Move to Tier 1, Group B, and cable the positions.
5. Perform the above steps for Tiers 2 and 3.
6. Bundle and secure cables as follows. Two cable-securing tabs are provided in each distribution assembly mounting bracket. See Figures 2-10 and 7-2 for cable securing locations

   1) All Group A – Bundle cabling from all tiers at the left front of the rack.

   2) All Group B – Bundle cabling from all tiers at the left rear of the rack.

2.7.3 Load Supply Cables, GJ1 Type Breaker Distribution

When ordered, GJ1 type distribution assemblies are always the upper-most distribution assemblies in a plant since no more distribution can be installed above a GJ1 type assembly. Cable routing and connection are shown in Figure 2-12. Connect the top breaker terminals to user loads. The bottom breaker terminals are bolted to the battery discharge bus at the factory.

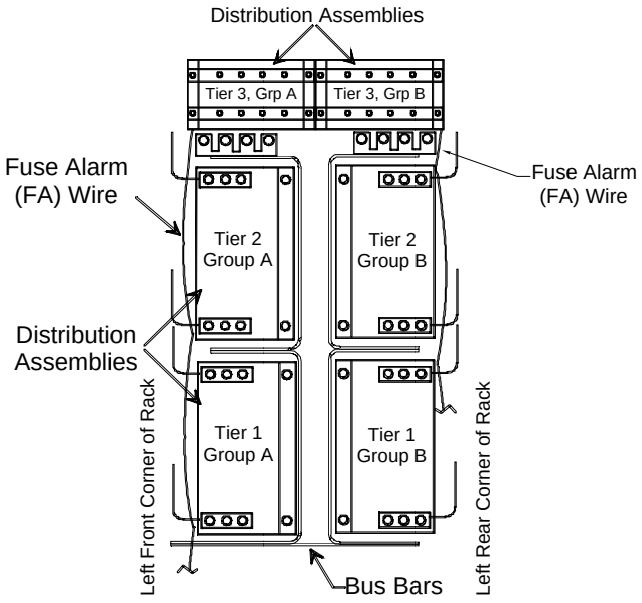


FIGURE 2-11 GJ1 TYPE BREAKER DISTRIBUTION ASSEMBLIES, TYPICAL

1. Select a starting point, the lowest Group letter, Position 1 is recommended.
2. For the load supply cable end, use a single-hole lug for a 3/8" bolt. See Figure 2-12.
3. Bolt the supply cable end to the breaker terminal using 3/8" hardware per figure 2-12.
4. Repeat the above steps for each GJ1 type breaker in the Group
5. F

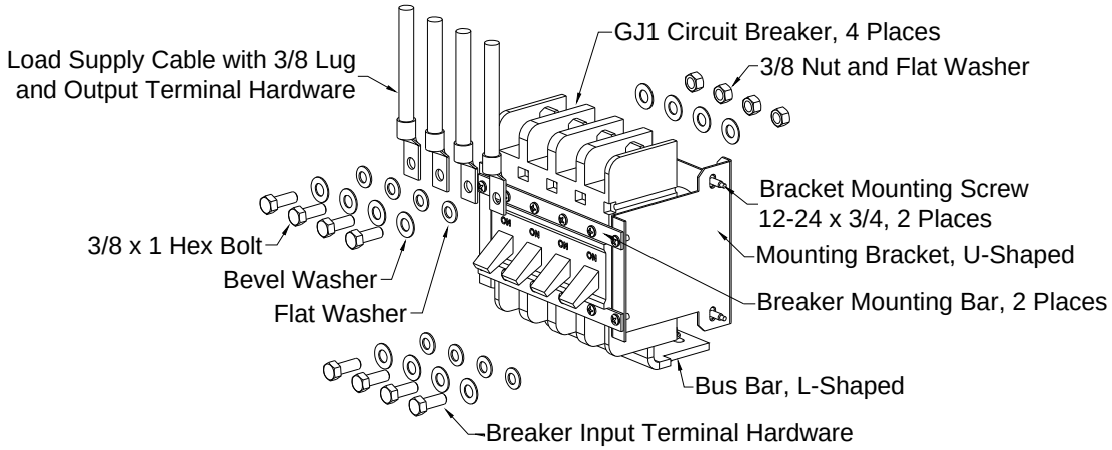


FIGURE 2-12 GJ1 TYPE BREAKER DISTRIBUTION WIRING

2.8 CONNECTING EXTERNAL ALARM ANNUNCIATORS

Five form C relay contact outputs are available for connection to external, user-supplied alarm annunciators. Figure 2-13 shows the Interface Board and the row of connectors (X6) provided for these connections. Review the alarm and relay contact specifications in Section 1.2.11 Alarm Specifications to ensure compatibility with external annunciators and other equipment before proceeding. Alarm relay outputs are provided for remote annunciation of fault conditions. All relays are user programmable through the SageView software.

As shown in Figure 2-13, each relay has three connections: common, normally open, and normally closed. The normally open (NO) and normally closed (NC) labels are for an <u>un-powered</u> Sageon III Base System. Relay coils are energized during normal Sageon III Base System operation. During an alarm, the appropriate relay coil is de-energized.

IMPORTANT: When the relay contacts are connected to a reactive load, such as a solenoid or relay coil, the load must be shunted by a transient suppression device to prevent damaging relay contacts.

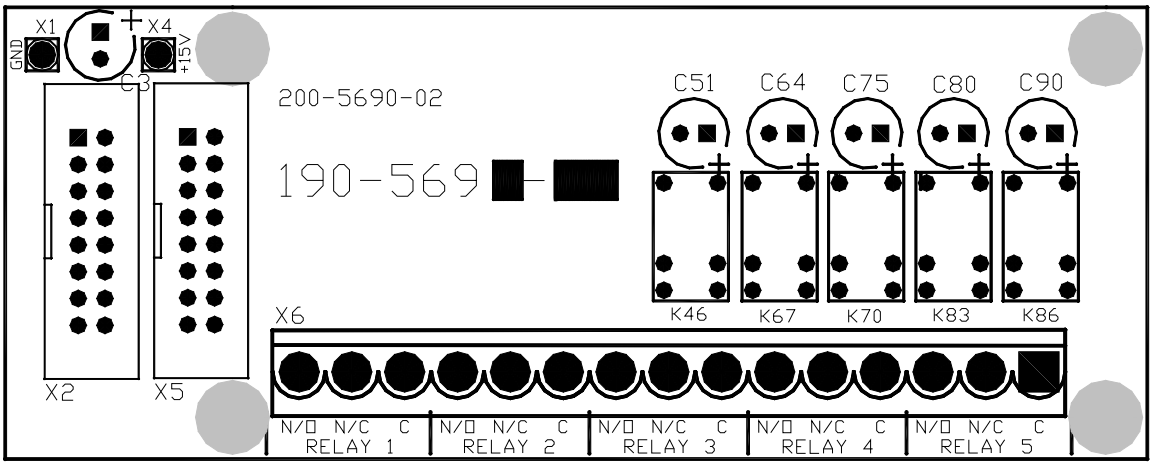


FIGURE 2-13 INTERFACE BOARD, CUSTOMER ALARM CONNECTIONS

2.9 BATTERY TEMPERATURE SENSORS AND KITS (OPTION)

The Multiple Battery Temperature Board is optional in the Sageon III distribution. It can accommodate up to four battery temperature sensors. Temperature sensors are ordered separately. If ordered with the system, the sensors are connected to the Multiple Battery Temp Board and the sensors and wires then coiled and tied to the return bus.

If not ordered with the Sageon III Base System, an Ambient and one (1) Battery Temperature Sensor can be ordered separately.

Installing the Sensors:

Open the distribution door and locate the Multiple Battery Temperature Board. Locate the coiled sensors.

1. If not already connected, plug the battery temperature sensor connectors and the ambient temperature sensor into the Controller backplane board. See Table 2-4 for the connectors. The connectors are keyed.

TABLE 2-4 BATTERY TEMPERATURE SENSOR CONNECTIONS

Sensor	Connector
Battery String 1 Temperature	X1 in Figure 2-19
Battery String 2 Temperature	X2 in Figure 2-19
Battery String 3 Temperature	X3 in Figure 2-19
Battery String 4 Temperature	X4 in Figure 2-19
Ambient Temperature	X3 in Figure 2-18

2. Select a location for mounting the ambient temperature sensor ring lug. The temperature of this mass should have a fairly long thermal time constant (e.g. temperature should not cycle with short-term temperature changes due to normal environmental heating and cooling cycles). Typically this could be a nearby equipment rack the Sageon III system is mounted adjacent to.
3. Fasten the ambient temperature sensor to the selected point using appropriate user-supply hardware.
4. Route the 4 battery temperature sensors to the battery string(s). Typically somewhere close to the string midpoint.
5. Determine which battery posts will have sensors attached. Suggested location is shown in the battery string drawing, figure 2-14.

   Note: The highest of the four battery temperature readings is used for compensation. Locate a sensor at the warmest battery, generally one at the center of a battery group.
6. Determine the charge/discharge status of the battery string. Connecting the sensors may result in a momentary battery string open circuit when the terminal bolt is removed.

   CAUTION: DO NOT proceed if the battery string is being charged or discharged at a high rate. Continue only when the charge or discharge rate is at a safe level.
7. Remove the bolt holding the inter-cell battery strap in place. Insert the bolt through the battery temperature sensor ring lug, through the strap, and into the battery terminal. Tighten the bolt as recommended by the battery manufacturer.
8. Repeat steps 6 and 7 to install the remaining battery temperature sensors.
9. Bundle and secure excess wiring.
10. Enable compensation using the operator panel push buttons and menus or a PC running SageView.
11. If installing the Sensor Kit, get the compensation chart label. Remove the backing from the label and place the label on the inside of the distribution area door.

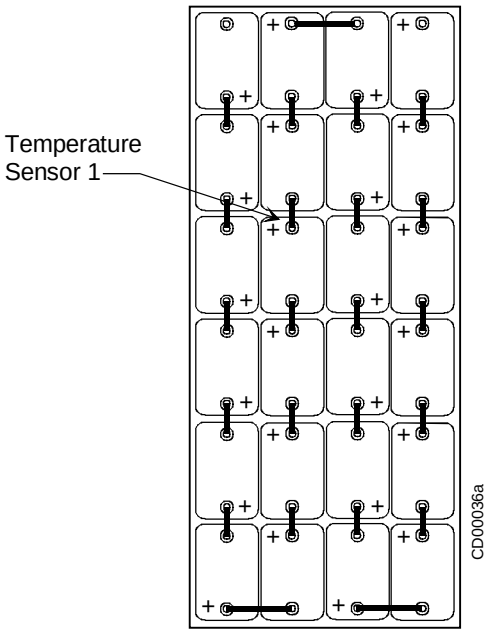


FIGURE 2-14 TEMPERATURE SENSOR LOCATION

2.10 INSTALLING A BATTERY CURRENT TRANSDUCER (OPTION)

The optional battery current transducer senses the battery current for display on the operator panel. When installed, the battery current transducer also allows the user to configure the SCU to limit the recharge current to the battery string in order to extend battery life; and set a fixed, repeatable discharge current for battery discharge tests.

Install one battery current transducer per battery string (up to four transducers). If not ordered with the Sageon III Base System, a Battery Current Transducer Kit is available.

To install a transducer kit:

1 Mount the transducer(s) with user-supplied hardware. Figure 2-15 shows a typical transducer. Often, transducers are mounted on the battery rack. The location must allow for convenient routing of one or more battery cables, or intercell connectors, through each of the transducers. The three possible installation options are:

   a. If transducer is installed on the positive lead(s) of the battery string, the arrow will point toward the battery string's positive post.

   b. If the transducer is installed on the negative lead of the battery string, the arrow will point toward the power system – away from the battery string's negative post.

   c. If the transducer is installed on one of the intercell connectors the arrow on the transducer will always point to the positive post of the next battery cell in the battery string. If the intercell strap will not fit through the current transducer, the strap may be replaced with a short cable, lugged on both ends that will fit through the transducer; consult the factory.

2 Open the distribution door and locate the supplied battery current transducer cables; there is one cable per transducer. The 4-conductor cables are coiled and tied to the return bus (loads) in the distribution area of the Sageon III Base System. The length of the supplied cables is 4 ft. (29.1m).

3 Refer to Table 2-5 and connect the battery current transducer cable(s) to the Battery Distribution Module connector(s). See Figure 3-14 for a view of the Battery Distribution Module.

4 Route the cable through overhead cable trays to the transducer. Connect the cable to the transducer.

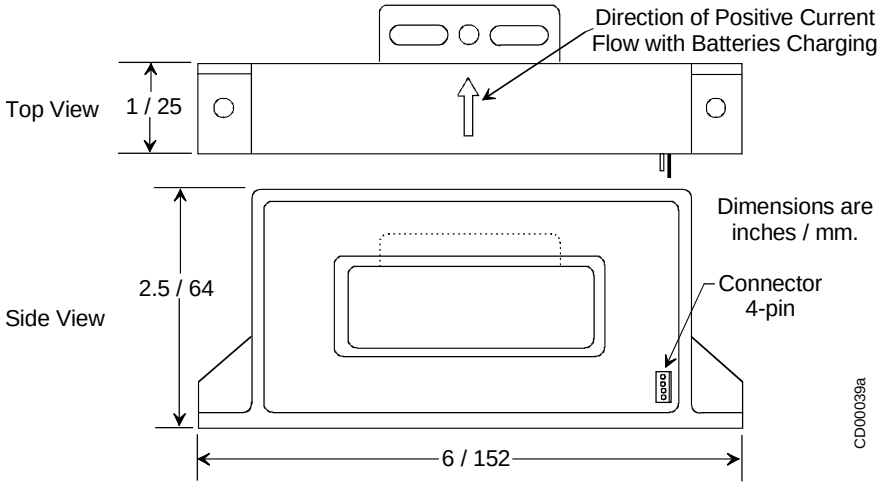


FIGURE 2-15 TYPICAL BATTERY CURRENT TRANSDUCER

TABLE 2-5 BATTERY CURRENT TRANSDUCER CONNECTIONS

Battery Current Transducer	Battery Distribution Module Board
1	X22 in Figure 3-12
2	X18 in Figure 3-12
3	X17 in Figure 3-12
4	X12 in Figure 3-12

2.11 SAGEON BATTERY MONITOR (OPTION)

The UNIPOWER Sageon Battery Monitor (SBM) is an add-on System for the Sageon III Control Unit (SCU). It is used to monitor individual cells of a battery during float or equalization operation, or during a discharge. Each SBM unit is capable of monitoring up to 24 cells or monoblocks. Up to four SBM units can be used to monitor up to 4 battery strings of 24 cells or monoblocks each.

Using the ability of the SCU to communicate to a remote or local PC, cell voltage data accumulated during a discharge can be transferred to a PC and saved. The cell voltages can also be viewed in real time when the SCU is connected to a PC. The SageView software that is running on the PC can display the cell voltage data in various convenient formats to ascertain the state of health of batteries.

In addition to the real time or historical representation of the data on SageView, the cell voltages can also be observed in real time on the SCU display.

In the event that the battery behaves in a way that is less than ideal during a test or actual discharge, a number of pre-programmed parameter levels are used to generate alarms. Alarms are annunciated on the SCU front panel by a LED and screen message and remotely via voltage free contacts or via the USB communications port that can connect directly to a PC locally or remotely via a modem or Ethernet.

Refer to the Sageon Battery Monitor Manual (PM990-4209–00) for detailed information.

2.12 SITE MONITOR SYSTEM (OPTION)

The Site Monitor System is used to monitor the status of equipment external to the Sageon III Base System. It has 12 digital inputs, 8 analog inputs, and 4 form-C user assignable alarm relay contacts. Digital inputs are often used to monitor site security, such as door or window openings, or other on/off function, such as a pump switch or motor starter. Analog inputs frequently used to monitor a fuel level or other variable such as a voltage, current, or frequency.

Refer to the Sageon Site Monitor Application Note (AN103-4012–00) for detailed information.

2.13 COMMUNICATIONS

Communication choices include operator panel mounted USB (standard) and an Ethernet network (optional) with or without SNMP support .The following devices can access the SCU and the data it has stored for System configuration, System operation, and troubleshooting alarm events:

- Connect a local PC running SageView (included) to the SCU by way of the operator panel mounted USB connector and a user-supplied USB-A plug to USB-B plug cable.
- Connect a remote (i.e. network connected) PC running SageView (included) to the SCU by way of the company's intranet or the Internet.
- Connect a remote (i.e. network connected) PC running standard SNMP based monitoring software (customer supplied) to the SCU by way of the company's intranet or the Internet.

For additional information about SageView, refer to Chapter 5.

IMPORTANT: Always consult your company's network administrator before connecting local or remote equipment to the SCU or to the company network. Security must be a primary concern.

Consult your company's network administrator about system communication and data compatibility, communications cable specifications, cable routing, and methods of connecting to a network.

2.14 INSTALLING AND REMOVING RECTIFIERS

When ordered with a Sageon III Base System, each Rectifier is shipped in a separate package. A Rectifier is shown in Figure 2-16.

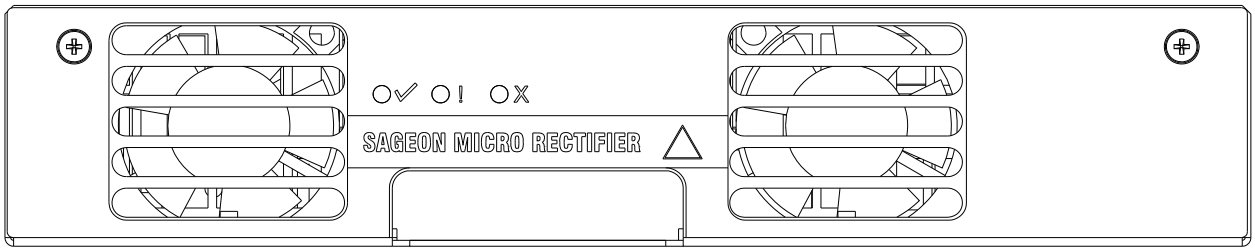


FIGURE 2-16 RECTIFIERS

A Rectifier can be installed or removed "hot" (i.e. with AC power and DC load applied) with no interruption of Sageon III Base System service. When removing a Rectifier, there must be sufficient remaining rectifier current capacity to supply the load.

WARNING

Electrical shock hazard

Hazardous voltage can cause death or serious injury.

240 VAC may be present at the Rectifier Switch Assembly and AC Backplane.

Always use insulated tools.

Installing a Rectifier:

1. Remove a Rectifier from its shipping container. Save the packaging materials.
2. Select a position in which to install the Rectifier.
3. The optional AC breaker should be in the OFF position.
4. To install a Rectifier:
   1) Note the voltage and current ratings of the rectifier. Use only 48V rectifiers in the system.
   2) Slide the Rectifier slowly into the Housing until the Rectifier's rear connectors just engage the Housing connectors. Fully seat the Rectifier in the Housing to properly engage the connectors.
5. Check to be sure that the locking mechanism has engaged with the rectifier.
6. If step 3 was performed: Apply power to the newly installed rectifier by turning on the AC breaker.
7. Repeat the preceding steps for each Rectifier to be installed.

To commission the Rectifier(s), go to Chapter 3 Commissioning.

Removing a Rectifier:

1. Optional: Remove power from the Rectifier. Set the breaker to the OFF position.
2. Lift the locking mechanism.
3. Grasp the rectifier handle and pull the Rectifier forward 1"[25 mm] to 2"[50 mm].
4. Grasp the Rectifier and pull it straight out from the Housing. The Rectifier weighs approximately 5 lbs (2.3kg).
5. Set the Rectifier aside and attach a tag stating its operating status (e.g. OK, needs servicing).

CAUTION

Electrical shock hazard

After removing a rectifier, be careful not to touch the rear connector. The rectifier will take approximately 1-2 minutes to self discharge. The red LED will flash during this time.

2.15 CONFIGURATION

2.15.1 General Description

Sageon III Base systems are turn-key DC uninterruptible power supply solutions (DC UPS) for powering 48VDC telecommunications and industrial equipment. The Power plant provides integrated battery management functions for a range of battery types (VRLA, flooded Lead-acid, NiCad, Ni-MH, Li-polymer) to enable easy commissioning of a DC UPS or it can be used as a standalone DC source when no batteries are used.

The Power plant provides the following integrated features:

- Power Distribution
- Battery Charge Current Limiting (opt)
- Battery Temperature Sensing (opt)
- Accurate Temperature Compensated Float and Equalization Voltages (opt)
- Modules for Monitoring Site Status and Battery Cell Voltages (opt)
- AC Breakers (opt)
- n+1 Redundant Rectifiers
- Short Circuit and Reverse Polarity Protection
- Monitoring and Control Module (Controller)
- Super Capacitor Backed Real-time System Clock
- Remote Communication capability, including Web-based Protocols (opt)
- All Rectifiers and the Controller are hot-swap and plug-and-play capable

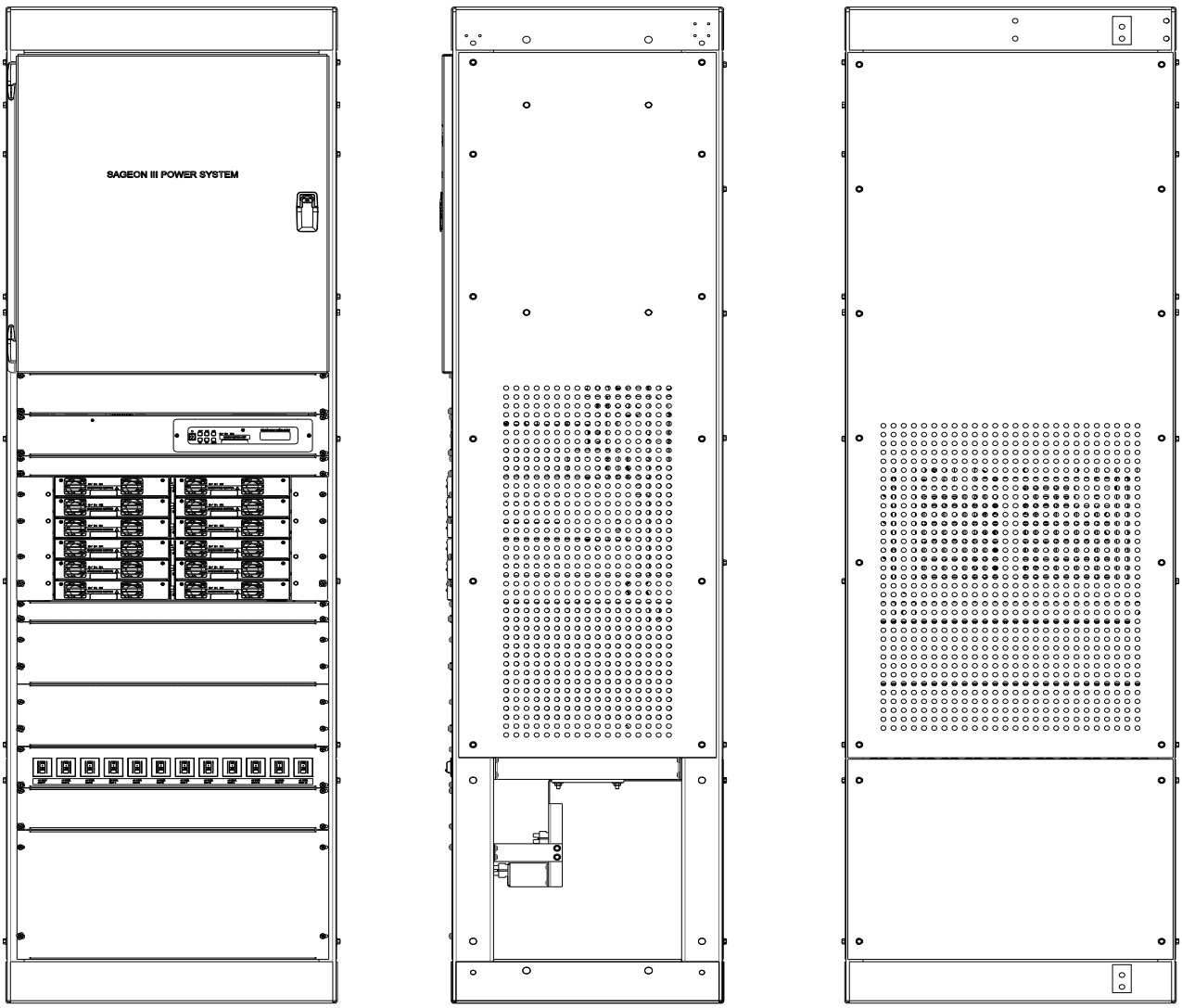


FIGURE 2-17 SAGEON III BASE SYSTEM

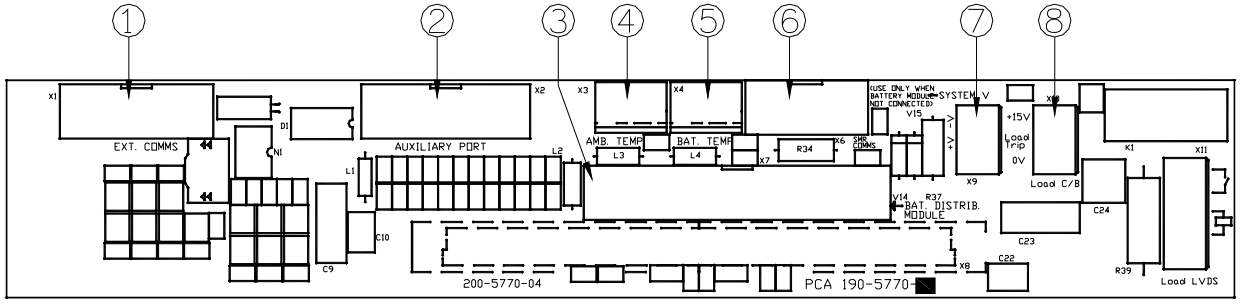


FIGURE 2-18 CONNECTIONS ON CONTROLLER BACKPLANE

(1) Remote communications module connection (14-way ribbon)*
(2) Auxiliary peripheral module (relays, battery cell monitor, etc) connection (16-way ribbon)*
(3) Battery (& load) distribution module connection (34-way ribbon)*
(4) Ambient temperature sensor connection
(5) Battery temperature sensor connection *
(6) Rectifier isolated communications connection (10-way ribbon)*
(7) Standalone system voltage connection (Controller power and voltage sensing)
(8) Load circuit breaker trip detection circuitry connection*

Notes:
* Devices and cable connections are pre-wired as part of the supplied and tested Power plant

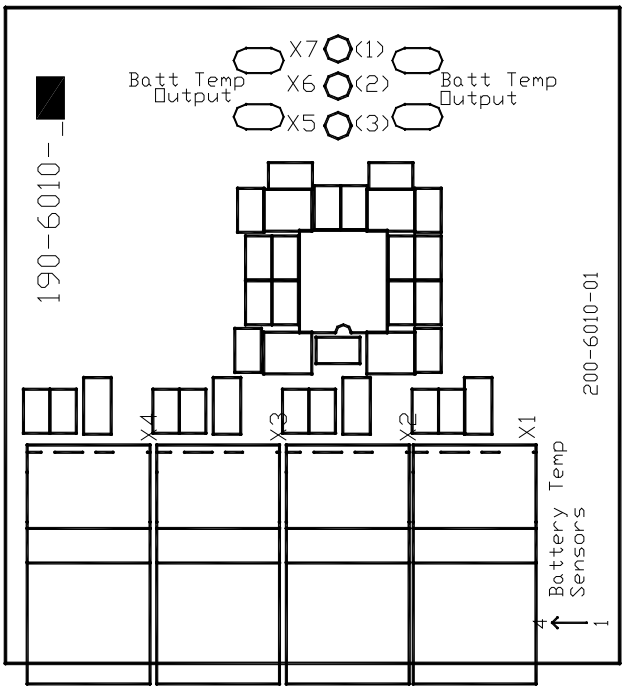


FIGURE 2-19 TEMPERATURE CONCENTRATOR BOARD

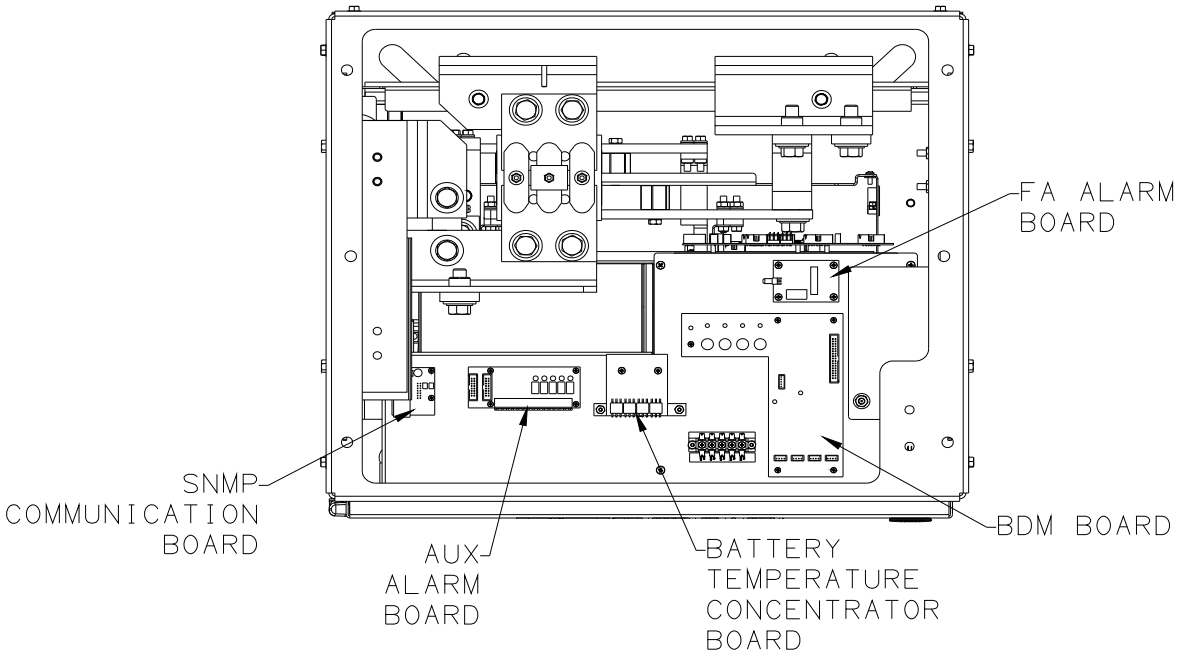


FIGURE 2-20 SAGEON III BOARD LOCATIONS

3.0 COMMISSIONING

This chapter describes commissioning a Power System. Individual system settings can vary widely so it is important that those performing the commissioning fully understand the system at hand. Modify these procedures as needed to accommodate the installed equipment and your company's commissioning procedures.

