

**SAGEON PSMC I
MONITOR/CONTROLLER
FOR POWER PLANTS**

**PRODUCT MANUAL FOR
103-2999-XX +24/-48 Vdc Model**

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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.

C&D Technologies 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 C&D Technologies. 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 C&D Technologies, ask the delivering carrier to send the packages back to C&D Technologies 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.

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 human-power 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 C&D Technologies equipment is identified by a part number on the nameplate. Please refer to this number in all correspondence with C&D Technologies.

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, it is suggested that spare fuses, circuit boards and other recommended components be purchased as listed on the Recommended Spare Parts List in the back of the product manual. If nothing else, it is strongly recommend that spare fuses be stocked for all systems.

Issue History

ISSUE	PAGE (S) ALTERED	DESCRIPTION OF CHANGE	APPR'D /DATE
A	--	Preliminary issue	CJM 06/03/08
1	ALL	Initial Release	CJM 7/17/08

DOCUMENT SUMMARY

This document explains the installation, operational, maintenance and troubleshooting methods for the C&D Technologies SAGEON PSMC I Monitor/Controller.

LEGAL DISCLAIMERS

C&D Technologies, Inc. believes that all information contained in this manual is accurate and reliable. However, this information does not constitute any guarantee or warranty by C&D Technologies, nor does it make C&D Technologies responsible for any damage that might occur during the installation, use, or maintenance of the equipment described in this manual.

C&D Technologies, Inc. also does not guarantee that the suggested equipment uses given in this manual do not infringe upon any existing or pending patents.

Installers, users, and maintainers of this equipment should not assume that all possible safety measures that could be taken with this equipment are mentioned in this manual. Where unusual environmental conditions or circumstances dictate otherwise, said personnel should not assume that no other precautionary measures may be required for the safe installation, use, and maintenance of this equipment.

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TABLE OF ABBREVIATIONS

ABBREVIATION, ACRONYM OR SYMBOL	MEANING
ANSI	American National Standards Institute
AWG	American wire gauge
CEV	controlled environment vault
CM	circular mils
CEMF	Counter Electro-motive Force
DIP	dual in-line package
EMI	electromagnetic interference
ESD	electrostatic discharge
FA	+48-volt fuse and breaker alarm
HVA	high voltage alarm
HVSD	high voltage shutdown
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
PCB	printed circuit board
PDR	power distribution rack
PSMC	Power Systems Monitor & Controller
RBOC	Regional Bell Operating Company
RFA	rectifier failure alarm
VLVA	very low voltage alarm
Vdc	volts direct current
NEMA	National Electrical Manufacturers Association
NEC	National Electric Code
UL	Underwriters Laboratory
UBC	Uniform Building Code

TABLE OF REFERENCES

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. June 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 Plant Rectifiers. May 1985
TR-EOP-000154	Bellcore Generic Requirements for 24-, 48-, 130-, & 140-Volt Central Office Power Plant 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

CHAPTER ONE: INTRODUCTION

- 1.1 General Description
- 1.2 Features
- 1.3 Specifications

1.1 GENERAL DESCRIPTION

The SAGEON PSMC I is a microprocessor based, single rack space, power plant monitor and controller for telecommunications applications. The SAGEON PSMC I was designed to be a compact and easy to use replacement for conventional meter and alarm panels. The SAGEON PSMC I has all of the standard metering and alarm functions, as well as a number of added features, which are outlined below:

The SAGEON PSMC I can be used to monitor:

- Plant voltage
- Plant current
- Load voltage
- Up to 9 feeder currents
- Two CEMF cells
- Five separate fuse alarms (battery true) inputs
- Up to 16 Rectifier Fail Alarms (RFA) inputs
- Temperature: Ambient and two battery strings
- Low voltage disconnect status
- Controller inhibit input making the SAGEON PSMC I a secondary controller

The SAGEON PSMC I has the following alarm and control output relays (all relay contacts rated 60W / 62.5VA):

- Dual Form C contacts for Major and Minor alarms
- Single Form C contacts for the following alarms:
 - High voltage (HVA)
 - Very Low Voltage (VLVA)
 - Low Voltage (LVA)
 - Rectifier Fail Alarm (RFA)
 - Low Voltage Disconnect (LVD)
 - Counter Electromotive Force (CEMF)
 - Temperature alarm (TEMP)
 - Control Inhibit (CTRL INH)
 - Auxiliary relay (AUX) (user defined)
 - Fuse alarm (FA)
 - Watchdog alarm (WD)
- Single Form A contacts for the following control functions:
 - High voltage (HV)
 - Rectifier Restart (RS)
 - Equalize (EQ)
- Front panel LED's that visually indicate alarm & control status
- Built-in audible alarm

1.2 FEATURES

- Compact single rack space design
- Simple four key access to status, system configuration, calibration, and control functions
- Alphanumeric display: shows measurement data and programming information

- Front panel LED alarm indicators: (Red) MAJOR, FA, VLVA, LVD, HVSD, WD, RFA, & TA; (Yellow) MINOR, LVA, CEMF, HVA, ACO, EQ, CTRL-INH, and (Green) Power
- Manual Equalize Mode with programmable duration from 1 to 255 hours
- Auto Equalize Mode with programmable on, off and duration thresholds
- Audible alarm with a user selectable trigger point and cut-out durations
- One “Auxiliary” output relay (user definable)
- User access may be password protected
- Built-in test & calibration modes
- Front panel test points for manual verification of test & calibration data
- Screw terminals for easy connection of users inputs & outputs

1.3 SPECIFICATIONS

1.3.1 Physical Specifications

Width:	19” or 23” (103-2999-19A or 103-2999-23A, respectively)
Height:	1.75” (1RU)
Depth:	11.0”
Weight:	10.0 lbs.

1.3.2 Environmental Specifications

Operating temperature	0°C to +50°C (+32°F to +122°F)
Storage temperature	-40°C to +85°C (-40°F to +185°F)
Shipping and handling	Shipped in a padded box when ordered as a separate item, or installed in rack and pre-wired to the plant when ordered as part of a custom power plant
Humidity	0 to 95 %, non-condensing
Altitude	10,000 feet (3,048 meters)
Heat dissipation	~150 BTU/hour maximum
Cooling	Natural convection
Seismic	UBC seismic zone 4 (Calculated response)

1.3.3 Electrical Specifications

<u>Power/Supply</u>	
Input:	+24 Vdc @ 400 mA (worst case)
	-48 Vdc @ 200 mA (worst case)
Maximum Supply Voltage:	60 Vdc
Minimum Supply Voltage:	20 Vdc

Analog Inputs

INPUT NAME	MIN.	NOMINAL	MAX.	UNITS
VOLTAGE	0.00	54.20 (27.10)	60.00	VOLTS
CURRENT (shunt)	0	25	50	mV
TEMPERATURE	0.000 (0.0°F)	.750 (75.0°F)	2.300 (230.0°F)	VOLTS

1.3.4 General Plant Performance Specifications

The SAGEON PSMC I was designed to operate in accordance with the monitor and control specifications portion of TR-EOP-000154, for +24 and -48 Vdc Power Plants.

1.3.5 Safety Specifications

Underwriters Laboratory Standards of Safety for Information Technology Equipment (UL 1950) and the Bellcore Network Equipment-Building System Generic Equipment Requirements (TR-EOP-000063) were adhered to in all component and wire selection. Particular attention was paid to safety ratings and OI-28 flammability requirements.

1.3.6 Monitoring Specifications

* See PN Drawings and Menu Flow Charts, located in the back of this manual, for electro-mechanical details and user menu information.

- The front panel meter of the SAGEON PSMC I is an alphanumeric LCD display. It displays voltage with 0.05 % accuracy (10mV; within one least significant digit of display), current readings with +/-0.2% accuracy and temperature readings within 1/2 °F.
- The information displayed (in the default mode) on the front panel of the SAGEON PSMC I is plant voltage, plant current, and the number of active alarms. When the Load Voltage channel has been enabled, the front panel will change to show the plant voltage, load voltage, current, and the number of active alarms. If an ambient temperature sensor is attached, it can be set up to toggle display with the plant current on the default screen (CONFIGURE MENU).
- Four front panel push buttons provide access to all menus for general channel polling, alarm status determination, system configuration, calibration, and testing.
- 15 analog channels predefined for plant voltage, plant current, load voltage, 9 feeder and/or rectifier shunts, and three temperature sensors (ambient & 2 battery string).
- 5 binary fuse alarm (FA) inputs for Charge, Discharge, Sense/Control, Battery, and Spare used for monitoring fuse and breaker status (battery level active/blown).
- 16 binary rectifier fail (RFA) inputs for monitoring individual rectifier status (active low/GND closure).
- 2 binary counter-emf cell inputs for CEMF cell status (active low/GND closure).

- 2 binary inputs: one for LVD alarming and one Controller-Inhibit (active low/GND closure).
- Test jacks for manual confirmation of voltage, current, and temperature readings. Test jacks are for reference only; proper calibration of the Sageon PSMC I should use measurements at the screw terminals. E.g. Due to internal inline-protection of the test terminals, a small voltage drop will be read.
- Built in audible alarm to enunciate a Major or Minor alarm with ACO (Audible Cut-Off), all user defined.

1.3.7 Control Specifications

- Equalize (EQ) output, which is user selectable for manual or automatic operation. Manual is initiated from front keyboard for 1 – 255 hours. Auto is triggered by user adjustable on and off voltage thresholds and adjustable duration from 0 to 10 hours. See section 3.8.8 EQUALIZE SUB-MENU for setting up equalize.
- High Voltage Shutdown (HVSD) output with user adjustable trigger voltage.
- Restart (RS) output triggered by the Low Voltage alarm threshold to try and automatically restart any rectifiers that are in “high voltage shutdown.”

1.3.8 Alarm Specifications

The front panel alarm indicators are listed below with their LED indication color, trigger source, and where applicable, the alarm input requirement:

FRONT PANEL ALARM INDICATIONS	
Major Alarm (MAJ)	Red LED Major alarm indicator Triggered by FA, VLVA, LVD, HVSD, OC (over-current) or any two or more minor alarms; RFA’s, TA’s, CEMF, LVA, HVA, CTRL INH alarms
Fuse Alarm (FA)	Red LED FA alarm indicator Triggered from charge, discharge, sense, battery, and spare fuse alarms (BAT input active/true)
Very Low Voltage (VLVA)	Red LED VLVA alarm indicator Triggered by user defined voltage threshold (see Set Thresholds Section 3.4)
Low Voltage Disconnect (LVD)	Red LED LVD alarm indicator Triggered by open low voltage disconnect contactor (GRD input active/true)
High Voltage Shutdown (HVSD)	Red LED HVSD alarm indicator Triggered by user defined voltage threshold (see Set Thresholds Section 3.4)

FRONT PANEL ALARM INDICATIONS

Watchdog/Aux (WD)	Red LED WD alarm indicator Triggered by SAGEON PSMC I internal default/detect circuitry (front panel reset or microprocessor failure). The WD will flash if the Aux alarm (user configured) is triggered.
Rectifier Fail (RFA)	Red LED RFA alarm indicator Triggered by any one of sixteen individual rectifier fail (RFA) inputs (GRD input active/true)
Temperature alarm (TA)	Red LED TA alarm indicator Triggered by any Hi or Lo temperature alarm thresholds for Ambient, Battery String 1, Battery String 2, also triggered by any temperature differential between strings and ambient temp.
Minor Alarm (MIN)	Yellow LED Minor alarm indicator Triggered by any single RFA, CEMF, LV, HV, or TA alarm
Counter-EMF Cell Alarm (CEMF)	Yellow LED CEMF indicator Triggered when CEMF Cell 1 or 2 are active (GRD true input)
Low voltage Alarm (LVA)	Yellow LED LVA alarm indicator Triggered by user defined voltage threshold (see Set Thresholds Section 3.4)
High voltage alarm (HVA)	Yellow LED HVA alarm indicator Triggered by user defined voltage threshold (see Set Thresholds Section 3.4)
Audible Cut-off Status (ACO)	Yellow LED ACO status indicator Triggered by manually turning audible alarm off from Alarm menu. Stays on until ACO timer expires or another audible alarm occurs.
Equalize (EQ) Status	Yellow LED EQ status indicator Triggered by manually initiating the Equalize mode (stays on until equalize is manually turned off or manual-timer expires), or automatically when plant voltage falls below threshold (stays on until plant voltage rises above off threshold or auto-

FRONT PANEL ALARM INDICATIONS

Control Inhibit Status (INH)

timer expires).

Yellow LED **CTRL INH** status indicator
 Triggered by binary control inhibit input from master controller when SAGEON PSMC I is used as a secondary controller (GRD true input)

1.3.9 Output Relay Specifications

The SAGEON PSMC I provides both Form-C alarm output relays and Form-A control relays for remote monitoring, audible and visual alarm panels, and rectifier control requirements.

REMOTE ALARM INDICATIONS

Form-C contacts Alarms

The SAGEON PSMC I provides screw terminals for 13 form-C alarm relay outputs; all relays except **MAJOR** and the **WATCHDOG** are normally de-energized

Plant alarm outputs are **MAJ, MIN, HVA, LVA, VLVA, FA, LVD, TEMP, CEMF,** and **RFA**. Two sets of contacts (2 form C) are provided for Major and Minor alarms

An auxiliary relay (**AUX**) is provided that the user can define as a major, minor, equalize, audible alarm, or any specific analog or binary input channel alarm. If triggered the **WD** LED will flash.

Status

A **WATCHDOG (WD)** relay is provided to enunciate a SAGEON PSMC I processor failure or a front-panel reset.

A control inhibit relay (**CTRL INH**) is provided to indicate that the SAGEON PSMC I is off line due to an active control inhibit input

Form-A contacts Control

A normally open set of contacts is provided for the **Equalize** mode output. (See Equalize mode section for operation details)

A normally open set of contacts is provided

REMOTE ALARM INDICATIONS

for the rectifier **Restart** output.

A normally open set of contacts is provided for the **HVSD** output.

Note: common control return (**CTRL RET**) pins are provided to allow control outputs to be either ground closures or battery outputs.

