Powering Business Worldwide

SC300 System Controller Operation Handbook

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About This Guide

Scope

This guide covers operation of the SC300 system controller.

See SC300 Identity Information on page 17 to determine the version of the embedded software.

Audience

This guide is intended for use by:

- Installers competent in:
  - installing and commissioning dc power systems
  - safe working practices for ac and dc powered equipment
  - the relevant local electrical safety regulations and wiring standards
- Operators and maintenance staff competent in:
  - operation of dc power systems
  - safe working practices for ac and dc powered equipment

Related Information

- *PowerManagerII* Online Help
- SiteSure-3G Installation and Operation Guide – IPN 997-00012-51
- SC300 Secure Configuration Guidance *Available on request from Eaton.*

Reporting Problems with this Guide

Please use this email address to report any problems you find in this guide:

Eaton DC Product Marketing Communications
EMAIL: DCMarketingNZ@eaton.com

For Further Information and Technical Assistance

For further information and technical assistance see Worldwide Support on page 159.

Third Party Software

This product includes cryptographic software written by Eric Young (eay@cryptsoft.com).

This product includes software developed by the OpenSSL Project for use in the OpenSSL Toolkit (http://www.openssl.org/).

End User License (EULA)

Use of the SC300 and associated software is subject to the EULA. Refer to page 150 for the full text.

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General Description

Overview

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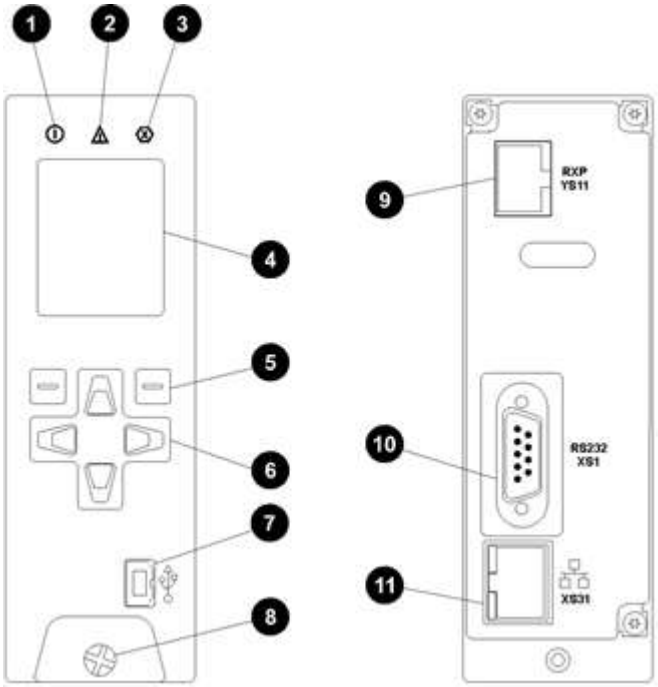
SC300 System Controller

The SC300 system controller is an advanced control and monitoring solution which provides a full suite of communications options, including built-in Ethernet interface, Web server, Modbus, and SNMP agent.

Alarm notifications may be by Email, SNMP traps, SMS text messaging, dial-out to PowerManagerII remote monitoring software, or relay contact closures.



1. Power on LED (green)
2. Minor alarm LED (yellow)
3. Critical/Major alarm LED (red)
4. Color LCD
5. Soft keys (2)
6. Navigation keys (4)
7. Micro USB type AB connector
8. Retaining screw
9. Power and system communications connector
10. RS-232 / RS-485 connector (RS-485 some versions only)
11. Ethernet connector (100baseT) and status LEDs

The SC300 is supplied pre-configured with either a default configuration file, or with one factory customized for a particular application. Some configuration file changes can be made with the keypad, or all settings can be changed via a PC connected to the SC300 through a network or the USB interface (see details on page 23).

For connector pin-outs see details on page 137. See Troubleshooting on page 122 for details of SC300 alarm LEDs.

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Input/Output Board

The Input / Output (I/O) board provides the I/O interfaces and connections for the SC300 system controller.

The I/O board includes a range of sense inputs for dc power system control and monitoring. It also allows real time data collection from building services and other external devices, and relay outputs for alarm signals or control of external devices.