3.1 PREPARATION

Perform the following steps prior to commissioning a Power system.

1. Gather system wiring diagrams, battery data sheets, and other site documentation for ready reference should it be needed.
2. Complete all installation steps. Refer to Chapter 2 Installation, as necessary.
3. Review the steps in Section 3.2 Commissioning a System.
4. Become familiar with operator panel LEDs, front panel displays, push buttons, and menus by reading Chapter 4 Configuration and Operation.
5. Start up configuration parameter values:
   - Battery String Connected to Plant – The string will power the SCU prior to starting the first Rectifier, assuming at least a minimal battery charge, and the SCU 2-line display and status LEDs will be active. You may then use the operator panel to change many of these default parameter values to accommodate the application. See Table 4-1 for a list of default parameters and values.
   - No Battery String Connected to Plant– When the first Rectifier starts and powers the SCU, the SCU will load a default plant configuration. You may then use the operator panel to change many of these default parameter values to accommodate the application. See Table 4-1 for a list of default parameters and values.

   Alternatively, edit the configuration parameter values, or load a new configuration, from a PC connected to the USB port on the plant operator panel or from a PC connected to an Ethernet network (an IP address must be entered). The PC must be running the optional SageView™ plant monitor software.
6. Become familiar with the Rectifier LED codes in Section 6.3 Troubleshooting.
7. The system may be commissioned with the battery string(s) connected or disconnected, however, consider the configuration statements in paragraph 5 above.
8. Finally, perform the steps in Section 3.2 Commissioning a System.

3.2 COMMISSIONING A SYSTEM

This procedure assumes a newly installed system that includes connected batteries and loads.

1. Before applying AC power, check that:
   - All AC input cables are connected to the correct terminals and that connections are tight
   - All load (supply and return) and battery cables are correctly connected and that connections are tight; check polarity as well
   - All alarm wiring is correct and tight, and that alarm annunciators function
   - The System housing and return bus are connected to the site earth ground

2. Read the operator panel display and note LED indications.
   - If a connected battery string is supplying sufficient power to the SCU, the operator panel 2-line display will be active and show System voltage and current. The LEDs should also be active with an alarm showing since all Rectifiers are Off. The factory-installed or uploaded configuration will specify the number of Rectifiers. See Table 4-1 for default parameters and values.
   - If a battery string is not connected or the string cannot supply sufficient power, the SCU will not be operating. There will be no operator panel display or lighted LEDs until a Rectifier is started later in this Section.
3. Ensure that the circuit breakers in the user's AC electrical service panel are Off..
4. Disconnect all loads from the system by turning Off all load breakers.
5. The Rectifier On/Off breaker of each Rectifier, is set to Off. See Figure 2-4.
6. Turn On power to Rectifier 1.

   The top-most left Rectifier in the stack will perform a power-up self-test lighting the three LEDs on the rectifier. After a brief period, the red and yellow LEDs will extinguish and green LED will remain lighted (Float mode). Refer to the following note and to Section 6.3 Troubleshooting should the red or yellow LEDs remain lighted.

   Yellow LED Note: When starting the System for the first time, it may be necessary for the rectifiers to supply significant current for initial battery charging. A lighted yellow LED on a rectifier may not be due to a rectifier problem but rather indicate that the rectifier is operating in the over-current mode due to a discharged battery string. If this is the case, continue with the procedure to bring additional Rectifiers on-line.

7. Read the rectifier current and voltage on the operator panel 2-line display. The Red LED on the panel will be lighted unless the number of operating Rectifiers equals the number of Rectifiers in the System configuration, in which case the Green LED will be lighted. Refer to Section 6.3 Troubleshooting as needed.

155A 54.2V FL

8. Connect a 10 to 50A load to the System through a distribution breaker or fuse. Refer to Chapter 4 Configuration and Operation and use the operator panel push buttons and menus to:
   1) Turn Off battery temperature compensation. (Note: If the float voltage is set at high or low battery temperature with battery temperature compensation turned On, compensation may adjust the System voltage by as much as 2 volts.)
   2) Connect the load to the System by closing the distribution breaker.
9. Repeat Steps 7 through 10 until all Rectifiers are on-line and taking load. As Rectifiers are brought on-line, the load may be increased.
10. At the operator panel, verify that each Rectifier is sharing current and the Sageon III Base System voltage is set to the desired Float voltage, generally –54.2 Vdc ±½ volts.
11. Configure the Sageon III Base System as described in Chapter 4 Configuration and Operation. If the configuration has been created on a PC and is to be uploaded to the operating Sageon III Base System, also refer to Chapter 5 SageView.
12. Thoroughly test the new configuration to ensure that all configurable parameters are correct. Test the alarm circuits to ensure correct activation.
13. As needed, operate the system for 15-20 hours to charge the battery string(s) before placing the system on-line.

3.3 OVERVIEW OF EXTERNAL WIRING CONNECTIONS

SD-SAGEON3.AXX drawings at the back of this manual show the internal and interface schematic for the Sageon III Base System with distribution. For the purpose of indicating how a system is connected, the same schematic applies to other Power plant products.

The system shown is for a –48V system where the positive side of the DC bus is tied to ground, usually on the common return bar. It is also possible to float the output, but under these conditions, there is no guarantee that all voltages on the DC bus will stay below the Safety Extra-Low Voltage (SELV) limits with respect to ground during fault conditions.

3.4 FACTORY SUPPLIED CONFIGURATIONS

Power plant internal AC distribution, are configured with each rectifier AC line being terminated in an individual block terminal. The grounding wire connects to the block terminal.

3.4.1 Single phase – individual protected external feeds

Connect each of the circuit breaker protected phase wires to the individual terminal blocks, labeled L1, that feed each rectifier. Connect the neutral (or phase 2) wires to the terminal labeled L2 for each rectifier.

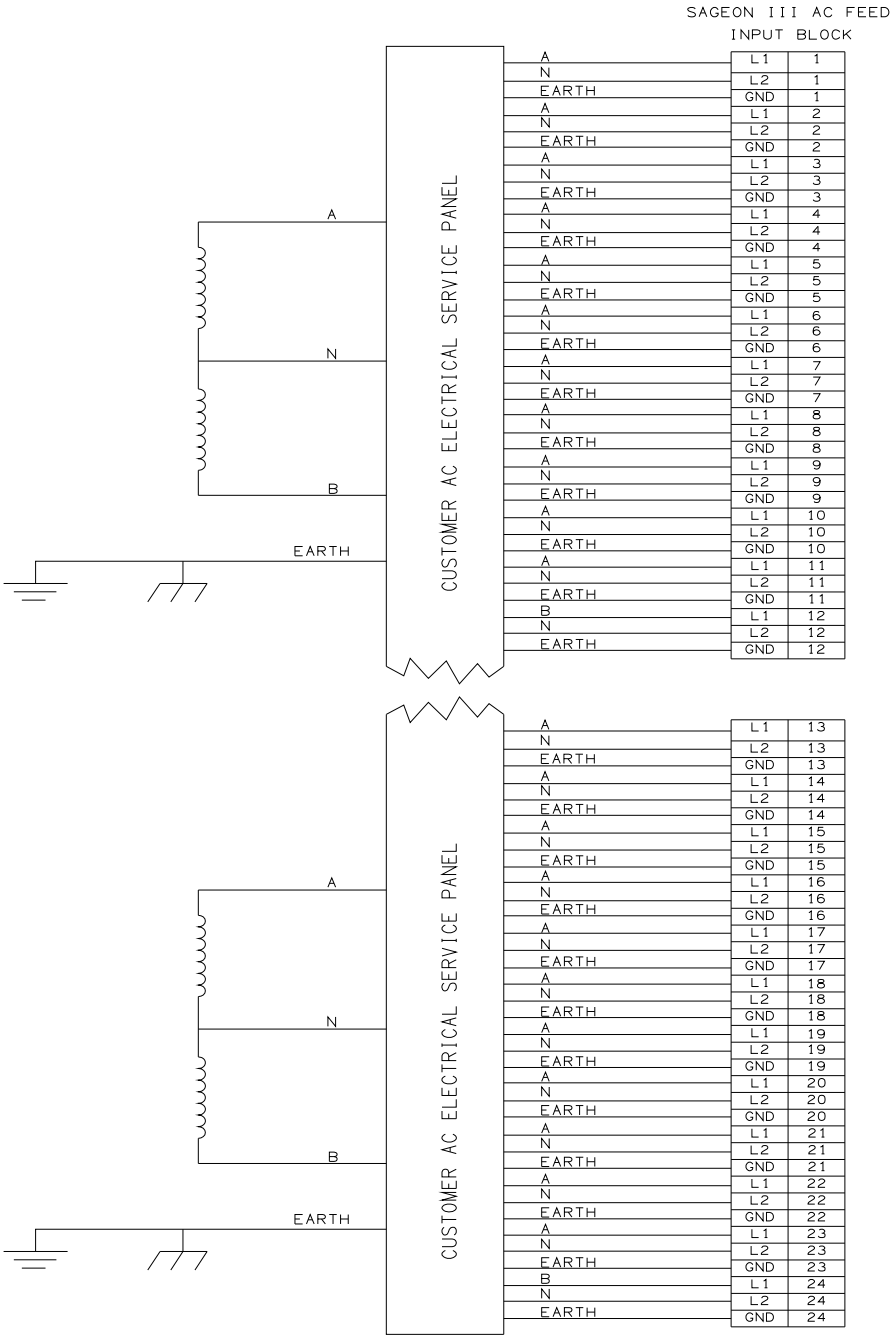


FIGURE 3-1 SINGLE PHASE FEED CUSTOMER WIRING (PHASE TO NEUTRAL)

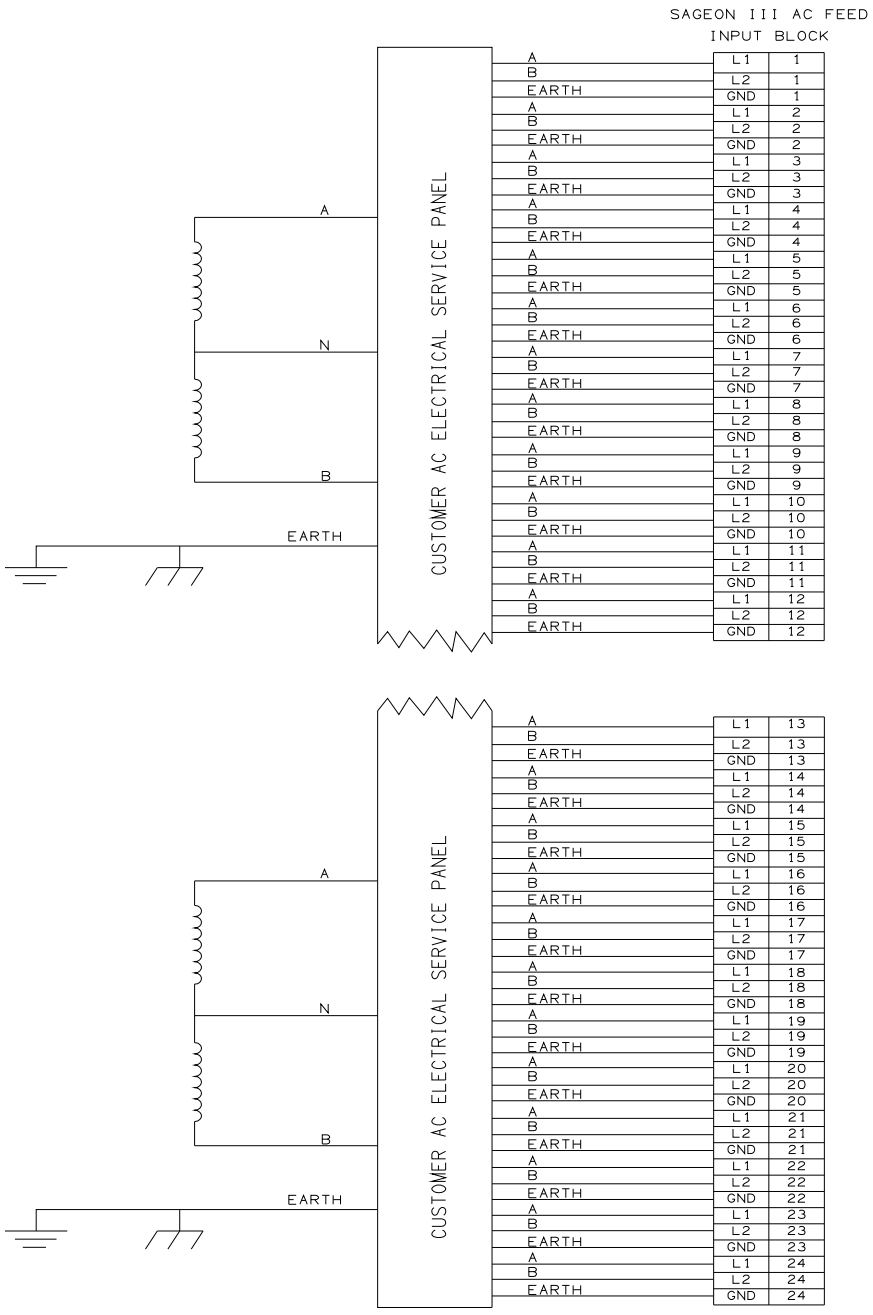


FIGURE 3-2 SINGLE PHASE FEED CUSTOMER WIRING (PHASE TO PHASE)

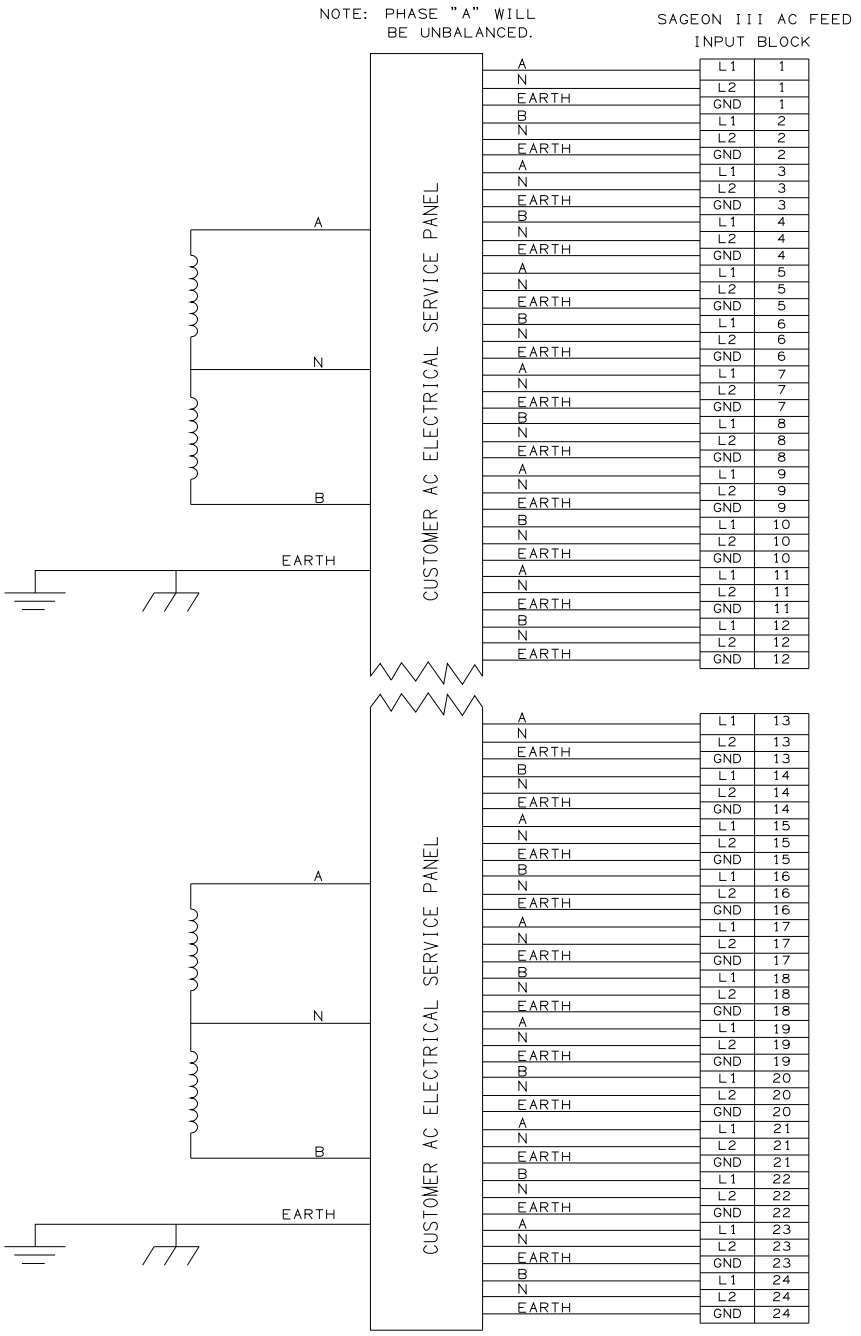


FIGURE 3-3 SPLIT SINGLE PHASE FEED CUSTOMER WIRING (PHASE TO NEUTRAL)

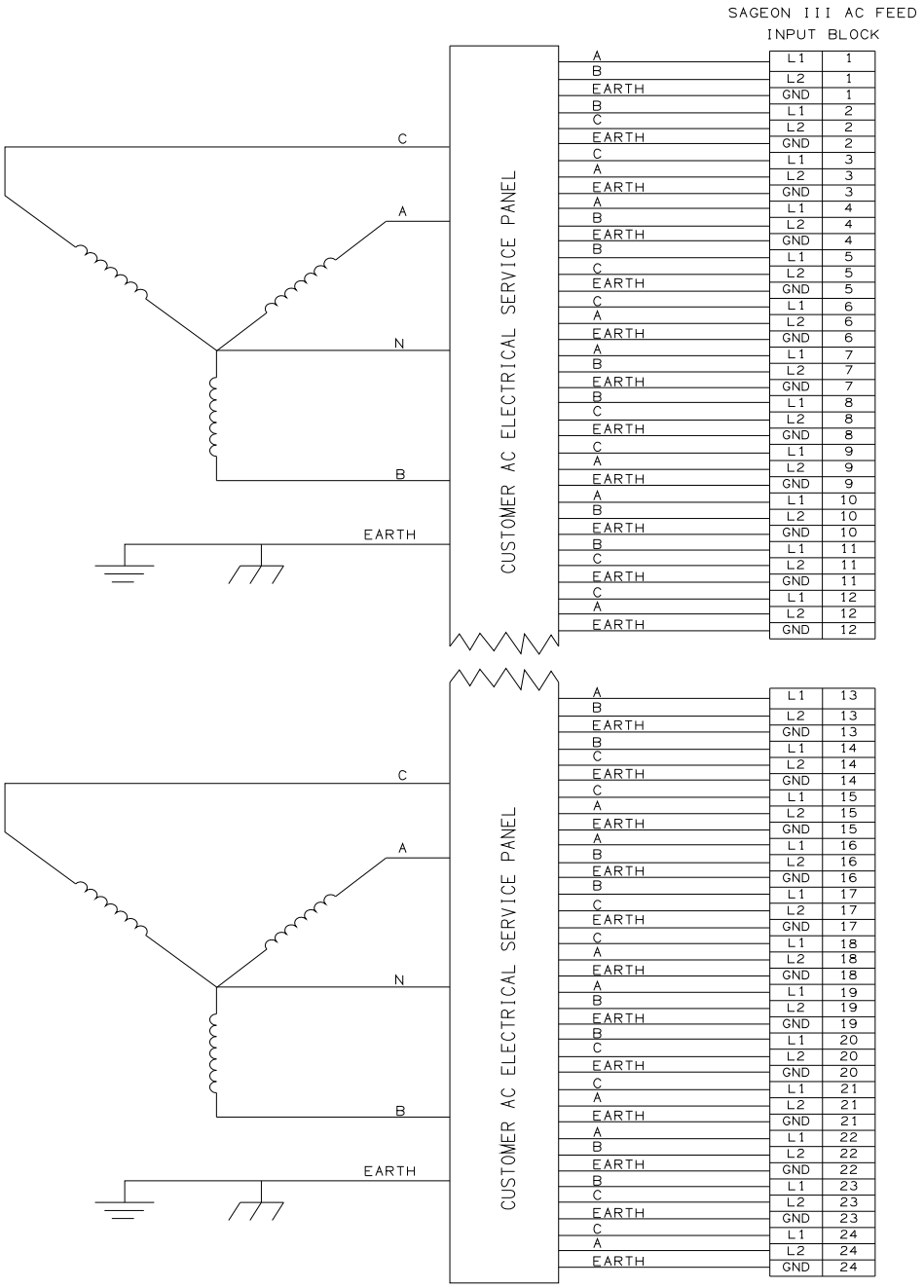


FIGURE 3-4 Y-THREE PHASE FEED △-CONNECTED RECTIFIERS CUSTOMER WIRING (PHASE TO PHASE)

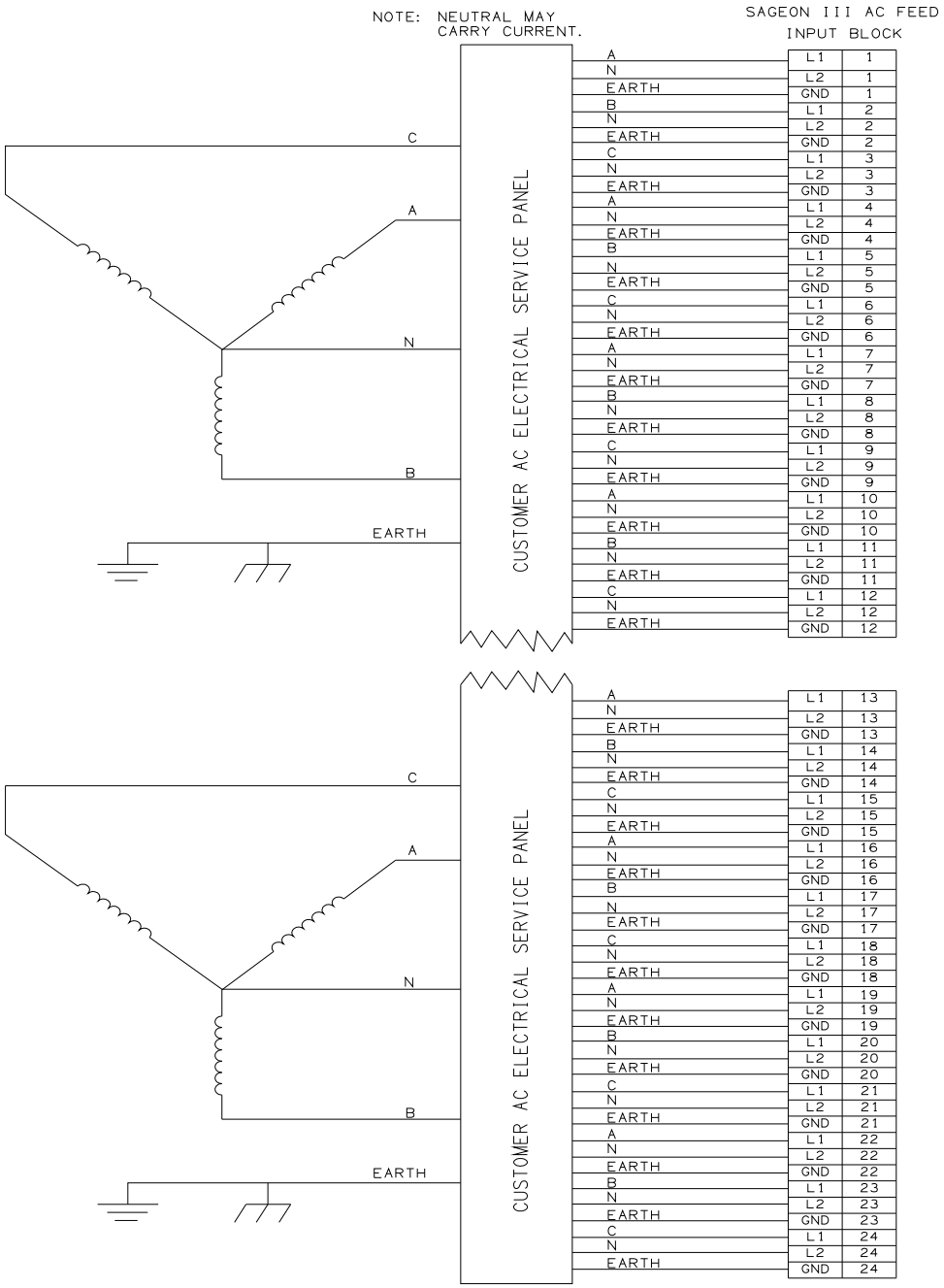


FIGURE 3-5 Y-THREE PHASE FEED CUSTOMER WIRING (PHASE TO NEUTRAL)

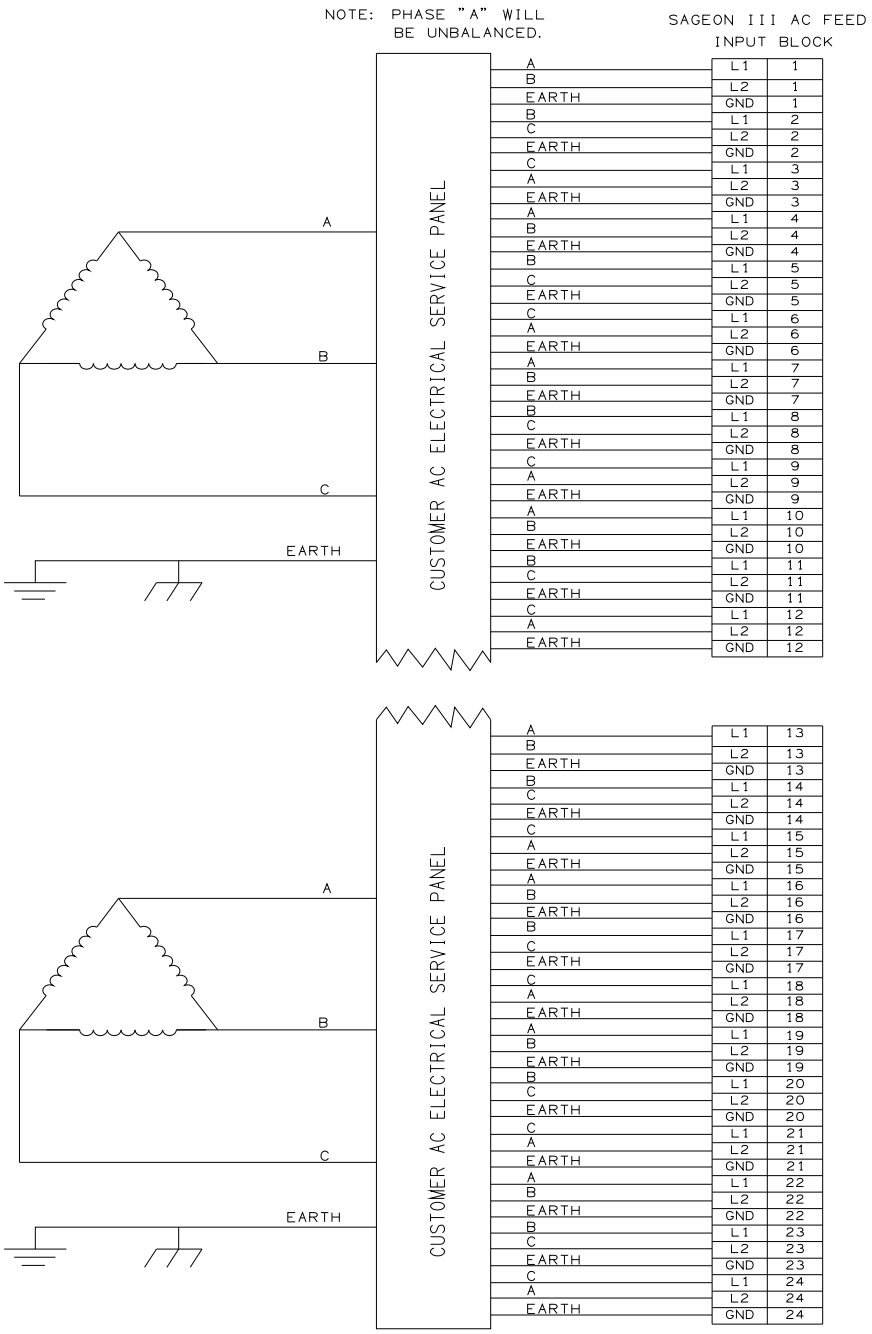


FIGURE 3-6 △-THREE PHASE FEED CUSTOMER WIRING (PHASE TO PHASE)

3.4.2 Surge protection requirements

The rectifiers are internally protected for surges up to 6kV/3kA. For higher levels of protection, particularly for sites with high incidence of lightning or switching surges, additional surge protection is required on the AC feed to the Power plant. Typically surge arrestors with a 10kA-40kA rating are required with the highest level of protection being provided when arrestors are connected between phase-neutral (x3 phases) and between phase/neutral-earth (x 3 phases).