CHAPTER TWO: SAGEON PSMC I INSTALLATION

- 2.1 Introduction
- 2.2 Selecting a location
- 2.3 Cabling Requirements
- 2.4 Installation procedure outline
- 2.5 Installation guidelines
- 2.6 Wiring the SAGEON PSMC I

2.1 INTRODUCTION

- 2.1.1 These instructions provide general information for installing the SAGEON PSMC I in custom applications as a stand alone unit. Units ordered as part of custom power plants will be installed, wired, and tested at the factory. These instructions are meant to be used with the SAGEON PSMC I product drawings PN 103-2999-XX and a datasheet for detailing the application specific wiring and programming. If the appropriate drawings are not included in this manual, contact Customer Support at 1-800-440-3504.
- 2.1.2 If questions or problems arise during installation, please call one of our Field Service technicians at 1-800-299-3907 for assistance. A name plate on the bottom of the cabinet gives the part number for the SAGEON PSMC I. Reference this number when requesting service.
- 2.1.3 To install the SAGEON PSMC I you will need:
 - o Standard installation tools
 - o Standard small screwdriver for screw terminals (i.e. Xcelite® USA R3322)
 - o PN drawing set
 - o Inline fuses and/or resistors
 - o Datasheet (for detailing wiring and setup)

2.2 SELECTING A LOCATION

Note: This procedure assumes a custom SAGEON PSMC I installation in an existing power plant.

- 2.2.1 The SAGEON PSMC I should be mounted at eye level for easy access and display viewing. The unit requires only one rack space for mounting. No precautions are necessary for internal cooling. If the unit is to be mounted over high heat producing equipment, such as a ferro-resonant rectifier, a heat shield should be installed between the units.

2.3 CABLING REQUIREMENTS

- 2.3.1 All connections to the SAGEON PSMC I utilize screw terminal connections. Care should be exercised to tighten the screws without breaking the wires. Make sure there is no bare wire showing that could possibly short to other wires. Good electrical contact should be checked for each connection.
- 2.3.2 Solid 20 - 24 AWG wire is recommended for screw terminal connections. This type of wire is readily available in single twisted pairs, or multiple-conductor jacketed cabling to facilitate the typical wiring associated with this monitor & controller product. If solid conductors are NOT used, then “tinning” the end of the conductor is suggested.

- 2.3.3 Overall system performance and safety depends on the proper wiring and the installation of inline protection devices where needed. Cable runs that will utilize overhead cable racks should be jacketed and carefully routed to protect the wiring to the SAGEON PSMC I.

2.4 INSTALLATION PROCEDURE OUTLINE

WARNING: The SAGEON PSMC I utilizes connections to battery for power and sensing connections that must include inline protection (fuses or current-limiting resistors) to eliminate potential hazards to personnel and equipment due to accidentally shorted battery connections.

GENERAL PROCEDURE OUTLINE

- 2.4.1 Verify the part number on the SAGEON PSMC I conforms to the voltage of the power plant before installation. The SAGEON PSMC I functions with +/-24 Vdc or +/-48 Vdc input power without adjustment. Maximum voltage input is 60 Vdc; minimum is 20 Vdc.
- 2.4.2 Locate the unit as directed in the “Selecting a Location” section and mount with four standard rack-mount screws; two of the screws must have “Paint-Cutting” washers installed to assure proper grounding for ESD protection.
- 2.4.3 Locate power source and sense points for battery power, plant voltage and load voltage connections. These connections must be fused at the source with inline protection or utilize a sense and control panel connection. Ideally, both the battery and ground leads should be protected. The minimum requirement is a fuse in the battery leg. A separate ground lead should be run to one of the common **Plant Ground** (PLANT GND, TB2 pins 2-12 and 21-24)screw terminals. This connection references the SAGEON PSMC I internal ground to the power plant ground reducing noise levels and providing a convenient plant ground connection point for ground closures on output relays.
- 2.4.4 A list of connections should be created for all the SAGEON PSMC I wiring before actual wiring begins using the Datasheet in the back of this manual. The Datasheet will greatly simplify the wiring process and provide a permanent record of the SAGEON PSMC I wiring.
- 2.4.5 Locate each sense point for plant voltage and shunts to determine what type of inline protection and cable routing is required. Note connection and protection requirements on Datasheet.
- 2.4.6 Locate rectifier connections for **Equalize**, **Restart**, **HVSD** inputs, and **RFA** outputs to determine connection requirements. The connections for **Equalize**, **Restart**, and **HVSD** MUST all be battery OR ground closures simultaneously e.g. **Equalize** CANNOT be a battery closure while **HVSD** and **Restart** are ground closures. This information determines the connection to the common “control return” (CTRL RTN) on the SAGEON PSMC I. The **RFA** inputs are ground closures.

Note: Add this information and any lug requirements on the Datasheet. Determine best cable routing to the rectifier connections. The **Equalize**, **Restart**, and **HVSD** connections can be “daisy chained” as necessary. The SAGEON PSMC I accepts up to 16 individual **RFA** inputs.

- 2.4.7 Locate fuse alarm (**FA IN**) connection points. Five individual inputs are provided for **Charge**, **Discharge**, **Battery**, **Sense/Control**, and one **Spare**. Multiple discharge fuse alarms can be “daisy chained” if desired.

Fuse alarms are battery voltage inputs. Inline fuse protection is recommended if these connections must utilize overhead cable runs. Determine best cable routing, connection requirements and add this information to the Datasheet.

Note: Do not use inline resistors for protection on fuse alarms as SAGEON PSMC I internal sensing circuits will be adversely affected and may fail to register fuse alarms; fuses must be used instead.

- 2.4.8 Two ground closure true inputs are provided for CEMF Cell alarm inputs (**CEMF1** & **CEMF2**). If a CEMF Cell is included verify it provides the proper input. No inline protection is required for ground closure type inputs. Determine the best cable routing, connection requirements and add this information to the Datasheet.
- 2.4.9 A ground closure true input is provided for a Low Voltage Disconnect (**LVD**) alarm. If a Low Voltage Disconnect is included, verify it provides the proper input. No inline protection is required for ground closure type inputs. Determine the best cable routing, connection requirements, and add this information to the Datasheet.
- 2.4.10 If Ambient (**AMB**) and battery temperature (**TS1** & **TS2**) sensors are included, determine the mounting locations. The ambient sensor should be bolted to a large thermal mass, such as the rack itself, to limit response to short term changes.

Two battery temperature sensor inputs are provided for up to two battery strings. Sensors are designed with lead plated ring lugs to be connected with battery strap hardware. Sensor detection circuits are isolated from battery potential. Sensors come with 30 ft. leads, which can be extended with butt splices if necessary.

Cable runs in excess of 100 ft. may degrade temperature readings due to voltage drops. No inline protection is required for temperature sensors. Determine best cable routing, connection requirements and add this information to the Datasheet.

- 2.4.11 The alarm output relays are the last consideration. The user must determine the local requirements such as the presence of a central alarm monitor or separate audible or visual alarm panels. All the output relays are normally de-energized except the Major alarm, which is energized for fail safe operation. All relays are rated at 60W, 62.5VA.

All alarm output relays are Form C, and can provide either normally open or normally closed connections. Ground closure alarms can utilize the Plant Ground screw terminals for jumpers to the common connection on the output relays. Determine best cable routing, connection requirements, and add this information to the Datasheet.

2.5 INSTALLATION GUIDELINES

The following topics provide guidelines and suggestions to facilitate wiring the SAGEON PSMC I in a fast and efficient manner, producing a quality installation that looks professional and limits potential problems.

- 2.5.1 Sketch out the wire routing from the SAGEON PSMC I on paper to determine the best routing that allows the maximum number of wires to be bundled together from the SAGEON PSMC I to the furthestmost possible connection point. Creating wiring bundles facilitates routing and provides protection to individual wires.
- 2.5.2 Always use multi-conductor twisted pair or jacketed cables whenever possible. Start cabling from the SAGEON PSMC I, filling in the wire color codes on the Datasheet as connections to the SAGEON PSMC I are made. If same color coded wires must be used repeatedly, use

sticky wire labels to uniquely label each wire. This will greatly speed up the wiring process at the destination end and make troubleshooting easier.

- 2.5.3 Familiarize yourself with the screw terminal board layout before starting the wiring process. Refer to Signal Identifier Label for screw terminal labeling located on the top panel of the SAGEON PSMC I. Develop a wiring progression such as power, analog, fuse alarms, etc. This will help eliminate wiring errors or missed connections.
- 2.5.4 The SAGEON PSMC I power inputs are protected against reverse polarity. The analog inputs are polarity sensitive. Reversed connections will not cause any damage but the SAGEON PSMC I will be unable to read the input. This requirement can be confusing, especially on shunt inputs. Using the power plant SD drawing to determine shunt polarities will save time later when troubleshooting analog channels.
- 2.5.5 Before starting the general plant wiring, lay any ground jumpers between output relay commons, **CTRL RET**, and Plant Grounds that are required. These connections can limit wiring access when added over the other plant wiring. The SAGEON PSMC I provides pluggable screw terminal blocks for ease of wiring. Take care to properly insert and seat the terminal blocks after wiring. If front access is required be sure to leave enough cable length (~3-4 ft) to remove the PSMC from the rack without disconnecting the terminal blocks.

2.6 WIRING THE SAGEON PSMC I

Note: Refer to Datasheet for specific wiring information. Be sure to add wire color references as connections are completed. Should actual wiring require any changes update the Datasheet immediately. The PN 103-2999-XX drawing provides general wiring diagrams for the typical SAGEON PSMC I connections, mechanical views, and fusing information.

At this point, the installer should have a Datasheet detailing the required connections and a wiring plan that provides the most efficient cable routing. The installer should be familiar with the wiring connections to the SAGEON PSMC I. The PN 103-2999-XX drawings should be available for reference to the actual SAGEON PSMC I connections and typical wiring diagrams.

2.6.1 Plant Ground

Determine plant ground jumper requirements for output relays from the data information sheet. “Daisy chain” jumpers with black wire, if possible, from the **Plant GRD** screw terminals to the common (C) connection on each relay requiring a ground closure.

2.6.2 Battery

Begin with the power connections to the SAGEON PSMC I running a fused Battery connection to the **BAT** pin on the SAGEON PSMC I. Several Ground leads should be run for power and plant ground connections. The power **GRD** return and the **PLANT GROUND** should be jumped together, but use separate wiring to a central ground point on the power plant to minimize noise pick-up. (See Fig.1 of PN drawing)

Note: See the PN 103-2999-XX drawing Table E for SAGEON PSMC I power fusing requirements.

2.6.3 Analog Inputs

Note: Analog inputs for Plant voltage, Load voltage and temperature sensors should be left open at the measurement (sense) point on the power plant at installation to facilitate calibration zeroing, which requires shorting the leads.

- 2.6.3.1 Connect the fused Plant Voltage sense leads to the **VB+** and **VB-** terminals on the SAGEON PSMC I, verifying the proper polarity. (See Fig. 2 of PN drawing)
- 2.6.3.2 Connect the fused Plant Shunt sense leads to the **PSH+** and **PSH-** terminals on the SAGEON PSMC I, verifying the proper polarity. (See Fig. 3 of PN drawing)
- 2.6.3.3 Connect any required Feeder Shunt sense leads starting at **SH1+** & **SH1-** up to **SH9+** & **SH9-**, as per the Datasheet. These inputs must also be protected and connected with the proper polarity. (See Fig. 4 & 5 of PN drawing)
- 2.6.3.4 Connect the ambient and battery temperature sensors to their respective inputs: **AMB** (ambient) and **TS1** & **TS2** for battery temperature sensors. Each sensor requires a connection to power (**P**), temperature return (**R**), and temperature signal input (**S**). These connections correspond to the red, black, and blue leads (respectively) of the temperature sensors. If the temperature sensor wires have been extended refer to the Datasheet for proper connections. (See Fig. 8 of PN drawing)

WARNING: Improper temperature sensor connection may damage the sensors. Always verify proper connections, and avoid shorting leads, especially when connecting to a powered SAGEON PSMC I. **The temperature sensor return lead (RTN) is isolated, and MUST NOT be connected to PLANT GROUND.**

- 2.6.3.5 Connect the fused load voltage sense leads to the **VL+** & **VL-** terminals on the SAGEON PSMC I, verifying the proper polarity. (See Fig. 2 of PN drawing)

This completes the analog input connections. Stop and verify these connections and update the Datasheet if necessary. Go to the Analog Channel Calibration section next.

2.6.4 Binary Inputs

Binary inputs consist of 2 **CEMF Cell** alarm inputs, 5 Fuse Alarm (**FA**) inputs, 1 Low Voltage Disconnect (**LVD**) Alarm, and 16 Rectifier Fail (**RFA**) alarms. The Binary inputs require pre-defined inputs for proper operation. Refer to the Datasheet for required connections and the PN 103-2999 drawings for typical wiring diagrams. (See Fig. 9 of PN drawing)

- 2.6.4.1 CEMF Cell alarm inputs require a ground closure input. Verify the CEMF Cell to be monitored can provide this type of alarm output before proceeding. Alarm leads are connected to the **+CEMF1** or **+CEMF2** input terminals. The **-CEMF1** and **-CEMF2** connections are not required, but can be jumpered to **PLANT GROUND** and used with twisted pair cable runs for noise suppression if desired.

Note: C&D Technologies CEMF Cells do not typically provide an alarm output. They do provide a fuse alarm that can be connected to the spare fuse (**SP**) alarm input to provide some measure of direct monitoring if desired.

2.6.4.2 Fuse Alarm inputs require a battery input. Five Fuse alarm inputs are provided to divide these alarms into charge (**CH**), discharge (**DIS**), battery (**BAT**), sense/control (**S/C**), and a spare input (**SP**) that can be used as desired (see 2.6.4.1). Refer to the Datasheet for the required connections. Route and terminate these connections carefully due to their battery potential when alarmed.

Note: Plant Ground (**PGND**) and (**GRD**) must be connected to the grounded terminal of the batteries for the fuse alarms to function properly. See PN drawing for typical connections.

2.6.4.3 The Low Voltage Disconnect alarm input requires a ground closure input. Verify the LVD to be monitored can provide this type of output before proceeding. The alarm lead is connected to the (**LVD**) input terminal. Refer to the Datasheet for the required connections.

2.6.4.4 The Rectifier Fail alarm inputs require a ground closure input. Verify the Rectifiers to be monitored can provide this type of output before proceeding. The SAGEON PSMC I can monitor up to 16 individual Rectifier fail alarm leads that are connected in sequence to the (**RFA**) input terminals. Refer to the Datasheet for the required connections. Make sure the Datasheet clearly shows which rectifier is connected to each input.

2.6.4.5 The Control Inhibit (**INH**) input requires a ground closure input. The Control Inhibit (**INH**) input relinquishes control functions from the SAGEON PSMC I. When triggered the Control Inhibit will disable the Rectifier ReStart (**RS**), Equalize (**EQ**), and High Voltage Shut Down (**HVSD**) control output relays. The SAGEON PSMC I will continue to monitor all input channels and provide alarm condition relay outputs when Control Inhibit is active. See section 2.6.5 for information about the control relays.