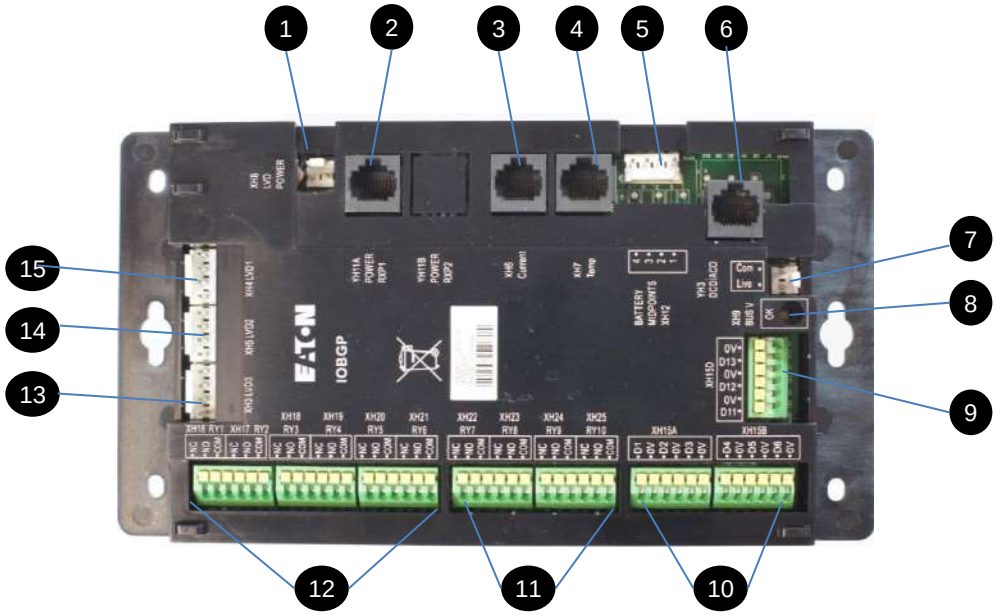
The I/O functions are:

Sensors:	Current - 3, Bus voltage - 1, Temperature - 2, Battery Mid-point - 4
Input/Output:	Digital inputs: 4 pre-defined system functions, 6 / 9 user-defined Relay outputs: 6/8/10 (one also used as Monitor OK alarm) LVD contactor outputs: 2 or 3

For input and output specifications see details on page 129. For connector pin-outs see details on page 138.

IO Board options include:

IOBGP-00	Uncased, 2 x LVD, 6 x relay, 6 x user DI
IOBGP-01	Cased, 2 x LVD, 6 x relay, 6 x user DI
IOBGP-10	Uncased, 3 x LVD, 10 x relay, 9 x user DI
IOBGP-11	Cased, 3 x LVD, 10 x relay, 9 x user DI
IOBGP-20	Uncased, 2 x LVD, 8 x relay, 9 x user DI
IOBGP-21	Cased, 2 x LVD, 8 x relay, 9 x user DI



1. LVD power input connector - XH8
2. Power and RXP comms input - YH11
3. Current sense inputs (3) - XH6
4. Temperature sense inputs (2) - XH7
5. Battery Mid-point Monitoring sense inputs - XH12
6. DC power system digital inputs (4 pre-defined: Load Fuse Fail, Battery Fuse Fail, AC Distribution Fan Fail, AC Distribution MOV Fail) - YH3
7. Bus voltage sense input - XH9
8. Power/Comms OK LED (green)
9. Digital inputs D11-D13 (3 user defined) – XH15D *IOBGP-10/11/20/21 only*
10. Digital inputs D1-D6 (6 user defined) - XH15A, XH15B
11. Digital (relay) outputs RY7-RY10 (4) – XH22-XH25 *IOBGP-10/11/20/21 only*
12. Digital (relay) outputs RY1-RY6 (6) – XH16-XH21
13. LVD contactor 3 connector (XH3) and status LED (green)
14. LVD contactor 2 connector (XH5) and status LED (green)
15. LVD contactor 1 connector (XH4) and status LED (green)

See Troubleshooting on page 122 for details of I/O board LED signals.