Other arrangements (for 3-phase "Y") with similar levels of protection are also possible as shown below. The voltage rating of the arrestor should be selected based on the maximum AC voltage likely to appear on the line. The arrestor should limit the voltage to <1200V – 1400V at the rated maximum pulse current.

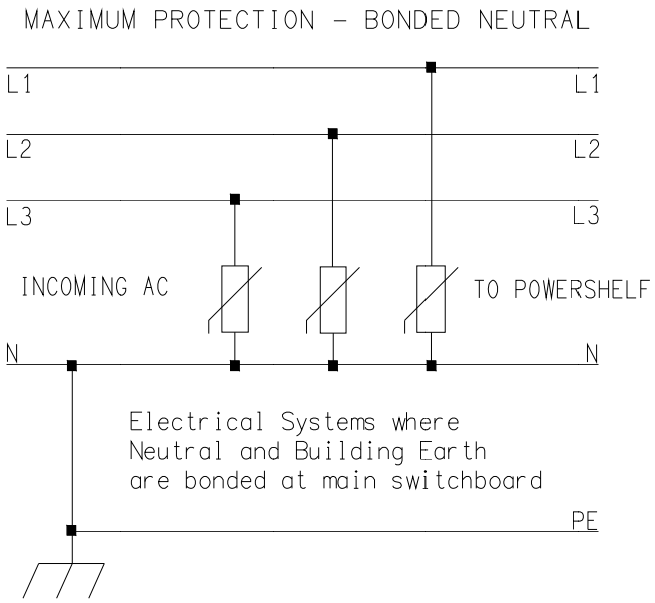


FIGURE 3-7 SURGE PROTECTION

3.4.3 Battery connections

The cables are brought out through the top of the unit.

This cable must be sized accordingly to carry the battery short circuit current for the time required to clear the battery protection devices.

Note: Ensure the battery circuit breakers are open before connecting the batteries. Connect the switched cable connections first, followed by the common return cable connections.

3.5 TEMPERATURE SENSORS

The optional sensors for measuring ambient and battery temperature are the same device (Part No. 385-5941-03, -06, -15, -30). The system auto-detects if the sensor is plugged into one of the positions (4) or (5). If no sensor is installed, the Controller will show "Not Available" in the menu items for the temperature measurements. Locate the ambient sensor on a mass with a fairly long thermal time constant. (see Section 2.9) Locate the battery sensor on a battery block in the middle module of the battery bank (likely hot zone).

3.6 AUXILIARY RELAY CONNECTIONS

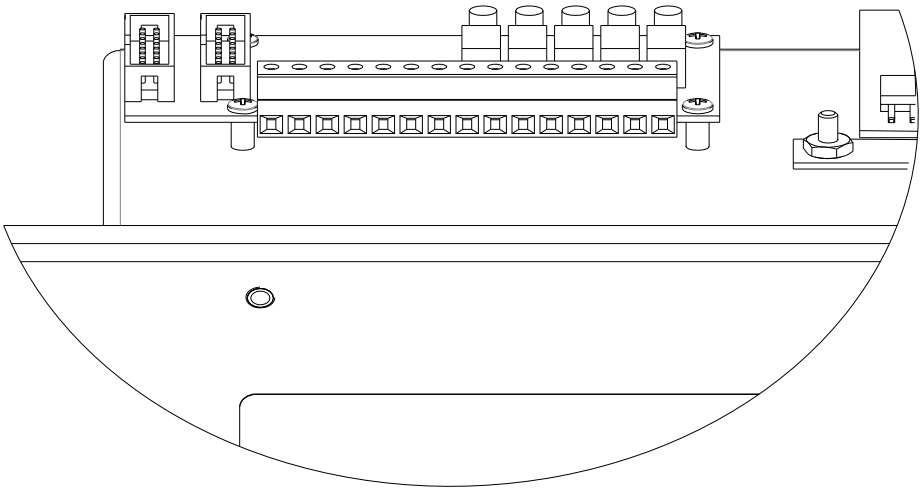


FIGURE 3-8 MULTIPLE ALARM BOARD

The user configurable auxiliary relays contacts are shown above. (See section 1.4.2 for contact ratings)

The pin configuration is: (Pin 1 shown in Figure 3-11)

Relay #	Pin #	Pin function
1	1	N.O. (normally open)
	2	N.C. (normally closed)
	3	C (common)
2	4	N.O.
	5	N.C.
	6	C
3	7	N.O.
	8	N.C.
	9	C
4	10	N.O.
	11	N.C.
	12	C
5	13	N.O.
	14	N.C.
	15	C

The relays, being user configurable, can be arranged to activate for multiple alarm conditions or a single alarm only. The logic can be inverted for individual relays so that one becomes a controller failure indicator (use the normally closed contact as this will also indicate if the relay power has failed).

3.7 CONTROLLER POWER CONNECTIONS

Power for the Controller and its peripherals is derived from the DC bus or the highest charged battery. The Battery distribution module has reverse polarity protection circuit that also serves to provide an "or-ing" of the highest supply voltage for the Controller. No additional user connections are required to power the Controller or provide system voltage regulation, if the battery distribution module is used.

3.8 FRONT PANEL USB COMMUNICATIONS CONNECTION

The front USB port on the Controller is configured as USB-slave and has a B-type connector. A standard USB A-to-B cable is required. The Controller can only communicate via the USB port to a PC running the Sageview software.

The USB connection requires that a USB driver be installed on the PC. The first time the Controller is plugged into the PC via the USB port, a Microsoft® Windows dialogue box will appear asking the user to install the Controller USB Interface drivers. The Microsoft® Windows operating system should be able to find the drivers automatically on the Sageview CD-ROM, assuming it is in the CD-ROM drive of the PC.

If Sageview is running when the unit is plugged in, a Windows dialogue box will appear asking the user if they wish to connect to the unit immediately. Otherwise the user will need to select the Controller from the available controller USB devices in USB section in the Connection Setup.

3.9 REMOTE COMMUNICATION CONNECTION

The remote communications module is:

P/N	*Description*
385.4015.32	Ethernet TCP/IP Interface Card w/SNMP

The following sections describe the interfaces in more detail and cover some of the set up requirements for the more advanced interfaces.

Termination of the line with resistors generally is not required. However, if high rate of data corruption is experienced (slow data update in monitoring program), line termination resistors should be installed at both ends of the network. The value of the resistors depends on the gauge of the twisted pair and should be equal (or closest) to line characteristic impedance. I.e. for a twisted pair of 24AWG wires characteristic impedance of 100ohm – use a 100ohm resistor.

3.9.1 TCP/IP and Sageview Interface

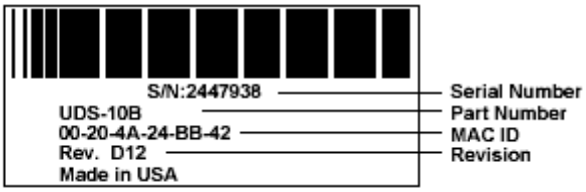
The interface is a 10/100BASE-T Ethernet adaptor. The TCP/IP port sends Controller data over a network to a PC running Sageview control and monitoring software. The Sageview interface provides this function for up to 2 PCs on the network simultaneously as well as providing SNMP traps on alarms, system time synchronization to a global clock if access to the internet is available, and a simplified system status Webpage (HTTP). If direct connection to a PC network port is required, a cross-over network cable should be used. To set up Sageview, follow the instructions on the installation CD.

To enable network access on the TCP/IP port, an IP address must be assigned to the port. If access over the Internet is considered, the gateway address must be programmed as well. There are several methods to do that, two are recommended and are described in section 7.1. Other operating parameters of the interface are pre-programmed and should not be changed. Factory default IP address is 192.168.10.60.

To be able to assign a network address, the Ethernet address (referred to also as hardware address or MAC ID) of the interface must be known. On the Power plant top cover is a small label indicating the MAC ID similar to one shown below.

Note: The interface IP address cannot be changed until the Power plant has been commissioned and the Controller is operational.

The MAC ID can have format 00-20-4A-24-BB-42 or 00:20:4A:24:BB:52.



3.10 BATTERY DISTRIBUTION MODULE

The battery distribution module is capable of handling up to four battery strings.

Connect the current transducer signal cable to the appropriately labeled connector on the circuit board.

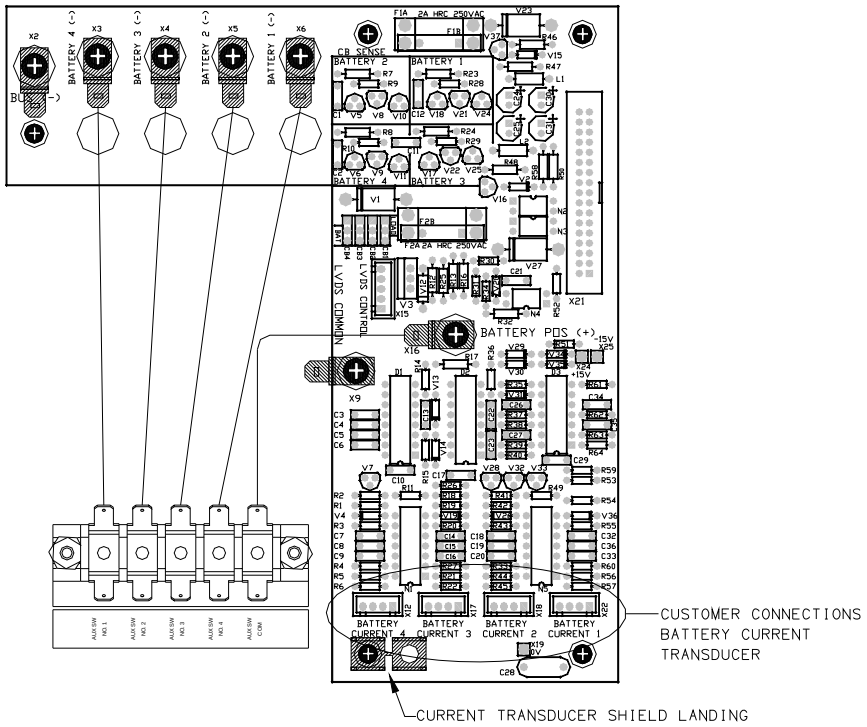


FIGURE 3-9 BATTERY DISTRIBUTION MODULE (BDM)

3.11 ADDING AUXILIARY EXPANSION MODULES

Modules such as the Sageon Battery Monitor and site monitor are daisy chained from the unused ribbon cable connection provided on the Auxiliary programmable relay board. All of these expansion modules are required to be mounted external to the Power plant, and a single 16-way ribbon cable connected to the available box-header.

For more detailed installation information for each of these modules, refer to the Sageon Battery Monitor Operation Manual (PM990-4209-00) and the Sageon Site Monitor Application Note (AN103-4012-00).

4.0 CONFIGURATION AND OPERATION

The Sageon III Base System is locally configured and operated from the operator panel. See the SageView chapter for remote configuration and operation. The operator panel is mounted below the distribution doors.

The operator panel consists of a 2-line alphanumeric display, six push buttons with tactile feedback, three status LEDs, and a USB communications connector. Menus, data, status/alarm messages, and parameter values appear on the display. Display contents are selected using the six buttons. System status is also shown by the three LEDs below the display. A USB-B port is provided on the left side of the operator panel for connecting a personal computer (PC). Operator panel operation, displayed data, and communications are all controlled by the SCU (Sageon III Control Unit). The operator panel is the Sageon III Base System's HMI (human machine interface).

Complete Sageon III Base System configurations can be created at the operator panel. Alternatively, the System can be configured from a personal computer (PC) running SageView System Monitor software. When the System is initially powered, the configuration stored in the SCU provides the System operating parameters. This configuration can be the default, factory-installed configuration or a configuration you created on a PC and uploaded to the SCU. Table 4-1 lists the default values; note that some default values will vary with customer specified equipment, such as the number of Rectifiers installed. Many values are user configurable and a column is provided in the table for recording of user-selected values.

To configure the System from the operator panel, review the screen sequences described in the following sections and enter the requested data. To download a configuration to a PC or to upload a configuration from a PC, refer to Chapter 5 SageView. The SCU must be powered during any configuration efforts.

In this chapter, Sections 4.1 and 4.2 describe the "Home" screen and use of the operator panel push buttons. Sections 4.3 and 4.4 address the status LEDs and alarm messages. Sections 4.5 through 4.9 explore the menu options available for configuration and operation of the System.

TABLE 4-1 SUMMARY OF DEFAULT SYSTEM (SCU) PARAMETERS

Parameter	**Description**	**48V System Range**	**48V System Default**	**User Value**
Base (Home) System Menu				
Amb Tmp Alm	Ambient temperature alarm level	30-99°C	55°C	
Volts High	System output volts high threshold	48-65V	57.5V	
Volts Low	System output volts low threshold	44-54V	48.0V	
No. of RECs	Set number of Rectifiers in system	0-225	1	
Num Batteries	Number of battery strings installed	1-4	1	
FS Batt 1	Battery current transducer full scale rating	10-30,000A	100A	
FS Batt 2	Battery current transducer full scale rating	10-30,000A	100A	
FS Batt 3	Battery current transducer full scale rating	10-30,000A	100A	
FS Batt 4	Battery current transducer full scale rating	10-30,000A	100A	
SCU #	SCU access code (7 digits)	0-9999999	0000000	
Date	Current system date			
Battery Monitor menu (after enabling Battery Monitor)				
Bat Config	Battery monoblock size x number (see SBM section of manual for more detail)	Various Configurations	2V x 24	

Parameter	Description	48V System Range	48V System Default	User Value
SBM Batteries	Number of battery banks to be monitored	1-4	1	
Vhi Cell	Cell high voltage alarm	2.0-16.0V	2.5V	
Vlow Cell	Cell low voltage alarm	1.0-12.0V	1.8V	
+dVc Cell	Cell positive deviation alarm	5-99%	10%	
-dVc Cell	Cell negative deviation alarm	5-99%	10%	
RECT Menu				
RECT V high	Rectifier high voltage alarm	48-65V	57.5V	
RECT V low	Rectifier low voltage alarm	44-54V	48V	
RECT HVSD	Rec. high voltage shutdown	48-66V	57.5V	
RECT limit	Rectifier current limit	4-60A	60A	
BATT Menu				
B Dis Alarm	Battery discharge alarm threshold	44-52V	47.0V	
Disch I Diff	Battery string discharge current difference alarm	5-99A	20A	
Batt T Alarm	Battery temperature alarm threshold	30 to 90°C	40°C	
Bat Rated	Ampere-hour rating of batteries	20-9,999AH		
BTC	Battery temperature coefficient	0-6 mV/°C /cell	0 mV	
Number Cells	Number of chemical cells in battery string	4 - 24	24	
B I Lim Vb<Vdd	Battery charging current limit for Vb<Vdd	5-999A	50A	
Vdd Level	Battery deep discharge voltage threshold	40-47V	45V	
B I Lim Vb<VfI	Battery charging current limit between Vdd & VfI	5-999A	50A	
Sys Float	System float voltage (Vfl)	48-58V	54.2V	
Sys Drop	System voltage drop	0.0-2.0V	0.5V	
Equalization	Enable/disable Eq function	On/Off	On	
FS Load I	Full Scale Load Current sensor value	50 – 3000	100	
Load Sensor	Enable/disable Load Sensor	On/Off	Off	
B I Lim Vb>VfI	Battery charging current limit in equalize Vb>VfI	5-999A	50A	
Sys Equal	System equalize voltage (Veq)	50-61V	56V	
V Start Eq	Enable/disable discharge voltage initiation of Eq	On/Off	Off	
V Eq trigger	Discharge voltage threshold for Eq charging	44-50V	48V	
Q Start Eq	Enable/disable battery charge depletion trigger	On/Off	Off	
Q disch Trig	Charge depletion threshold for Eq charging	5-999AH	15AH	
Eq End Current	Equalization termination for I bat < Eq End	1-2,000A	5A	
Eq duration	Maximum duration of Equalization charging	3-48Hr	20Hr	

Parameter	Description	48V System Range	48V System Default	User Value
Eq period	Time between periodic Equalization charging	0-52wk	12 Wk	
Manual Stop/Start Eq	Force stop/start of Equalization charging	Toggle state		
LVDS Trip	Battery voltage below which LVDS will open	40-48V	42.6V	
BDT Per	Period between consecutive discharge tests	0-365 days	0 days	
BDT Time	Time of day to begin BDT (hr:min)	00:00-23:59	02:00	
BDT Dur	Maximum duration of BDT	5-1,440 min	180 min	
BDT Curr	Discharge test current	0-5,000A	50A	
BDT End V	Battery voltage limit to terminate BDT	36-48V	44V	
BDT End Q	Battery capacity limit to terminate BDT	25-9,995AH	300AH	
Temp Sen Alarm	Enable/disable temp. sensor failure alarm	On/Off	On	

4.1 THE "HOME" SCREEN

The Home screen, shown at right, is the default screen. It shows Sageon III Base System output current and voltage. This screen also shows the present mode: FLoat or EQualize. If an activity such as battery discharge is being performed, the current and voltage are displayed continuously while the second line alternates between the mode and the activity status, for example "BDT in progress."

```
155A  54.2
FL
```

The Home screen is the first to appear when power is applied to the System. Since the Home screen is the default screen, the display will revert to the Home screen from any other screen if an operator panel push button is not pressed for approximately one minute. Section 4.5 describes in detail the selections available from the Home screen.

4.2 USING THE OPERATOR PANEL PUSH BUTTONS

Use the six buttons to view System data, individual rectifier data, battery data, or the alarm log. In addition, programmable parameter values can be viewed and changed. Each button is described below.

The HOME screen shows the System voltage and current. The data will initially be located in the center of the display and after a brief period will scroll right to left. From the HOME screen, press "up arrow" or "down arrow" to move through the series of menus described in Section 4.5.

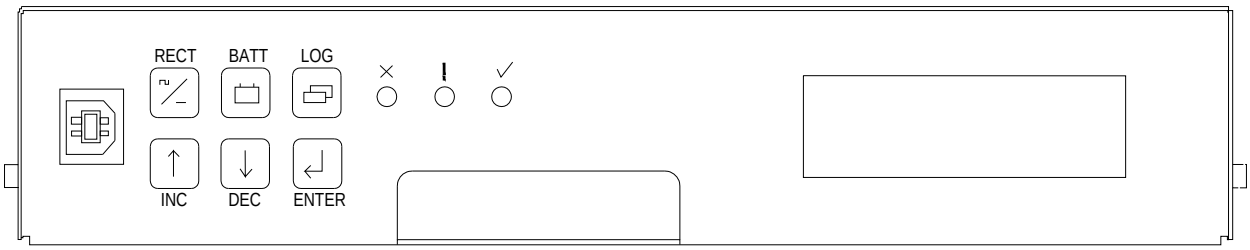


FIGURE 4-1 OPERATOR PANEL

RECT (RECTifier) – Press to access a menu of rectifier related parameters as well as to view the output current and heat sink temperature of each rectifier. See Section 4.6 for the screens displayed in the RECT menu.

BATT (BATTery) – Press to access a menu of battery parameters. See Section 4.7 for the screens displayed in the BATT menu.

LOG – Press to view a menu of the 99 most current alarms in chronological order. Section 4.8 shows the screens.

The alarm log number and alarm description are displayed first. Two seconds later, the alarm log number and the date and time of the alarm occurrence are displayed. These two screen then alternate at a two second rate.

(Increment) – Press the "up-arrow" to scroll through a menu, selected using an SMR, BATT, or LOG button, from the first menu screen to the last. When editing a flashing parameter, press to increase the parameter value.

(Decrement) – Press the "down-arrow" scroll through a menu, selected using an SMR, BATT, or LOG button, from the last menu screen to the first. When editing a flashing parameter, press to decrease the parameter value.

(Enter) – With a editable parameter displayed, press Enter to cause the value to flash indicating that the "up arrow" or "down arrow" button can be used to change that value. Press ENTER to store the edited value.

When setting a parameter with multiple digits (e.g. access code, time, date), set the left-most digit as described above. Then press ENTER to cause the second digit to flash. Press "up arrow" or "down arrow" to set the flashing digit to the desired value. Repeat until each digit is set to the desired value.

When an alarm condition exists and you are prompted to press ENTER, the ENTER button will cause alarm details to be displayed.

CAUTION

Setting correct parameter values is critical. Incorrect values can result in unsatisfactory performance, unexpected shutdown, and other unanticipated performance characteristics.

Moving from one menu to another:

To move from any menu to any other menu, simply press the desired button.

To move to the Home menu from any other button, press the button for the current menu. For example, if battery parameters are presently being displayed, press BATT to access the Home menu.

To change a parameter when the security function is activated:

A "Panel Locked" message will appear when an attempt is made to alter any parameter while security is activated. The security On/Off selection is located in the HOME menu, Section 4.5.

To change a parameter, simultaneously press and hold the "up arrow", "down arrow" and ENTER buttons for 3 seconds. Parameters may now be changed as described above.

4.3 READING THE OPERATOR PANEL SYSTEM STATUS LEDS

The table below describes the indications presented by the system status LEDs.

TABLE 4-2 READING OPERATOR PANEL SYSTEM STATUS LEDS

Symbol	LED Color	State	Meaning
✓	Green	On	System OK
		Off	A failure or alarm condition exists
!	Amber	Flashing	Alarm - Alarm condition exists in the system or a Rectifier
		On	Plant is in Equalize Mode
		Off	No alarm condition exists in the Sageon III Base System
X	Red	On	Rectifier Shutdown - One or more Rectifiers has shut down
		Off	All Rectifiers are operating

If all three LEDs are Off:

- There may be no System output or battery string DC to power the SCU
- The SCU may have failed
- There may be no AC power to the System
- On initial startup; all 3 LEDs may be off for approximately 10 seconds while the system boots up.

4.4 READING ALARM MESSAGES

If an alarm exists, an alarm message will alternate with the Home screen (the status LEDs will also indicate the presence of an alarm). The alarm message will display for two seconds every six seconds. A sample alarm message is shown below.

```
3 Alarms
Press ENTER
```

This message states that three alarms exist and they can be viewed by pressing the ENTER button. When the button is pressed, the name and description of the most recent alarm are displayed, as shown below. Press either the “up arrow” or “down arrow” button to view remaining alarms. Pressing ENTER, or not pressing any button for ten seconds, will display the Home screen.

```
Alarm 1
Amb Temp High
```

To read the time and date of any alarm, press the LOG button and use the “up arrow” or “down arrow” button to scroll to the desired alarm(s).

A list of all operator panel annunciated messages is found in Table 4-3.

TABLE 4-3 OPERATOR PANEL ANNUNCIATED ALARM MESSAGES

Alarm Name	Comment	LED ON/FL
SMR Alarm	Combination of one or more SMR alarms	Amber (FL)
SMR Urgent	One or more SMRs have shut down	Amber+Red
SMR HVSD	SMR shut down due to output over-voltage	Amber+Red
UNIT OFF	SMR is off	Amber+Red
No Response	A particular SMR is not responding to the SCU	Amber (FL)
Power Limit	SMR is in Power Limit	Amber (FL)
No Load	SMR output current less than minimum for SMR type	Amber (FL)
Current Limit	SMR in current limit	Amber (FL)
Voltage High	Voltage measure by SMR too high	Amber (FL)
Voltage Low	Voltage measure by SMR too low	Amber (FL)
UNCAL SMR	SMR internal adjustment for current sharing out of limits	Amber (FL)
EEPROM Fail	EEPROM failed (SCU or SMR)	Amber (FL)
Fan Fail	SMR internal fan failure alarm	Amber (FL)
Relay Fail	SMR output relay contacts failure	Amber (FL)
No Demand	Control loop in SMR not in normal state	Amber (FL)
H/S Temp High	SMR heatsink temperature too high	Amber (FL)
Temp Sensor Fail	Temperature sensor in SMR microprocessor circuit failed	Amber+Red
Vref Fail	Voltage reference in SMR microprocessor faulty	Amber+Red
AC Volt Fault	None of the SMRs are responding (AC failure assumed), or if AC monitor is used, AC voltage is out of limits	Amber+Red
AC Freq Fault	AC frequency lower or higher than preset value	Amber (FL)
Battery switch	One or more battery switches open	Amber (FL)
Cct Breaker	Fuse or circuit breaker in load distribution open	Amber (FL)
LVDS Open	Low Voltage Disconnect switch open	Amber (FL)
Sys Volts High	System output voltage too high	Amber (FL)
Sys Voltage Low	System output voltage too low	Amber (FL)
Cell V High	One or more cells being monitored by SBM are too high	Amber (FL)
Cell V Low	One or more cells being monitored by SBM are too low	Amber (FL)
Cell %dev High	One or more cells being monitored by SBM are too high % deviation from the mean battery cell voltage	Amber (FL)
Cell %dev Low	One or more cells being monitored by SBM are too low % deviation from the mean battery cell voltage	Amber (FL)
Range SMR	SMR parameter range error. SCU could not overwrite values	Amber (FL)
Site Monitor	Alarm preset from the site monitor System. See site monitor menu for details of alarm channel	Amber (FL)
Battery Disch	Batteries are discharging	Amber (FL)
Disch Tst Fail	Battery discharge test failed to reach a programmed end point	Amber (FL)
SMR Comms Fail	One or more SMRs are not responding	Amber (FL)
Amb Temp High	Ambient temperature higher than preset limit	Amber (FL)
Batt Temp High	Battery temperature higher than preset limit	Amber (FL)
Batt Temp Sens	Battery temperature sensor not connector or failure	Amber (FL)
Batt I-Limit	Battery charging current is being limited to preset value	Amber (FL)
Bat Sym Alarm	Battery discharge currents from battery strings not sharing load equally	Amber (FL)
Equalize	System is in equalize mode	Amber (On)

Table Notes: FL = LED Flashing; On = LED On Steady

4.5 HOME MENU SCREENS

With the Home screen displayed, pressing the “up arrow” or “down arrow” button will move through a series of screens showing ambient temperature, a series of editable parameters (e.g. float voltage high and low, security, number of batteries), and enabling and disabling of auxiliary parameters (e.g. battery cell voltage monitoring). The following map summarizes the available menu screens.

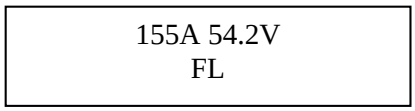
Home Screen	System current, voltage and mode	
	Ambient temperature	
	3-Phase AC Monitor option	
	Programmabl	Ambient temperature alarm
		Voltage, high alarm
		Voltage, low alarm
		Failsafe Alarms: on/off
		Bat Cur Sensor: on/off
		Security: on/off
		Password setup
When viewing another screen, the Home screen will reappear in ~60 seconds if no button is pressed.		Test indicators
		Number of Rectifiers (SMRs)
		Number of battery strings connected
		Full scale battery current
		Load sensor on/off
		FS Load Current
		Access code (7 digit number)
		Date format
		Date/time set
		Alarm report: on/off
		Daily report: on/off
		Daily report time
		Modem on/off
		Phone numbers 1, 2, and 3
		Audio alarm: on/timeout/off
		Cct input: no/nc/disable*
		Battery switch: no/nc/disable*
		LVDS: no/nc/disable*
		Auxiliary units, press ENTER
		1-ph AC monitor: on/off
		3-ph AC monitor: on/off
		Sageon III Battery Monitor: on/off
		Battery configuration
		Number of batt strings monitored
		Cell voltage high/low/differential
		Site monitor, press ENTER
		Outputs 1-4, on/off status
		*no = normally open; nc = normally closed

Note: The screen examples in this and subsequent sections will vary with System voltage, loads, environment, battery quantity, type, and condition, included System options, and other factors.