This completes the Binary input connections. Stop and verify these connections and update the Datasheet if necessary. See Enabling Channels section after the installation wiring is complete.

2.6.5 Control Relays

The SAGEON PSMC I provides three rectifier control outputs: Equalize (**EQ**), High Voltage Shutdown (**HVSD**), and Restart (**RS**). These Form A, normally open, relay outputs share a common control connection to **CTRL RET**. This connection must be tied to the appropriate potential, either plant ground or battery. Most applications will require a ground closure. In either case, all three outputs **MUST** utilize the same common output potential or the user must decide which outputs he can use appropriately.

2.6.5.1 The Equalize (**EQ**) output provides an operator initiated manual timer or a voltage initiated automatic timer. If this control feature is desired, determine if the rectifiers support this function and what type of input is required. The **CTRL RET** terminals are common to one another and must be jumpered to the proper potential. Multiple rectifiers can be daisy chained with a lead from the **EQ** output. See Fig. 6 of PN drawing and Setting Up Equalize section in this manual.

2.6.5.2 The High Voltage Shutdown (**HVSD**) output provides a triggered output from the user settable **HVSD** threshold. If this control feature is desired, determine if the rectifiers support this function and what type of input is required. The **CTRL RET**

terminals are common to one another and must be jumpered to the proper potential. Multiple rectifiers can be daisy chained with a lead from the **HV** output. See Fig. 6 of PN drawing and Setting Up HVSD & Restart section in this manual.

- 2.6.5.3 The Restart (**RS**) output provides a triggered output from the user settable low voltage **LV** threshold. If this control feature is desired, determine if the rectifiers support this function and what type of input is required. The **CTRL RET** terminals are common to one another and must be jumpered to the proper potential. Multiple rectifiers can be daisy chained with a lead from the **RS** output. See Fig. 6 of PN drawing and Setting Up HVSD & Restart section in this manual.

This completes the Control Output connections. Stop and verify these connections and update the Datasheet if necessary. See Setting Thresholds section after the installation wiring is complete.

2.6.6 Output Relays

The output relays all provide Form C relay contacts supporting normally open or normally closed connections. Two sets of Major and Minor contacts are provided for separate remote monitoring and local annunciation panels. The Major alarm relay is normally energized for fail safe operation. All other relays are normally de-energized. An Auxiliary relay is user programmable. See Programming the Auxiliary Relay section of this manual. The relays requiring ground closures should have been jumpered to **PLANT GRD** at the beginning of the wiring process based on the Datasheet requirements. Refer to the Datasheet and PN drawing figures for assistance in wiring the output relays.

The SAGEON PSMC I also supports an internal audible alarm that can be user programmed to trigger from various alarm outputs. Refer to Setting Up The Audible Alarm section of this manual for programming instructions.

- 2.6.6.1 Verify ground closure jumpers to common (**C**) terminals on designated output relays against Datasheet and modify connections if necessary. Ground closure relays should be jumpered to **PLANT GND** and can be daisy chained as necessary.
- 2.6.6.2 The two **Major** output relays are normally energized. These outputs are triggered by an **FA, VLVA, LVD, HVSD, WD, OC (over-current)**, or any two **RFA's, TA, CEMF, LVA or HV** alarms. Connections to powered annunciation panels should be kept separate from remote alarm connections. Make the required connection to the normally open (**NO**) or normally closed (**NC**) terminals as required. If necessary the Aux relay can be configured as another Major output relay. Refer to the Datasheet for required connections.

Note: The labels for ALL output relays are provided in the de-energized state. e.g. The **NO** labeled contact of the Major alarm relay will be closed during regular operation (no-alarm/relay energized); likewise, the **NC** labeled contact of the Major alarm relay will be open.

- 2.6.6.3 The two **Minor** output relays are normally de-energized. These outputs are triggered by a single **RFA, CEMF, LV, HV, or TA** alarm. Connections to powered annunciation panels should be kept separate from remote alarm connections. If necessary, the Aux relay can be configured as another Minor output relay. Make the required connection to the normally open (**NO**) or normally closed (**NC**) terminals as required. Refer to the Datasheet for required connections.

- 2.6.6.4 The other output relays **HVA, LVA, VLA, FA, LVD, RFA, TEMP, CEMF**, and **WD (WATCHDOG)** are generally only used when a remote alarm call-out device is part of the power plant or with an alarm monitor panel in a large central office. Make the required connection to the normally open (**NO**) or normally closed (**NC**) terminals as required. Refer to the Datasheet for required connections.
- 2.6.6.5 The Control Inhibit (**CTRL INH**) relay is triggered by the Inhibit input, which causes to PMSC to relinquish control of the power plant. This relay would only be used in a large power plant where the SAGEON PSMC I was designated as a back up monitor/controller. This relay would confirm the status of the SAGEON PSMC I. Contact the Factory for information on implementing master/slave control scheme.
- 2.6.6.6 The Auxiliary (**AUX**) relay is a user definable relay and can be configured to trigger of any ONE of any number of alarms. The Auxiliary relay can be triggered from any (1) of the following: a MAJOR, MINOR, SINGLE RFA, ANY RFA, PLANT OVER-CURRENT, SINGLE FEED OVER-CURRENT, ANY OVER-CURRENT, HVSD, CTRL INH, SINGLE FA, STR 2 TEMP DIFF, STR1 TEMP DIFF, LOWN AMB TEMP, HIGH AMB TEMP, LOW BATT TEMP STR 2, LOW BATT TEMP STR1, HI BATT TEMP STR 2, HI BATT TEMP STR 1 HI LOAD VOLTAGE, HIGH VOLTAGE, LOW VOLTAGE, VERY LOW VOLTAGE, EXT LVD, CEMF 1, CEMF 2. When triggered the Auxiliary alarm will flash the **WD** LED on the display panel.

This completes the Output Relay connections. Stop and verify these connections and update the Datasheet if necessary. See Programming the Auxiliary Relay and Setting Up Thresholds section after the installation wiring is complete.

CHAPTER THREE: SAGEON PSMC I OPERATION

- 3.1 Introduction
- 3.2 Programming the SAGEON PSMC I
- 3.3 Enabling Thresholds
- 3.4 Set Thresholds
- 3.5 Enabling Thresholds
- 3.6 Analog Calibration
- 3.7 Set Shunt Scales
- 3.8 System Options Menu

3.1 INTRODUCTION

3.1.1 General Description

The SAGEON PSMC I was designed to provide all the basic meter/alarm functions in an extremely compact, single rack space unit. The unit utilizes a microprocessor and alphanumeric display to provide enhanced functionality. The simple four key front panel allows:

- Polling for status on each input
- Detailed alarm identification
- Enabling/disabling of inputs and outputs
- Zero and Gain calibration for analog channels
- System configuration including alarm thresholds
- Equalize timer set-up and initiation
- Control of output relays
- Test and verification of all functions

The SAGEON PSMC I utilizes simple intuitive menu structures to access any function. Four keys, “**Select**”, “**Next**”, “**Previous**”, and “**Escape**” allow the user to move up or down through the menus or change values with ease. The “**Escape**” key always allows the user to easily return to the last menu or all the way back to the default idle screen. References to key presses and/or menus will be highlighted in bold print.

On the +24/-48v unit, the user selects the operation voltage in software after which the SAGEON PSMC I automatically defaults to the proper alarm thresholds. No jumpers or switch settings are required to accommodate voltage changes. The SAGEON PSMC I is by default 48V. The lower right hand corner of the LCD the start up screen will display the current voltage configuration of the unit.

The SAGEON PSMC I will automatically time-out and default to the idle screen from any sub-menu within 5 minutes. The default idle screen always displays plant voltage (V_b) and number of alarms. A configuration option allows the screen to also display plant current only, ambient temperature only, or toggle between plant current and ambient temperature. When the Load Voltage channel is enabled, the Load Voltage (V_L) is also displayed.

LED indicators provide visual indications of alarms, HVSD, Equalize status, and power. Test jacks allow for manual verification of analog input voltages. These test jacks are for reference only and should not be used for gain calibration; measurements for calibration should be taken at the screw terminals of the analog input channel. The LCD display screen can be configured to turn off the LCD backlight after a given period of inactivity. Pressing any key will cause the display to illuminate. A Configuration option can be changed to keep the backlight constantly ON. A front panel potentiometer VIEW ADJ. allows the user to adjust the display contrast.

The SAGEON PSMC I's functionality is menu driven. Menu flowcharts are provided in the back of this manual to help the user find a particular function. There are four main menus below the default idle display screen: **Status**, **Alarms**, **Configure**, and **Test**. If the Equalize function has been enabled, a fifth main menu will appear for initiating the **Equalize** mode. The Operations section of the manual will first explain the menu structure of the SAGEON PSMC I and methods for moving about within them to reach a desired function. Then each function block will be discussed in a logical order such as, enabling channels, calibration, setting thresholds, etc.

3.1.2 SAGEON PSMC I Menu Structure

Note: Referring to the menu flowcharts in the back of the manual provides a visual representation of the material in this section.

As described in the introduction, the SAGEON PSMC I breaks the functional modes of the unit into four main menus:

1. Status: Polling analog channels
2. Alarms: Detailed alarm information
3. Configure: System custom set-up and calibration
4. Test: System test and verification
5. Equalize*: Controls manual equalize functionality

* A fifth menu is added when the manual Equalize timer is selected for use.

- Status:** The Status menu only displays the current status of the analog channels. There are no sub-menus for other tasks under this main menu.
- Alarm:** The Alarm menu provides an ACO alarm cut-off control of the audible alarm (if audible alarm is enabled) and the specific trigger source of each active alarm. The UP/DOWN keys can be used to scroll through the active alarms. There are no other sub-menus under this main menu. (The audible alarm can be disabled in the Configure/System Options menu.)
- Configure:** The Configuration menu provides sub-menus organized for functionality in custom configuring the SAGEON PSMC I for the user's application. It also provides menus for calibrating analog input channels, setting alarm thresholds, and system options.
- Test:** The Test menu provides the means for testing and troubleshooting analog, binary, and output channels along with tests to verify LED and Display operation.

Note: If the SAGEON PSMC I has been already been commissioned, testing output relays and binary input channels will initiate nuisance alarm conditions.

Note: Analog/digital input channels are not continuously polled in “analog test mode”.

3.1.3 Accessing the Menus

The SAGEON PSMC I always defaults to the idle display screen if no key presses occur within 5 minutes from any menu. This prevents the user from inadvertently leaving the unit in a sub-menu where operation could be impaired, such as a test mode. The display backlight can be configured to turn off after 5 minutes of inactivity unless there is an active alarm present. This option is selected in the Configurations/Systems Options menu. The Display will always remain in the lit state when an alarm is present.

The idle display screen always displays Plant Voltage, Plant Current, and the number of active alarms, if any. A sub-menu selection allows the display to toggle between plant current and ambient temperature, if desired. When the Load Voltage channel is enabled the idle screen also displays the Load Voltage.

The user interface is limited to four push button keys:

Escape: This key is used to return to the last menu. Pressing “**Escape**” from anywhere within the menu structure will abort the current activity and return the user to the next higher level in the menu structure. Multiple presses of the escape key will always bring the user back to the idle display screen.

Select: This key, as its name implies, is used to select, or access, a particular menu or sub-menu. The select key is also used within many menus to toggle the status of some parameter, such as, yes/ no, enable/disable. It is also used to select a variable where the “**Next**” and “**Previous**” keys walk the user through a list of choices and the user presses the “**Select**” key for the desired choice.

Next & Previous: These keys provide three functions:

1. The means to move between menu selections in either direction from the current location.
2. Selecting parameter choices within a menu where a predefined set of choices exist for a given parameter and the user must choose one.
3. Calibration, threshold and timer changes. The keys change the displayed value up (next) or down (prev.) to reach a desired value.

From the idle display menu pressing “**Select**”, “**Next**”, or “**Previous**” brings the user to the Status menu. From the Status menu the “**Next**” and “**Previous**” keys can be used to access any of the main menus. Once the desired main menu is reached pressing “**Select**” drops the user down one level allowing access to any of the sub-menus under that main menu using the “**Next**” and “**Previous**” keys as before to access the desired sub-menu.

The “**Escape**” key can be used as an exit from any menu. Depending on where the user currently is in the menu structure one, or more, presses of the “**Escape**” key may be required to reach the top-level idle display screen. Pressing the “**Escape**” from the idle display screen will refresh the display; this function is useful if an error has occurred in communications between the microprocessor and the LCD.

3.1.4 Menu Functionality

The main menus group common functions together simplifying access. The following descriptions highlight the basic functions of each main menu. Menus are presented in the order that they are accessed in, by pressing the “**Next**” key, starting at the **Status** menu.

Note: If any channels have been disabled in the Configure/Enable Channels menu they will not appear in any subsequent menus, nor will any alarm conditions be triggered from input to that particular channel.

Status: The status menu provides a means of polling each analog input channel for its current status. Pressing “**Select**” when the Status menu appears drops the user down to the first analog channel. Pressing “**Next**” progresses the user through the channels in the following order:

1. Plant Voltage
2. Ambient Temp.
3. Temp. String 1
4. Temp. String 2
5. Load Voltage
6. Feed Current 1
- .
- .
- .
14. Feed Current 9
15. Plant Current
16. PCB Temperature

The last value read before entering the **Status** menu is displayed for each channel. The user can update the displayed channel by pressing the “**Select**” key. Press “**Escape**” once to return to the main **Select Mode** menu.

Alarms: The **Alarm** menu provides quick access to detailed alarm identification. The menu is accessed with the “**Next**” or “**Previous**” keys and entered with the “**Select**” key. The initial screen displays the current number of active alarms and the status of the audible alarm cut-off (ACO control will not be displayed if the audible alarm has been disabled in Configure/System options). Here, the “**Select**” key toggles the audible alarm on or off when it is enabled.

The “**Next**” and “**Previous**” keys take the user through each active alarm, showing the source of the alarm; i.e., Alarm 1 of 3: RFA 3; or Alarm 1 of 1: LOW VOLTAGE.

The LED alarm indicators on the front panel provide general information that corresponds to the detailed alarm information. The LED’s may indicate a fuse alarm and a rectifier fail alarm currently exist. The **Alarm** menu tells the user which specific fuse type and rectifier is in alarm. Pressing “**Escape**” when completed, will return the user to the main **Select Mode** Menu.