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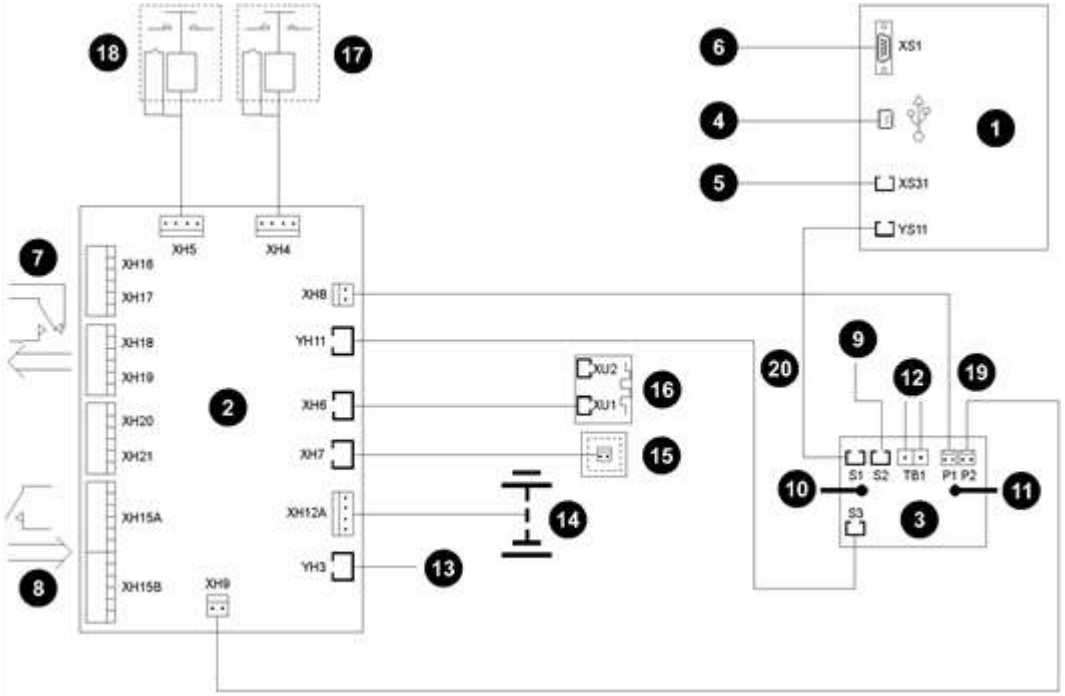
Connections

The following diagram shows the connections between the SC300, the I/O board, the other dc power system components and external devices, for the IOBGP-00. Other I/O board options have additional digital inputs, outputs, and an extra LVD.



1. SC300 system controller
2. I/O board (IOBGP-00/01 shown)
3. Voltage feed module
4. USB communications
5. Ethernet communications
6. RS-232 / RS-485 communications
7. Digital relay outputs to external devices and/or alarm indication system
8. Digital inputs from external voltage-free switches or relay contacts
9. Connection to additional I/O board(s) and/or SiteSure-3G I/O module(s)
10. Connection to dc common bus
11. Connection to dc live bus
12. Communications to rectifiers
13. DC power system digital inputs (Load Fuse Fail, Battery Fuse Fail, AC Distribution Fan Fail, AC Distribution MOV Fail)
14. Connections for battery mid-points / quarter points (4)
15. Connection for temperature sensors (2)
16. Connection for current sensors (3)
17. Connection for LVD contactor and auxiliary switch
18. Connection for LVD contactor and auxiliary switch
19. Bus voltage sense and LVD power connections
20. I/O and system controller power and RXP comms connections

For connector pin-outs see details on page 138. For input and output specifications see details on page 129.

Compatible Software

The following software is compatible with the SC300 system controller:

- PowerManagerII Remote Control and Monitoring Software. Contact your Eaton dc product supplier for further information (see Worldwide Support on page 159).
- Recommended web browsers: Microsoft Internet Explorer 11[1] or later, Mozilla Firefox 3.0 or later.
- Any SNMP management tool or network management software
- Any Modbus master, such as a Building Management System (BMS).

[1] Internet Explorer 10 / 11: Ensure that Compatibility Mode is turned off (*Tools > Compatibility View Settings)*

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Starting the SC300

When dc power is applied to the SC300 (via the RXP connector YS11) the start-up sequence begins:

Start-up screen

→ Approx. 30s

Main screen

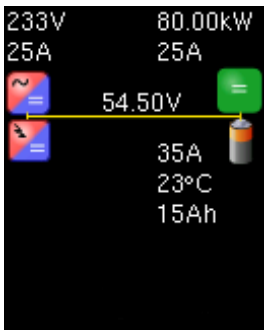
→ Menu

← Esc

Menu screen

↓ Summary

↑ Esc



Summary screen

The values shown on the Main Screen are configurable. See details on page 14. All active Critical, Major, Minor and Warning alarms are displayed.