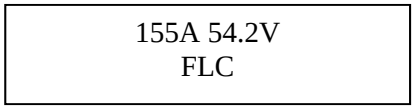
Note: Screens for options will not be viewable unless the option is installed and/or enabled.

Access the screen series shown here by pressing the “up arrow” button. Press the “down arrow” button to access the screens in reverse order.

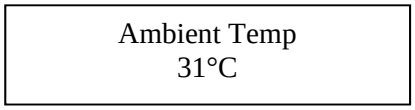
Home screen



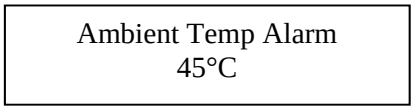
“C” indicates that the battery temperature compensation is active



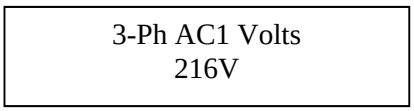
Ambient temperature is displayed in degrees Centigrade



Ambient temperature alarm level



3-Phase AC monitor voltage, current, and frequency



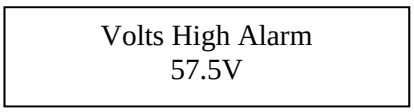
Use “up arrow” or “down arrow” to scroll through the three AC inputs for each parameter. AC monitor option must be installed to view these screens.

Programmable parameters:

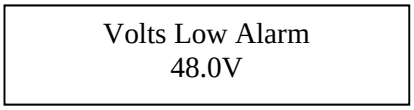
This series of screens contain programmable parameters. To change a parameter value:

1. Scroll to the desired screen using the “up arrow” or “down arrow” button.
2. Press the ENTER button; the selected value will flash.
3. Use the “up arrow” or “down arrow” button to edit that value. Press ENTER to store the new value or to move to the next number to be set in a series of numbers.

Float voltage high level: Set to the desired high alarm value.

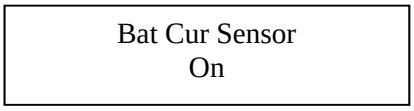


Float voltage low level: Set to the desired low alarm value.



Failsafe Alarms: When Failsafe alarms are on, all alarm relays will be normally energized when no alarm condition is present. Relays will de-energize when an alarm occurs.

Battery current sensor: When Battery current sensor is turned on, the controller will read battery current from the installed battery current transducers.



Security on/off toggle: When security is On, no parameter values may be edited. Without first entering the password; this menu will not appear if a password has not been set.

Password Setup: The Sageon systems are shipped without a password set by default. Enter a password to prevent unauthorized changes to system parameters.

Password Setup
Press ENTER

Controller features password security for setting of parameter. A valid password is an alphanumerical code having minimum three and maximum eight characters.

Wrong Password
Panel Locked

Units leave the factory without a pre-programmed password and the security function is not active. To activate the security, a password must be programmed. Once that is done, security can be enabled.

When the security function is active any changes to the system settings can be done only after a valid password was entered. When the ENTER key is pressed to change a parameter, the display will show a message “Enter Password” on the top line and a blinking cursor on the right hand side of the bottom line. Using INC and DEC keys scroll to the first character of the password and press ENTER. The character will be substituted by an asterisk (*) displayed to the left of the cursor. Enter all characters of the password the same way. If the password is less than eight characters long press ENTER again after last character. If the entered password was correct the display will return to the selected parameter ready for modification. If the entry was incorrect following will be displayed.

There is no limit on password entry re-tries. To abort password entry any of the top row buttons should be pressed. The display will return to the selected parameter. Once unlocked, the security is disabled until there is no keypad activity for >1 minute.

Display test: All LEDs on the rectifiers and operator panel will flash when ENTER is pressed, and the screen will alternate between the SCU software version and an all pixels on screen (not shown).

Test Indicators
Press ENTER

Number of SMRs (Rectifiers) in system: This number must be entered to prevent the operator panel from indicating that some SMRs are not responding.

Number of SMRs
15

Number of battery strings: Set to the number of connected battery strings.

Num of Batteries
2

Battery current transducer full-scale rating: Set to the full-scale rating of the battery current transducer.

FS Batt Current
200A

Load sensor: On = SCU displayed System current is derived from the voltage across System shunt.

Load Sensor
ON

Off = SCU displayed System current is the sum of the Rectifier currents.

FS Load
2500A

Full Scale Load Current: Set to the full scale rating of the installed plant system shunt.

SCU Access Code (i.e. System ID): Type a unique 7 digit number for each Sageon III Base System in your network. Be sure to record your access code(s) and store in a secure location.

Access Code
1252636

Date format: Set the date format: DD/MM/YYYY, MM/DD/YYYY, or YYYY/MM/DD.

Date Format
MM/DD/YYYY

Clock set: Set the date and time. Note that this is a 24-hour clock.

Date 12/31/2012
Time 21:58:34

Alarm report on/off toggle: When on, the system will dial the Phone 1 number, see the Phone 1 screen below. If there is no answer, Phones 2 and 3 will be dialed in turn. The cycle will continue until a connection is made. See Note following Phone 3 below.

Alarm Report
On

Daily report on/off toggle: When on, the system will log in to the telephone numbers below at the time set in the following screen and download the status and all operating parameters. See Note following Phone 3 below.

Daily Report
On

Time of daily report: Note that is a 24-hour clock.

Daily Report
15:15

Modem enable on/off toggle: The Phone number screens will appear only when the modem is toggled on.

Modem
On

Phone 1: Set the first number to be dialed when an alarm occurs. Up to 20 digits can be stored. Numbers longer than 10 digits are shown on two screens.

Phone 1
0398887788

Second screen example.

Phone 1 Cont
2323

Phone 2: This number will be dialed when the above number does not answer.

Phone 2
0398880033

Phone 3: This number will be dialed should the previous number not answer.

Phone 3
0398880003

Note: To send Alarm Report or Daily Report to a local PC, set the Report to On and Modem to Off.

Audio alarm on/off toggle: Set to On to audibly annunciate an alarm. Press ENTER to silence (acknowledge) the alarm.

Audio Alarm
On

Circuit breaker auxiliary contact input: Configure options are normally closed, normally open, or disabled (not used).

Cct Input
Used – N/C

Battery circuit breaker auxiliary contact circuit input: Configuration options are normally closed, normally open or disabled (not used).

Bat Sw Input Used – N/O

Battery low voltage disconnect switch auxiliary contact circuit input: Configuration options are normally closed, normally open or disabled (not used).

LVDS Input Used – N/O

Press ENTER to access the Sageon Battery Monitor, and the Sageon Site Monitor. Press “up arrow” to go to the top of the menu string.

Auxiliary Units Press ENTER

Note: Screens for installed options (e.g. Sageon Battery Monitor, Site Monitor) appear next. If no options are installed, the HOME screen will appear.

4.5.1 Sageon Battery Monitor

Note: See Section 4.9 Sageon Battery Monitor Setup for additional information.

When battery cell voltage monitoring is included in software, the window at right will appear next.

Battery Monitor Press ENTER

Battery monitor on/off toggle: Press ENTER to display the current On/Off status (flashing). Press “up arrow” or “down arrow” to set the desired state, then press ENTER to store.

Battery Monitor On

The following screens *will not appear* if Off has been entered.

Battery configuration: Set the number of cells in a battery string and the number of battery strings connected to the monitor. See Section 4.9 Sageon III Battery Monitor Setup for details.

Bat Config 24 cells

After pressing ENTER, “current configuration” will flash. Scroll through the available configurations and press ENTER again once the correct battery type is chosen.

Battery strings: Set the number of connected battery strings. The maximum is four.

SBM Batteries 2

Note: This number must equal to or be less that the Num of Batteries entered in the Home, Programmable Parameters series of screens.

High voltage alarm threshold: Set the cell voltage above which an alarm will be generated.

Cell Vhi Alm 2.48V

Low voltage alarm threshold: Set the cell voltage below which an alarm will be generated.

Cell Vlo Alm 1.44V

Delta positive voltage threshold: Set the percentage of nominal cell voltage by which any individual cell voltage can exceed the nominal. Above this value, an alarm will be generated.

Cell +dVc Al 10%

Delta negative voltage threshold: Set the percentage of nominal cell voltage by which any individual cell voltage can be less than the nominal. Below this value, an alarm will be generated.

Cell -dVc Al 10%

4.5.2 Site Monitor

When the Site Monitor is included in the software, the window at right will appear next.

Site Monitor Press ENTER

Site monitor on/off toggle: Press ENTER to display the current On/Off status (flashing). Press “up arrow” or “down arrow” to set the desired state, then press ENTER to store.

Site Monitor On

Contact the factory for additional details concerning this feature.

4.6 RECT (RECTIFIER) MENU SCREENS

Enter this series of menus by pressing the REC (SMR) button. Press “up arrow” or “down arrow” to select the Rectifier number (i.e. rectifier position address) and press ENTER. Press “up arrow” to scroll through the screens in the order shown. Repeat for each Rectifier. The following map summarizes the available menu screens.

RECT Button	Select Rectifier number* (1-24); read number, current, and temperature	
	Press ENTER for firmware version	
	Float voltage	
	Equalization voltage	
	Programmable	Voltage, high/low alarm
		Voltage, high voltage shutdown
		Current limit
		Fault, reset SMR

***** The Rectifier number is the “rectifier position address” of the target Rectifier (e.g. SMR **“4”**).

SMR no response: A No Response message appears when the target Rectifier is not installed, not connected, not switched On, or is faulty.

SMR1 No Response

SMR initial display: When a Rectifier is online and operating normally, its output current and heatsink temperature are shown.

SMR1 92A 29°C

SMR version and temperature: Press enter display Rectifier’s software version.

SMR1 G1045a

SMR output current: Press the “up arrow” button to display the output current from other Rectifiers.

SMR2 91A

Float voltage: This parameter is globally (and indirectly) set in the Batt menu. It cannot be changed in this screen.

SMR Float 54.2V

Equalization voltage: This parameter is globally (and indirectly) set in the Batt menu. It cannot be changed in this screen.

SMR Equalize 57.0V

Programmable Parameters:

The following screens allow access to the SMR programmable parameters. Note that the parameter values apply to ALL installed SMRs.
To change a parameter value:

1. Scroll to the desired screen using the “up arrow” or “down arrow” button.
2. Press the ENTER button; the selected value will flash.
3. Use the “up arrow” or “down arrow” button to edit that value. Press ENTER to store the new value.

SMR high voltage alarm threshold:

SMR V high Alarm 57.0V

SMR low voltage alarm threshold:

SMR V low Alarm 48.0V

SMR high voltage (DC) shutdown:

SMR HVSD 58.0V

SMR current limit:

SMR I Limit 50A

Fault reset: Press ENTER to reset latched alarms, such as HVSD. The Rectifier will restart unless damaged or faulty.

Reset SMR Fault Press ENTER

Note: Pressing “up arrow” button will display the HOME screen.

4.7 BATT MENU SCREENS

Enter this series of menus by pressing the BATT button. Press the “up arrow” button to scroll through the screens in the order presented. Repeat the series for each battery string. The following map summarizes the available menu screens.

BATT Button	Battery string (1-4) current*
	Battery string temperature
	Estimated charge (1-4)
	Programmable

Programmable
Battery discharge alarm voltage
Battery temperature alarm
Battery Ah rating
BTC on/off
BTC Temperature coefficient
BTC Temperature compensation nominal
Number of cells per string
Battery charge current limit: <Vdd
Battery deep discharge voltage: Vdd
Battery charge current limit: from Vb<Vfl
System float voltage
System voltage drop
Equalization on/off
Charge current limit: >Vfl
Equalization voltage
Equalization trigger voltage
Equalization no trigger voltage
Equalization trigger charge: Ah
Equalization trigger discharge rate: Ah
Equalization no trigger discharge rate: Ah
Equalization end charge current
Equalization end charge: Ah
Equalization end duration: hours
Equalization auto-initialize: weeks
Equalization end: manual
Equalization start: manual
LVDS trip voltage
LVDS mode: auto/closed/open
Temperature sensor alarm on/off
Discharge current and battery voltage
BDT period: 0-365 days
BDT start time: hours, minutes
BDT duration: hours, minutes
BDT current: 0-5000A
BDT end voltage
BDT end charge: Ah
BDT alarm reset
BDT end, manual
Last BDT results: pass, fail, abort, etc.
Last BDT time/date; duration
Last BDT battery string voltage and charge

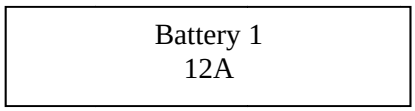
* Press ENTER to read individual cell voltages if SBM option is installed and enabled.

Complete descriptions for testing vented lead acid and VRLA batteries are beyond the scope of this manual but are discussed in detail in IEEE STD-450-2002 (or its latest revision) and IEEE 1188-1996, respectively, battery specific manuals, and other professional society standards.

It is important to recognize that standby batteries/cells are designed for emergency standby operation and excessive testing or cycling of a battery can materially shorten the life of a battery.

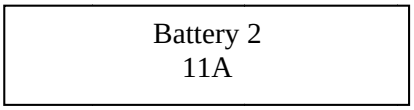
IMPORTANT: The number of the target battery string (e.g. Battery **1**) must be entered!

Battery 1 current:

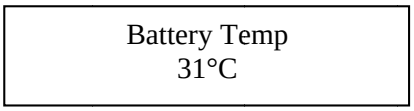


Press ENTER to display cell voltages for selected string if Battery Monitor option is installed and enabled. Press “up arrow” or “down arrow” to scroll through cells.

Battery 2 current: If additional battery strings are connected, set the number of that string; a maximum of four battery strings may be connected.

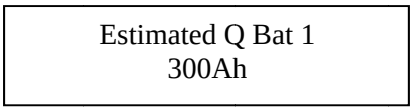


Battery temperature: This screen shows the highest battery temperature when temperature sensors are installed on the battery string.

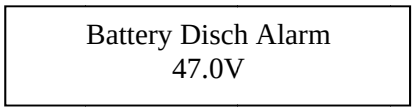


If sensors are not installed, Sensor Not Attached will be displayed.

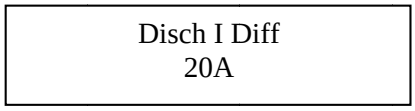
Estimated battery charge:



Battery discharge alarm threshold: Set to the voltage to which the battery string falls during discharge. When battery voltage reaches this value, an alarm will be generated.

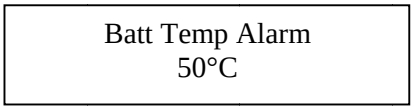


Battery discharge current differential threshold: The allowable battery string discharge current difference is entered at this screen. A reasonable value is 20% of the total discharge current. An alarm is generated when the differential exceeds the value entered.

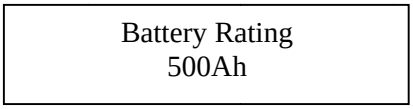


When two or more battery strings are connected, the value in this screen is read by the SCU when an AC outage occurs and the battery strings are supplying the load current. A difference in discharge current is an indication of the state of the battery strings.

Battery over temperature alarm threshold: Set the maximum allowable battery temperature.

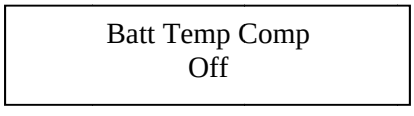


Ampere-hour battery rating: Set the battery string’s A/H rating.

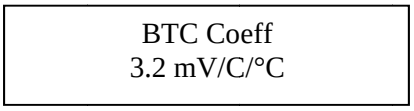


4.7.1 Battery Temperature Compensation

Battery temperature compensation on/off toggle:

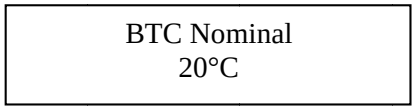


Battery temperature compensation (BTC): Enter the temperature compensation coefficient in mV per degree C per cell in this screen. The allowable range is 0.1 to 6 mV/Cell/°C. If the value is less than 0.1, the display will show Off. See “BTC Notes” below.

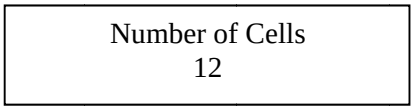


For Liberty 1000 batteries, enter 3.6 mV/C/°C (2 mV/C/°F). Normal operating temperature is 25°C (77°F).

BTC nominal temperature: When battery temperature compensation is active, type the temperature at which system voltage is NOT corrected. This temperature must be between 18°C and 27°C. Note that compensation range is 10-35°C. See the Notes below.



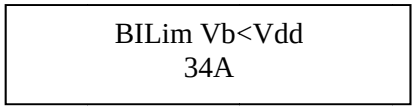
Battery cells per string: Set the number of physical cells in a string.



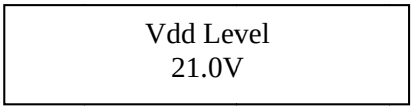
BTC Notes:

1) If the battery temperature sensor is not connected, compensation is based on the ambient temperature sensor.
2) If battery and ambient temperature sensors are connected, compensation is based solely on the battery sensor.
3) When temperature compensation is active, the SMR voltage setting is automatically adjusted by the SCU as needed.

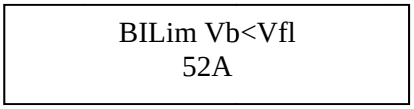
Battery charging current limit: Set the maximum battery charge current when the voltage across the two battery strings is less than the deep discharge voltage (Vdd).



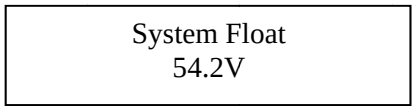
Battery deep discharge voltage (Vdd):



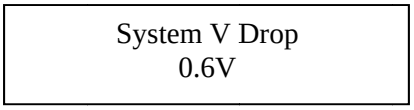
Battery charging current limit: Set the current when the battery voltage is between Vdd and the float voltage (Vfl). This current is typically higher than that for the deeply discharge battery.



System float voltage: Set the system output voltage at the output bus bar terminals.

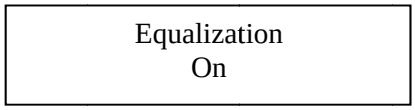


System voltage drop: Set the maximum voltage drop as defined by: maximum rectifier output – system float voltage. A typical value is 0.6V.



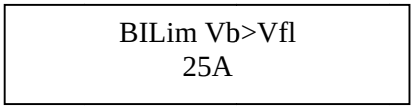
4.7.2 Equalization

Equalization on/off toggle:

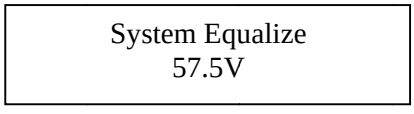


If equalization in off, the following screens will not appear.

Battery charging current limit: Set the maximum equalization charging current (Vbattery > Vfloat). This applies when batteries are being equalized.



Equalization voltage: Set the maximum voltage reached during equalization of the batteries.



Equalization on/off toggle:
On – voltage trigger
Off – ampere/hour trigger

Volts Start Eq
On

Equalization trigger, voltage: Set the voltage at which equalization will be initialized, during battery discharge.

Volts Eq Trig
48.0V

Equalization on/off trigger:
On – voltage trigger
Off – ampere/hour discharge trigger

Volts Start Eq
Off

Equalization A/h on/off toggle:
On – ampere/hour discharge trigger
Off – voltage trigger

Q Start Eq
On

Equalization trigger, A/h: Equalization is initialized when the charge supplied to the load exceeds the value set in this screen.

Qdis Trig
10Ah

Equalization A/h on/off toggle:
On – ampere/hour discharge trigger
Off – voltage trigger

Q Start Eq
Off

Equalization termination: Equalization can be terminated based on charging current or charging time.

EQ End Current
25A

If equalization is to end at a specific charging current, set that current in this screen.

If equalization is to end after a specific time, reduce the value in this screen to less than 5% of the A/H rating of the battery string. The ampere value entered will be replaced by Off.

Equalization termination time: Set the period of equalization. If equalization is to be based only on the A/h discharge method, set the period to maximum: 48 hours.

EQ Duration
20 hours

Force equalization: If equalization does not occur due to battery discharge, set the period after which equalization should be forced.

EQ Period
12 Weeks

Equalization manual termination: To manually terminate equalization, at this screen press ENTER. The system must be in equalization mode for this screen to appear.

Manual Stop EQ
Press ENTER

When ENTER is pressed, the system reverts to Float mode and the screen changes to that shown at right, ready for manual equalization manual start. The system must be in Float mode for this screen to appear.

Manual Start EQ
Press ENTER

4.7.3 Low Voltage Battery Disconnect (LVBD)-(LVLD Screens)

LVBD switch trip voltage: Set to establish the voltage at which the batteries will be disconnected from the load to prevent excessively discharging the battery string (LVLD).

LVLD Trip
45.0V

LVBD Off/On: Set to Off or On depending on whether or not your system has LVBD.

Low Voltage Load Dis.
On

NOTE: LVDS screens have no functioned control over the contactor; use LVLD screens.

Temperature sensor alarm toggle: Set to On when sensors are connector. Set to Off if sensors are not connected.

Temp. Sen. Alarm
On

Note: Battery discharge test screens are shown next; go to Section 4.7.1. If the test screen shows Off, the Last BDT screen appears next; see Section 4.7.2.

4.7.4 Battery Discharge Test (BDT) Screens

The battery discharge test performs a periodic, controlled discharge of the connected battery string(s). The test confirms battery string capacity and uses the customer loads to discharge the battery string(s) so no battery strings need to be disconnected and individually loaded, as would be the case in a typical manual discharge test.

To access test parameters, press the BATT button and then press “down arrow” to access the following screens.

While the test is in progress:

- The display will alternate between the Home screen and the BDT in Progress screen shown at right.
- The system alarms Battery Discharge, Voltage Low and SMR Voltage Low.
- Low Load alarm will be suppressed.
- SMR alarms will be shown in the SMR status.

50A 54.1V
BDT in Progress

Test time interval: The interval between tests can be set to 0-365 days.

BDT Period
14 Days

When set to zero, the automatic execution of the test is disabled (set to Off). Display messages below will be shown only if the test is enabled.

BDT Time
17:35

Time of test: Set the time of day the test is to be performed. This is a 24-hour clock.

BDT Duration
1h30min

Test duration: Set the duration of the test. Duration can be set from 5 minutes to 24 hours in increments of 5 minutes.

BDT Current
50A

Discharge rate: Set the rate of discharge. Rate can be set from 0 to 5000A. If rate is set to zero, the control function is disabled and the battery will discharge under full load current.

Note: The total load supplied by the system during the test must exceed the desired battery discharge current by at least 10%. Rectifiers will supply the additional load, leaving the battery string to supply a user defined current to the load.

End of test: Set the battery voltage that will terminate the test if reached before the test duration set above.

BDT End V
47.0V

At the end of test, whether ended by test duration or end voltage, normal operation is restored and recharging of the battery string(s) is begun. The test result will be "Fail." Battery string end of voltage depends upon system voltage: 48V system 36V to 48V

BDT End Q
500Ah

Battery end of capacity: Set the remaining battery capacity at which the test must end. Capacity can be set from 25Ah to 9995Ah. If rate is set to zero, the control function is disabled and the battery will discharge under full load current.

Reset of failed test alarm: This message appears when the preceding test fails and is not reset. Press ENTER to reset the alarm and hide the message.

BDT Alarm Reset
Press ENTER

Abort MBT: This screen is available when a discharge test has been started.

BDT in Progress
ENTER to abort

4.7.5 BDT Results Screen

The final screen contains a brief test result message. The message appears on the second line of the Last BDT display. Each message is explained below.

Last BDT
N/A

N/A – Not Available: No test has been performed.

Passed – Test ran for programmed duration without reaching an "End V" or "End Q" value.

Failed – Test terminated prematurely after reaching an "End V" or "End Q" value before the test duration expired. This will trigger a "BDT Fail" alarm.

AC Lost – Test terminated due to loss of AC supply. Detected by the AC monitor or by all SMRs being Off.

Cell V Low – A cell in a battery string discharged below a safe level. Alarm issued. Available only when BDM is active. BDT flagged as having failed.

No Control – Test aborted due to loss of control of rectifiers. No alarm issued.

Low Load – Test aborted due to load current being too low to control discharge current. No alarm issued.

SMR Overload – Test aborted due to load current being too high to support controller discharge. No alarm issued.

User Aborted – Test terminated manually by user from the SCU.

4.7.6 BDT Results Screen, Additional Details

To view additional details about the preceding test, press ENTER while viewing one of the above Last BDT screens. These sub-menu details appear on the second line of the Last BDT screen.

09/12/2012 – States the date of preceding test in a day/month/year format.

Dur 1h18min – Provides the duration of preceding test.

EndV 47.0V – Shows the battery string voltage when test was terminated.

EndQn 380Ah – States the remaining estimated capacity of the battery string at the time the test was terminated, where "n" is the number of the string.

4.7.7 BDT Disabled

The battery discharge test function is disabled for 2 minutes if any of the following has occurred. If an automatic test is scheduled during this period, it will be performed at the next opportunity, at the BDT Time.

- SCU has recently been powered up.
- An AC supply failure has been recorded.

4.8 ALARM LOG SCREENS

An alarm log resides in SCU memory and these alarms can be viewed by momentarily pressing the Alarms Log button. The following map summarizes the available menu screens.

LOG Button ———	Alarm number and description
	Alarm date and time
	Clear alarm log

Initial Alarm Log screen: Log 1 is the most recent alarm. Previous alarms are number in sequence, 2 through "n." The second line provides the alarm name.

Log 1 AC Freq Fault

Press and hold the "up arrow" button for 2 seconds to display the preceding alarm (Log 2). Press again to display the preceding alarm, Log 3.

Log "n" Alarm Name

Momentarily (less than 2 seconds) press the "up arrow" button to display a screen showing the date and time alarm occurred. The date format is day/month/year; the time format is 24 hours.

Log 1 16/03/2015 13:55

Clear Alarm Log: From any alarm log screen, press ENTER and then press "down arrow" to clear all log entries. A deletion confirmation screen will be displayed.

"Down arrow" to Clear Log Entries

The alarm log can only be cleared from the front panel. There are no means to clear the alarm log entries remotely.

LOG No Alarms

4.9 SAGEON BATTERY MONITOR SETUP

With the SBM option enabled, SBM parameters must be set before monitoring can be performed. From the HOME screen, scroll through the operator display screens shown in Section 4.5.2 to the Auxiliary, "Bat Config" and "SBM Batteries" screens and there declare the number of battery cells per battery string (2-24) and the number of battery strings (1-4) whose cell voltages are to be monitored by the SCU.

Refer to the Sageon Battery Monitor Manual (PM990-4209–00) for detailed information.

The quantity of SBM boards needed for the above selection is calculated by the SCU based on battery type and configuration. The relationship between battery configuration and quantity of SBM boards is shown in the table below.

TABLE 4-4 SBM BOARDS NEEDED FOR VARIOUS BATTERY CONFIGURATIONS

48V Battery	SBM Batt = 1	SBM Batt = 2	SBM Batt = 3	SBM Batt = 4
24, 2V Cells	1 SBM Board	2 SBM Boards	3 SBM Boards	4 SBM Boards
12, 4V Cells	1 SBM Board	1 SBM Board	2 SBM Boards	2 SBM Boards
8, 6V Cells	1 SBM Board	1 SBM Board	2 SBM Boards	2 SBM Boards
4, 12V Cells	1 SBM Board	1 SBM Board	1 SBM Board	1 SBM Board

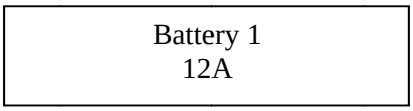
4.9.1 Frequency of Measurement

The frequency of cell voltage polling is programmable from 10 minutes to 8 hours in 1-minute steps. A typical polling interval is 4 minutes, which yields 15 points for a 1-hour discharge. For a programmed test discharge of 30 minutes, a polling interval of 2 minutes might be used. This parameter is not accessible from the operator panel. A PC running SageView is needed.

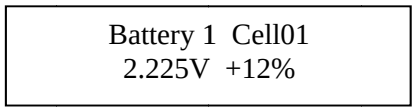
4.9.2 Battery Cell Measurements

When SBM is active, individual cell voltages can be monitored on the operator panel by selecting a battery from the BATT menu and pressing ENTER. The cell information will appear on the screen and the next and previous cells can be selected by pressing the "up arrow" and "down arrow" buttons.

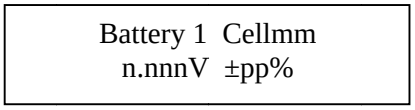
Select battery: Battery 1 screen appears after pressing the BATT button. Press ENTER.