Configure: The **Configure** menu provides all of the sub-menus necessary to custom configure the SAGEON PSMC I for a particular application. Pressing “**Select**” when the **Configure** menu appears allows access to the configuration menus. “**Next**” and “**Previous**” keys are used to locate the desired sub-menu. Pressing “**Select**” again accesses the displayed menu. The **Configure** menu consists of eight standard and one optional sub-menu (**Equalize**):

Manual Equalize: Optional menu that appears when **Timer** mode is selected under **Systems Options EQUALIZE MENU**. In Timer mode the user can set the desired Equalize time from 1 to 255 hours in the Configure Manual EQ Time menu. The **Equalize** menu appears first when enabled so the user can quickly access the time parameter for the manual equalize mode. Pressing “**Next**” or “**Previous**” moves the user to the next/last **Configure** sub-menu, “**Escape**” moves the user back to the main **Configure** menu.

Enable Thresholds: Lets the user decide which alarm thresholds are active and which are not. The user presses “**Select**” to enter the menu, then “**Next**” or “**Previous**” to access each alarm threshold. The “**Select**” key can be used to toggle each alarm threshold on or off. See Setting up the Analog Channels section of this manual for more details. Pressing the “**Escape**” key when complete returns the user to the

Enable Thresholds menu.

Set Thresholds: Permits the user to make changes to each individual alarm threshold. To change an alarm threshold the user presses “**Select**” when the desired alarm threshold appears in sequence using the “**Next**” and/or “**Previous**” keys. The alarm's current threshold will appear below the alarm threshold's name. The words “**Set at**” will change to “**modify**” when select is pressed then the user presses the “**Next**” (up) or the “**Previous**” (down) keys to adjust the value of the alarm threshold. Once the desired value is displayed the user presses “**Select**” again to save the new threshold value which changes the wording back from “**Modify**” to “**Set at**”. If an error is made while in “**Modify**” pressing “**ESC**” will abort the operation and restore the original value. See Setting up the Analog Channels section of this manual for more details. Pressing “**Escape**” returns the user to the **Set Thresholds** menu under the Configure menu.

Enable Channels: Lets the user to turn off unused channels to simplify access and possible confusion. Channels that are disabled will not appear in other menus, such as, **Set Thresholds**, eliminating possible confusion and confining activity to only pertinent parameters. If a hardware connection is not made to the rear panel of the SAGEON PSMC I it is suggested that the channel be disabled in this menu. As before the user enters with the “**Select**” key using the “**Next**” and “**Previous**” keys to move from channel to channel. Pressing “**Select**” toggles the channel on or off. When completed, pressing “**Escape**” returns the user to the **Enable Channels** menu.

Calibrate Zero: Part of analog channel calibration; eliminates measurement errors due to sense lead length and noise. This menu requires the user to short the measurement leads at the actual sense point to null out line losses. See **Setting up the Analog Channels** section of this manual to use this menu.

Calibrate Gain: Part of analog channel calibration scales the particular channel to accurately read the input value. The user must measure and verify the input manually first; this measurement should be performed at the sense point of the wire leads. Then the displayed value is adjusted up or down with the “**Next**” or “**Previous**” keys to match the manual reading. Once set the SAGEON PSMC I automatically scales the input linearly to accurately read any input value for that channel. See **Setting up the Analog Channels** section of this manual to use this menu.

Set Shunt Scales: Before the SAGEON PSMC I can accurately read the various shunt inputs the individual shunts full scale rating must be entered. The PSMC defaults to a 600A full scale setting for all feeder shunt inputs. Plant shunt is default 2500A. To change the full scale setting the user presses “**Select**” to enter the menu, then using the “**Next**” and “**Previous**” keys to display the desired shunt input. Pressing “**Select**” again allows the user to change the full scale rating in 5A increments from 5 to 10,000 amps using the “**Next**” and “**Previous**” keys to change the value up and down. When the desired value is reached press “**Select**” again to enter the value. The “**Next**” and “**Previous**” keys can then be used to select another shunt input. Pressing the “**Escape**” key returns the user to the “**Set Shunt Scales**” menu. The SAGEON PSMC I is configured to use 50mV shunts only.

System Options: Contains several sub-menus for setting system level parameters:

Password: Enables or disables a pre-defined sequence of numbers that will

prevent access to the Configure and output relay Test menus. Once enabled, after 5 min. these menus will be inaccessible without the password. If the user attempts to enter the Configure or output relay Test menus they will be prompted for the password. (See Security section of manual).

Neg. Volts: Toggles **NO/YES** to place a Negative sign in front of the voltage readings to correspond with use in -48 volt power plant.

Neg. Amps: Toggles **NO/YES** to place a Negative sign in front of the current readings to correspond with use in -48 volt power plant.

Temp. Units: Toggles °C (Celsius) or °F (Fahrenheit) for temperature readings.

Idle Display: Changes idle display screen parameter for current only, ambient temperature only, or toggling between current and ambient temperature.

Audible Alarm: Enables audible alarm in response to major or minor alarms, and sets the ACO time-out (See Audible Alarm section of manual).

System Voltage: Sets SAGEON PSMC I for use in a +24vdc, -48vdc power plant operation.

Equalize: Enables Equalize mode (See Setting Up Equalize section of manual).

Aux. Relay: Sets up Auxiliary Relay parameters (See Setting up Auxiliary Relay section of manual).

Backlight Usage: Toggles between having the Backlight turn on with any key press, remain on constantly, or always off.

SW version: Displays the presently installed software version.

Test: The Test menu provides the various test modes needed to verify the SAGEON PSMC I operation as installed in a power plant. In the analog or binary test mode the selected channel is read continuously. The user can also turn output and alarm relays on or off and perform LED, LCD and audible alert test verifications. (See appropriate testing section of manual for detailed operating instructions).

<p>Note: Plant monitoring ceases during Analog, Binary, and Output Relay tests.</p>
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3.2 PROGRAMMING THE SAGEON PSMC I

This section will deal with the Configure menus only. The Configure menu provides all of the menus necessary to customize the SAGEON PSMC I for the user's specific requirements. Each sub-menu will be covered in detail which will enable the user to completely configure the SAGEON PSMC I for their specific application. The user should read through this material then experiment with their unit to become familiar and comfortable with programming the SAGEON PSMC I. None of the functions under Configure are capable of damaging the equipment. The only function that could cause a power interruption would result from setting the HVSD alarm threshold lower than the current plant voltage or setting the system voltage to +24vdc on a -48vdc plant, this would give an HVSD alarm.

3.2.1 Factory Default Settings

The PSMC as shipped from the Factory is initially programmed for use in a very basic power plant. Many channels and functions are programmed to be initially disabled. This allows the user to install the PSMC ready to use with the most basic monitoring and control functions already programmed into the unit. The user can then add whatever additional channels and functions required to customize the SAGEON PSMC I for their specific application.

The Configure menu descriptions detail the full implementation for each menu. Since the SAGEON PSMC I has been factory programmed many of the channels and alarm thresholds will not appear when the user first enters some menus. Use the following table of Factory settings to determine the initial status for these menus.

Configuration Defaults

Channels Name	Default State
PASSWORD	OFF
NEG. VOLTS	NO
NEG. AMPS	NO
TEMP UNITS	°F
IDLE DISP	AMPS
AUD. ALRM MENU	MAJOR ON
	MINOR OFF
	ACO TIME 30min.
SYS VOLTS	48V
EQUALIZE MENU	NONE ENABLED
AUX RELAY MENU	NONE ENABLED

3.3 ENABLING THRESHOLDS

This sub-menu allows the user to disable any analog threshold. Disabling a threshold will disable the associated alarm. Only the thresholds of enabled channels will appear in this menu. By default all alarm thresholds are enabled.

Enter the “**Enabling Thresholds**” menu from the Configure menu by pressing “**Select**”, then press “**Next**” until the “**Enabling Thresholds**” menu appears, then press “**Select**” again to access the first threshold. The full list of alarm thresholds appears below in the order they would be accessed using the “**Next**” key. Use the “**Next**” or “**Previous**” key to walk through the thresholds as shown below; pressing “**Select**” to disable the unneeded thresholds. When completed, press “**Escape**” to return to the initial “**Enabling Thresholds**” menu. Use “**next**” or “**Previous**” to reach other Configure sub-menus, or “**Escape**” again to return to the top Configure menu.

Alarm Thresholds Table

1. HVSD	9. Feeder 4	17. Hi Bat Temp 2
2. VLV	10. Feeder 5	18. Lo Bat Temp 1
3. LV	11. Feeder 6	19. Lo Bat Temp 2
4. HV	12. Feeder 7	20. Hi Amb Temp
5. Plant Current	13. Feeder 8	21. Lo Amb Temp
6. Feeder 1	14. Feeder 9	22. Strg 1 Temp Diff
7. Feeder 2	15. Load Voltage	23. Strg 2 Temp Diff
8. Feeder 3	16. Hi Bat Temp 1	

3.4 SET THRESHOLDS

The **“Set Thresholds”** menu allows the user to change default thresholds to any desired value. Only the enabled thresholds will appear in sequence. The SAGEON PSMC I allows thresholds to be set for plant current and the 9 feeder shunts; an over-current on any shunt will automatically trigger a major alarm. The Auxiliary alarm output relay can also be configured to trigger from an over-current threshold (See section 3.8.9 AUXILIARY RELAY SUB-MENU for setting up the Aux. relay). The table below lists the SAGEON PSMC I’s default thresholds for 24V, 48V operation.

Enter the **“Set Thresholds”** menu from the Configure menu by pressing **“Select”**, then press **“Next”** until the **“Set Thresholds”** menu appears, then press **“Select”** again to access the first threshold. Use the **“Next”** key to walk through the thresholds as shown below. Press **“Select”** when you reach a threshold you want to change. When you press **“Select”**, the screen will change from **Set at: (value)** to **Modify: (value)**. The user then uses the **“Next”** (up) or **“Previous”** (down) to scroll to the desired threshold value. Once the correct value is displayed, pressing **“Select”** loads the new value and returns the display screen to **Set at: (new value)**. The **“Next”** and/ or **“Previous”** keys can then be used to select another threshold. When completed, press **“Escape”** to return to the initial **“Set Thresholds”** menu. Use **“Next”** or **“Previous”** to reach other Configure sub-menus, or **“Escape”** again to return to the top Configure menu.

Alarm Triggering Thresholds

48V PLANT

{PRIVATE }ALARM THRES	FROM	TO	DEFAULT
HVSD:	50.0 V	60.0 V	57.0 V
High Voltage:	50.0 V	60.0 V	56.5 V
Low Voltage:	44.0 V	54.0 V	51.5 V
Very Low Voltage:	40.0 V	50.0 V	46.5 V
Plant Current:	0 A	10000 A	2500 A
Feeder Current:	0 A	10000 A	600 A
High Temp, String 1:	0 F	200 F	95.0 F
Low Temp, String 1:	0 F	200 F	32.0 F
High Temp, String 2:	0 F	200 F	95.0 F
Low Temp, String 2:	0 F	200 F	32.0 F
High Temp, Ambient:	0 F	200 F	95.0 F
Low Temp, Ambient:	0 F	200 F	32.0 F
String 1 Temp Diff	0 F	200 F	20.0 F
String 2 Temp Diff:	0 F	200 F	20.0 F

24V PLANT

{PRIVATE }ALARM	FROM	TO	DEFAULT
High Voltage Shutdwn:	25.0 V	30.0 V	28.5 V
High Voltage:	25.0 V	30.0 V	28.2 V
Low Voltage:	22.0 V	27.0 V	25.7 V
Very Low Voltage:	20.0 V	25.0 V	23.3 V
Plant Current:	0 A	10000 A	2500 A
Feeder Current:	0 A	10000 A	600 A
High Temp, String 1:	0 F	200 F	95.0 F
Low Temp, String 1:	0 F	200 F	32.0 F
High Temp, String 2:	0 F	200 F	95.0 F
Low Temp, String 2:	0 F	200 F	32.0 F
High Temp, Ambient:	0 F	200 F	95.0 F
Low Temp, Ambient:	0 F	200 F	32.0 F
String 1 Temp Diff	0 F	200 F	20.0 F
String 2 Temp Diff:	0 F	200 F	20.0 F

3.5 ENABLING CHANNELS

The “**Enable Channels**” menu lets the user select only the channels needed for their application. Removing unused channels allows the SAGEON PSMC I to scan at a higher rate and the user to access information faster without scanning through unused channels and thresholds. When Enable Channels is “**Selected**”, the “**Next**” key scrolls through the channels in this order:

Enable Channel Table

- | | | | |
|------------------|------------------------|------------|------------------|
| 1. Plant Voltage | 11. Feeder 9 | 21. RFA 2 | 31. RFA 12 |
| 2. Plant Current | 12. Load Voltage | 22. RFA 3 | 32. RFA 13 |
| 3. Feeder 1 | 13. Strg 1 Bat Temp | 23. RFA 4 | 33. RFA 14 |
| 4. Feeder 2 | 14. Strg 2 Bat Temp | 24. RFA 5 | 34. RFA 15 |
| 5. Feeder 3 | 15. Amb Temp | 25. RFA 6 | 35. RFA 16 |
| 6. Feeder 4 | 16. Charge Fuse | 26. RFA 7 | 36. Ctrl Inhibit |
| 7. Feeder 5 | 17. Discharge Fuse | 27. RFA 8 | 37. CEMF 1 |
| 8. Feeder 6 | 18. Sense/Control Fuse | 28. RFA 9 | 38. CEMF 2 |
| 9. Feeder 7 | 19. Battery Fuse | 29. RFA 10 | 39. Spare Fuse |
| 10. Feeder 8 | 20. RFA 1 | 30. RFA 11 | 40. LVD |

Enter the “**Enable Channels**” menu from the Configure menu by pressing “**Select**”, then press “**Next**” until the “**Enable Channels**” menu appears, then press “**Select**” again to access the first channel. Use the “**Next**” key to walk through the channels as shown above, pressing “**Select**” to disable the unneeded Channels. When completed, press “**Escape**” to return to the initial “**Enabling Channels**” menu. Use “**next**” or “**Previous**” to reach other Configure sub-menus, or “**Escape**” again to return to the top Configure menu.