See navigation details on page 11.

If Logon is required see Keypad Access Security on page 13.

The display will appear some time before rack control starts and remote communications is enabled. This is a different sequence to the SC200.

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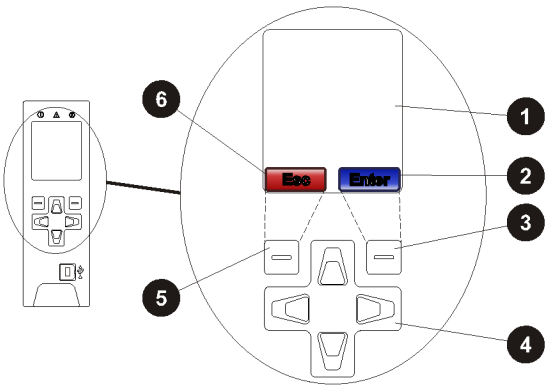
Main Screen Shortcut Keys

Key	Function
	From the Main Screen go directly to the *Alarms* screen.
	From the Main Screen go directly to the *Settings* screen.
	From the Main Screen go directly to the *Control Processes* screen.
	From the Main Screen go directly to the *Analogs* screen.

SC300 Operation using the Keypad and Screen



1. LCD
2. Soft key 1 label
3. Soft key 1
4. Navigation keys (Up - Down - Left - Right)
5. Soft key 2
6. Soft key 2 label

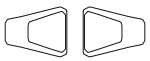
Soft Keys

The function of the soft keys is indicated by the corresponding labels on the LCD screen. The following table shows the most common labels and key functions.

Label	Key function
	Go to menu screen. See details on page 11.
	Go back to parent menu screen.
	Go to sub-menu or configuration screen*.
	Save a new configuration setting*.
	Ignore a new configuration setting*.
	From the Main Screen, go to the Summary Screen

* See Changing a Configuration Setting on page 13.

Navigation Keys

Key	Function
	• Move up/down in the menu screen. See details on page 11. • Move up/down in a list (hold to go to the top or bottom of the list). • Select options in a configuration screen. • Increase/decrease a value in a configuration screen. • From the Main Screen, press up arrow to go to *Active Alarms*, and down arrow to go to *Setup.*
	• Move left/right in the menu screen. See details on page 11. • Move left/right between tabs in *Rectifiers*, *Alarms*, *Battery* or *Settings* menus. • Move left/right between segments of a multiple segment value in a configuration screen. • From the Main Screen, press left arrow to go to *Control Processes*, and right arrow to go to *Analogs*.

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Main Menu Navigation

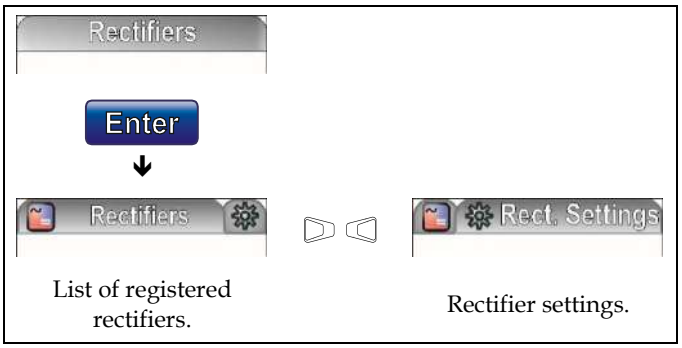
At each menu screen press *Enter* to access the associated configuration menu screen(s).