Battery cell parameter: Battery 1, Cell 01 values are displayed. As shown here, the cell voltage is 2.225V, which is a deviation of +12% from the average cell voltage in this battery string.



Battery cell voltage deviation: Battery 1, Cellmm, cell voltage n.nnnV is deviating +/-pp% from the average cell voltage in this battery string. Press "up arrow" or "down arrow" to change the cell number.



4.10 COMMISSIONING THE CONTROLLER

With all the batteries, load and AC cabling wired, and checked for correct polarity, the system is commissioned by the following steps:

- Ensure no rectifiers are installed in the Power plant and no load is applied.
- Plug in the Controller – it should power up off the battery. If not, it is possible that the battery polarity is reversed.
- Set up the Controller menu items for:

- number of batteries and size (Ah),
- number of rectifiers,
- set the required float and equalize voltages,
- set LVLD option to ON and set the LVLD Aux to 42.0V
- set the Battery Switch to “Normally Open”
- set the Cct Switch to “Normally Open”
- set the Battery Transducer FS as size according to ordered transducers.
- set the amount of battery temperature compensation voltage adjustment if used and after confirming that the battery temperature is being measured
- set the battery charging current limit to 10% of the Ah rating (i.e. if 150Ah battery is used, set the limit to 15A) – this value can be adjusted later to meet your specific charging requirements. Always refer to the manufacturers recommendations for charging batteries.

In many cases, these values are set up in the factory and will only require modification if the particular battery being used requires a different set up. Refer back to section 3 to continue commissioning procedures.

4.11 OPERATION

System operation is controlled by the Controller system controller. As a result, operation information for the system is directly related to the operation of the Controller as described in this section.

4.12 SUMMARY OF CONTROLLER FRONT PANEL CONTROLS

There are four Menus which can be viewed using the INC or DEC buttons:
a) The default or "Home" menu which contains general system information;
b) RECTIFIER menu - contains all the parameters relating to the switch-mode rectifiers (RECTIFIER);
c) Battery menu - contains all the parameters relating to the batteries;
d) Alarms log - which is a chronological record of the last 100 alarms.

Moving from one menu to another

If no button has been pressed for two minutes, the display will revert back to the Home screen. This shows the output voltage and load current.
To move from any menu to any other menu, press the corresponding button. e.g. to move to the Battery Menu from any other menu, momentarily press the BATT button.
To move to the Home menu from any other menu, press the button of the current menu. e.g. if in the RECTIFIER menu, press RECTIFIER button to return to the Home menu.

Scrolling through the Menus:

To scroll through any menu from the first screen to the last, press the INC button;
To scroll to the last (bottom) screen first, then upwards through the menu to the first screen, press the DEC button.

Incrementing and decrementing programmable parameters

To change a programmable parameter press ENTER; the value will flash on and off. To increase the number, press INC; to decrease the number press DEC. When the desired number is on the screen, press ENTER again.

To change parameters when the security function is activated

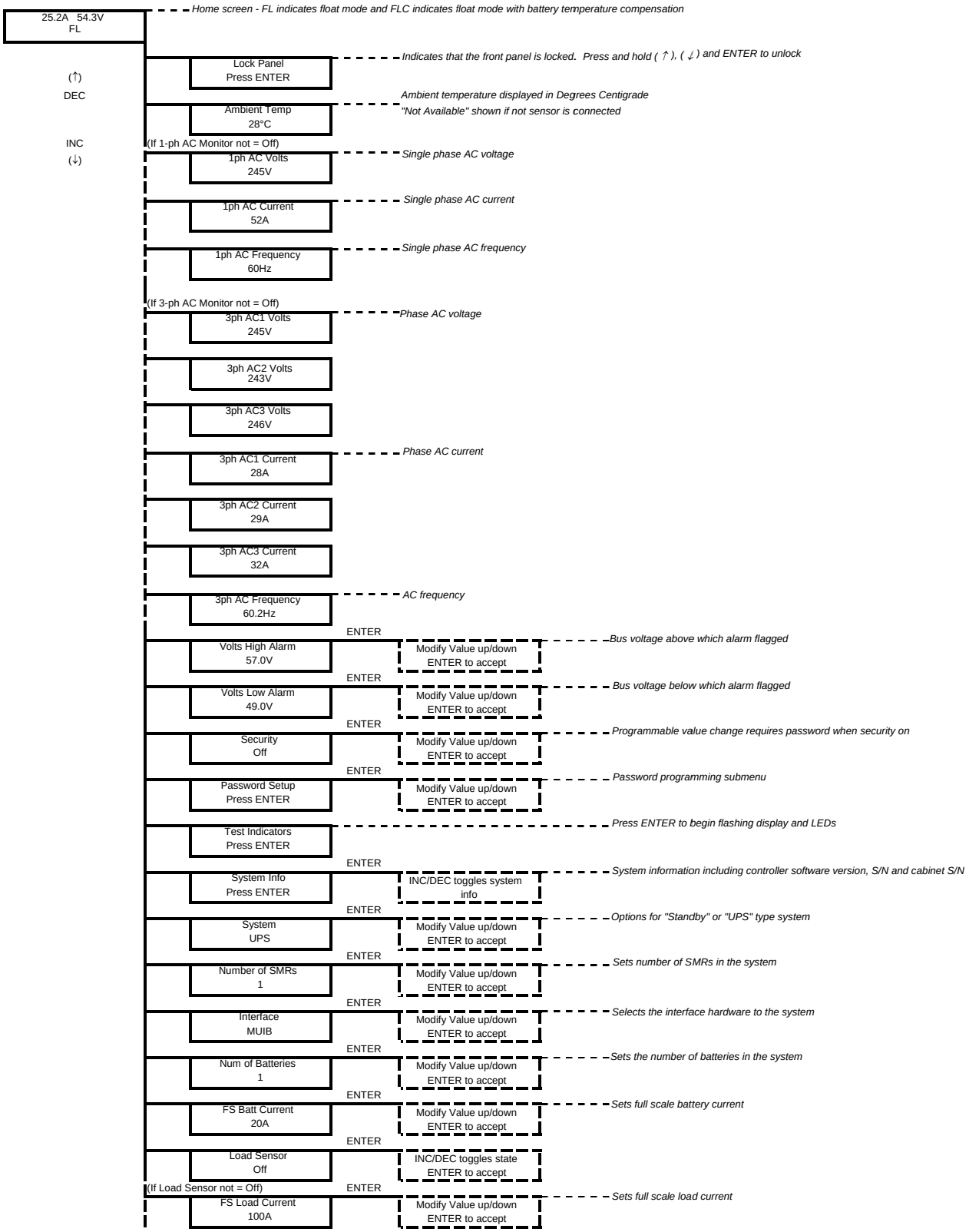
If an attempt is made to alter any parameter when the security function is activated, the display will show the message "Enter Password".
To change a parameter, enter a valid password. Then proceed to change the parameter in the normal way.

When scrolling through the Alarms log

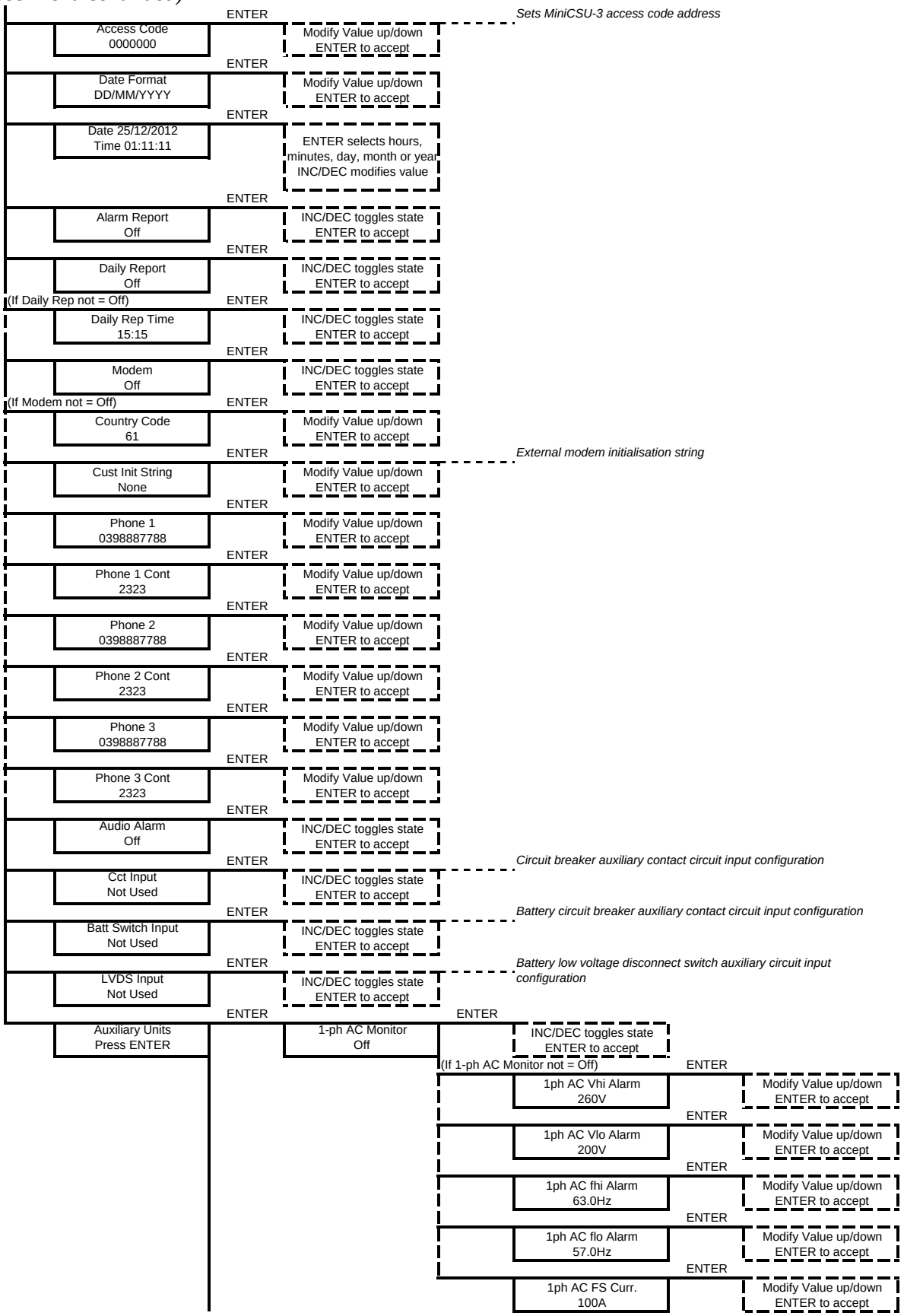
To observe the date and time of a given alarm, do not press any button for at least two seconds. The date and time will display for two seconds and then the alarm name will be displayed for two seconds. The display will alternate between the two screens in this manner until a button is pressed.

4.13 NAVIGATING CONTROLLER FUNCTIONS

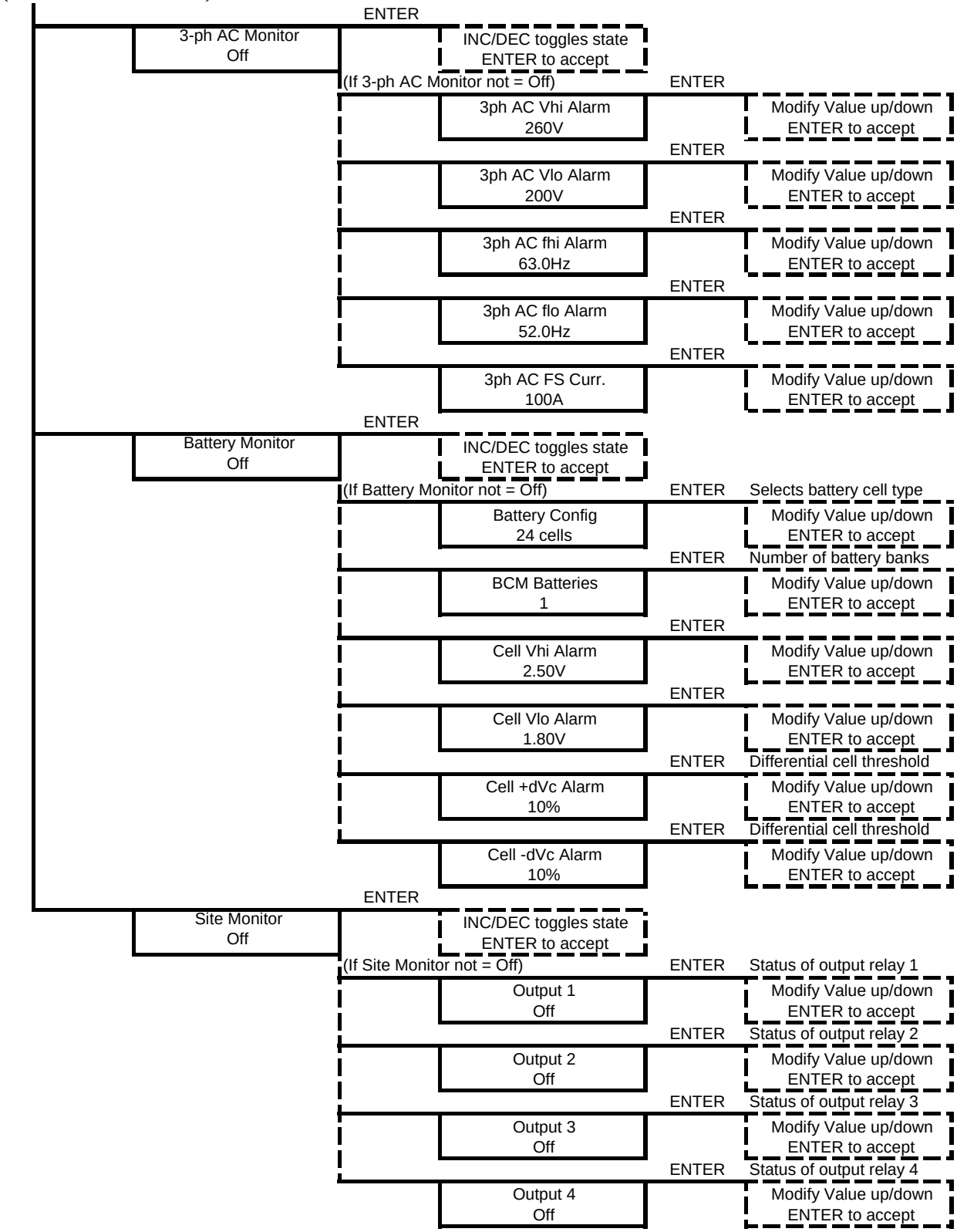
4.13.1 Base Menu (System Level Functions)



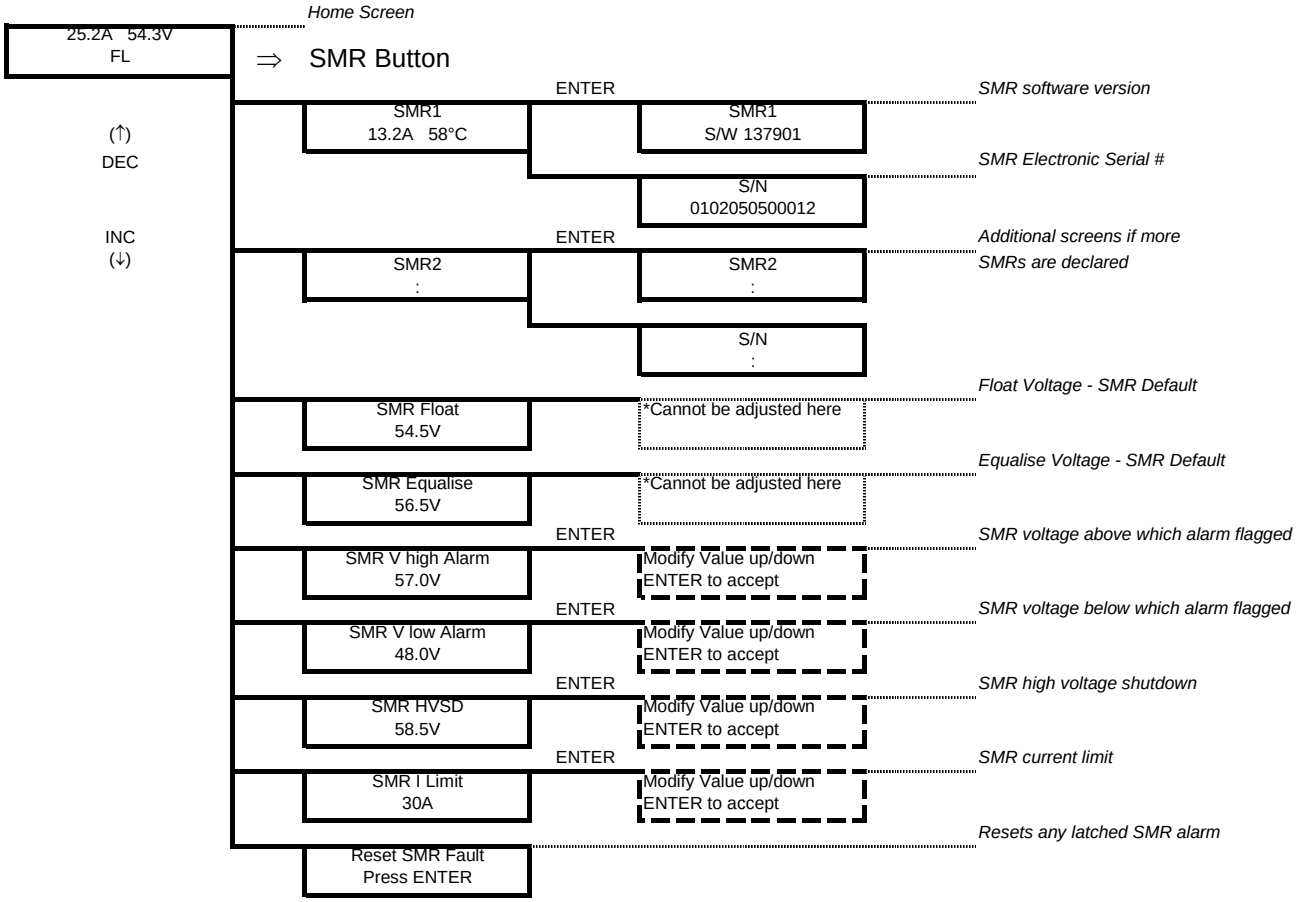
(Base Menu continued)



(Base Menu continued)

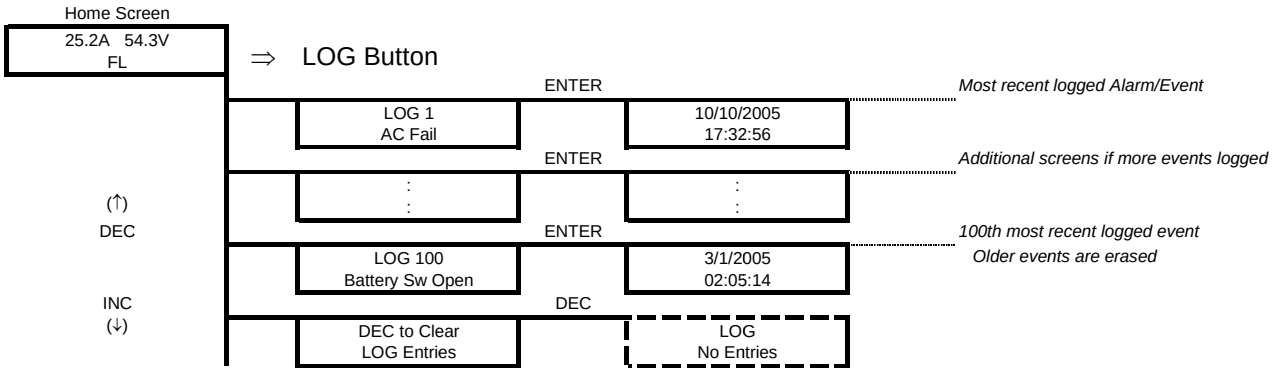


4.13.2 Rectifier Menu (Rectifier Specific Functions)

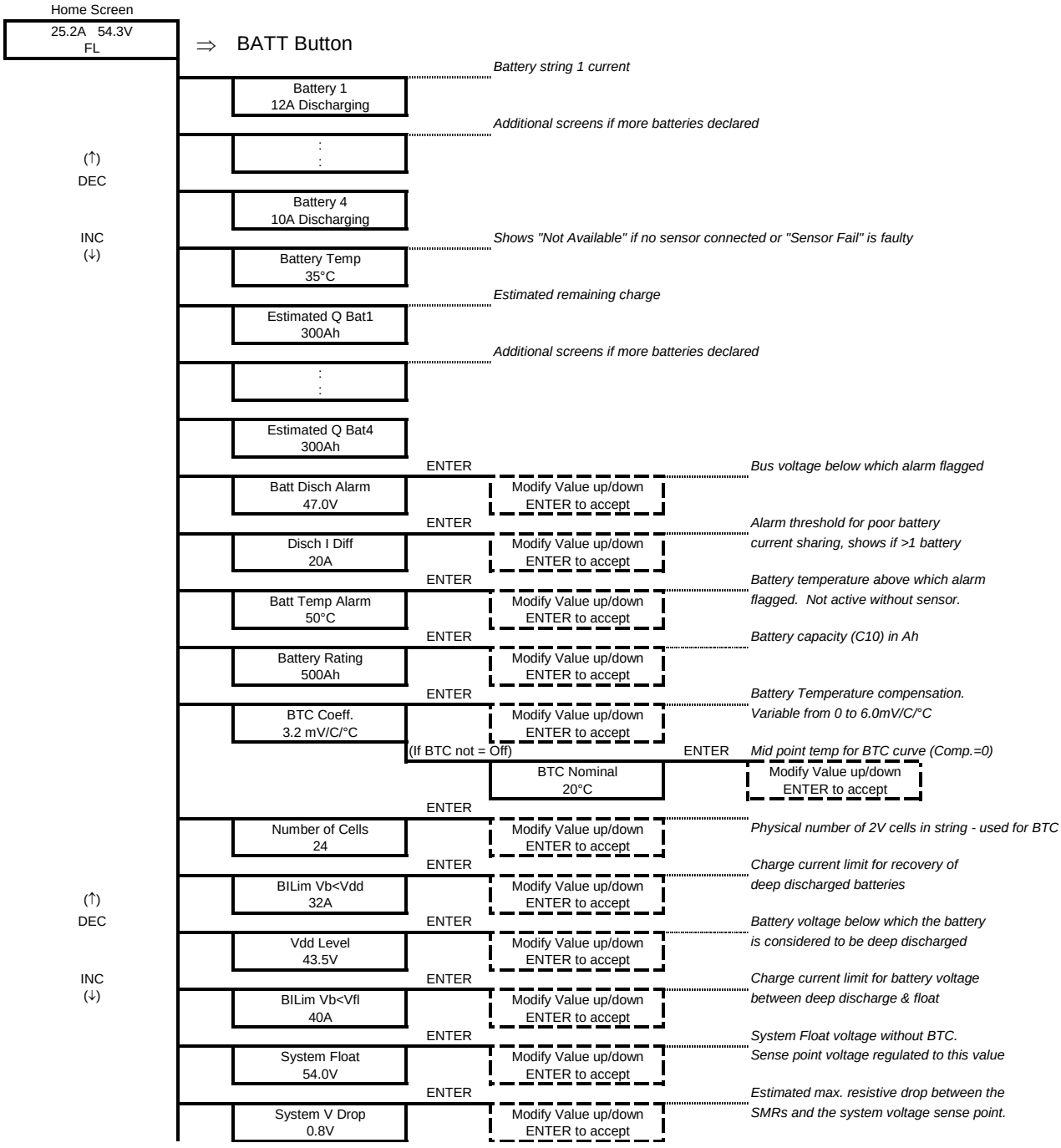


The RECTIFIER Float and Equalize voltages are the default values set in the rectifier that will be used if the Controller fails to operate. They are a copy of the raw values set in the BATTERY menu without battery temperature compensation and system drop adjustments.

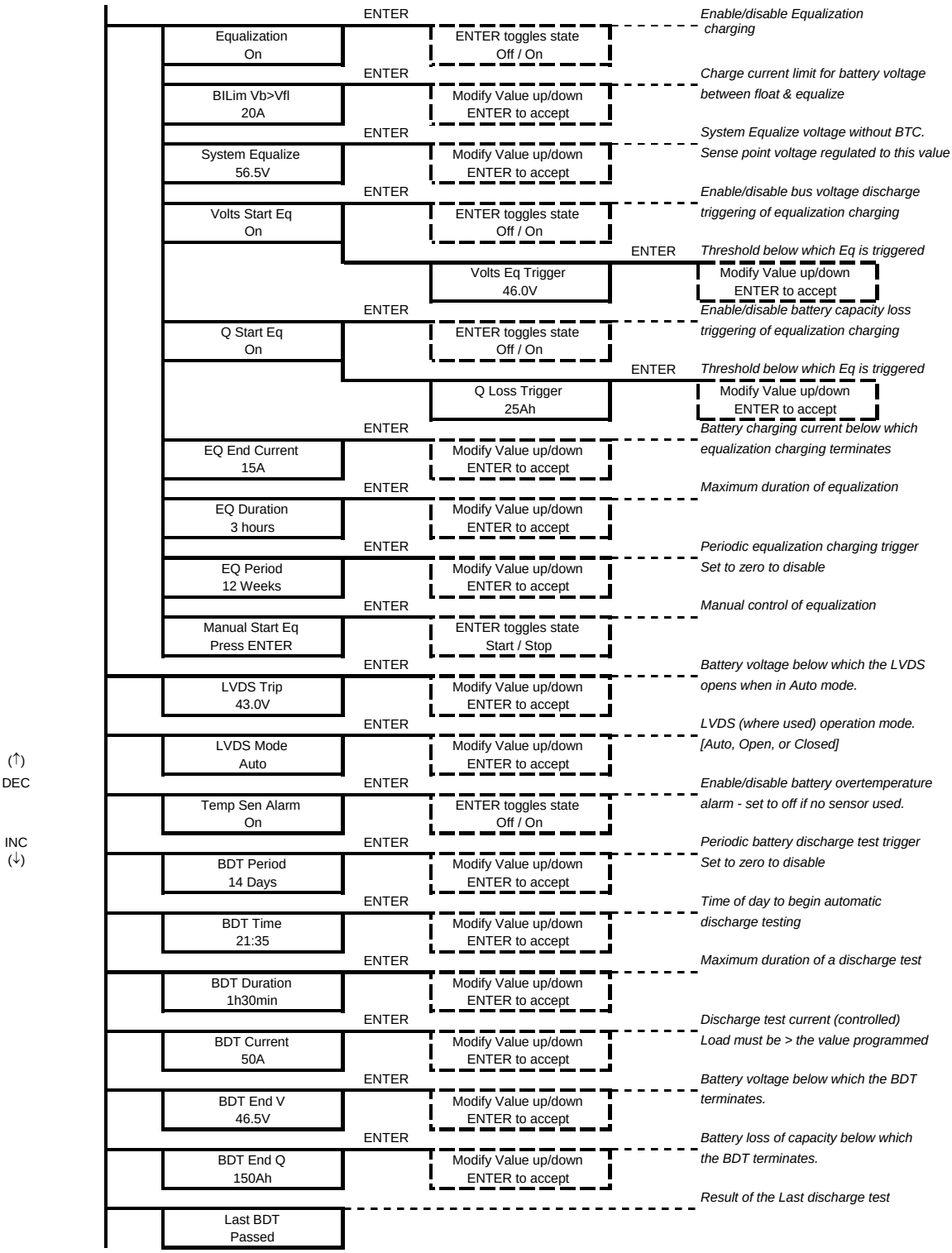
4.13.3 Alarm Log



4.13.4 Battery Menu (Battery Specific Functions)



(Battery Menu continued)



More detailed explanations of all the menu items are available in the Controller Operation PDF on the Manual CD.

5.0 SAGEVIEW

SageView™ System Monitor software enables configuring and monitoring of a Sageon III Base System from a local or remote personal computer (PC). Figure 5-1 shows the various access options.

Local monitoring involves a PC connected to the USB connector on a System's operator panel.