Channel Enable factory defaults

Channels Name	Default State
PLANT VOLTAGE	PERMANENTLY ENABLED
PLANT CURRENT	PERMANENTLY ENABLED
FEEDER CURRENT 1	DISABLED
FEEDER CURRENT 2	DISABLED
FEEDER CURRENT 3	DISABLED
FEEDER CURRENT 4	DISABLED
FEEDER CURRENT 5	DISABLED
FEEDER CURRENT 6	DISABLED
FEEDER CURRENT 7	DISABLED
FEEDER CURRENT 8	DISABLED
FEEDER CURRENT 9	DISABLED
LOAD VOLTAGE	DISABLED

TEMP STRING 1	DISABLED
TEMP STRING 2	DISABLED
AMBIENT TEMP	DISABLED
SENSE FUSE	ENABLED
CHARGE FUSE	ENABLED
DISCHARGE FUSE	ENABLED
BATTERY FUSE	DISABLED
SPARE FUSE	DISABLED
RECT FAIL 1	ENABLED
RECT FAIL 2	ENABLED
RECT FAIL 3	ENABLED
RECT FAIL 4	ENABLED
RECT FAIL 5	ENABLED
RECT FAIL 6	ENABLED
RECT FAIL 7	ENABLED
RECT FAIL 8	ENABLED
RECT FAIL 9	ENABLED
RECT FAIL 10	ENABLED
RECT FAIL 11	ENABLED
RECT FAIL 12	ENABLED
RECT FAIL 13	ENABLED
RECT FAIL 14	ENABLED
RECT FAIL 15	ENABLED
RECT FAIL 16	ENABLED
CTRL INHIBIT	DISABLED
CEMF CELL 1	DISABLED
CEMF CELL 2	DISABLED
EXTERNAL LVD	DISBALED

3.6 ANALOG CALIBRATION

The next two menus are used to calibrate the analog channel inputs. The first menu, “**Calibrate Zero**” nulls out any offset due to amplifier zero-offset and/or analog to digital converter zero-error. The second menu “**Calibrate Gain**” sets up each channel to accurately read that channels input. When completed the SAGEON PSMC I has a zeroed measurement point to reference all others from and a scaling factor to allow it to read out in amps or degrees as required. Proper calibration is critical to the SAGEON PSMC I’s performance and customer satisfaction. Properly completed the SAGEON PSMC I should only require a yearly verification of the measurement accuracy.

3.6.1 Calibrate Zero

The “**Calibrate Zero**” menu provides a fast and simple means to null out the analog measurement sense leads. This process requires the user to short the measurement leads together as close to the actual measurement point as possible. For this reason sense leads should be left open at the measurement end to facilitate this procedure on start-up.

WARNING: Zeroing an analog channel without shorting the measurement leads can dramatically offset the display measurement. While no physical damage will result the user may require a service call, to open then short and zero the input, in order to restore proper operation.

DANGER: NEVER short analog measurement leads that are connected to their sense points on the power plant. Arcing and damage to inline protection devices and equipment may result.

The menu structure provides a prompt: **INPUTS SHORTED? CONFIRM? NO** that the user must toggle to **YES** with the “**Next**” or “**Prev**” key before the SAGEON PSMC I will allow the user to press “**Select**” and zero the channel as a safety measure.

This procedure assumes a new installation where each analog channel would require a full calibration before use:

Note: At installation time perform steps 1 to 6 with the input leads shorted. Each channel should display a value close to zero. Whether it does or not, calibrate the value for zero with its inputs shorted. Doing so fixes the proper offset values into memory. Once these steps are complete connect the inputs to their respective sources, repeat steps 1 to 6 and adjust for the proper levels.

Calibrate Zero Procedure

1. Enter the “**Calibrate Zero**” menu from the **Configure** menu by Pressing “**Select**”, then press “**Next**” until the **Calibrate Zero** menu appears, then press “**Select**” again to access the first channel:

PLANT VOLTAGE
READING: *(present value)*

2. Short the Plant Voltage sense leads together at the measurement point; the reading will show the zero offset value.
3. Press “**Select**” again, and the SAGEON PSMC I will prompt:

**INPUT SHORTED?
CONFIRM? NO**

4. Verify proper shorting of the input leads then press “**Next**” or “**Previous**” to toggle the input to “**YES**”
5. Press “**Select**” again and the SAGEON PSMC I will zero the channel and return to the initial display showing the offset as zero:

**PLANT VOLTAGE
READING: 0.00**

6. Only those analog channels that were enabled in the Enable Channels menu will appear in sequence. Press “**Next**” to reach the next analog channel; repeat this procedure to zero all the analog channels. Shunt channels are displayed in milliVolts and temps are displayed in degrees F.

Note: The temperature sensors by construction do not support shorting at the measurement point. These channels can only be zeroed at the SAGEON PSMC I input when the standard sensor and cable assembly are disconnected. In cases where an extension cable was necessary the user can zero out the extension cable before connection to the actual sensor wiring. BE SURE to short only the **SIG** and **RTN** leads.

When all the analog channels have been zeroed, leave the sense leads open to prepare for the Calibrate Gain procedure. Press “**Escape**” to return to the initial “**Calibrate Zero**” menu. Use “**Next**” or “**Previous**” to reach other Configure sub-menus, or “**Escape**” again to return to the Save Configurations menu.

3.6.2 Calibrate Gain

The Calibrate Gain menu allows the user to quickly calibrate any analog channel to provide an accurate reading scaled for volts, amps, or degrees. Since the overall performance of the SAGEON PSMC I is tied directly to the accuracy of its measurements careful attention to detail is mandatory when calibrating the SAGEON PSMC I.

The front test jacks provide a convenient means for checking the actual input with a DVM for comparison with the SAGEON PSMC I. By performing the Zero calibration first any losses due to lead length should be removed and the test jack accuracy should be quite good. However, during the initial installation calibration, users should confirm the test jack accuracy by measuring the inputs at their source and comparing the results.

A suitable DVM with at least 4-digit accuracy should be used for all analog input measurements.

Shunt and temperature readings will require calculations to acquire the actual amps or temperature value from the shunt or temperature sensor test jack voltage outputs for calibration.

See sections 3.6.3 and 3.6.4 before calibrating the gain of shunt and temperature inputs. To maximize the accuracy of the shunt input calibrations certain precautions should be followed. Temperature inputs require a simple calculation before the gain is adjusted.

Calibrate Gain Procedure

1. Enter the “**Calibrate Gain**” menu from the main **Configure** menu by Pressing “**Select**”, then press “**Next**” until the **Calibrate Gain** menu appears, then press “**Select**” again to access the first channel:

PLANT VOLTAGE
READS: (current value)

2. Measure the actual input between the voltage and Com test jacks on the front panel, or at the measurement source. See below for required shunt and temperature calibration calculations.
3. Press “**Select**” again, and the SAGEON PSMC I will prompt:

PLANT VOLTAGE?
GAIN: (current value)

4. Use “**Next**” (up) / “**Previous**” (dwn) to make the display value match the measured value.
5. Press “**Select**” again to load the new calibrated value. The display will change to confirm the new calibrated value that was entered:

PLANT VOLTAGE
READS: (calibrated value)

6. The user can press “**Select**” again to re-adjust the current calibration value, or press “**Next**” to access the next enabled channel. Repeat the procedure for each active analog channel.

When all the analog channels have been calibrated press “**Escape**” to return to the initial “**Calibrate Gain**” menu. Use “**next**” or “**Previous**” to reach other Configure sub-menus, or “**Escape**” again to return to the top Configure menu.

3.6.3 Shunt Calibration Calculations

In order to calibrate shunts, a suitable load current must be passing through it to use it for calibration. The load current should be at least 70% or 80% of the full scale rating to get an accurate calibration. A load box connected to the shunts output may be required to generate the required current levels during calibration. Shunts are displayed in milliVolts so they can be compared to the DVM readings connected to the inputs.

Note: The SAGEON PSMC I is hardware limited to reading only 50mv full-scale rated shunts. In addition, only load currents from the main plant voltage can be monitored. Battery discharge current and/or opposite polarity DC/DC converter output currents **can not** be monitored with the SAGEON PSMC I.

The resulting displayed calibrated current reading can be verified against the actual shunt input performing the following calculation. Measure the actual milli-Volt input on at the screw terminal inputs on the back of the SAGEON PSMC I for the particular shunt being calibrated. Determine the shunts full scale rating; such as, 600A @ 50mV full-scale. Then multiply the measured value by the full scale rating and divide the result by 50 to get the actual current value. This calculated value should agree with the number of amps passing through the load; within 2% of the shunts full scale rating.

$$\text{Measured value} = 30 \text{ mV}, \quad \text{Actual_Amps} = \frac{30\text{mV}(600\text{Amps})}{50\text{mV}} = 360\text{Amps}$$

3.6.4 Temperature Calibration Calculations

The SAGEON PSMC I utilizes C&D Technologies' standard temperature sensors that provide a calibrated output of 10 mV per degree Fahrenheit. For SAGEON PSMC I Calibration the easiest method is to measure the sensor output on the temperature inputs at the rear of the SAGEON PSMC I. Reading between the **SIG** and **RTN** with a DVM on the millivolt range provides a voltage that can be read directly as Degrees Fahrenheit. For example, a reading of 782 mV can be read as 78.2°F for entry as the calibration value.

$$\frac{782mV}{10mV/^{\circ}F} = 78.2^{\circ}F$$

This value may also be read on the tip jacks located on the front panel, while the unit is set to calibration or test mode and the corresponding sensor channel is selected. The PSMC measures temperatures from 0°F to 200°F, i.e. voltage ranges from 0 to 2.00 Volts.

3.7 SET SHUNT SCALES

The PSMC can monitor plant current and nine feeder shunts. The calibrate zero and gain menus set-up the hardware analog input channels to accurately read a 50mv shunt. In order to display the correct ampere reading for each particular shunt the full-scale rating must be entered. The factory default setting is 2500A for the PLANT SHUNT and 600A for all FEEDER SHUNTS, with a possible range of 5 to 10,000 Amps.

Enter the “**Set Shunt Scales**” menu from the main Configure menu by pressing “**Select**”, then press “**Next**” or “**Previous**” until the “**Set Shunt Scales**” menu appears. Pressing “**Select**” again enters the menu with the display showing:

Plant Shunt Scale
Set at: 600A

Press “**Select**” again to modify the current setting and the display changes to:

Plant Shunt Scale
Modify: 600A

Press the “**Next**” key to raise the value, or the “**Previous**” key to lower the value, in 100A increments. When the desired shunt value is reached press “**Select**” again to enter the value. The display will return the “**Set at**” display with the selected value shown. The user can then use the “**Next**” or “**Previous**” keys to select any of the other nine shunt feeder channels to change the scaling as needed in the same manner. When all the channels have been set press “**Escape**” one or more times to return to the Configure menu or to main default screen.

3.8 SYSTEM OPTIONS MENU

The system options menu provides eleven sub-menus that include:

1. Enabling a password for access
2. Setting the voltage display polarity for positive or negative readings
3. Setting the current display polarity for positive or negative readings
4. Setting temperature display for °F or °C display
5. Setting idle display for current or current / ambient temperature toggle
6. Setting up the audible alarm
7. Setting the system operation voltage 24V / 48V
8. Setting the Equalize mode for Manual timed or AutoEq.
9. Setting up the Auxiliary relay mode
10. Setting the Backlight to turn on by KEY-PRESS, remain ON constantly, or OFF always
11. Display the Software revision level

Enter the “**System Options**” menu from the main Configure menu by pressing “**Select**”, then use the “**Next**” or “**Previous**” keys to locate the **System Options** menu. Press “**Select**” again when the “**System Options**” menu appears to access the first sub-menu **System Password**. Use the “**Next**” key to walk through the menus in the order shown above. The following procedures assume a new installation and a sequential procedure through each sub-menu.

3.8.1 System Password Sub-Menu

The system password prevents a user from accessing any of the Configure or Output Relay Test menus thereby protecting the system configuration from an unauthorized change or unauthorized trigger of nuisance alarms. When the System Password sub-menu appears, press the “**Select**” key to turn the password **On** or **Off**.

System Password is: 09191

The system password does not take affect until after 5min. of idle time (without key-presses) From that point on, any attempt to enter the Configure menu will be preceded by a display screen: **ENTER PASSWORD?** The user must enter the correct number sequence using the “**Next**” and “**Previous**” to scroll sequentially through the numbers followed by the “**Select**” key to proceed.

CAUTION: Inadvertent enabling of the Password can not be un-done without the actual password to gain entry to the System Options sub-menu. Be sure the Password feature is desired before enabling it. Call Customer Service if password & product manual are lost.
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3.8.2 Negative Volts Sub-Menu

The SAGEON PSMC I reads everything as a positive value. In order to display the proper polarity the user must select positive or negative with this menu. Simply set the polarity to match the plant voltage polarity using the “**Select**” key to toggle the **Negative Polarity: Yes** to **No** for a positive polarity power plant. The setting affects all voltage readings.

Use the “**Next**” key to access the next menu.

3.8.3 Negative Amps Sub-Menu

The SAGEON PSMC I reads everything as a positive value. In order to display the proper polarity the user must select positive or negative with this menu. Simply set the polarity to match the plant current polarity using the “**Select**” key to toggle the **Negative amps: Yes to No** for a positive polarity on current readings. The setting affects all current readings.

Use the “**Next**” key to access the next menu.

3.8.4 Temperature Inputs Sub-Menu

The SAGEON PSMC I can display temperature in °F or °C as desired by the user. The Factory recommendation is to use °F because the temperature sensor output is scaled for Fahrenheit. Reading in °F will also make the gain calibration somewhat easier when calculating the actual reading which is explained in the Calibrate Gain menu section. Use the “**Select**” key to select °F or °C operation. The setting affects all temperature readings.

Use the “**Next**” key to access the next menu.

3.8.5 Idle Display Sub-Menu

The main display screen provides an option for displaying Plant Current, Ambient temperature, or toggling between Plant Current and Ambient Temperature every 5 seconds. Use the “**Select**” key to select **AMPS, TEMP, or AMPS/TEMP** operation. This selection is in addition to the display of Plant Voltage and active alarms.

Use the “**Next**” key to access the next menu.

3.8.6 Audible Alarm Sub-Menu

The SAGEON PSMC I provides an internal audible alarm using a PCB mounted audio transducer. The user can select the audible alarm to respond to a Major alarm, a Minor alarm, or both. The user can also set the ACO cut-off time to: 30, 60, 90 minutes, or Off. In the Off mode the audible alarm will continually sound until the alarm condition is corrected. If the 30, 60, or 90 minute ACO time is selected, the user can disable the audible alarm from the Main Alarm menu. It will remain off for the selected time unless another alarm occurs. While in ACO the yellow ACO LED will be on and the Major and Minor LED’s will blink.

The user presses the “**Select**” key to toggle the **On/Off** for a major alarm. Then press “**Next**” to reach the Minor alarm, which is also toggled **On/Off** with the “**Select**” key. Pressing “**Next**” again allows the user to use the “**Select**” key to toggle between 30, 60, 90, or Off for the ACO time. Once the selections are made pressing “**Escape**” returns the user to the **Audible Alarm** menu.

