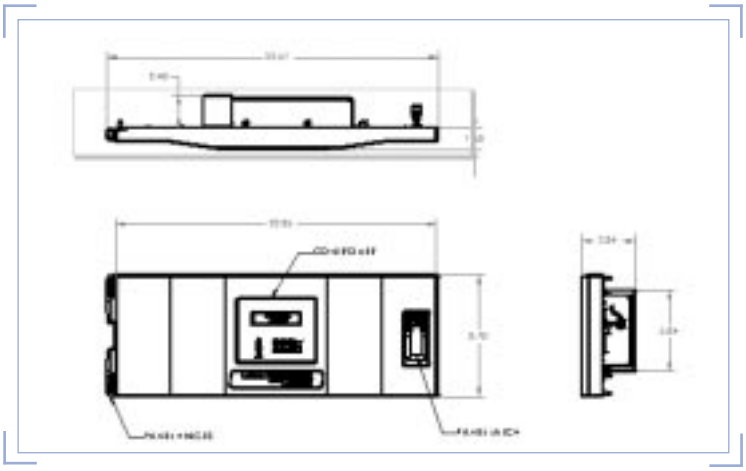
SAGEON™ POWER SYSTEM PLANT CONTROLLER

For telecommunications applications



The Sageon™ Plant Controller is a control and supervisory unit designed to control up to 225 parallel connected Sageon rectifiers (rectifier), and up to four parallel connected battery strings (standard configuration) in a 24VDC or 48VDC uninterruptible power system. It can be expanded to accommodate monitoring functions such as battery cell voltage, AC supply parameter, and site monitoring.

The Sageon Controller is well suited to facilitating a network of centrally monitored DC power systems due to its ability to provide remote monitoring and control with SageView™ software.

Operating characteristics of the Sageon Controller are specified at 77F (25C) ambient, unless otherwise stated.

INPUT

- Voltage: Operates from 18VDC to 70VDC
  Suitable for 24V and 48V systems
- Protection: Automatically Resetable fuse in both input lines
  Polarity reversal protection included
- Current: 1.5A max at 18VDC
  200mA typical at 54VDC
  (Varies with auxiliary expansion modules)

ENVIRONMENTAL

- Cooling: Natural convection cooling
- Temperature: Operating range:
  -15F (-25C) to 158F (70C)
- Humidity: 0 to 90% RH non-condensing
- Altitude: Operational to 13,120 ft (4,000 m)

COMPLIANCE STANDARDS

- EMC: Designed to ETSI EN 300 386 V1.2.1 (2000)
- Safety: Designed to IEC 60950 (1999)
- Environmental: Designed to
  ETS 300 019-1-3, class 3.3
- UL 60950 Pending

MECHANICAL

Size:

Width:	23.57 in	(598.7 mm)
Height:	8.70 in	(221 mm)
Depth:	3.84 in	(97.5 mm)
Mass:	2.87 lb	(1.30 kg)

Mounting:

The Sageon Controller is designed to mount in the door of the Sageon Distribution Panel.

COMMUNICATIONS

Front Panel Mounted RS-232 Port:
9-pin D-connector for direct connection to a PC or Notebook.

Remote Monitoring:
Optional remote monitoring is available using RS232, RS485, modem, or LAN/WAN access with a 10BASE-T interface and TCP/IP protocol.

Multiple User Access:
Two users can be connected at the same time through available communications ports. The latter connected user cannot transmit parameters while the first connected user is on line.

Protection:
All signals optically isolated to > 2kV DC.

PERIPHERALS

System and User Interface:
Interface provided through 64 position ribbon cable to interface board and 16 position auxiliary ribbon cables connected to the back plane. Various configurations of the Sageon Controller and auxiliaries are available depending on system requirements (see below):

Standard Controller:
Provides connection to the following system peripherals/monitoring points:

- System/Battery voltage
- 4 battery current transducers
- Ambient and battery temperature sensors (for 4 strings)
- Load and Battery Circuit breaker trip input (digital)
- Low Voltage Disconnect Switch (LVDS) control
- LVDS auxiliary contact input (digital)
- 4 alarm relays (Fan speed, HVSD, Alarm, Rectifier shutdown)

Advanced Controller:
Basic functionality of standard controller with addition of one Sageon Battery Monitor (SBM).

Sageon 3 Phase AC Monitor (SAM):
Connected through auxiliary port, monitors voltage and current of each phase, and frequency on one phase.

Sageon Battery Monitor (SBM):
The Sageon Battery Monitor (SBM) is a module that is used to monitor individual cells of a 24V or 48V lead acid battery. Up to four SBM modules can be daisy chained together to monitor a number of battery strings. The cells of the battery are not limited to 2 volts. Depending on how the module is setup, monoblocks of 4V, 6V, or 12V may also be monitored.