Remote monitoring also connects a Sageon III Base System to a PC, however, they can be separated by a few feet or by hundreds of miles. Your company's Ethernet network or intranet, the Internet, or a pair of telephone modems can provide the interconnection. *Refer to TG990.4262.10 for more details on SageView.*

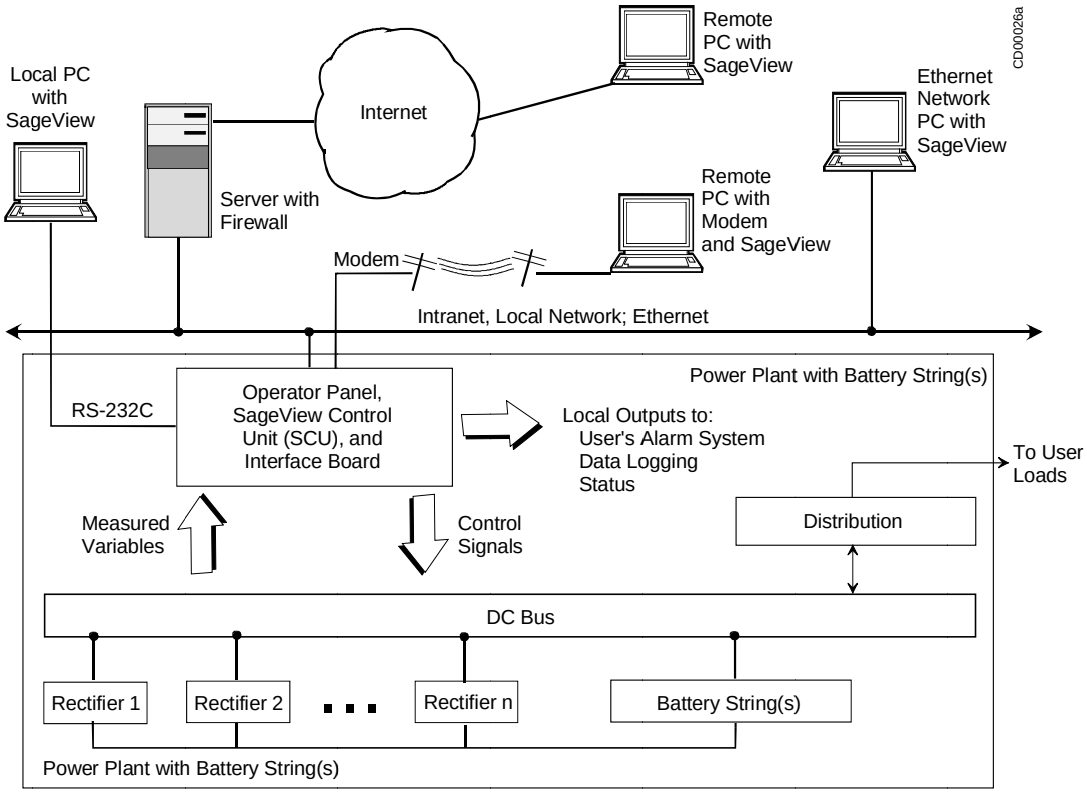


FIGURE 5-1 NETWORK CONNECTIONS

5.1 CONFIGURATION

Use SageView to develop a completely new configuration and then upload this configuration to a connected Sageon III Base System. If an operating configuration requires minor parameter value changes, download the configuration from the System to the PC, edit as needed, and then uploaded to the same System or to another connected System.

5.1.1 SageView benefits:

- Saves time since configuration development and Sageon III Base System installation can proceed simultaneously
- Reduces configuration errors since the configuration can be developed and checked for accuracy at a PC before being uploaded to the System
- Includes on-line security with access code and password protection
- Provides a permanent configuration record for comparison with operating cost data and service records

5.2 MONITORING

SageView screens provide for efficient, effective monitoring of System operation. System output voltage and current, alarms, battery status, and many other performance parameters are read on a single PC display.

SageView includes comprehensive Help. It provides the latest information about program installation and operation, communication options, and other topics.

5.3 SECURITY

Security is a major consideration when deciding upon a communications strategy that involves sending proprietary data over your company's intranet, the Internet, or telephone lines. Before enabling local or remote communications, carefully review your company's electronic security policies. Contact your company's network administrator for details about network structure and security. The administrator can also furnish an IP (Internet Protocol) address when Ethernet access is needed.

5.4 CABLE AND NETWORK CONNECTIONS

Figure 5-1 shows typical connections for local and remote access to Sageon III Base System data. Additional information is provided in the SageView Help topic titled Connection Setup.

Local connection details are provided below. Guidelines for remote connections are also provided. Remote connection specifics are beyond the scope of this manual since actual connections and required hardware are determined by the systems operating within your System. Consult your company's network administrator.

5.5 LOCAL CONNECTION, STANDARD

For a local connection, cable the serial port on the Sageon III Base System's operator panel to the USB port on a Windows-based PC. A customer supplied USB-A to USB-B cable is required.

5.6 REMOTE CONNECTION, ETHERNET, OPTION

When the Ethernet option is ordered, the Sageon III Base System includes an RJ-45 connector for the Ethernet network cable. As shown in Figure 5-1, a remotely located Windows-based PC can be connected to your System's Ethernet network. With the addition of the necessary hardware (e.g. server with firewall), a remote PC can connect to your System's network over the Internet.

5.7 PC REQUIREMENTS

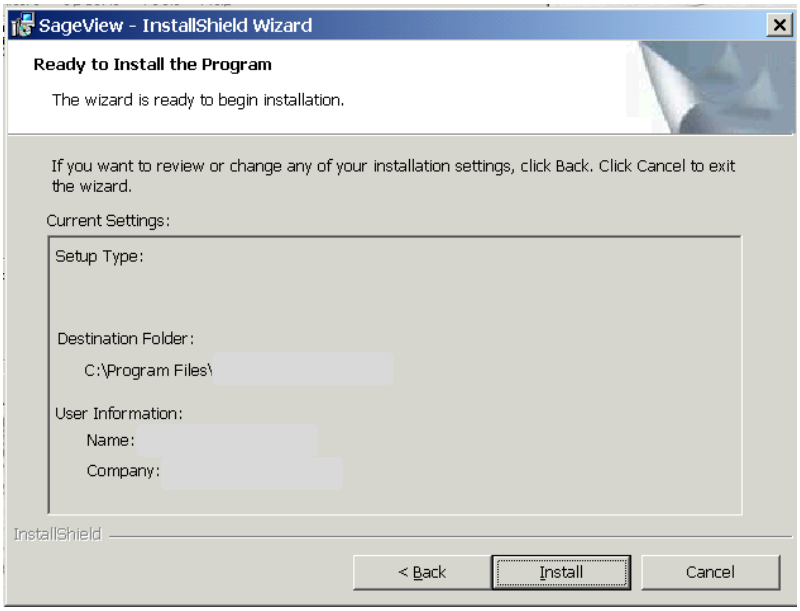
- Microsoft® Windows® 98, ME, NT4, 2000, or XP
- Pentium III or better microprocessor
- 128 KB or more RAM
- 10 MB unused hard disk space for program and database files
- CD-ROM drive
- USB port, with USB-A to USB-B cable.

5.8 INSTALLING SAGEVIEW

Before beginning the installation, review the PC requirements above to be sure the PC at hand meets the minimum requirements. Also, read the ReadMe.txt file on the CD for the latest information about installing and using SAGEVIEW.

1. Insert the SAGEVIEW CD in your computer's CD-ROM drive. The opening screen will appear. If it does not appear, click **Start** and then click **Run**. In the **Run** dialog box type d:\setup.exe. Substitute your CD-ROM's drive letter for "d" as needed.
2. Windows' InstallShield will start and the screen shown below will appear. Click **Next** to continue the installation or click **Cancel** to exit the installation.

3. In the Choose Destination Location screen, click **Next** to accept the default location for installation of the SageView program. Alternatively, type another path or browse to another location for installation of the program and then click **Install**.



4. The final installation screen is the Setup Complete screen. Click **Finish** to complete the installation.

Refer to the SageNET user manual for more information on setting up the Remote Communications Unit over TCP/IP. This manual will describe network setting sand SageNET module configuration.

6.0 MAINTENANCE

This chapter provides periodic maintenance procedures and assembly replacement procedures. If troubleshooting is required, refer to drawing SD-SAGEON3.AXX for schematic representations of Sageon III Base System circuits. A list of spare and replacement parts is located in Chapter 9.

IMPORTANT: Regularly monitor the LEDs on the operator panel, and Rectifiers. Review the alarm log regularly to detect minor problems before they become significant problems.

6.1 CIRCUIT BOARD HANDLING

Semiconductors such as ICs (integrated circuits), diodes, and transistors must be protected against damaging electrostatic discharges. A properly grounded wrist strap must be worn whenever a circuit board is handled or touched. A service kit with a wrist strap and static dissipative work mat is available from both mail order and local electronic supply companies.

Always store circuit boards in anti-static bags.

6.2 PERIODIC MAINTENANCE

Perform the following periodic maintenance procedures at least twice a year.

1. Thoroughly review the Alarm Log at the operator panel or at a local or remote PC. Look for repetitive alarms, determine their cause(s), and take steps to correct events that result in alarms.
2. Check operator panel LEDs. Refer to Chapter 4 Configuration and Operation for details.
3. Check all Rectifier LEDs. Refer to Section 4.3 for details.
4. Check all electrical connections. Check that all breakers and fuses are fully seated. Tighten connections as required. Seat breakers and fuses as required. Look for signs of overheating, arcing, and accumulation of dust, dirt, and other contaminants. Refer to Chapter 2 Installation for factory installed and customer installed connections.

WARNING

Electrical shock and arcing hazard

Hazardous voltage can cause death or serious injury.

Use extreme care when performing maintenance on an operating Sageon III Base System.

Use insulated tools. Remove watch and jewelry.

5. Verify the Sageon III Base System configuration and all parameter values. Refer to Chapter 4 Configuration and Operation for operator panel and PC screens.
6. Confirm that all alarm annunciators are functioning. Refer to Chapter 4 Configuration and Operation for operator panel and PC screens.
7. Verify LVBD parameter values. Refer to Chapter 4 Configuration and Operation for operator panel and PC screens.
8. Confirm that all Rectifiers are on-line and sharing current. From the operator panel or a PC, check each Rectifier for voltage and current output. Refer to Chapter 4 Configuration and Operation for operator panel and PC screens.

9. If load requirements allow, remove Rectifier Systems one at a time. Use low-pressure air to clean Systems. Clean dust and lint from Rectifier fans. Refer to Section 2.14 Installing and Removing Rectifiers for procedures.
10. Verify communications with remote PCs, dial-up connections, and databases as appropriate.
11. Test any spare Rectifiers.
    a) Insert a spare device.
    b) Test the device to ensure correct operation.
    c) If the device is to remain a spare, remove it and repeat the above steps until all spares are tested. If spares are to remain installed, for run-time equalization, repeat the above steps until the spare devices are installed.

6.3 TROUBLESHOOTING

Troubleshooting is based on displayed alarm messages and error codes that appear in response to a detected change in status of the Sageon III Base System, batteries, or environment; see Table 6-1.

TABLE 6-1 ALARM MESSAGES AND ERROR CODES

Location	Display Method	See Chapter or Section
Operator Panel	LED	Chapter 4 Configuration and Operation
Operator Panel or connected personal computer	Text message	Chapter 4 Configuration and Operation
Rectifier front panel	LED	Section 6.3.1

It is possible for a configuration mistake to cause an error or change in status display. If this occurs after editing the configuration or uploading a new configuration from a PC to the Sageon III Base System, carefully check the configuration's programmable parameter values before changing a hardware assembly.

6.3.1 Reading Rectifier Status Led Codes

There are 3 LEDs on a Rectifier's front panel to indicate operating status; see the following table.

TABLE 6-2 RECTIFIER LED CODES

Green ✓	Yellow !	Red x	Meaning	User Action
Off	Off	Off	No AC power to Rectifier.	Apply AC power to Rectifier
Flashing	Off	Off	AC input is too low or too high. Primary circuit is faulty.	Troubleshoot AC input to Rectifier; replace Rectifier
On	Off	Off	Rectifier functioning normally in Float mode.	No action needed
On	Flashing	Off	Alarm condition.	Refer to Chapter 4 Operations and Replacing a Rectifier in Chapter 6 Maintenance
On	On	Off	Rectifier functioning normally in Equalize mode.	No action needed
Off	Flashing	On	Rectifier shut down by remote control. Rectifier not inserted in holder properly. Internal control circuit fault.	No action needed Remove and reseat Replace Rectifier
Off	Off	On	SCU microprocessor fault.	Replace SCU

6.4 REPLACING A RECTIFIER

In the event of Rectifier failure, replace the unit. There are no user-serviceable parts in the Rectifier.

A rectifier is identified by a label in the bezel recess and on the rear of the rectifier. Be certain you are installing the correct model Rectifier. Only 48V/50Amp rectifiers are available with the Sageon III System.

To replace a Rectifier, refer to Section 2.14 Installing and Removing Rectifiers.

6.5 REPLACING THE SAGEON III CONTROL UNIT (SCU)

In the event of SCU failure, replace the assembly. There are no user-serviceable parts in the SCU.

The Sageon III Base System SCU can be hot-swapped. Be certain a replacement SCU is on hand before beginning this procedure.

To remove the Controller Assembly

1. Check that a known good replacement Controller Assembly is on-hand for immediate installation.
2. Re-install the new SCU.

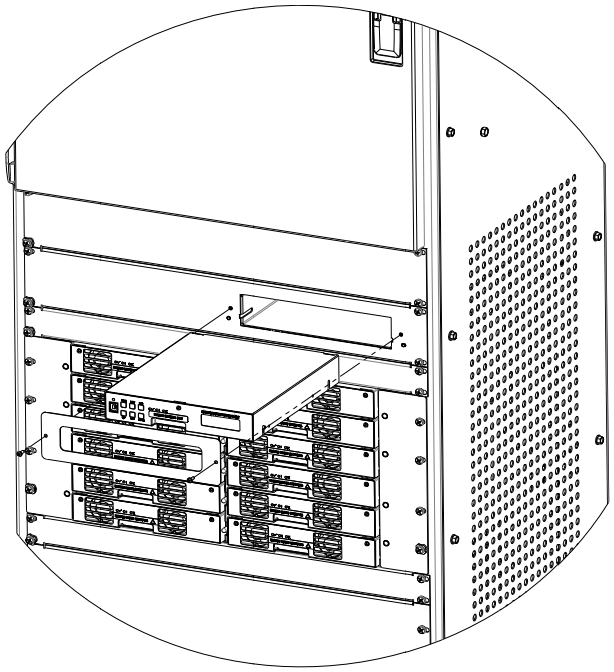


FIGURE 6-1 REPLACING THE SCU (SAGEON III CONTROL UNIT)

6.5.1 Configuration Considerations

The System configuration is stored in non-volatile memory on the SCU Backplane board. The SCU plugs into the SCU Backplane board so the SCU can be replaced without affecting the configuration.

It is recommended that if you have not previously recorded System configuration values and the SCU is functioning, do so now before performing the replacement.

Alternatively, download the SCU configuration to either a local PC plugged into the operator panel USB connector or a remotely connected PC. If the SCU is malfunctioning and you believe the configuration values

may not be correct, save the file under a new filename to prevent overwriting earlier good data. (SageView System Monitor software must be installed in the PC.) Refer to Sageview manual for more information.

If the SCU is not functioning, the replacement unit will power up with the configuration stored on the SCU Backplane, which can then be edited from the operator panel or a PC.

6.6 REPLACING AN AC BACK PLANE BOARD

1. The system must be powered down to replace a rectifier back plane board.

   IMPORTANT: Each rectifier position address must be unique; do not use an address number more than once. Addresses must be in numerical order with the uppermost (in the System) Rectifier having address 1. The address number increases by 1 with each Rectifier installed.

2. To install the Rectifiers, go to Section 2.14 Installing and Removing Rectifiers.

TABLE 6-3 RECTIFIER POSITION ADDRESSES 1 THROUGH 24

Table Notes: ADR = Rectifier position address

	ADR↓	SW1 Switch Positions 1	2	3	4	5	6	7	8
TOP SHELF	1	Off	Off	Off	Off	Off	Off	Off	On
	2	Off	Off	Off	Off	Off	Off	On	Off
	3	Off	Off	Off	Off	Off	Off	On	On
	4	Off	Off	Off	Off	Off	On	Off	Off
	5	Off	Off	Off	Off	Off	On	Off	On
	6	Off	Off	Off	Off	Off	On	On	Off
	7	Off	Off	Off	Off	Off	On	On	On
	8	Off	Off	Off	Off	On	Off	Off	Off
	9	Off	Off	Off	Off	On	Off	Off	On
	10	Off	Off	Off	Off	On	Off	On	Off
	11	Off	Off	Off	Off	On	Off	On	On
	12	Off	Off	Off	Off	On	On	Off	Off
BOTTOM SHELF	13	Off	Off	Off	Off	On	On	Off	On
	14	Off	Off	Off	Off	On	On	On	Off
	15	Off	Off	Off	Off	On	On	On	On
	16	Off	Off	Off	On	Off	Off	Off	Off
	17	Off	Off	Off	On	Off	Off	Off	On
	18	Off	Off	Off	On	Off	Off	On	Off
	19	Off	Off	Off	On	Off	Off	On	On
	20	Off	Off	Off	On	Off	On	Off	Off
	21	Off	Off	Off	On	Off	On	Off	On
	22	Off	Off	Off	On	Off	On	On	On
	23	Off	Off	Off	On	On	Off	Off	Off
	24	Off	Off	Off	On	On	Off	Off	On

Non-Shaded addresses 1 through 12 are used for 50-600A systems
Shaded addresses 13 through 24 are used for 650-1200A systems

Troubleshooting

Symptom	*Likely Causes*	*Action*
Rectifiers do not power up – no LEDs lit on front panel	AC power is not connected or internal fuse blown or rectifier not properly plugged in.	Re-insert rectifier(s) and make sure the rear connections are good. Confirm that AC power is available to the rectifier backplanes. Replace the rectifier module if the unit is suspected to have failed.
No output current from rectifiers and the Green LED on each rectifier blinks occasionally	AC power either <70VAC or >320VAC. An internal relay will be heard open and close periodically if the AC voltage is excessive.	Check that the AC supply voltage and connection arrangement are correct and match the expected system supply wiring.
Over-temperature alarm or fan failure alarm present	High ambient temperature. Fan air intake/exhaust vents are blocked or a fan is jammed with a foreign object or excessive dust.	Check the ambient temperature and improve site cooling if possible. Check and remove obstructions from the air vents. Replace the module or remove and replace the fan assemblies in the module (requires only that the rectifier lid be removed)
LVBD will not close	One or more batteries are reverse polarity. No battery is connected to the battery distribution module. Fuse link blown in the battery distribution module (BDM). Controller setting for LVLD is “Off”. Low Voltage Load Disconnect setting is greater than the current bus voltage.	Check battery wiring polarity. Connect a battery. Check that the Controller is powered up even when no rectifier is operational. If not, service the fuses in the BDM. Set LVLD to “On”. Power up the rectifiers and reduce the load until the bus voltage increases to the float voltage.
Load or Battery circuit breaker alarm does not set when the breaker is opened or is incorrectly alarmed as battery switch instead of load trip or visa-versa.	No battery or load alrm/aux switch is connected to the circuit breaker connection. Alarm link in BDM is incorrectly configured.	Check load and battery alrm/aux switch connections to the BDM and that the alarm links are correctly configured.
Battery or Ambient temperature sensor reading is indicated as “Not Available”	Sensor / cable faulty. Sensor connector reversed. No sensor installed.	Turn cable connector around and reconnect. Replace faulty sensor assembly.
Battery current indicated does not match independent measurement.	Full-scale current of the DC hall effect current transducer is incorrectly set and will result in an error larger than +/- 5% at more than 50% full-scale current.	Change the setting of the “FS Batt Curr” value in the Base Menu of Controller to the correct full-scale value.
Battery current indicates 0A when more than 5A is flowing in the battery or is inaccurate at low currents (<5A)	Transducer is not calibrated DC hall effect transducer or wiring is faulty. Current transducer sensitivity is too low for 1A measurement.	Calibrate transducer Service the DC current transducer – check the wiring is intact and still connected properly, or replace the DC CT is suspected to be faulty Revise size of DC CT full-scale value for the size of the load and battery charging requirements.
Load current indicates 0A when known to be >5A	Number of RECTIFIERs is incorrectly set too low or the battery current FS is set too high. The load current is calculated from the sum of the RECTIFIER currents minus the measured battery currents	Check that the number of RECTIFIERs in the Controller Base menu matches the actual number of rectifier modules installed. Check the Battery DC CT rated full-scale value is correctly set in the Base menu.
One unit is alarmed as HVSD (high voltage shutdown) and is latched off.	The unit has developed a fault that causes it to output a voltage above the HVSD protection limit and has been supplying load current while above this	Replacing the rectifier module is recommended. However, a random event may have triggered the HVSD and to determine if the unit has a real fault,

Symptom	*Likely Causes*	*Action*
	voltage limit. A random event on the DC bus has occurred that forced a unit into HVSD.	the HVSD latched alarm can be reset using the "Reset Latched Alarm" function in the Controller RECTIFIER Menu. (If the system does not have any batteries, cycling the AC power will have the same effect). If the unit does not recover by latching off again, it is faulty.
"RECTIFIER Urgent" alarm activated	One or many RECTIFIERs are off due to AC power failure, internal faults, incorrect command signal from Controller or all rectifiers are in current limit	Check the AC power and restore. Replace faulty rectifier modules. Check for DC bus overload faults.
All units are latched off as HVSD	Absolute Overvoltage shutdown protection activated. The system is likely to have no load and without a battery. An event on the DC bus has caused the voltage to exceed 70V for 48V systems. The event could be caused either by a faulty rectifier or other equipment connected to the bus.	Add a small amount of load (>2A per rectifier) to the system and check for a faulty rectifier. Check for other faulty equipment connected to the bus that could cause the overvoltage transient. Use the "Reset Latched Alarm" from the Controller to reset the system.
A rectifier is indicating "RECTIFIER Off" or "No Response" on the Controller RECTIFIER display	An AC failure to the rectifier is the most likely cause. While the rectifier internal power rails are still available, the unit will communicate with "RECTIFIER Off" if the AC has failed on its input. Once the internal power dies, the unit will no longer communicate and Controller will indicate "No Response". "No Response" all the time and the RECTIFIER is known to have AC power indicates a communications wiring problem.	Check the AC feed to the rectifier for a tripped circuit breaker, blown fuse or faulty connection. Check the RECTIFIER communications 10-way ribbon cable for broken connections and replace cable if necessary.
One or more rectifiers has a current limit or power limit alarm activated	Total load, including battery charging current is equal to the output limits of the rectifiers. (System overload) One rectifier in current limit only indicates a likely calibration problem with the module. The Controller can usually compensate for an out of calibration unit in a system and will take a few minutes to adjust the unit to correctly share the load.	Revise the load level on the system and expand the number of rectifiers as required to remove the overload condition.
One rectifier has an "UNCAL RECTIFIER" alarm	The Controller has not been able to make the unit share the load with the other units. Either the RECTIFIER is faulty (excessive internal voltage drop) and cannot be adjusted to share load, or it is too far out of calibration.	Replace the rectifier module. Send the unit for repair and re-calibration.
"System Voltage Clamp" alarm activated	Controller cannot reach the desired system voltage. This can be due to possible excessive voltage drop along the DC bus bars, inside one or more rectifiers or "System V Drop" parameter has been set too low. If this alarm comes up during equalize, the maximum output voltage from the rectifier may not be high enough to overcome the system drops to the sense point and allow the system to regulate at the desired high equalize voltage.	Increase "Sys V Drop" parameter. Replace faulty rectifier (unlikely to current share as well). Check that the number of RECTIFIERs in the system is correctly set (more RECTIFIERs than declared can generate this problem). Revise the requirements for high equalize voltage level.

Symptom	*Likely Causes*	*Action*
RECTIFIER "EEPROM Fail" alarm is activated as indicated at the RECTIFIER Menu for a particular RECTIFIER.	Corrupted data found on the EEPROM inside the rectifier that is outside the allowable data range. The rectifier software has attempted to over-write and has failed due to the memory cell being damaged. Note: excessive electrical noise can corrupt the read data transfer, which can lead to the same alarm being generated.	Replace the faulty rectifier if the memory cell is confirmed to have failed. This can be done by, modifying each of the RECTIFIER parameters on the Controller and checking to see if the alarm clears. (EEPROM corrects the data). Check for EMC problems and remove/reduce the source of electrical interference where possible.
"EEPROM Fail" alarm for the Controller is activated.	Corrupted data found on the backplane EEPROM that is outside the allowable data range. (similar to RECTIFIER corruption above)	Replace the faulty backplane if the memory cell is confirmed to have failed.
"Range RECTIFIER" alarm for the rectifier is activated.	Corrupted data found on the EEPROM inside the rectifier that is inside the allowable data range but does not match the value programmed.	Try adjusting the RECTIFIER parameters to see if the EEPROM cells can be updated. If not, replace the faulty rectifier.

6.7 TO REMOVE A RECTIFIER MODULE

Lift the securing latch in the center divider adjacent to the module and pull the module out of the Power plant.

When removing modules, especially if the ambient temperature is high and the unit has been operating at maximum load, avoid skin contact with the metal casing as it may be too hot to touch. Pull the unit halfway out of the magazine and let cool for 2-3 minutes before handling.

6.8 TO INSERT A RECTIFIER MODULE

Insert the module into the slot. Push the module all the way in so the rear connector fully mates and the securing latch spring clicks back down into place.

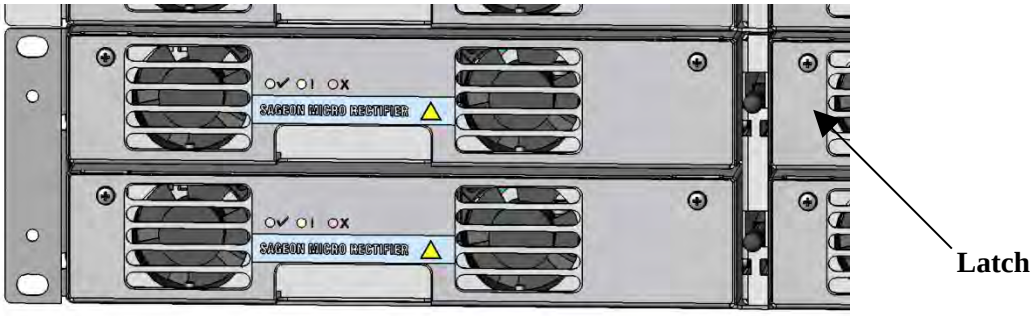


FIGURE 6-2 REMOVING RECTIFIER MODULE

7.0 DISTRIBUTION OPTION KIT INSTALLATION

Distribution options included on the initial Power system order are factory installed. To field install a distribution option, follow the appropriate section in this chapter.

While it is recommended that the Power system be powered down before installing a distribution option, an option can be installed in a live Power system when proper safeguards are observed.

> WARNING
>
> Arcing hazard
>
> Arcing can cause equipment damage, load interruptions, and personal injury.
>
> Remove watch and jewelry. Use insulated tools and extreme caution when working on a live Power system or on a battery string.
>
> Insulate the free ends of any un-terminated cables.

There are 6 distribution groups organized in three Tiers with two Groups in each Tier: All are located in the Power system's distribution area, as shown in Figure 7-1. The type of distribution that can be installed in each group is discussed below and listed in Table 7-1. Tier 2 & Tier 3 can be field installed. Figures 7-2 and 7-3 show typical left and right side views of the distribution area.

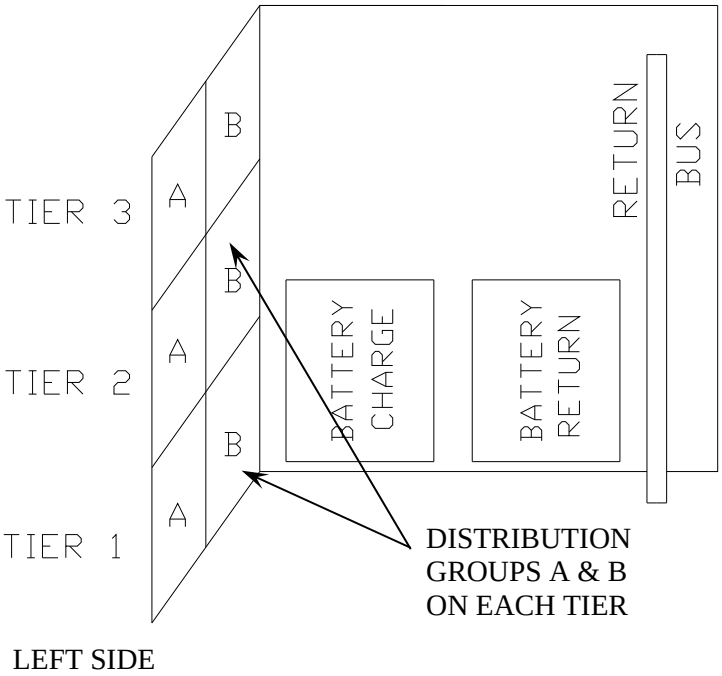


FIGURE 7-1 DISTRIBUTION LOCATION BY TIER AND GROUP

Distribution guidelines

- A Power system can have three tiers of distribution: Tiers 1, 2, and 3.
- When adding distribution groups, tier 1 is factory installed (group A & B) with AM1 capability start at tier 2 upwards.
- AM1 type breaker distribution can be located in any group.
- GJ1 type breaker distribution must be installed as the topmost group, above all other distribution types.
- As distribution is added, additional return bus sections (up to 3 total) may be needed to provide terminations (landings) for load returns. See Figure 7-3. Order the return bus sections separately as needed.