<p>Note: The audible alarm transducer is rated at 85 DBA @ 10cm which is loud enough for a small office or CEV. Offices where the operator may be more the 25 ft. away or there is a high level of back ground noise should use a separate audible alarm panel operated by an output relay. (See Aux. Relay 3.7.10)</p>
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3.8.7 System Voltage Sub-Menu

This menu selects the operating voltage for the SAGEON PSMC I. The user selects **24v** or **48v** with any 103-2999-XX model (The default is for a 48V plant). The “**Select**” key toggles between the choices and resets alarm thresholds to the default thresholds for the new voltage setting.

Note: Changing the plant voltage will load factory defaults for all thresholds and enabled channels.

Use the “**Next**” key to access the next menu

3.8.8 Equalize Sub-Menu

This menu allows the user to choose an Equalize mode. Use the “**Next**” (up) / “**Prev**” (down) keys to scroll through the options of “Timer” and “Auto Eq.”. Press the “**Select**” key to enable the desired mode (s). Both of these modes can be enabled simultaneously.

The Timer and Auto Eq. modes will terminate prematurely should a High Temperature “TA” alarm occur for Ambient, and if enabled Temp String 1 or Temp String 2. Timer and Auto Eq. equalize modes will terminate in the presence of a Controller Inhibit signal.

Selecting **TIMER** enables the manual equalize mode. This causes the “Manual Eq Time” menu to appear at the top of the Configure menu. Here the user can configure the duration of a manual equalize cycle from 1-255 hours. Also a top-level “Manual Equalize” menu is added where the user can press the “**Select**” key to initiate an equalize cycle. The PSMC will display the number of equalize hours elapsed out of the total number of Eq hours.

Pressing select under the **AUTO EQ** menu when disabled will enable it, and when enabled will disable it. When enabled the PSMC displays the Auto Eq. sub-menu. Here the user chooses the Auto-Eq ON threshold; which is the voltage level that the plant must fall below and then raise above to trigger an Auto Eq. cycle. Its default is the Low Voltage Alarm Threshold. You can also set the Auto Eq. OFF threshold; which is the voltage level that the plant must raise above to terminate an Auto Eq. cycle. Its default is the High Voltage Alarm Threshold. The last setting in this sub-menu is the Auto Eq. Time, which is a timer from 0 – 10 hours that will terminate the Auto Eq. once the cycle has started. Its default is one hour. A setting of 0 hours configures the Auto-Eq cycle to only terminate when the plant voltage exceeds the Auto Eq. OFF threshold or premature termination point (above) occurs i.e. Auto Eq. shut-off by HVA. Any high temp alarm will abort an Auto-Eq cycle while in progress.

Use the “**ESC**” and “**Next**” key to access the next menu.

3.8.9 Auxiliary Relay Sub-Menu

The Auxiliary Relay menu allows the user to define the Auxiliary relay as one of the following: an extra Major or Minor alarm output, an Equalize alarm relay, an Audible alarm relay, or any Alarm Condition output. If the user “**Selects**” **Alarm Cond**, any enabled analog or binary channel's threshold is made available for the Auxiliary Relay trigger.

The user presses the “**Select**” key to enter the sub-menu, then “**Next**” to scroll through the choices. Pressing “**Select**” at any point sets the Aux relay to “**Energize**” when an alarm occurs. Pressing “**Select**” again changes it to “**De-Energize**” (FAIL-SAFE MODE) when an alarm occurs. Pressing “**Select**” third time will disable the Aux relay. When the selection is

“**Energize**” or “**De-Energize**” all previous selections are disabled. Pressing “**Select**” when the **Alarm Cond** display appears sends the user to a listing of the enabled analog thresholds and binary channels. The user presses the “**Next**” key to scroll through the choices, and the “**Select**” key to pick one. After making a choice, press “**Escape**” to return to the top of the Auxiliary Relay menu.

3.8.10 Backlight Option

The backlight can be configured to turn on only when a key is pressed or to always be on. Pressing the **SELECT** key will toggle between “**ALWAYS ON**”, “**KEY ON**”, or “**OFF**” options. When the backlight is set to “**KEY ON**” the backlight will turn on when a key is pressed and will extinguish after 5 minutes of inactivity. The light will also turn on when any alarm condition occurs. The light will remain on until the alarm extinguishes. When set to “**OFF**” the backlight will always remain in the off state.

Use the “**Next**” key to access the next menu.

3.8.11 About PSMC

This menu indicates what version of software is in the PSMC unit. This information is helpful when contacting Customer Support.

Use the “**Next**” key to access the next menu.

You can now press “**Next**” or **Previous**” to return to any **System Options** menu. When completed, press “**Escape**” again to return to the top of the **System Options** where “**Next**” or “**Previous**” can be used to scroll to any **Configure** menu.

When completed, press “**Escape**” to return to the “**SELECT MODE:**” menu. Use “**Next**” or “**Previous**” to reach other menus, or “**Escape**” again to return to the Idle Display.

CHAPTER FOUR: SAGEON PSMC I TEST & VERIFICATION

- 4.1 Introduction
- 4.2 Test Analog Channels
- 4.3 Test Binary Channels
- 4.4 Test Output Relays
- 4.5 Test LED's
- 4.6 Test LCD
- 4.7 Test Audible Alert

4.1 INTRODUCTION

The SAGEON PSMC I Test menu provides for comprehensive testing of all input and output functions. Analog and Binary channels can be continuously monitored to verify operation or troubleshoot the power plant. The alarm output and control relays can be toggled on & off to verify SAGEON PSMC I or power plant operation. Testing is provided for the LED display, LCD display, and Audible Alert. These tests turn on all of the LED's, LCD segments, or sounds the alert to verify operation.

Caution: The SAGEON PSMC I relinquishes monitoring and control functions while in the test mode. No alarms are recognized or rectifier control functions initiated while in the Test mode.

The main **Test** menu is accessed from the idle display screen by pressing “**Select**”, “**Next**”, or “**Previous**” to access the main menus. Press “**Previous**” or “**Next**” until the **Select Mode: Test** menu appears, then press “**Select**” to enter the **Test** mode. The various test modes are accessed in the following order with the “**Next**” key:

1. Analog test mode
2. Binary test mode
3. Output Relay test mode
4. LED ‘LAMP’ test mode
5. LCD test mode
6. Audible Alert test mode

4.2 TEST ANALOG CHANNELS

Press “**Select**” when the **Analog Channels** menu appears to enter the analog test mode. The first enabled analog channel will appear with its current value displayed and updated continuously. The user can press “**Next**” or “**Previous**” keys to move through the list of analog channels. The displayed channel is continuously monitored until the user moves to another channel.

The analog test mode can be used to troubleshoot the power plant or SAGEON PSMC I connections during installation. The Test mode can also be used to monitor plant voltage during a battery discharge test, quickly read and compare feeder shunt information, or monitor battery and ambient temperature changes.

When completed, press “**Escape**” to return to the **Select Test** display. Press “**Next**” or “**Previous**” to access other test modes. Press “**Escape**” to return to the main menus or the idle display screen.

4.3 TEST BINARY CHANNELS

Press “**Select**” when the **Binary Channels** menu appears to enter the binary test mode. The first enabled binary channel will appear with its current status displayed and updated continuously. The user can press “**Next**” or “**Previous**” to move through the list of binary channels. The displayed

channel is continuously monitored until the user moves to another channel.

The Binary Test mode can be used to verify or troubleshoot the unit during installation/operation.

When completed, press “**Escape**” to return to the **Select Test** display. Press “**Next**” or “**Previous**” to access other test modes. Press “**Escape**” to return to the main menus or the idle display screen.

4.4 TEST OUTPUT RELAYS

Press “**Select**” when the **Output Relays** menu appears to enter the output relay test mode. The first output relay will appear with its current status “**Open**” or “**Closed**” displayed and updated continuously. The output relays are accessed in the following order using the “**Next/Up**” key:

- | | | |
|----------|--------------|----------|
| 1. Major | 7. Temp | 13. AUX |
| 2. All | 8. Minor | 14. EQ |
| 3. VLVA | 9. HVA | 15. RS |
| 4. LVD | 10. LVA | 16. HVSD |
| 5. RFA | 11. CTRL INH | |
| 6. FA | 12. CEMF | |

Pressing the “**Select**” key when a specific output relay is displayed will toggle that relay **Open** (off) or **Closed** (on). In the special case of “ALL” relays, all output relays will either be closed or open concurrently. The user can press “**Next**” or “**Previous**” keys to move through the list of output relays channels. The output relay status will automatically return to its controlled state when the user leaves the output relay test mode.

Note: The front panel alarm LED’s will not indicate relay status in the output relay test mode.

CAUTION: Alarms that are connected to a remote alarm monitor will send false ‘nuisance’ alarm status if toggled while in the output relay test mode.

Warning: Turning the control relays for Equalize or HVSD on in the test mode will result in the power plant entering that mode. The power plant rectifiers will be shutdown if the HVSD output relay is turned on; the rectifiers will also be shut down if the test “ALL” relays option is used. If the power plant has been commissioned use extreme caution when testing these relays to make sure that power plant operation will not be adversely affected.

The output relay test mode can be very useful during the power plant test and acceptance to verify operation. Rectifier response to Equalize, HVSD, and Restart can be checked. External audible or visual monitors can be tested. Alarm call outs can be verified, etc.

When completed, press “**Escape**” to return to the **Select Test** display. Press “**Next**” or “**Previous**” to access other test modes. Press “**Escape**” to return to the main menus or the idle display screen.

4.5 LED TEST MODE

Press “**Select**” when the display reads **LAMP OFF** to activate all front panel LED’s at once. All LED’s should be illuminated. Press “**Select**” to perform the test again, or press “**Escape**” at anytime to exit the test.

Note: The LED's test will automatically end after approx. 10 seconds. Press "**Select**" again, if desired, to start the test again.

Note: Any LED that is not illuminated indicates a SAGEON PSMC I internal circuitry failure requiring a service call to repair.

When completed, press "**Next**" or "**Previous**" to access other test modes. Press "**Escape**" to return to the main menus or the idle display screen.

4.6 LCD TEST MODE

Press "**Select**" when the display reads "**LCD OFF**" to activate all of the front panel alphanumeric LCD segments at once. All of the LCD segments in the 2 by 16 matrix should be on during the test. Each segment consists of a square of pixels on the screen. Be sure each segment's pixels are on.

Note: The LCD's test will automatically end after approx. 10 seconds. Press "**Select**" again, if desired, to start the test again.

Note: Any LCD segment or pixel that is not illuminated indicates a SAGEON PSMC I internal circuitry failure requiring a service call to repair.

When completed, press "**Next**" or "**Previous**" to access other test modes. Press "**Escape**" to return to the main menus or the idle display screen.

4.7 ALERT TEST MODE

Press "**Select**" when the display reads "**ALERT OFF**" to activate the internal audible alert buzzer. The display changes to "**ALERT ON**". The Alert should be heard now although it may not be heard in noisy environments like Central Offices.

Note: The Alert test will automatically end after approx. 10 seconds. Press "**Select**" again, if desired, to start the test again. No sound coming from the Alert in a quiet environment indicates a SAGEON PSMC I internal circuitry failure requiring a service call to repair.

When completed, press "**Next**" or "**Previous**" to access other test modes. Press "**Escape**" to return to the main menus or the idle display screen.

CHAPTER FIVE: MAINTENANCE

The SAGEON PSMC I should not require any regular maintenance. Once a year, the analog channel calibration should be verified against actual measurements. On a 2 to 5 year basis, a complete system test should take place that checks all alarm and output functions to make sure alarm detection, control functions, and output relays work properly.

CHAPTER SIX: SPARING / ACCESSORIES, OPTIONAL PARTS

SAGEON PSMC I parts can be shipped overnight from the factory for critical replacements if necessary. The following list of internal parts can be used to order spares or replacements:

<u>Part Description</u>	<u>C&D Technologies P/N</u>	<u>Where Used</u>
Main Processor Board	306-2999-00	+24 or -48 Volt applications
Display Board	306-3001-04	Keyboard/ LED Assembly
LCD Display	350-8020-00	Alpha numeric 16 x 2 LCD
Display Board Cable	070-4230-07	Ribbon cable J1 to J7
Terminal Block	214-2727-00	12-pos. screw terminal block
 Optional equipment:		
Temperature Sensor Kit	385-5627-11	30ft. cable. Direct Connect to PSMC. Measurement of ambient or battery string temperatures. Longer cable lengths available; contact factory.
Inline fuse, 0.5A Kit	385-2778-01	Protection of PSMC wiring
Inline Resistor Kit	385-2789-00	Protection of shunt wire connections
Alternate Screw Terminal Block	Pheonix Contact P/N 1850767	Screw terminal block / rear accessible. Prevents having to remove top terminal block to access bottom TB screws. Purchase direct from Pheonix contact or distributor.

CHAPTER SEVEN: APPENDIX LISTINGS

7.1 FLOW CHARTS FOR SAGEON PSMC I MENU STRUCTURES

Appendix A: Main Menus

Appendix B: Configuration Menu

Appendix C: Enable Channels Menu

Appendix D: Enable Thresholds Menu

Appendix E: Set Thresholds Menu

Appendix F: Calibrate Zero Menu

Appendix G: Calibrate Gain Menu

Appendix H: Set Shunt Scales Menu

Appendix I: System Options Menu

Appendix J: Auxiliary Relay Menu

Appendix K: Test Menu

7.2 PROGRAMMING DATA WORK SHEET

◆ Sageon PSMC I Datasheet

7.3 REFERENCE DRAWINGS

PN 103-2999 Power System Monitor & Controller, SAGEON PSMC I

- Sht 1: Cover Sheet, PSMC Ordering Information, Optional Equipment, Reference Tables, Fusing Requirements, Engineering Notes
- Sht 2: Engineering Notes (Cont'd)
- Sht 3: Mechanical Layout
- Sht 4: Electrical Block Diagram, Wiring Interface PCB Detail
- Sht 5: Figures 1 to 9, Installation Wiring Details

APPENDIX A: MAIN MENUS

The top level menus of the PSMC:

*This menu will only appear if enabled.

<i>Idle Menu</i>	<i>Select Mode</i>	<i>Description</i>	
Idle screen w/o load voltage	STATUS		
Idle screen with load voltage			
MANUAL EQUALIZE*			Shows the latest reading for all enabled analog input channels.
TEST			If enabled will show if manual equalization is active, the number of hours equalization has been both active and the total number of hours.
CONFIG			See appendix K for details.
ALARMS	See appendix B for details.		
		Shows descriptions for all active alarm outputs.	