> *These menus have multiple configuration menu screens. See details on page 12.*

Sub-menu Tabs

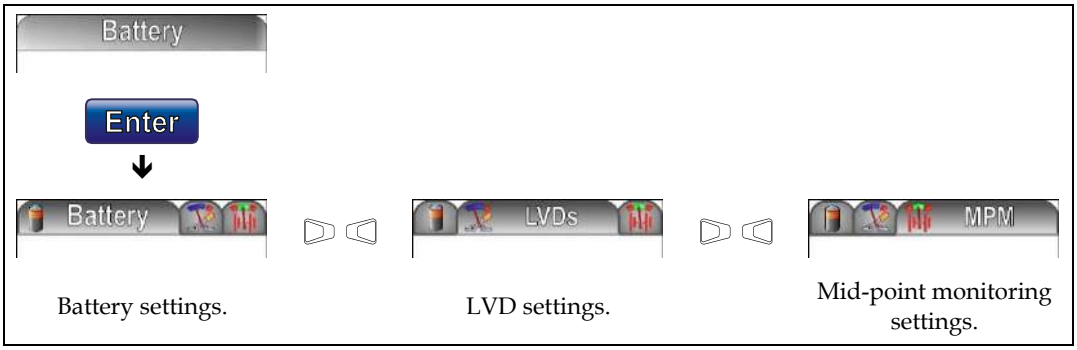
The following menu screens have sub-menus accessed via tabs at the top of the screens.

Rectifiers Sub-menus

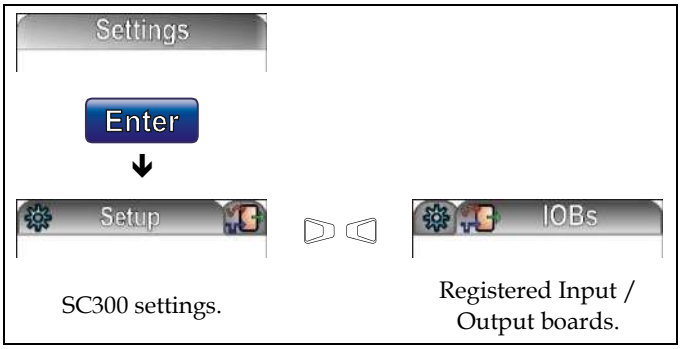


Alarms Sub-menus

Battery Sub-menus



Settings Sub-menus



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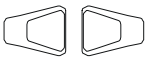
Changing a Configuration Setting using the Keypad

For the configuration settings that can be changed using the keypad, the keys have the following functions.

Edit	Press to change the setting or activate a control process.
	Press to change the value. Hold key to change at a faster rate.
	Use these keys for values with multiple segments (for example an IP address).
Save Or	Press to save the new value.
Cancel	Press to leave the value unchanged.

Keypad Access Security

This feature prevents accidental or unauthorized changes to settings from the SC300 keypad.

All access to change an SC300's settings will be lost if:

- All communications are disabled (see S3P Access on page 117 and HTTP/HTTPS Access on page 118), and
- Keypad access is *Read Only*, or *PIN Protected* and the keypad access PIN is lost.

The SC300 will continue to function, but no configuration changes can be made. Contact your Eaton dc product supplier or Eaton for advice (see Worldwide Support on page 159).

► To use Web / DCTools to enable/disable keypad access

- In Web go to *System* > *Interfaces* > *Front Panel*.
- In DCTools, go to *Configuration* > *Communications* > *Front Panel*.
- Set *Access* to:
  - *Unprotected* - keypad access is allowed to view and change parameters, or
  - *Read Only* - keypad access is allowed to view parameters only, or
  - *PIN Protected* - keypad access is allowed to view and change parameters if the correct 4-digit number is typed in the *Access PIN* field. Otherwise, *Read Only* access is allowed.

► To use the SC300 when access is set to PIN Protected

- At the Main Screen press *Menu*. The *Logon* screen appears.
- If the *Access PIN* is not known then press *Skip* to use the SC300 with *Read Only* access.
- If the *Access PIN* is known:
  - Use the Left and Right keys to access each digit position. Use the Up and Down keys to change the digits.
  - When the correct digits are entered, press *Logon*.

Keypad access will return to PIN Protected mode when the display returns to the Main Screen.

Display Settings

► To change the display contrast

- Use the keypad to go to: *Settings* > *Setup* > *Contrast* > *Edit*.

► To change the display language

- See Language Options on page 21.