TABLE 7-1 INSTALLABLE DISTRIBUTION TYPES BY TIER AND GROUP

Tier/Group, Positions	Installable Distribution, See notes below	
	AM1 -48V Plant	GJ1 -48V Plant
1/A, 1-10	Y	N
1/B, 11-20	Y	N
2/A, 21-30	Y	Y[2]
2/B, 31-40	Y	Y[2]
3/A, 41-50	Y	Y[2]
3/B, 51-60	Y	Y[2]

Table Notes:

Y - Yes; indicated circuit breaker or fuse type can be installed in the group listed in the column at left.

N - No; indicated circuit breaker or fuse type cannot be installed in the group listed in the column at left.

1. Refer to the Distribution Guidelines above for additional information.

2. The GJ1 type breaker Distribution Option is an assembly that can hold up to four GJ1 type breakers.

The GJ1 Option must be the topmost distribution. Other distribution types cannot be installed above GJ1 distribution.

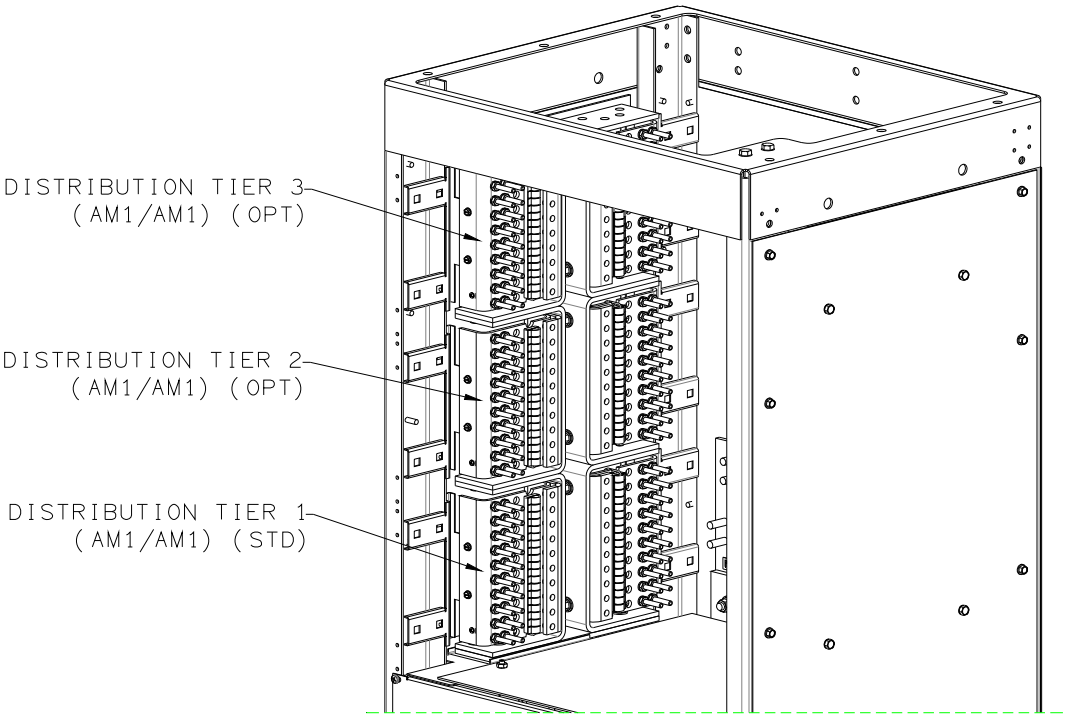


FIGURE 7-2 DISTRIBUTION AREA, LEFT SIDE

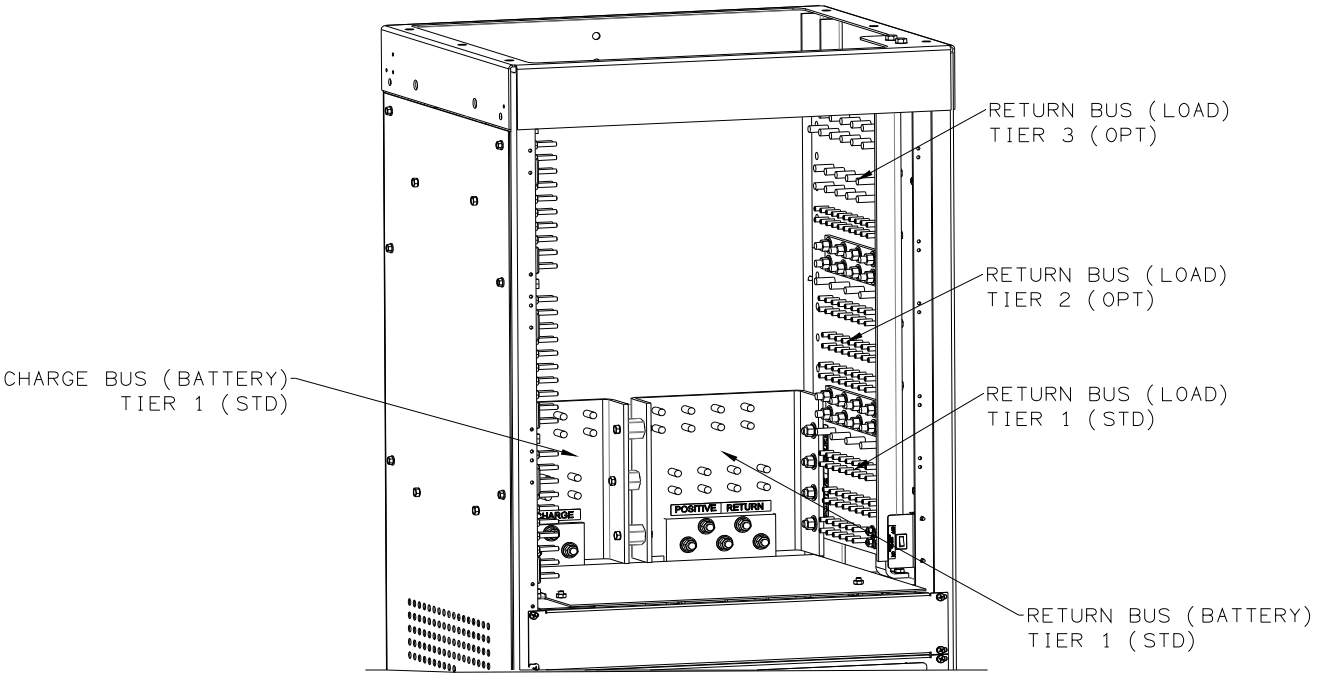
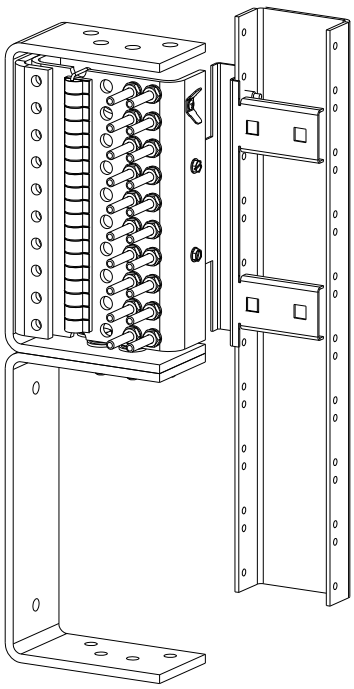


FIGURE 7-3 DISTRIBUTION AREA, RIGHT SIDE

7.1 AM1 DISTRIBUTION, TIERS 2 AND 3, GROUPS A & B



This section describes installation of a kit for adding AM1 type breaker distribution. Kit contents and part numbers are listed below. Installation of circuit breakers and fuses is described in Chapter 8.

The figure at right shows many of the components included in the kit: the U-shaped bus bar, distribution assembly, assembly support bracket, and required hardware. There are two kits. Kit PN 385.5881.00 is for installation in Group A. Kit PN 385.5881.01 is for installation in Group B.

Figure 7-4 shows the orientation of the AM1 distribution assemblies. It also shows routing of the supply cables upward through the open top of the rack and the daisy-chained alarm wiring.

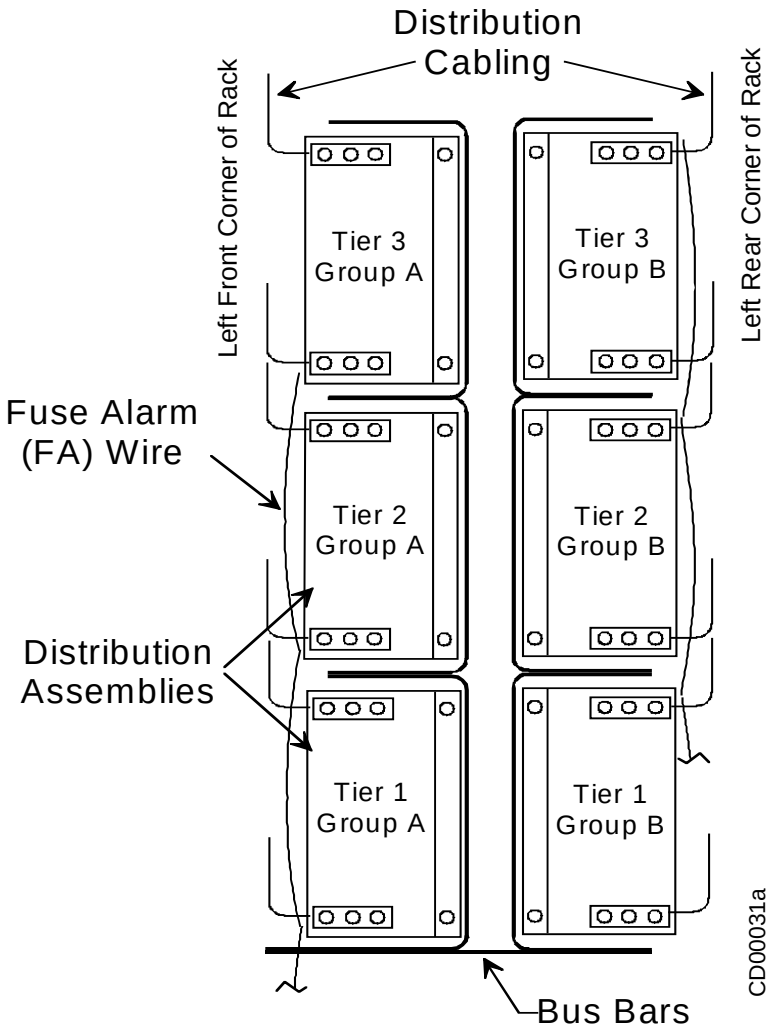


FIGURE 7-4 ORIENTATION OF DISTRIBUTION ASSEMBLIES, -48V SYSTEMS

7.1.1 Kit Contents

Some hardware listed below may be factory-installed on another item in the kit and disassembly may be needed to install the option kit.

Description	Kit PN 385.5881.00A, Quantity	Kit PN 385.5881.01A, Quantity
10-Position Distribution Assembly	1	1
Bus Bar, U-Shaped	1	1
Bracket, Distribution Assembly Support	1	1
Screw, 10-32, Hex Head	2	0
Screw, 12-24 x 3/4	2	2
Bolt, Hex, 5/16-18 x 1	4	4
Washer, bevel, 5/16	6	6
Washer, Flat, 5/16	6	6
Nut, Hex, 5/16-18	2	2

7.1.2 Installing the kit

While installing the kit, refer to Figure 7-5 and to a factory-installed group for location and orientation of items included in the kit.

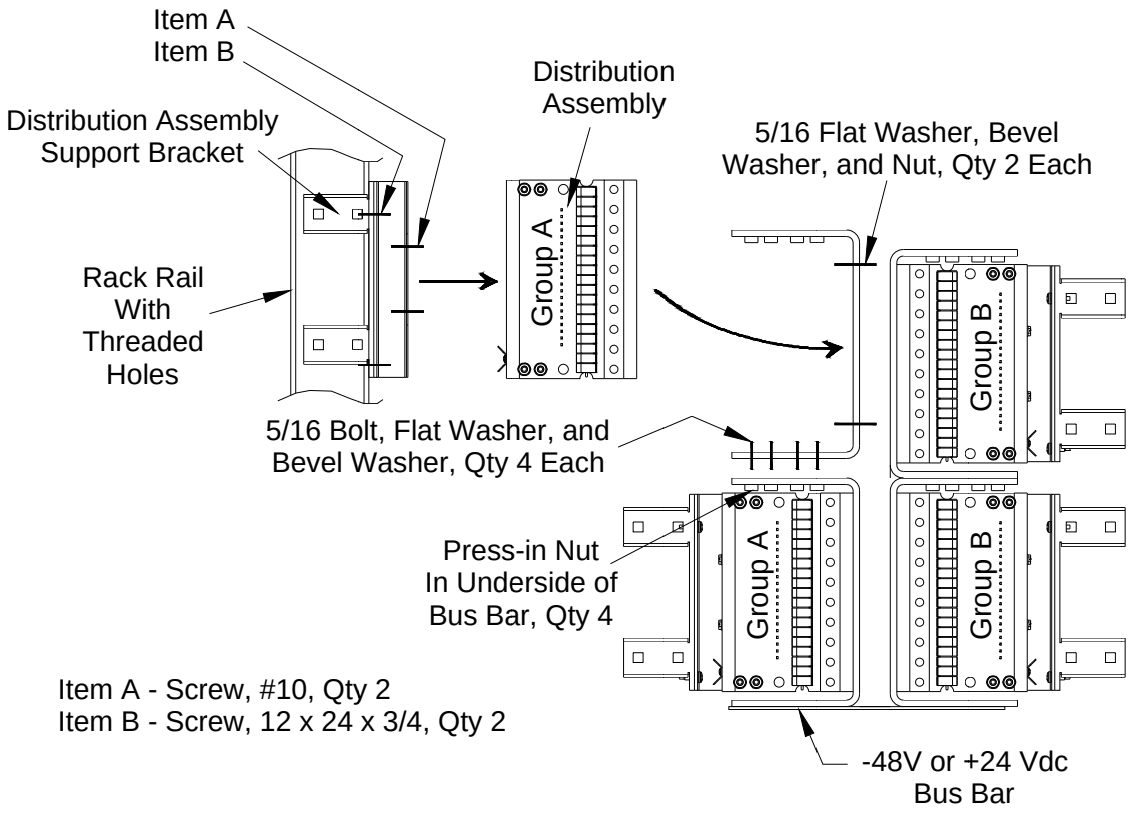


FIGURE 7-5 TYPICAL INSTALLATION OF AM1 DISTRIBUTION

1. Open the kit. The packing list will identify the kit by part number and name.

2. Open the distribution area door. Refer to Figure 7-1 and locate the Group where the additional distribution is to be installed.

3. From the kit, collect the U-shaped bus bar and four each: 5/16-18x¾" bolts, 5/16" bevel washers, and 5/16" flat washers.

4. In the selected group, position the four unthreaded holes of the U-shaped bus bar from the kit onto the factory installed U-shaped bus bar of the distribution option directly below the your selected group. Orientation will be the same as the installed bus bar; see Figure 7-4. Using the hardware collected in step 3 above, bolt the bus bar from the kit to the factory installed bus bar.

5. From the kit, collect the distribution assembly support bracket, two 12-24x¾" screws.

6. Orient the support bracket as shown in Figure 7-5, so the bracket legs with the two rectangular holes is against the closest vertical rail of the rack. Use the two 12-24x¾" screws to fasten the bracket to the rack rail.

7. From the kit, collect the distribution assembly and two each: 10-32 hex-head screws, 5/16" flat washers, 5/16" bevel washers and 5/16x18 hex nuts.

8. Referring to Figures 7-4 and 7-5 for assembly orientation, insert the studs of the distribution assembly into the U-shaped bus bar and fasten with the flat washers, bevel washers and nuts. The 10 pairs of output studs on the distribution assembly should be oriented towards the vertical rail of the rack.

9. Fasten the support bracket to the distribution assembly using the two 10-32 hex-head screws.

10. Tighten all hardware. Refer to Table 2-2 for torque specifications.

11. Repeat the above steps for each AM1 distribution assembly kit to be installed.

12. From the kit(s), collect the Failure Alarm (FA) jumper wire(s).

13. Connect one end of each wire to the push-on terminal on the edge of a newly installed distribution assembly. Connect the other end to a convenient push-on connector on an adjacent distribution assembly in daisy chair fashion. Newly installed distribution assemblies must be connected (in daisy chain fashion) to a previously installed distribution assembly.
See Figure 7-4.

14. Refer to Chapter 8 to install AM1 circuit breakers fuses.

7.2 GJ1 DISTRIBUTION, TIERS 2 AND 3, GROUPS A & B

This section describes installation of the GJ1breaker distribution option in Tiers 2 and 3, Groups A & B. Installation of GJ1 circuit breakers is described in Chapter 8.

Figure 7-7 shows many of the components included in the kit. Figure 7-6 shows GJ1 distribution assemblies in Groups A & B. It also shows the alarm wiring.

Table 7-1 identifies the groups in which a GJ1 distribution assembly can be installed. A GJ1 assembly must be the topmost distribution assembly since other distribution types cannot be installed above a GJ1 assembly.

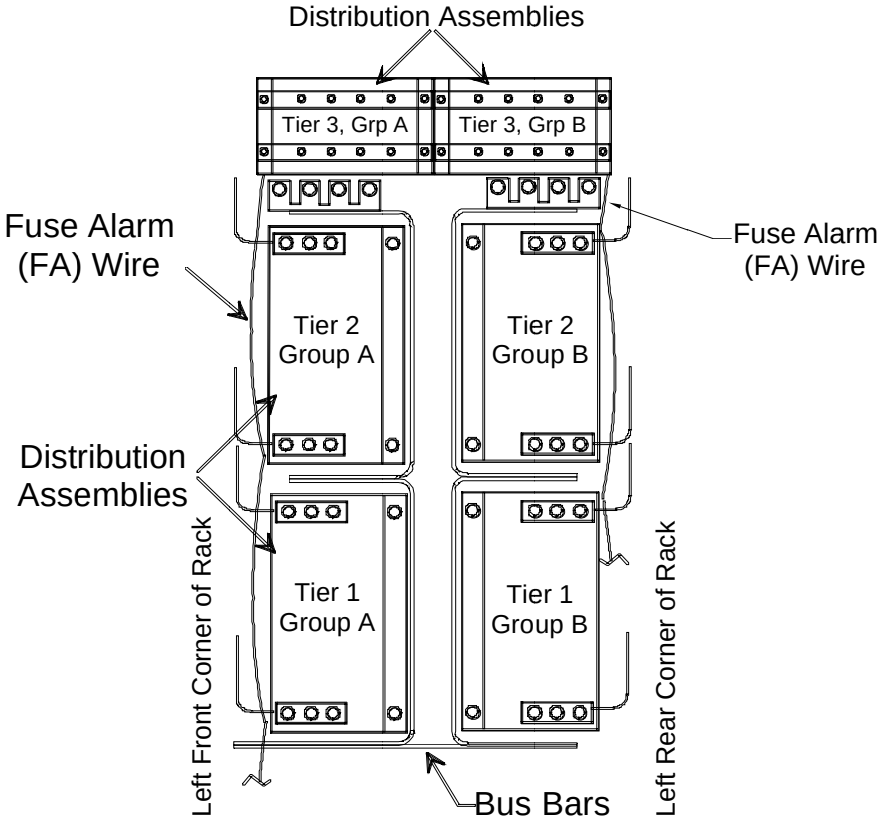


FIGURE 7-6 DISTRIBUTION ASSEMBLIES, GJ1

7.2.1 Kit Contents

Description	Kit PN 385.5882.00, Quantity
Breaker Mounting Bracket, U-Shaped	1
Breaker Mounting Bar, 5/8" x 7-1/2"	2
Bus Bar Assembly, L-Shaped	1
Rack Screw, 12-24 x 3/4”	2
Bolt, Hex, 5/16-18 x 1”	4
Washer, bevel (Bevel), 5/16	4
Washer, Flat 5/16	4
Screw, Phillips Head, 10-32 x 1/2”	4
Alarm Wire with Ring Lug, Red	1
Fuse Alarm Jumper Wire, Orange	1

7.2.2 Installing the Kit

1. Open the kit. The packing list will identify the kit by part number and name.

2. Open the distribution area door. Refer to Figure 7-1 and locate the Group where this distribution will be placed.

3. From the kit, collect the L-shaped bus bar and four each: 5/16-18x1” bolts, 5/16” bevel washers, 5/16” flat washers and the red alarm wire with the ring-terminal lug.

4. Position the L-shaped bus bar against the top of the U-shaped distribution bus in the factory installed distribution group and align the mounting holes; see Figures 7-6 and 7-7. The upward pointing fingers with the press-in nuts should be toward the inside of the pant. Place the ring terminal of the red alarm wire on one of the bolts. Loosely install the hardware. Do not tighten the hardware at this time.

5. From the kit, collect the painted U-shaped breaker mounting bracket and two 12-24x3/4” screws.

6. Position the bracket against the nearest vertical rack rail, align the holes in the bracket with those in the rail and install the screws. The bottom edge of the bracket extending into the pant should be approximately 1.5" (3.8 cm) above the horizontal leg of the L-shaped bus bar.

7. Tighten the U-shaped bracket mounting hardware. See Table 2-2 for torque specifications. Do not tighten the L-shaped bus bar hardware at this time.

8. From the kit, collect two painted 5/8”x7 1/2” breaker mounting bars, four 10-32 x 1/2” Phillips head screws.

9. Refer to Figure 7-7 and loosely mount the bars on the U-shaped breaker mounting bracket.

10. From the kit, collect the orange fuse alarm wire and temporarily drape it over the U-shaped bracket. This wire and the red alarm wire will be connected when the GJ1 type breakers are installed.

11. Repeat the above steps for each GJ1 distribution group to be installed.

12. Refer to Chapter 8 to install the GJ1 circuit breakers.

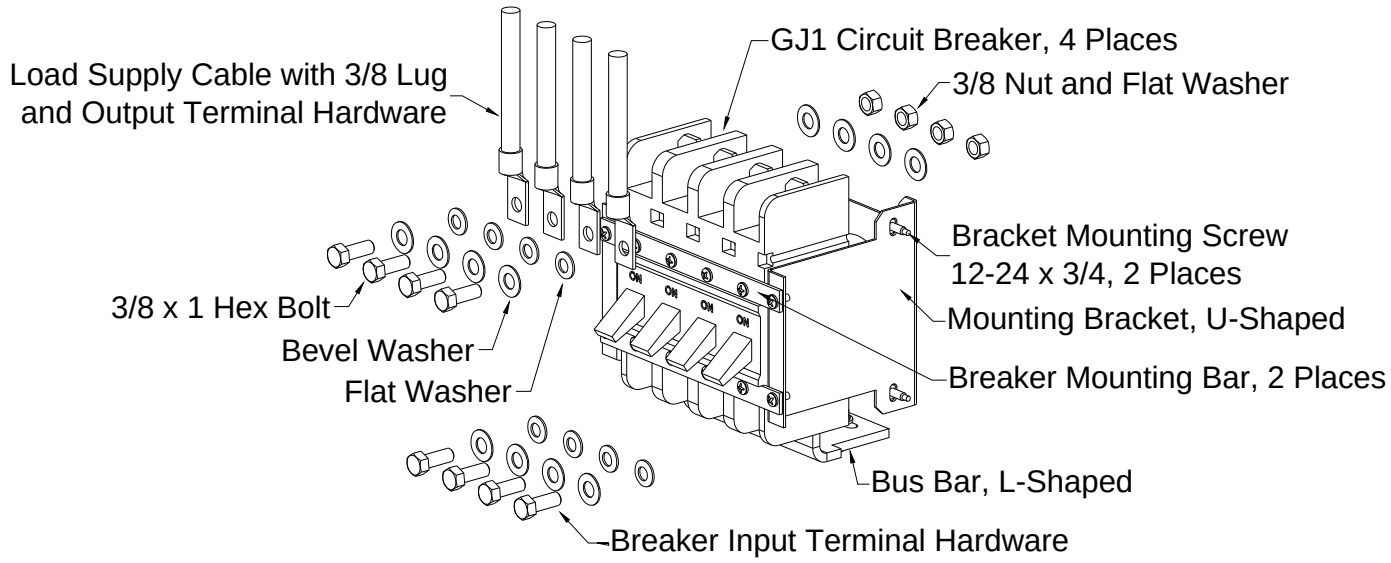


FIGURE 7-7 GJ1 DISTRIBUTION KIT (W/ BREAKER KIT)

8.0 CIRCUIT BREAKER AND FUSE KIT INSTALLATION

All AM1 type breaker fuse kits included in the initial Power system order are shipped from the factory in separate, protective packaging. This packaging is placed inside the tower, at the base the Power system. GJ1 type breaker kits included in the initial Power system order are factory installed.

All Breaker (AM1 & GJ1) Kits can also be ordered separately to add to existing distribution when empty positions exist.

8.1 AM1 TYPE BREAKER KITS

8.1.1 Kit Contents

Description	Quantity
AM1 type breaker, Bullet type mount	1
Bus Bar, Output	1
Nut, Hex, 1/4-20	2
Washer, Flat, 1/4	2

8.1.2 Installing the Kit

1. Remove an AM1 type breaker kit from its protective packaging. The package label will identify the kit by part number.

2. Open the distribution area door. Refer to Figure 7-1 and locate the Distribution Tier and Distribution Group where this kit will be installed.

3. Place the Output Bus Bar over the two threaded studs of the Distribution Assembly; orient as indicated in Figures 8-1 and 8-2.

4. Place load cable lug over Output Bus Bar.

5. Place the two 1/4” flat washers over the load cable lug.

6. Install the two 1/4-20 hex nuts over the flat washers and tighten. See Table 2-2 for torque specifications.

7. Insert the AM1 type breaker into the Distribution Assembly as indicated in Figure 8-2. This completes installation of the AM1 type breaker Kit; repeat steps 1 – 7 for all AM1 type breaker Kits to be installed.

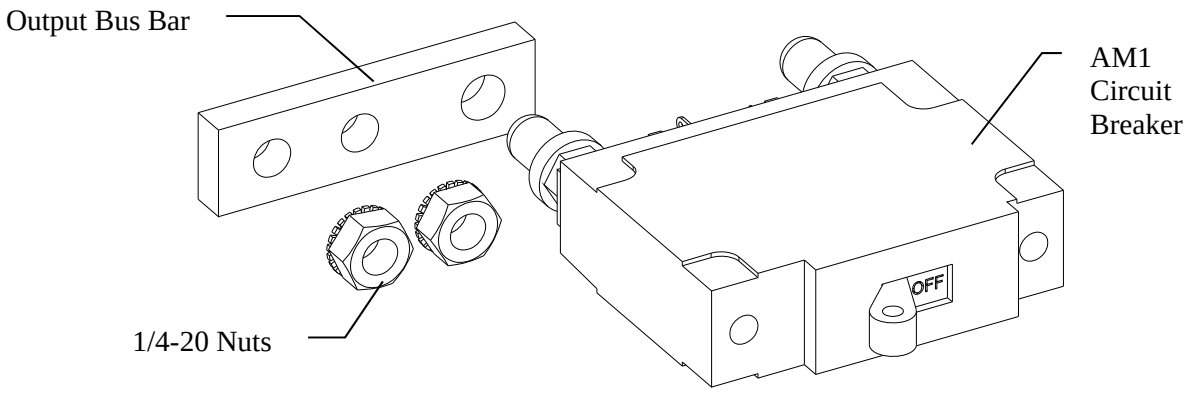


FIGURE 8-1 AM1 TYPE BREAKER KIT COMPONENTS

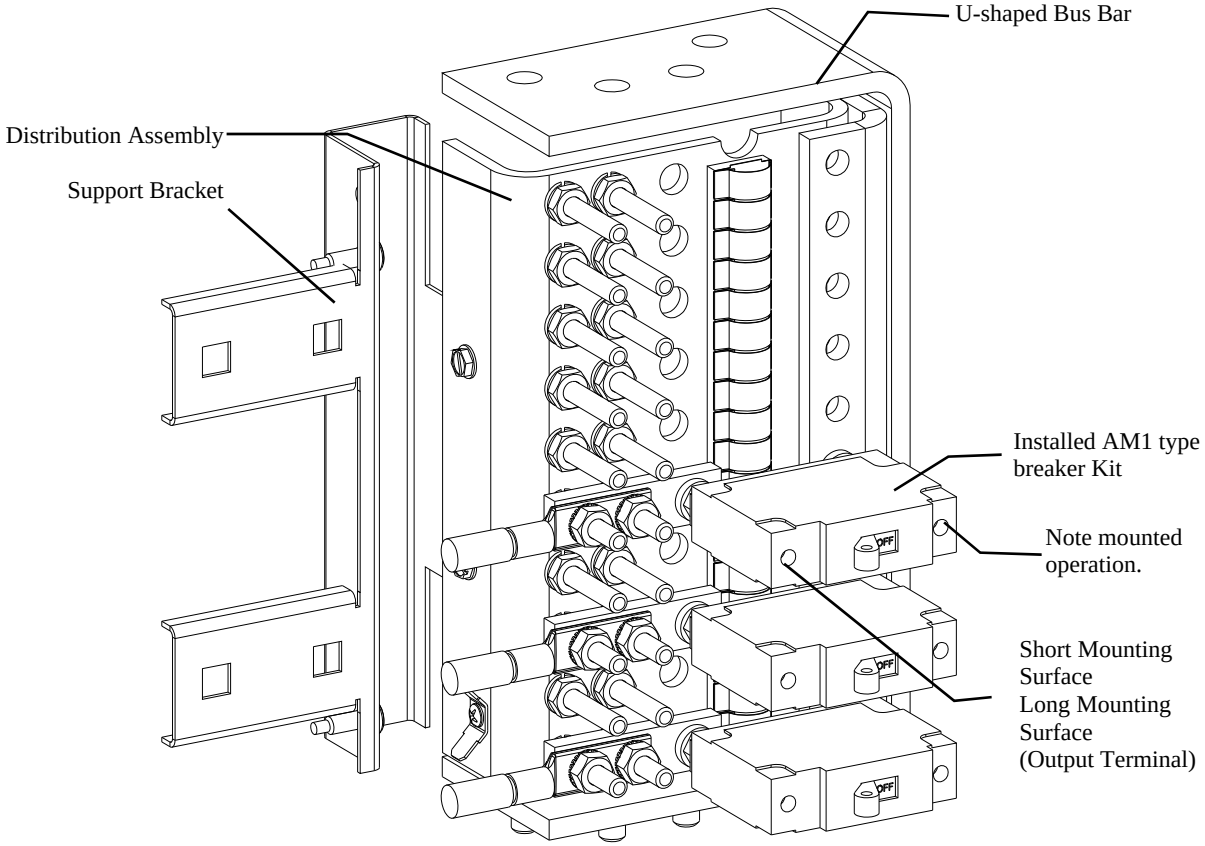


FIGURE 8-2 AM1 TYPE BREAKER (SHOWN) KIT INSTALLATION

8.2 GJ1 TYPE BREAKER KITS

8.2.1 Kit Contents

Description	Quantity
GJ1 type breaker	1
Screw, Phillips Head, 10-32 x 1/2”	2
Washer, Flat, 3/8	3
Washer, Bevel, 3/8	2
Bolt, Hex Head, 3/8-16 x 1 1/4	2
Nut, Hex, 3/8-16	1
Alarm wire adapter (breaker kits 200A and over only)	1

8.2.2 Installing the Kit

1. Open the distribution area door. Refer to Figure 7-1 and locate the Distribution Tier and Distribution Group where this kit will be installed.
   Note: GJ1 distribution cannot be installed in any Group of Tier 1.