<i>Main Menu</i>	<i>Status submenu</i>	<i>Description</i>
STATUS	Plant Voltage	Voltage reading of the Battery or Plant
	Ambient Temp *	Temperature reading from the ambient temperature sensor (external).
	Temp String *	Temperature reading from the first battery string temperature sensor (external).
	Temp String 2 *	Temperature reading from the second battery string temperature sensor (external).
	Load Voltage *	Voltage reading on the load.
	Feed Current *	The current reading from feeder shunt #1
	Feed Current 2 *	The current reading from feeder shunt #2
	Feed Current 3 *	The current reading from feeder shunt #3
	Feed Current 4 *	The current reading from feeder shunt #4
	Feed Current 5 *	The current reading from feeder shunt #5
	Feed Current 6 *	The current reading from feeder shunt #6
	Feed Current 7 *	The current reading from feeder shunt #7
	Feed Current 8 *	The current reading from feeder shunt #8
	Feed Current 9 *	The current reading from feeder shunt #9
	Plant Current	Current reading from plant.
	PCB Temp.	The temperature of the PSMC's Printed Circuit Board (PCB)

Note: * Menu will not appear if channel is disabled.

<i>Main Menu</i>	<i>Submenu</i>	<i>Description</i>
MANUAL EQUALIZE	EQ: ON/OFF Elapsed 0 of XXX Hrs	Indicates if equalize is currently on or off. The 'XXX' represents the number of hours elapsed on equalize. The "SEL" key toggles equalize on or off.

APPENDIX B: CONFIGURATION MENU

Top level of the CONFIGURE set of menus.

<i>Menu</i>	<i>Submenu</i>	<i>Description</i>
CONFIGURE	MANUAL EQ TIME*	Selecting this menu allows setting the number of hours for a manual equalize.
	SYSTEM OPTIONS	Submenus allow enabling system password, backlight on/off, aux relay mapping, choosing equalization/sleep modes.
	SET SHUNT SCALES	Allows selecting the size of the current shunts for all the shunt inputs.
	CALIBRATE ZEROS	Allows setting zeros for analog inputs.
	CALIBRATE GAINS	Allows setting gains for analog inputs.
	ENABLE CHANNELS	Allows enabling/disabling reading analog and binary inputs
	SET THRESHOLDS	Allows setting of alarm thresholds
	ENABLE THRESHOLDS	Enables alarms.
		Note: * This menu will not exist if the Manual Equalization timer is not enabled.

<i>Configure Menu</i>	<i>Submenu</i>	<i>Description</i>
MANUAL EQ TIME*	MANUAL EQ TIME*	Selecting this menu allows setting the number of hours a manual equalization will take to complete.
	SYSTEM OPTIONS	Submenus allow enabling system password, backlight on/off, aux relay mapping, choosing equalization/sleep modes.

APPENDIX C: ENABLE CHANNELS MENU

<i>Configure Menu</i>	<i>Submenu</i>	<i>Description</i>
ENABLE CHANNELS	FEED CURRENT 1	Enables or disables feeder current 1 input.
	FEED CURRENT 2	Enables or disables feeder current 2 input.
	FEED CURRENT 3	Enables or disables feeder current 3 input.
	FEED CURRENT 4	Enables or disables feeder current 4 input.
	FEED CURRENT 5	Enables or disables feeder current 5 input.
	FEED CURRENT 6	Enables or disables feeder current 6 input.
	FEED CURRENT 7	Enables or disables feeder current 7 input.
	FEED CURRENT 8	Enables or disables feeder current 8 input.
	FEED CURRENT 9	Enables or disables feeder current 9 input.
	EXTERNAL LVD	Enables or disables external low voltage disconnect input.
	CEMF CELL 1	Enables or disables the CEMF CELL #1 input.
	CEMF CELL 2	Enables or disables the CEMF CELL #2 input.
	CTRL INHIBIT	Enables or disables the CTRL INHIBIT input.
	RECT FAIL 1	Enables or disables the rectifier failure # 1 input.
	RECT FAIL 2	Enables or disables the rectifier failure # 2 input.
	RECT FAIL 3	Enables or disables the rectifier failure # 3 input.
	RECT FAIL 4	Enables or disables the rectifier failure # 4 input.
	RECT FAIL 5	Enables or disables the rectifier failure # 5 input.
	RECT FAIL 6	Enables or disables the rectifier failure # 6 input.
	RECT FAIL 7	Enables or disables the rectifier failure # 7 input.
	RECT FAIL 8	Enables or disables the rectifier failure # 8 input.
	RECT FAIL 9	Enables or disables the rectifier failure # 9 input.
	RECT FAIL 10	Enables or disables the rectifier failure #10 input.
	RECT FAIL 11	Enables or disables the rectifier failure #11 input.
	RECT FAIL 12	Enables or disables the rectifier failure #12 input.
	RECT FAIL 13	Enables or disables the rectifier failure #13 input.
	RECT FAIL 14	Enables or disables the rectifier failure #14 input.
	RECT FAIL 15	Enables or disables the rectifier failure #15 input.
	RECT FAIL 16	Enables or disables the rectifier failure #16 input.
	SPARE FUSE	Enables or disables the spare fuse input.
	BATTERY FUSE	Enables or disables the battery fuse input.
	DISCHG FUSE	Enables or disables the dischg fuse input.
CHARGE FUSE	Enables or disables the charge fuse input.	
SENSE FUSE	Enables or disables the sense fuse input.	
AMBIENT TEMP	Enables or disables the ambient temperature input.	
TEMP STRING 1	Enables or disables the battery string 1 temperature input.	
TEMP STRING 2	Enables or disables the battery string 2 temperature input.	
LOAD VOLTAGE	Enables or disables the load voltage input.	

Note: Each of these listed channels is either on (enabled), or off (disabled). Note that disabled channels will not appear in other menus. Plant voltage, plant current, and PCB Temperature readings are always enabled, and do not show up in this menu.

APPENDIX D: ENABLE THRESHOLDS MENU

<i>Configure Menu</i>	<i>Submenu</i>	<i>Description</i>
ENABLE THRESH.	HVSD VOLTAGE	Enables/disables the high voltage shutdown threshold.
	STR 1 TEMP DIFF	Enables/disables the battery string 1 temperature Difference threshold
	STR 2 TEMP DIFF	Enables/disables the battery string 2 temperature Difference threshold
	LOW AMB TEMP	Enables/disables the low ambient temperature threshold.
	HIGH AMB TEMP	Enables/disables the high ambient temperature threshold.
	LOW BAT TEMP S1	Enables/disables the low battery string 1 temperature threshold.
	LOW BAT TEMP S2	Enables/disables the low battery string 2 temperature threshold.
	HI BAT TEMP S1	Enables/disables the high battery string 1 temperature threshold.
	HI BAT TEMP S2	Enables/disables the high battery string 2 temperature threshold.
	HI LOAD VOLTAGE	Enables/disables the high load voltage threshold.
	PLANT CURRENT	Enables/disables the plant over current threshold.
	SHUNT 1 CURRENT	Enables/disables the feeder 1 over current threshold.
	SHUNT 2 CURRENT	Enables/disables the feeder 2 over current threshold.
	SHUNT 3 CURRENT	Enables/disables the feeder 3 over current threshold.
	SHUNT 4 CURRENT	Enables/disables the feeder 4 over current threshold.
	SHUNT 5 CURRENT	Enables/disables the feeder 5 over current threshold.
	SHUNT 6 CURRENT	Enables/disables the feeder 6 over current threshold.
	SHUNT 7 CURRENT	Enables/disables the feeder 7 over current threshold.
	SHUNT 8 CURRENT	Enables/disables the feeder 8 over current threshold.
	SHUNT 9 CURRENT	Enables/disables the feeder 9 over current threshold.
HIGH VOLTAGE	Enables/disables the high voltage threshold.	
LOW VOLTAGE	Enables/disables the low voltage threshold.	
VERY LOW VOLTAGE	Enables/disables the very low voltage threshold.	

APPENDIX E: SET THRESHOLDS MENU

<i>Configure Menu</i>	<i>Submenu</i>	<i>Description</i>
SET THRESHOLDS	HVSD VOLTAGE	Changes the High Voltage shutdown alarm threshold.
	STR 1 TEMP DIFF	Changes the battery string 1 temperature difference alarm threshold.
	STR 2 TEMP DIFF	Changes the battery string 2 temperature difference alarm threshold.
	LOW AMB TEMP	Changes the Low Ambient Temperature alarm threshold.
	HIGH AMB TEMP	Changes the High Ambient Temperature alarm threshold.
	LOW BAT TEMP S1	Changes the Low Battery String 1 Temperature alarm threshold.
	LOW BAT TEMP S2	Changes the Low Battery String 2 Temperature alarm threshold.
	HI BAT TEMP S1	Changes the High Battery String 1 Temperature alarm threshold.
	HI BAT TEMP S2	Changes the High Battery String 2 Temperature alarm threshold.
	HI LOAD VOLTAGE	Changes the High Load Voltage alarm threshold.
	PLANT CURRENT	Changes the Plant over Current alarm threshold.
	SHUNT 1 CURRENT	Changes the Feeder 1 over current alarm threshold.
	SHUNT 2 CURRENT	Changes the Feeder 2 over current alarm threshold.
	SHUNT 3 CURRENT	Changes the Feeder 3 over current alarm threshold.
	SHUNT 4 CURRENT	Changes the Feeder 4 over current alarm threshold.
	SHUNT 5 CURRENT	Changes the Feeder 5 over current alarm threshold.
	SHUNT 6 CURRENT	Changes the Feeder 6 over current alarm threshold.
	SHUNT 7 CURRENT	Changes the Feeder 7 over current alarm threshold.
	SHUNT 8 CURRENT	Changes the Feeder 8 over current alarm threshold.
	SHUNT 9 CURRENT	Changes the Feeder 9 over current alarm threshold.
HIGH VOLTAGE	Changes the High Voltage alarm threshold.	
LOW VOLTAGE	Changes the Low Voltage alarm threshold.	
VERY LOW VOLTAGE	Changes the Very Low Voltage alarm threshold.	

APPENDIX F: CALIBRATE ZERO MENU

<i>Configure Menu</i>	<i>Submenu</i>	<i>Description</i>
CALIBRATE ZEROS	PLANT VOLTAGE	Remove offset from the "PLANT VOLTAGE" analog input.
	PLANT CURRENT	Remove offset from the "PLANT CURRENT" analog input.
	AMBIENT TEMP	Remove offset from the "AMBIENT TEMP " analog input.
	TEMP STRING 1	Remove offset from the "TEMP STRING 1" analog input.
	TEMP STRING 2	Remove offset from the "TEMP STRING 2" analog input.
	LOAD VOLTAGE	Remove offset from the "LOAD VOLTAGE " analog input.
	FEED CURRENT 1	Remove offset from the "FEED CURRENT 1" analog input.
	FEED CURRENT 2	Remove offset from the "FEED CURRENT 2" analog input.
	FEED CURRENT 3	Remove offset from the "FEED CURRENT 3" analog input.
	FEED CURRENT 4	Remove offset from the "FEED CURRENT 4" analog input.
	FEED CURRENT 5	Remove offset from the "FEED CURRENT 5" analog input.
	FEED CURRENT 6	Remove offset from the "FEED CURRENT 6" analog input.
	FEED CURRENT 7	Remove offset from the "FEED CURRENT 7" analog input.
	FEED CURRENT 8	Remove offset from the "FEED CURRENT 8" analog input.
FEED CURRENT 9	Remove offset from the "FEED CURRENT 9" analog input.	

APPENDIX G: CALIBRATE GAIN MENU

<i>Configure Menu</i>	<i>Submenu</i>	<i>Description</i>
CALIBRATE GAINS	PLANT VOLTAGE	Adjust gain of the "PLANT VOLTAGE" analog input.
	PLANT CURRENT	Adjust gain of the "PLANT CURRENT" analog input.
	AMBIENT TEMP	Adjust gain of the "AMBIENT TEMP " analog input.
	TEMP STRING 1	Adjust gain of the "TEMP STRING 1" analog input.
	TEMP STRING 2	Adjust gain of the "TEMP STRING 2" analog input.
	LOAD VOLTAGE	Adjust gain of the "LOAD VOLTAGE " analog input.
	FEED CURRENT 1	Adjust gain of the "FEED CURRENT 1" analog input.
	FEED CURRENT 2	Adjust gain of the "FEED CURRENT 2" analog input.
	FEED CURRENT 3	Adjust gain of the "FEED CURRENT 3" analog input.
	FEED CURRENT 4	Adjust gain of the "FEED CURRENT 4" analog input.
	FEED CURRENT 5	Adjust gain of the "FEED CURRENT 5" analog input.
	FEED CURRENT 6	Adjust gain of the "FEED CURRENT 6" analog input.
	FEED CURRENT 7	Adjust gain of the "FEED CURRENT 7" analog input.
	FEED CURRENT 8	Adjust gain of the "FEED CURRENT 8" analog input.
FEED CURRENT 9	Adjust gain of the "FEED CURRENT 9" analog input.	

APPENDIX H: SET SHUNT SCALES MENU

<i>Configure Menu</i>	<i>Submenu</i>	<i>Description</i>
SET SHUNT SCALES	PLT SHUNT SCALE	Allows changing the maximum current rating of the plant shunt.
	FD SHUNT 1 SCALE	Allows changing the maximum current rating of the feeder shunt 1.
	FD SHUNT 2 SCALE	Allows changing the maximum current rating of the feeder shunt 2.
	FD SHUNT 3 SCALE	Allows changing the maximum current rating of the feeder shunt 3.
	FD SHUNT 4 SCALE	Allows changing the maximum current rating of the feeder shunt 4.
	FD SHUNT 5 SCALE	Allows changing the maximum current rating of the feeder shunt 5.
	FD SHUNT 6 SCALE	Allows changing the maximum current rating of the feeder shunt 6.
	FD SHUNT 7 SCALE	Allows changing the maximum current rating of the feeder shunt 7.
	FD SHUNT 8 SCALE	Allows changing the maximum current rating of the feeder shunt 8.
	FD SHUNT 9 SCALE	Allows changing the maximum current rating of the feeder shunt 9.