► To change the display orientation (horizontal/vertical)

Either:

- Use the keypad to go to: *Settings* > *Setup* > *Orientation* > *Edit*.
- Select the required orientation (vertical, horizontal-left or horizontal-right). Press *Save.*

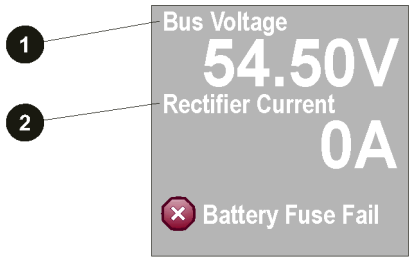
Or:

- In Web go to: *System* > *Interfaces*> *Physical Ports* > *Front Panel*.
- In DCTools, go to *Configuration* > *Communications* > *Front Panel* > *Physical Mounting*.
- Select the required orientation (vertical, horizontal-left or horizontal-right). Click *Apply.*

  The functions of the navigations keys also change to suit the new display orientation.

Main Screen Parameters

The parameters displayed on the SC300 main screen are configurable. Either two large or three small parameters can be displayed. The default settings are two large parameters with the values *Bus Voltage* and *Rectifier Current*.



1. Value 1
2. Value 2

► To change the parameters displayed on the main screen

Either:

- Use the keypad to go to: *Settings* > *Setup (tab)* > *Display Settings* > *Main Screen Layout.*

Or:

- In Web go to: *System* > *Interfaces* > *Physical Ports* > *Front Panel*.
- In DCTools, go to *Configuration* > *Communications* > *Front Panel.*
- Set *Main Screen Layout* to *Two Large* or *Three Small.*
- Select the required parameters (see Note 1) for *Value 1* and *Value 2 (*and *Value 3* if *Three Small* is selected).
- For each of *Value 1/2/3 Units*, select *No Units*, e.g. Battery Temp. 25, *With Value*, e.g. Battery Temp. 25°C, or *With Label*, e.g. Battery Temp. (°C) 25.
- If any of *Analog Input, Energy Meter, Power Meter, Current Meter, Voltage Meter or Smart Analog* are selected as a display parameter, then also select a value for *Value 1/2/3 Index*. See Note 2.

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Notes:

1. The parameters available are: *Bus Voltage, Rectifier Current, Load Current, Battery Current, Battery Temperature, Load Power, System Power, Analog Input, Ah Discharged, Energy Meter, Power Meter, Current Meter, Smart Analog, Alternative Source Current, Solar Power, Generator Power*.
2. If *Analog Input, Energy Meter, Power Meter, Current Meter, Voltage Meter or Smart Analog* is selected as a display parameter, then also select a value for *Value 1/2/3 Index*. This value is the number of the meter or input from the appropriate table.

Display Time-out

If there is no keypad activity for 60 seconds the display will go back to the main screen.

Alarm Indicators

Visual indicators

	Power on LED (green)
	Minor Alarm LED (yellow)
	Critical/Major Alarm LED (red)
???	The system value cannot be displayed because of a failed, disconnected or unconfigured sensor.

Audible indicator

- One beep – indicates an invalid key press
- Three beeps every 2 seconds – refer to the alert message on the display
- One beep every 2 seconds – Minor alarm is active
- Continuous sound – Critical/Major alarm is active

Critical/Major alarms always override Minor alarms.

► To stop the audible indicator

- Press any key

The audible indicator will restart at the next active alarm or alert message.

► To enable/disable the audible alarm indicator

Either:

- Use the keypad to go to: Alarms > Alarm Settings (tab) > Audible Alarms > Edit.

Or:

- In Web go to: *System* > *Interfaces*> *Physical Ports* > *Front Panel.*
- In DCTools, go to *Configuration* > *Communications* > *Front Panel.*

When Disabled, the audible indicator will still indicate an invalid key press.

SC300 Operation Using a PC/Laptop

DCTools is configuration software for editing a system controller's configuration file (on-line) and monitoring the operation of Eaton's dc power systems. It is available free from dcpower.eaton.com/downloads.

DCTools can be run on a PC/laptop connected to the SC300's USB port.

DCTools can also be run on a remote PC/laptop connected to the SC300's RS232 serial port (via a modem) or Ethernet port. For remote PC/laptop connection details see Communications Options on page 104.

Before you start you will need:

- The latest version of *DCTools* available from dcpower.eaton.com/downloads.
- A PC/laptop with USB port and USB micro cable .

  The USB micro cable is the same as used with many smart phones.