Connection to Sageon Controller is made via the 16 way auxiliary ribbon cable. Individual wires to each cell of the battery strings provide cell voltage information. Up to 4 SBMs, each monitoring 24 cells, can be connected.

Battery Sensing Terminals:
Maximum Input Voltage: 70Vdc

Resolution:
5mV for 2V cells (after A/D conversion)

Protection:
Current limiting resistors embedded in termination at the battery cell sense terminals provide protection against short circuits in the battery sense wire loom.

Accuracy:
+/-10mV for 2V Cells
+/-25mV for 4V Cell blocks
+/-50mV for 6V Cell blocks
+/-100mV for 12V Cell blocks

Sageon Site Monitor (SSM):
Connection to the Sageon Controller is made via the 16 way auxiliary ribbon cable. Input and output controls are defined using SageView software on a PC. The site monitor provides:

- 8 user defined analog inputs
- 12 user defined digital inputs
- 4 relay control outputs

FRONT PANEL

Push Buttons:
Six push-buttons are available on the front panel. Three push-buttons are used to move through the various menus and for making alterations to operating parameters. Three other push-buttons enable entry into three additional menus:

- INC - increases parameter value or moves forward through a menu
- DEC - decreases parameter value or moves backward through a menu
- ENTER - accept new value or open sub-menu
- RECTIFIER - opens rectifier parameter menu
- BATT - opens battery parameter menu
- LOG - opens alarm log menu

Alphanumeric Display:
Two line, 16 character, vacuum fluorescent display (VFD). Normally displays output voltage and current as well as the system status - Float or Equalize, and any active alarms which may occur.

Status LEDs:
Three LEDs to the right of the push buttons are used to indicate system status:

- GREEN - System operating normally
- YELLOW (Flashing) - System alarm
- YELLOW (Constant) - Equalize operation mode
- RED - Rectifier off or faulty, or any system alarms

ALARMS

Alarms are displayed on the Sageon Controller front panel as an alarm menu that activates only when an alarm is registered. An audible alarm can also be enabled to alert personnel. Individual alarms are displayed by INC or DEC through alarm menu.

All alarms are displayed simultaneously in the Alarm Window of SageView.

Adjustable System Alarms:

Alarm	Range	Steps
24V Systems		
Voltage high alarm	26.0-33.0V	0.1V
Voltage low alarm	20.0-27.0V	0.1V
Battery discharge alarm	22.0-26.0V	0.1V
48V Systems		
Voltage high alarm	52.0-66.0V	0.1V
Voltage low alarm	40.0-54.0V	0.1V
Battery discharge alarm	44.0-52.0V	0.1V
All Systems		
Ambient temperature high alarm	30-90°C	1°C
Battery temperature high alarm	30-90°C	1°C
Differential battery discharge current	5-99A	1A

Non-adjustable System Alarms:

Alarm	Source	State
Power Distribution Unit Fuse Fail	Voltage-free contacts	Open
Battery Switch Open	Voltage-free contacts	Open
LVDS Open Auxiliary contacts of contactor	Voltage-free contacts	Open
EEPROM Fail Default values replace bad data	Software	-
Battery Temp. Sensor Fail	Software	-
System Voltage Clamp Excessive voltage drop along bus bar	Software	-
Processor Fail Indicated by front panel red LED only	Internal circuit	-

Adjustable Rectifier Alarms:

Alarm	Source	State
24V Systems		
SMR voltage high alarm	26.0-32.5V	0.1V
SMR voltage low alarm	22.0-27.0V	0.1V
SMR HVSD	27.0-33.0V	0.1V
48V Systems		
SMR voltage high alarm	52.0-65.0V	0.1V
SMR voltage low alarm	44.0-54.0V	0.1V
SMR HVSD	54.0-66.0V	0.1V

AC Supply Monitoring Alarms:

Available when optional module is used.

Alarm	Source	State
AC supply high voltage alarm	220-315V	1V
AC supply low voltage alarm	140-270V	1V
Frequency high alarm	50.0-65Hz	0.1Hz
Frequency low alarm	40.0-60Hz	0.1Hz

Sageon Battery Monitoring Alarms:

Available when optional module is used.