2. Remove the two painted breaker mounting bars from the existing GJ1 Distribution Option to allow access to mount the GJ1 type breaker kit (See Figure 8-3).
   Note: It may be necessary to remove the 10-32 x 1/2" Phillips head screws from any GJ1 type breakers already installed in existing GJ1 Distribution to facilitate removal of the two painted breaker mounting bars.

3. From the existing GJ1 Distribution Option: carefully remove the insulated sleeving from the orange fuse alarm wire and the red alarm wire for the breaker position you are installing.

4. Remove a GJ1 type breaker kit from its packaging. The package label will identify the kit by part number.

5. Connect the red alarm wire of the GJ1 Distribution Option to the Common (C) pole and the orange fuse alarm wire of the GJ1 Distribution Option to the Normally Closed (NO) pole on the rear of the GJ1 type breaker.

   Note: For GJ1 type breakers 200A and over, the breaker kit contains an alarm wire adapter that must be connected between the breaker and the red alarm & orange FA alarm wires of the GJ1 Distribution Option.

6. Carefully place the GJ1 type breaker from the kit over one of the vertical tabs of the L-shaped bus bar of the GJ1 Distribution Option (see Figure 8-3).

7. Collect from the GJ1 type breaker Kit, one each of the following: 3/8-16 x 1 1/4" hex head bolt, 3/8 bevel washer and 3/8 flat washer. Insert through tab of the GJ1 type breaker and thread into the insert of the vertical tab of the L-shaped bus bar of the GJ1 Distribution Option (see Figure 8-4) and tighten. See Table 2-2 for torque specifications.

8. Replace the two painted breaker mounting bars of the GJ1 Distribution Option using the 10-32 x 1/2" screws removed in step 2.

9. Collect the two 10-32 x 1/2" from the GJ1 type breaker Kit and secure the new GJ1 type breaker to the two painted breaker mounting bars of the GJ1 Distribution Option replaced in step 8.

10. Use the remaining 3/8” hardware from the GJ1 type breaker Kit to secure load cabling to the GJ1 type breaker (see Figure 8-4).

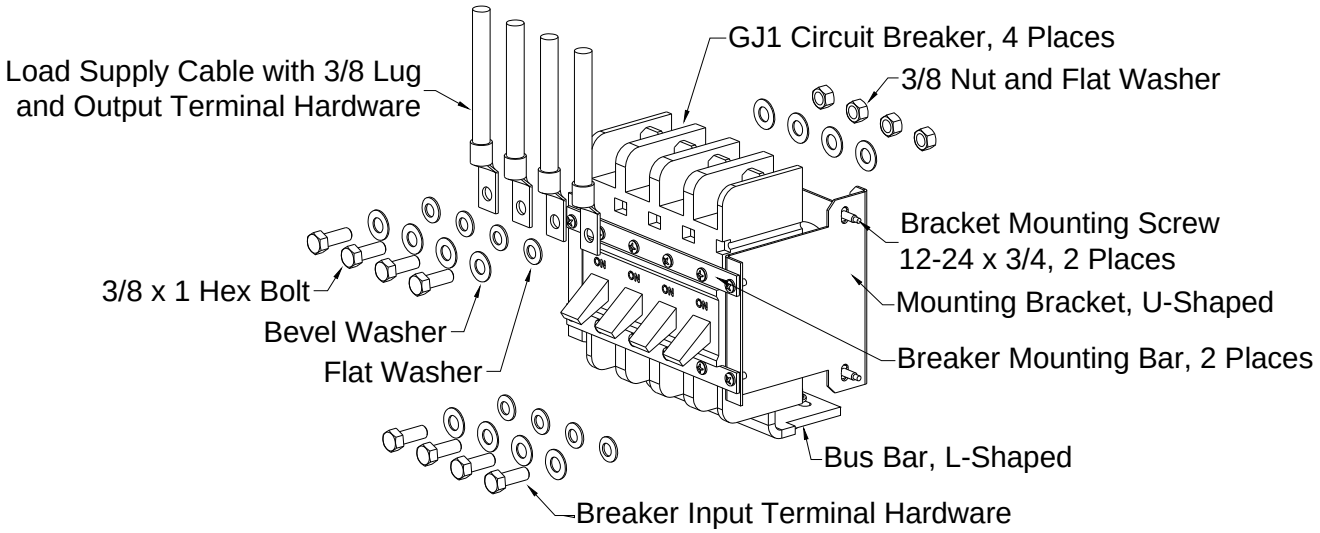


FIGURE 8-3 GJ1 TYPE BREAKER KIT COMPONENTS

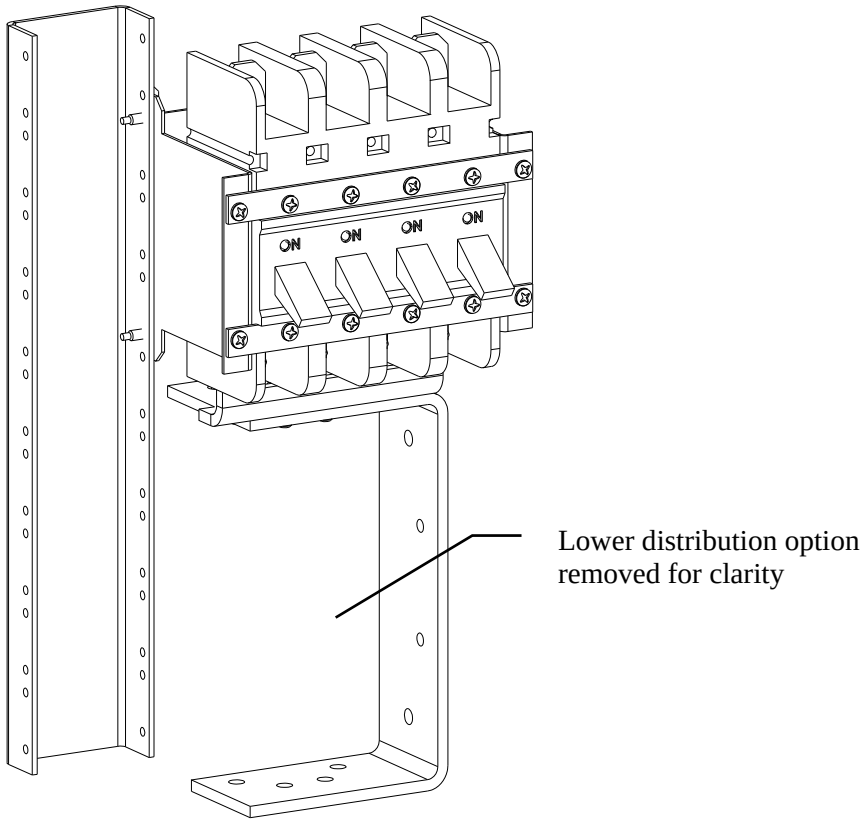


FIGURE 8-4 GJ1 TYPE BREAKER KIT INSTALLATION

9.0 SPARE AND REPLACEMENT PARTS

To minimize downtime should maintenance be required, a supply of spare circuit breakers and fuses, circuit boards, rectifiers, and other recommended components should be immediately available. See the Recommended Spare Parts List below.

Please refer to the UNIPOWER part number when placing orders. For assistance in ordering spare parts, call UNIPOWER and ask to speak with Order Entry. The telephone number is found in Section 1.5 Product Support.

TABLE 9-1 LIST DRIVEN PCB'S

	Contactor	Aux Relay PCB	Controller Backplane PCB w/o C1	Controller Backplane PCB with C1	Circuit Breaker 20A	Battery Ditribution PCB	Battery Concentrator PCB	SNMP TCP/IP PCB
List A1	246.0840.10	ERT190.5691	ERT190.5770					
List A2		ERT190.5691	ERT190.5770					
List B2					272.3701.20			
List B4					272.3701.20			
List C1				ERT190.5770T		ERT190.5740X48P	ERT190.6011	
List D1								103.4015.32

TABLE 9-2 MAJOR REPLACEMENT COMPONENTS

Controller

103.4130.48	48V Controller

Rectifiers

100.7675.4850	Sageon Rectifier: 48V, 50A (208/240VAC, single phase)
124.0073.00	Blank Rectifier Panel (Required to fill open rectifier positions)

Sageon Battery Monitor

385.5201.20	Include 30' Ribbon Cable to SCU; Requires Battery Cell Wire Bundle and Battery Adaptor Kit

Battery Cell Wire Bundle	**Requires 385.5201.20**
350.7812.10	10' Battery Cell Leads
350.7812.25	25' Battery Cell Leads
350.7812.50	50' Battery Cell Leads
350.7812.100	100' Battery Cell Leads

Battery Adaptor Kits	**Requires 350.7812.xx**
385.6151.03	For #10 Battery Hardware (Includes harness & flat washers)
385.6151.04	For 1/4" and 6mm Battery Hardware (Includes harness & flat washers)
385.6151.05	For 5/16" and 8mm Battery Hardware (Includes harness & flat washers)
385.6151.06	For 3/8" and 10mm Battery Hardware (Includes harness & flat washers)
385.6151.07	For 1/2" and 12mm Battery Hardware (Includes harness & flat washers)

Battery Current Transducers	**Requires SAGEON3.C01**
385.5932.50	Sageon Battery Current Transducer (50A) – with 30' lead
385.5932.100	Sageon Battery Current Transducer (100A) – with 30' lead
385.5932.200	Sageon Battery Current Transducer (200A) – with 30' lead
385.5932.600	Sageon Battery Current Transducer (600A) – with 30' lead
385.5932.1000	Sageon Battery Current Transducer (1000A) – with 30' lead
385.5970.50	Sageon Battery Current Transducer (50A) – with 100' lead
385.5970.100	Sageon Battery Current Transducer (100A) – with 100' lead
385.5970.200	Sageon Battery Current Transducer (200A) – with 100' lead
385.5970.600	Sageon Battery Current Transducer (600A) – with 100' lead
385.5970.1000	Sageon Battery Current Transducer (1000A) – with 100' lead
385.5980.500	Sageon Split-Core Current Transducer (500A) – with 30' lead
385.5980.1000	Sageon Split-Core Current Transducer (1000A) – with 30' lead

Battery Temperature Sensors	**Requires SAGEON3.C01 for more than One(1) Battery String**
385.5941.03	Temperature Sensor 10' (3M)
385.5941.06	Temperature Sensor 19' (6M)
385.5941.15	Temperature Sensor 50' (15M)

MAJOR REPLACEMENT COMPONENTS CONTINUE…

AM1 Series Breaker Kits

274.3830.01	1 Ampere, AM1 Series Breaker, 1 Position
274.3830.03	3 Ampere, AM1 Series Breaker, 1 Position
274.3830.05	5 Ampere, AM1 Series Breaker, 1 Position
274.3830.10	10 Ampere, AM1 Series Breaker, 1 Position
274.3830.15	15 Ampere, AM1 Series Breaker, 1 Position
274.3830.20	20 Ampere, AM1 Series Breaker, 1 Position
274.3830.25	25 Ampere, AM1 Series Breaker, 1 Position
274.3830.30	30 Ampere, AM1 Series Breaker, 1 Position
274.3830.40	40 Ampere, AM1 Series Breaker, 1 Position
274.3830.50	50 Ampere, AM1 Series Breaker, 1 Position
274.3830.60	60 Ampere, AM1 Series Breaker, 1 Position
274.3830.70	70 Ampere, AM1 Series Breaker, 1 Position
274.3830.80	80 Ampere, AM1 Series Breaker, 1 Position
274.3830.90	90 Ampere, AM1 Series Breaker, 1 Position
274.3830.100	100 Ampere, AM1 Series Breaker, 1 Position
274.3830.125	125 Ampere, AM1 Series Breaker, 2 Positions
274.3830.150	150 Ampere, AM1 Series Breaker, 2 Positions
274.3830.200	200 Ampere, AM1 Series Breaker, 2 Positions
385.3830.00	Breaker Toggle Guard Kit

AM1 Breaker Adapter Bus Bars (adapt the breaker output to accept larger 2-hole lugs - 45° up angle – utilizes two breaker spaces)

209.4743.01	2H Landing Bus Bar, 1” C-to-C 3/8”x16 Studs (Distribution Group A)
209.4743.02	2H Landing Bus Bar, 1” C-to-C 3/8”x16 Studs (Distribution Group B)

GJ1 Series Breakers **Requires SAGEON3.E03, E04, E05**

274.3833.100	100 Ampere, GJ1 Series Breaker, 1 Position
274.3833.125	125 Ampere, GJ1 Series Breaker, 1 Position
274.3833.150	150 Ampere, GJ1 Series Breaker, 1 Position
274.3833.175	175 Ampere, GJ1 Series Breaker, 1 Position
274.3833.200	200 Ampere, GJ1 Series Breaker, 1 Position
274.3833.225	225 Ampere, GJ1 Series Breaker, 1 Position
274.3833.250	250 Ampere, GJ1 Series Breaker, 1 Position
274.3833.300	300 Ampere, GJ1 Series Breaker, 2 Positions
274.3833.350	350 Ampere, GJ1 Series Breaker, 2 Positions
274.3833.400	400 Ampere, GJ1 Series Breaker, 2 Positions
274.3833.600	600 Ampere, GJ1 Series Breaker, 3 Positions

GJ1 Breaker Adapter Bus Bars (adapt the breaker output to accept 2-hole lugs)

209.8104.00	For single position breakers (1 lug landing, 1” C-to-C, 3/8x16 studs)
209.5235.00	For two position breakers (1 lug landing, 1” C-to-C, 3/8x16 studs)
209.5240.00	For three position breakers (3 lug landings, 1” C-to-C, 3/8x16 studs)
209.5228.00	For four position breakers (4 lug landings, 1” C-to-C, 3/8x16 studs)

NOTES:

1. ALARM CONTACTS ARE RATED 2 AMP RESISTIVE AT 48 VDC.

2. ALL WIRES ARE 20 GA MINIMUM UNLESS OTHERWISE NOTED.

3. CURRENT TRANSDUCER OPTIONS (REQUIRES SAGEON3.C01 LIST): SELECT UP TO 4 EXTERNAL INDIVIDUAL BATTERY STRING CURRENT TRANSDUCERS. ORDER AS SEPARATE LINE ITEMS.

4. ORDER TEMPERATURE SENSORS AS SEPARATE LINE ITEMS.

5. INDIVIDUAL 20AMP AC BREAKERS INCLUDED FOR EACH RECTIFIER POSISTION.

6. DASHED LINES DENOTE CUSTOMER CONNECTIONS OR EXTERNAL PANEL CONNECTIONS.

7. DASH-DOT LINES DENOTE COMPONENTS OR CONNECTIONS INTERNAL TO SAGEON3.

8. BATTERY DISCONNECT PANELS ARE NOT INCLUDED AND MUST BE ORDERED AS A SEPARATE LINE ITEM. SHOWN HERE FOR ILLUSTRATION OF TYPICAL APPLICATION ONLY.

9. BATTERIES ARE NOT INCLUDED AND MUST BE ORDERED SEPARATELY. SHOWN HERE FOR ILLUSTRATION OF TYPICAL APPLICATION ONLY.

SHEET INDEX NOTE:

THE ISSUE OF SHEET 1 REFLECTS THE LATEST ISSUE OF THE DRAWING SET. WHEN THE DRAWING SET IS REVISED, ONLY THE ISSUE NUMBERS OF MODIFIED SHEETS ARE CHANGED. THE ISSUE NUMBERS OF UNMODIFIED SHEETS ARE NOT CHANGED.

ISSUES

ISSUE #	DESCRIPTION	ISS. BY ISS. DATE	APP. BY APP. DATE
4	SEE ECN 20076. UPDATED LOGO/VERBIAGE TO STATE UNIPOWER.	WD 2/13/15	DBW 2/13/15

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ± TOLERANCES ON:		APPROVALS	DATE
HOLES	+0.004 −0.002	DRAWN WD	2/28/13
FRACTIONS	±1/32	CHECKED MCM	3/8/13
DECIMALS (XX)	±0.020	APPROVED DBW	3/11/13
DECIMALS (XXX)	±0.010	APPROVED	
ANGLES	±1/2°		

SQUARE CORNERS AND ANGLES ARE 90° UNLESS OTHERWISE SPECIFIED.

WORKMANSHIP:
PER SPEC ENG032

MATERIAL:

FINISH:

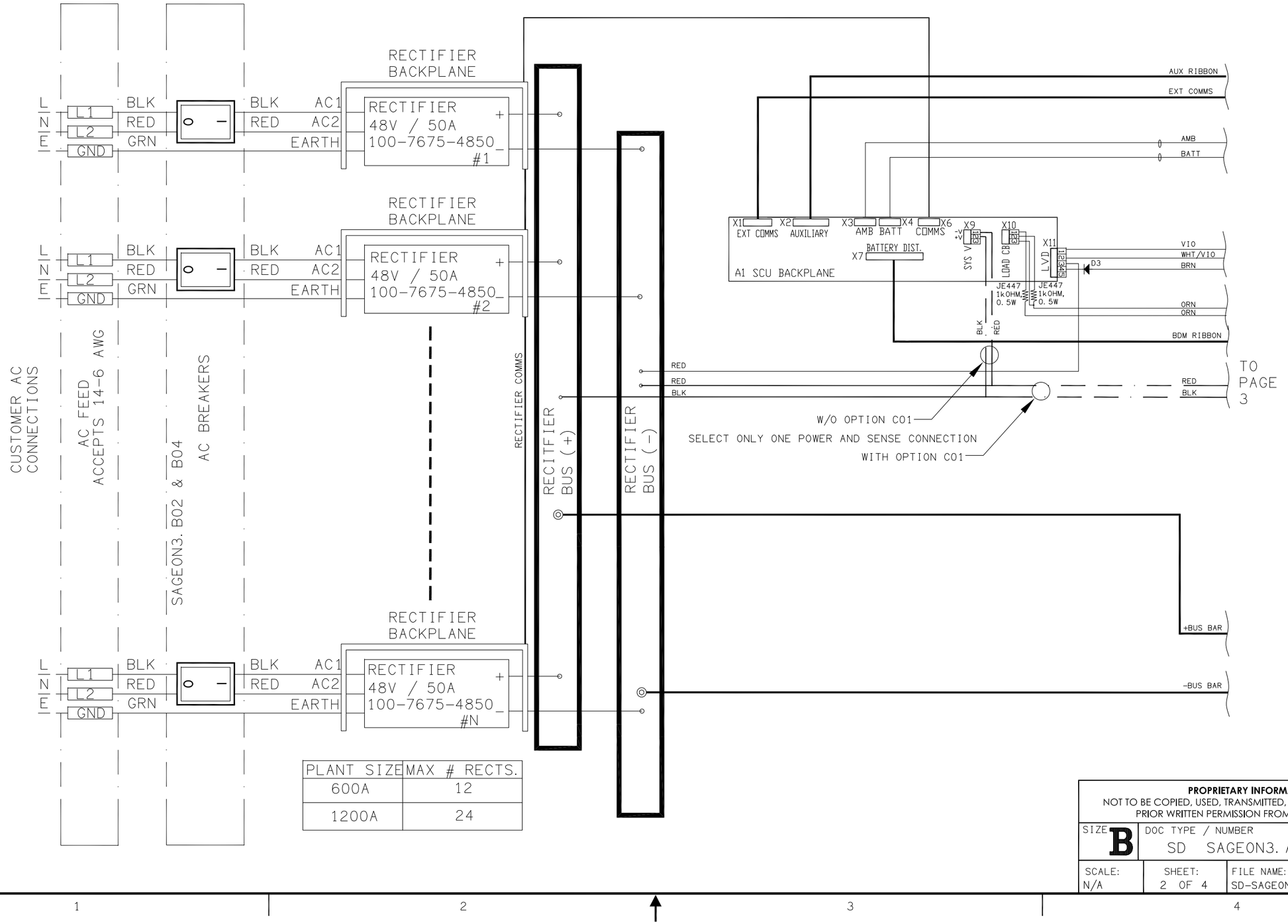
PROPRIETARY INFORMATION
NOT TO BE COPIED, USED, TRANSMITTED, OR DISCLOSED WITHOUT PRIOR WRITTEN PERMISSION FROM UNIPOWER, LLC.

UNIPOWER
Powering Technology

SCHEMATIC DIAGRAM
SAGEON III POWER SYSTEM

SIZE	DOC TYPE / NUMBER	ISSUE
B	SD SAGEON3.AXX	4

SCALE:	SHEET:	FILE NAME:
N/A	1 OF 4	SD-SAGEON3.AXX_ISS_4



PLANT SIZE	MAX # RECTS.
600A	12
1200A	24

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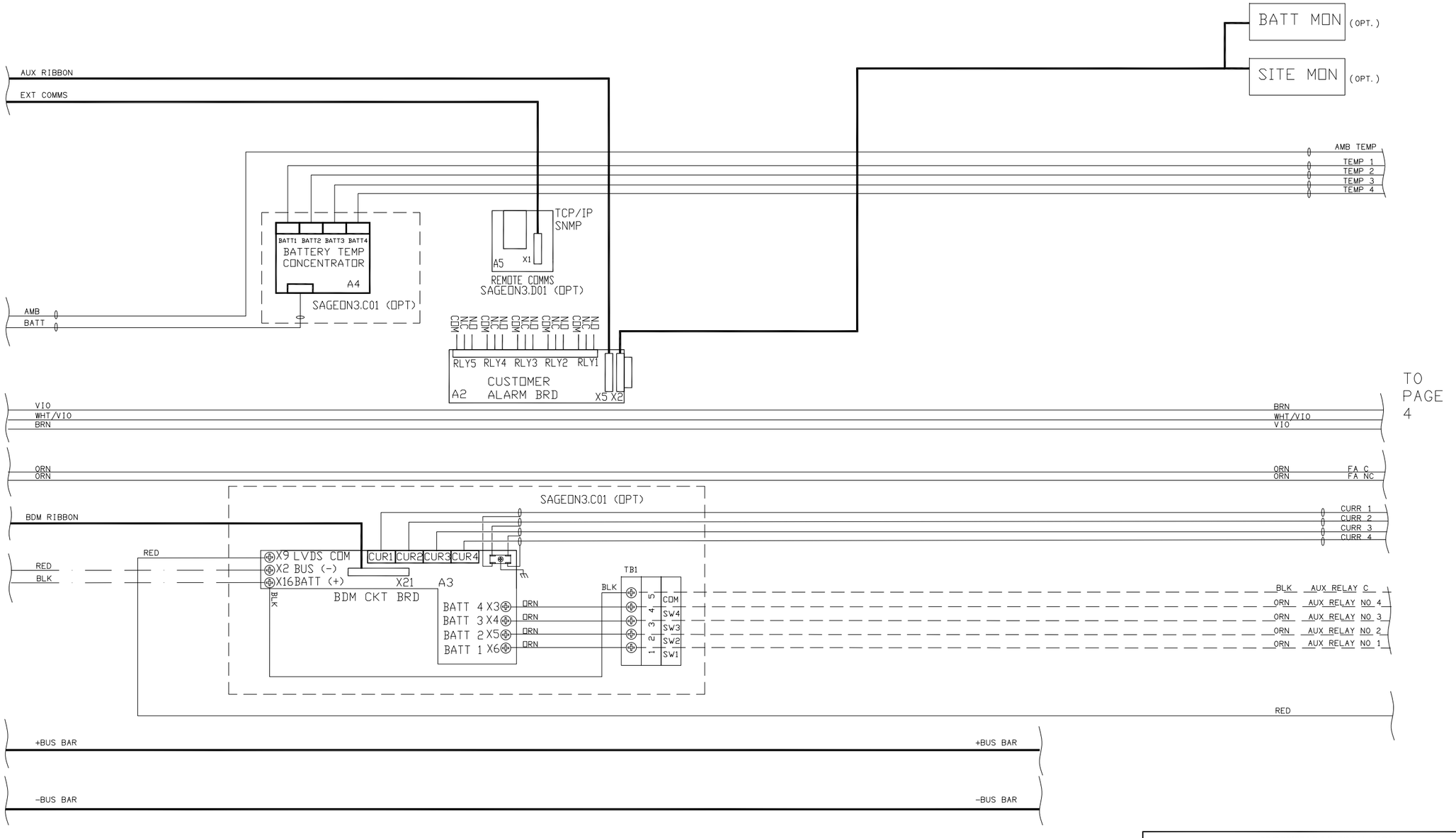
B	SD SAGEON3. AXX	4

SCALE:	SHEET:	FILE NAME:
N/A	2 OF 4	SD-SAGEON3. AXX_ISS_4



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POS

BATTERY LANDING TERMINAL (+)

8 LANDINGS
2-HOLE
3/8" ON 1" C-C

AMBIENT TEMP (MOUNT ON LARGE THERMAL MASS)

AMB TEMP
TEMP 1
TEMP 2
TEMP 3
TEMP 4

ORN
ORN
BLK

C
NC
NO
GND
24V IN
-48V OUT
-48V IN
24V OUT

FA CKT BRD

ORN

DIST. GROUP A TIER 1
DIST. GROUP B TIER 1
DIST. GROUP A TIER 2
DIST. GROUP B TIER 2
DIST. GROUP A TIER 3
DIST. GROUP B TIER 3

FA

CUSTOMER LOADS (-48 VOLT)

"CUSTOMER SPECIFIC"

BLK

CONNECT STRING TEMPERATURE SENSORS AT STRING MIDPOINTS

(OPT.) EXTERNAL CT'S (SEE NOTE 3)

SEE NOTE 8

DC CT
DC CT
DC CT

ORN
BATTERY DISCONNECT PANEL
NC NO C
BLK

SEE NOTE 9

TO PAGE 3

VIO
WHT/VIO
BRN

ORN
ORN

CURR 1
CURR 2
CURR 3
CURR 4

BLK AUX RELAY C
ORN AUX RELAY NO 4
ORN AUX RELAY NO 3
ORN AUX RELAY NO 2
ORN AUX RELAY NO 1

RED

+BUS BAR

-BUS BAR

RED
SAGEON3. A01 (ONLY)

INTERNAL BATTERY LVD

LVD CONTROL
BY-PASS SWITCH

CONTACTOR

WHT/VIO
VIO
BRN
RED
BRN
RED/BLK
BLK
D2
RED
BLK
BLVD

BATTERY LANDING TERMINAL (-)

8 LANDINGS
2-HOLE
3/8" ON 1" C-C

NEG

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