APPENDIX I: SYSTEM OPTIONS MENU

<i>Configure Menu</i>	<i>Submenu</i>	<i>Description</i>
SYSTEM OPTIONS	PASSWORD	This menu allows turning the system password protection on or off.
	ABOUT PSMC	Shows the software version of the PSMC.
	BK LIGHT	Can choose if backlight stays on, off, or turns off after 5 minutes in the absence of any alarms or keypad input.
	AUX RELAY MENU	Allows selecting an alarm condition that will (energize/de-energize) the auxiliary alarm relay.
	EQUALIZE MENU	This menu allows enabling manual equalization and automatic low voltage equalization.
	SYS VOLTS	Displays and allows changing the plant voltage setting.
	AUD. ALRM MENU	Allows enabling an audible alarm for a Major, or Minor alarm. Also allows setting the amount of time the audible confirmation can be disabled in the alarm menu.
	IDLE DISP	Allows choosing plant current, temperature, or toggle between both on the idle screen.
	TEMP UNITS	Toggle all temperature reading units between °C and °F
	NEG. AMPS	Enable/disable the display of a minus sign for all amperage readings.
NEG. VOLTS	Enable/disable the display of a minus sign for all voltage readings.	

APPENDIX J: AUXILIARY RELAY MENU

<i>System Options Menu</i>	<i>Submenu</i>	<i>Description</i>
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> AUX RELAY MENU </div>	AUX. RELAY FUNCT IS: x	Displays whether or not the auxilliary relay function is enabled or disabled.
	ALRM CND x	Leads to a set of menus for using the auxiliary relay be triggered by any of a number of different alarm conditions.
	AUD ALRM x	Allows triggering the auxiliary relay if the audible alarm is triggered.
	EQUALIZE x	Allows triggering the auxiliary relay if equalization is in progress.
	MINOR x	Allows triggering the auxiliary relay if the minor alarm is active.
	MAJOR x	Allows triggering the auxiliary relay if the major alarm is active.

'x' represents either "enabled", or "disabled"

<i>Auxiliary Relay Menu</i>	<i>Submenu</i>	<i>Description</i>
ALRM CND MENU	HVSD ALARM	The auxiliary relay maps to the high voltage shutdown alarm.
	CTRL. INHIBIT	The auxiliary relay maps to the controller inhibit alarm.
	RECT FAIL 1	The auxiliary relay maps to rectifier failure alarm 1.
	RECT FAIL 2	The auxiliary relay maps to rectifier failure alarm 2.
	RECT FAIL 3	The auxiliary relay maps to rectifier failure alarm 3.
	. . .	
	RECT FAIL 15	The auxiliary relay maps to rectifier failure alarm 15.
	RECT FAIL 16	The auxiliary relay maps to rectifier failure alarm 16.
	ANY RECT FAILURE	The auxiliary relay maps to any rectifier failure alarm.
	SPARE FUSE	The auxiliary relay maps to the spare fuse alarm.
	BATTERY FUSE	The auxiliary relay maps to the battery fuse alarm.
	SENSE FUSE	The auxiliary relay maps to the sense fuse alarm.
	DISCHARGE FUSE	The auxiliary relay maps to the discharge fuse alarm.
	CHARGE FUSE	The auxiliary relay maps to the charge fuse alarm.
	EXTERNAL LVD	The auxiliary relay maps to the external low voltage disconnect alarm.
	CEMF CELL 1	The auxiliary relay maps to the CEMF cell 1 alarm.
	CEMF CELL 2	The auxiliary relay maps to the CEMF cell 2 alarm.
	STR 1 TEMP DIFF	The auxiliary relay maps to the battery string 1 temperature difference alarm.
	STR 2 TEMP DIFF	The auxiliary relay maps to the battery string 2 temperature difference alarm.
	LOW AMB TEMP	The auxiliary relay maps to the low ambient temperature alarm.
	HIGH AMB TEMP	The auxiliary relay maps to the high ambient temperature alarm.
	LOW BATT TEMP S1	The auxiliary relay maps to the low battery string 1 temperature alarm.
	LOW BATT TEMP S2	The auxiliary relay maps to the low battery string 2 temperature alarm.
	HI BATT TEMP S1	The auxiliary relay maps to the high battery string 1 temperature alarm.
	HI BATT TEMP S2	The auxiliary relay maps to the high battery string 2 temperature alarm.
	HI LOAD VOLTAGE	The auxiliary relay maps to the high load voltage alarm.
	FEED CURRENT 1	The auxiliary relay maps to the feed current 1 alarm.
	FEED CURRENT 2	The auxiliary relay maps to the feed current 2 alarm.
	FEED CURRENT 3	The auxiliary relay maps to the feed current 3 alarm.
	. . .	
FEED CURRENT 8	The auxiliary relay maps to the feed current 8 alarm.	
FEED CURRENT 9	The auxiliary relay maps to the feed current 9 alarm.	
HIGH PLT CURRENT	The auxiliary relay maps to the high plant current alarm.	
ANY OVER CURRENT	The auxiliary relay maps to any over current alarm.	
HIGH VOLTAGE	The auxiliary relay maps to the high voltage alarm.	
LOW VOLTAGE	The auxiliary relay maps to the low voltage alarm.	
VERY LOW VOLTAGE	The auxiliary relay maps to the very low voltage alarm.	

APPENDIX K: TEST MENU

<i>Main Menu</i>	<i>Select Test Submenu</i>	<i>Description</i>
TEST	ANALOG CHANNEL	Allows continuous measurement of any enabled analog channel.
	ALERT OFF/ON	Tests buzzer when select is pressed.
	LCD TEST OFF/ON	Allows one to turn on all the pixels in the LCD when select is pressed.
	LAMP OFF/ON	Allows turning on all the LED's on the front panel when select is pressed.
	OUTPUT RELAYS	Allows closing/opening of output relays. See section X.
	BINARY INPUTS	Allows finding the current status of any enabled binary input. See section X.

<i>Test menu</i>	<i>Submenu</i>	<i>Description</i>
ANALOG CHANNEL	PLANT VOLTAGE	Analog input relays select the Plant (battery) voltage continuously.
	AMBIENT TEMP*	Analog input relays select the ambient temperature input continuously.
	TEMP STRING*	Analog input relays select the battery string 1 temperature voltage continuously.
	TEMP STRING 2*	Analog input relays select the battery string 2 temperature voltage continuously.
	LOAD VOLTAGE*	Analog input relays select the Load voltage continuously.
	FEED CURRENT*	Analog input relays select the feed current shunt #1 continuously.
	FEED CURRENT 2*	Analog input relays select the feed current shunt #2 continuously.
	FEED CURRENT 3*	Analog input relays select the feed current shunt #3 continuously.
	FEED CURRENT 4*	Analog input relays select the feed current shunt #4 continuously.
	FEED CURRENT 5*	Analog input relays select the feed current shunt #5 continuously.
	FEED CURRENT 6*	Analog input relays select the feed current shunt #6 continuously.
	FEED CURRENT 7*	Analog input relays select the feed current shunt #7 continuously.
	FEED CURRENT 8*	Analog input relays select the feed current shunt #8 continuously.
	FEED CURRENT 9*	Analog input relays select the feed current shunt #9 continuously.
	PLANT CURRENT	Analog input relays select the Plant (battery) current continuously.
	PCB Temperature	The temperature reading of the PSMC's Printed Circuit Board (PCB).
	Note:	* Will not appear if channel is disabled.

<i>Test Menu</i>	<i>Submenu</i>	<i>Description</i>
Output Relays	MAJOR x	Indicates if the MAJOR alarm relay is energized.
	HVSD x	Indicates if the HVSD alarm relay is energized.
	RS x	Indicates if the RS alarm relay is energized.
	EQ x	Indicates if the EQ alarm relay is energized.
	AUX x	Indicates if the AUX alarm relay is energized.
	CEMF x	Indicates if the CEMF alarm relay is energized.
	CTRL INH x	Indicates if the CTRL INH alarm relay is energized.
	LVA x	Indicates if the LVA alarm relay is energized.
	HVA x	Indicates if the HVA alarm relay is energized.
	MINOR x	Indicates if the MINOR alarm relay is energized.
	TEMP x	Indicates if the TEMP alarm relay is energized.
	FA x	Indicates if the FA alarm relay is energized.
	RFA x	Indicates if the RFA alarm relay is energized.
	EXT LVD x	Indicates if the EXT LVD alarm relay is energized.
	VLVA x	Indicates if the VLVA alarm relay is energized.
ALL x	Indicates if all alarm relays are energized.	
Note	'x' Represents either "CLOSED" (energized), or "OPEN" (de-energized.) The state of the output relay will toggle when the "select" key is pressed.	

<i>Test Menu</i>	<i>Submenu</i>	<i>Description</i>
BINARY INPUTS	SENSE FUSE	Displays the state of the sense fuse alarm.
	EXTERN LVD	Displays the state of the external low voltage disconnect alarm.
	CEMF CELL2	Displays the state of the Counter Electro-Motive Force Cell 2 alarm.
	CEMF CELL1	Displays the state of the Counter Electro-Motive Force Cell 1 alarm.
	CTRL INHIB	Displays the state of the sense fuse alarm.
	RFA 16	Displays the state of the 16th rectifier failure alarm.
	RFA 15	Displays the state of the 15th rectifier failure alarm.
	⋮	⋮
	RFA 2	Displays the state of the 2nd rectifier failure alarm.
	RFA 1	Displays the state of the 1st rectifier failure alarm.
	SPARE FUSE	Displays the state of the spare fuse alarm.
	BATT FUSE	Displays the state of the battery fuse alarm.
	DISCH FUSE	Displays the state of the discharge fuse alarm.
	CHARG FUSE	Displays the state of the charge fuse alarm.
		Note: Each binary input menu needs to be enabled in order to see it.

SAGEON PSMC I DATA SHEET					
SITE:				EMERGENCY PHONE NUMBERS	DATE:
ADDRESS:			NAME:	PH:	PROG'D BY:
RESP. ENGR:	PH:	NAME:	PH:	C & D CUSTOMER SERVICE: 1-800-440-3504	

ANALOG CHANNELS								
ENB Y/N	ANALOG CHANNEL	POL:	WIRE COLOR	WIRE DESIG.	PROTECTION			SIGNAL SOURCE
					INF	INR	PANEL	
	PLT VOLT	+						
	PLT AMPS	-						
	FDR 1	+						SHUNT RATING:
	FDR 2	-						SHUNT RATING:
	FDR 3	+						SHUNT RATING:
	FDR 4	-						SHUNT RATING:
	FDR 5	+						SHUNT RATING:
	FDR 6	-						SHUNT RATING:
	FDR 7	+						SHUNT RATING:
	FDR 8	-						SHUNT RATING:
	FDR 9	+						SHUNT RATING:
	FDR 10	-						SHUNT RATING:

TEMPERATURE SENSORS			
AMB SENSOR	DEFAULT COLORS	EXT COLOR	WHERE LOCATED
PWR	RED		
SIG	BLUE		
RTN	BLACK		
TS1 SENSOR	DEFAULT COLORS	EXT COLOR	WHERE LOCATED
PWR	RED		
SIG	BLUE		
RTN	BLACK		
TS2 SENSOR	DEFAULT COLORS	EXT COLOR	WHERE LOCATED
PWR	RED		
SIG	BLUE		
RTN	BLACK		

TEMPERATURE THRESHOLD INFORMATION				
THRESH.	DEFAULTS		ACTUAL	
	HI	LO	HI	LO
AMB	95° F, 35° C	32° F, 0° C		
STRG 1	95° F, 35° C	32° F, 0° C		
STRG 2	95° F, 35° C	32° F, 0° C		
** DIFFERENTIAL THRESHOLDS				
STRG 1 TEMP DIFF	20° F, -6. 7° C			
STRG 2 TEMP DIFF	20° F, -6. 7° C			

* TS1 = STRG 1, TS2 = STRG 2
 ** DIFFERENCE BETWEEN AMB & TS1 OR TS2

BINARY INPUTS					
ENB Y/N	BINARY CHANNEL	WIRE COLOR	WIRE DESIG.	RECT/ PANEL DISIGNATION	VERIFY INPUT (Y/N)
	CHG FUSE				(BAT)
	DSCHG FUSE				(BAT)
	S/C FUSE				(BAT)
	BAT FUSE				(BAT)
	SPARE FUSE				(BAT)
	RFA 1				(GRD)
	RFA 2				(GRD)
	RFA 3				(GRD)
	RFA 4				(GRD)
	RFA 5				(GRD)
	RFA 6				(GRD)
	RFA 7				(GRD)
	RFA 8				(GRD)
	RFA 9				(GRD)
	RFA 10				(GRD)
	RFA 11				(GRD)
	RFA 12				(GRD)
	RFA 13				(GRD)
	RFA 14				(GRD)
	RFA 15				(GRD)
	RFA 16				(GRD)
	CTRL IHB				(GRD)
	CEMF 1				(GRD)
	CENF 2				(GRD)
	LVD				(GRD)

THRESHOLDS							
ENB Y/N	THRESHOLD	VALUE	ENB Y/N	THRESHOLD	VALUE	ENB Y/N	THRESHOLD
	PLT VOLT HVSD			FDR 4			HI BAT TEMP1 VALUE:
	PLT VOLT. VLVA			FDR 5			HI BAT TEMP2 VALUE:
	PLT VOLT LVA			FDR 6			LO BAT TEMP1 VALUE:
	PLT VOLT HV			FDR 7			LO BAT TEMP2 VALUE:
	PLT CURR			FDR 8			HI AMB TEMP VALUE:
	FDR 1			FDR 9			LO AMB TEMP VALUE:
	FDR 2			FDR 10			STRG 1 DIFF VALUE:
	FDR 3						STRG 2 DIFF VALUE:

ENTER DEFAULT FROM MANUAL OR CUSTOMER THRESHOLD UNDER "VALUE"
 ENTER FULL SCALE VALUE FOR EACH MONITORED SHUNT BY "RATING"

CONTROL RELAYS				
RELAY	CTRL RTN	WIRE COLOR	WIRE DESIG.	ENTER RECTIFIERS BY EQUIP. NO. GROUPS: (EXAMPLE 1-6 TB1-6)
RS	BAT/GRD			
HVSD				
EQ				

ALARM OUTPUT RELAYS						
RELAY	DESTINATION:	WIRE COLOR	WIRE DESIG.	CONTACT NO	COMMON NC	COMMON BAT GRD
MAJOR						
MAJOR						
MINOR						
MINOR						
HVA						
LVA						
VLA						
FA						
LVD						
TEMP						
CEMF						
WD						
RFA						
CTRL INH						
AUX						

SPECIFIC EQUIPMENT DESIGNATIONS			
RECTIFIERS	RECTIFIERS	DIST PANELS	MISC.
1	13	1	1
2	14	2	2
3	15	3	3
4	16	4	4
5	17	5	5
6	18	6	6
7	19	7	7
8	20	8	8
9	21	9	9
10	22	10	10
11	23	11	11
12	24	12	12