Alarm	Source	State
Cell Low Voltage Alarm	1.0-12.0V	0.01V
Cell High Voltage Alarm	2.0-16.0V	0.01V
Cell Positive Deviation Alarm	5-99%	1%
Cell Negative Deviation Alarm	5-99%	1%

MONITORING AND CONTROL

Rectifier Status:

Sageon Controller and SageView monitor status of the rectifier:

- Output current of rectifier
- Temperature of heatsink of rectifier
- Software version of rectifier

Load/Battery Current:

Monitored on the Sageon Controller and SageView with 0.1A or 1A resolution dependent on system size; Analog measurement accuracy ± 2.5% at full load.

System Voltage:

System voltage displayed on front panel alphanumeric display. Remote monitoring using SageView. Analog measurement accuracy ± 0.5% .

Remote Reporting:

The software has automatic reporting features whereby a PC running SageView software is contacted via an Ethernet, RS485 line, modem, or RS232 connection in the event of an alarm condition occurring, or at regular daily time. For modem dial-up:

- Up to 3 phone numbers are dialled sequentially until connection made
- Up to 20 digits in each phone number

Network Connection:

Network connection via optional 10BASET interface using TCP/IP protocol is available.

Digital active current sharing

Normal system operation is made with continuous active current sharing of rectifier currents. Accuracy of sharing typically 5% of rated rectifier current (limited by rectifier tolerances).

PROGRAMMABLE PARAMETERS

Rectifier Operating Parameters:

SMR operating parameters are programmable from the Sageon Controller (values written to all rectifiers in system):

- Float and Equalize voltage levels
- Current limit (in 1A steps)
- Active current sharing adjustment (done automatically when: Sageon Controller is powered-up, or a rectifier in the system has been replaced, or at the end of an equalization cycle)

Actual programmed output voltage from SMR is the sum of the Float/Equalize voltage, system voltage drop (user adjustable) and the battery temperature compensation voltage (if active).

Battery Equalization Parameters:

Automatic equalization of the battery with selectable start and end parameters:

Parameter	Range	Steps
24V Systems		
Equalize start voltage	22.0-25.0V	0.1V
Equalize voltage	25.0-30.5V	0.1V
48V Systems		
Equalize start voltage	44.0-50.0V	0.1V
Equalize voltage	50.0-61.0V	0.1V
All Systems		
Equalize start discharge AH	5-99AH	1AH
Equalize time duration	3-48 Hrs	1 Hr
Equalize end battery current	**	1A
Periodic equalize interval	1-52 weeks	1 week

** Current range limits are based on user defined parameters:
=(10% of BatILim3 OR 3% of Sensor FSD) - 20% of Bat. AH

Parameter	Range	Steps
24V Systems		
Deep discharge range limit (Vdd)	20.0-24.0V	0.1V
Float charge range limit (Vfl)	24.0-29.0V	0.1V
48V Systems		
Deep discharge range limit (Vdd)	40.0-47.0V	0.1V
Float charge range limit (Vfl)	48.0-58.0V	0.1V
All Systems		
Battery current limit range below Vdd	5-999A	1A
Battery current limit between Vdd & Vfl	5-999A	1A
Battery current limit above Vfl	5-999A	1A
Battery (V) temp. compensation (BTC)	0-6mV/C/cell	0.1mV
Zero BTC voltage set point temp.	64F-81F (18C-27C)	33.8F (1C)
BTC operating range	50F-95F (10C-35C)	-

LVDS Parameters:

Parameter	Range	Steps
24V Systems Trip level range	20.0-23.5V	0.1V
48V Systems Trip level range	40.0-47.0V	0.1V
All Systems Reconnect level	Vfloat - 1V	-

Other System Parameters:

Parameter	Range	Steps
Batt. current transducer full scale current	10-9990A	10A
Load current transducer full scale current	50-9990A	10A
Batt. current transducer full scale voltage	±4V	-
Load current transducer full scale voltage	+4V	-
Number of batteries	1-4 (4)	1
Load current transducer (activation)	ON/OFF	-
Battery capacity	20-9999AH	1AH

Battery Discharge Test:

Battery Discharge Test performs a periodic, controlled battery discharge using the normal system load to discharge the battery. The test can be used to confirm capacity of the battery and is disabled for 100 hours if AC failure has been recorded. Battery discharge test is a 'safe' test; rectifiers remain on at all times, their output voltages are simply set lower than the battery voltage.

Parameter	Range	Steps
BDT Period (Days)	Off, 1 - 365	1 day
BDT Time (24 Hour Format)	00:00-23:59	1 min
BDT Duration (Hours:Minutes)	0:05-24:00	5 min
BDT Current	0–5000A	1A
BDT End Capacity (Q)	25–9995AH	5AH
24V Systems		
BDT End Voltage	18–24V	0.1V
48V Systems		
BDT End Voltage	36–48V	0.1V

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