► To connect a PC/laptop to the SC300:

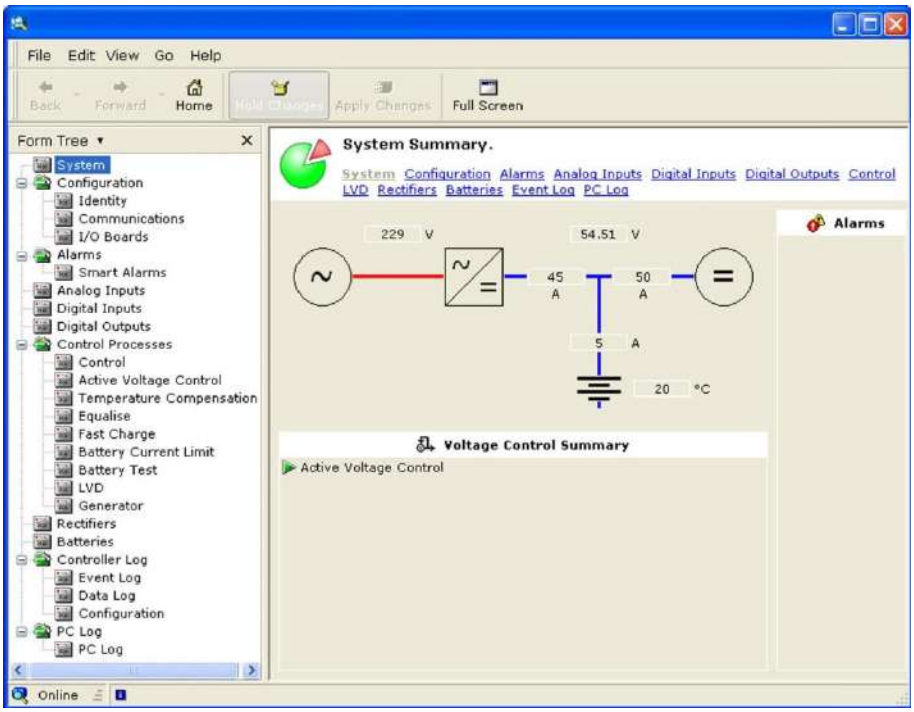
1. Download the latest version of *DCTools* from dcpower.eaton.com/downloads.
2. Install *DCTools* on the PC/laptop.
3. Connect a USB micro cable from a USB port on the PC/laptop to the USB port on the SC300.

   See the diagram on page 2 for location of the USB port.

   Do not connect USB to the SC300 before start-up. This will cause start-up to become very slow.
4. *DCTools* will now connect to the SC300.

   If connection is not successful refer to DCTools Help (press F1) or Troubleshooting on page 122.
5. For details of the SC300 control and monitoring functions available via *DCTools see* System Operation on page 25.

   For help using DCTools press F1.



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SC300 Identity Information

The following identity information is stored in the SC300.

Parameter	Description	Where to find:
Serial Number	The SC300 serial number (factory set).	SC300: Info Web: Identity > Software DCTools: Configuration > Identity > Software
Software Version (App Version)	The version of the embedded software in the SC300 (factory set).	

If required, the following site specific information can be stored in the SC300 to assist site management.

Parameter	Description	Where to find:
System Manufacturer	The manufacturer of the dc power system.	Web: Identity DCTools: Configuration > Identity
System Type	The dc power system model number.	
System Serial Number	The dc power system serial number.	
System Location	Location of dc power system at the site.	
Map Coordinates	Longitude and latitude. When these values are entered, a web browser will show these coordinates on a map (using Google Maps).	
Site Name	Name of the site.	
Site Address	Address of the site.	
Site Building	The building name.	
Site Room	The equipment room name.	
Site Contact	Contact details for the person in charge of the site.	
Site Support Contact	Details of the person supporting this equipment.	
Site Notes	Any notes relevant to site access, location or other matters.	
Configuration Name	A name that can be entered for the configuration file. *This name is automatically loaded if the user selects a Generic System Type, or when a configuration file is loaded from web or DCTools.*	

The following configuration information is automatically stored by the SC300:

Parameter	Description	Where to find:
Master Configuration[2]	The name of the configuration file that was last loaded into the SC300 by web interface or DCTools. A version number (such as "87668" is attached) to assist tracking of changes.	Web: Identity DCTools: Configuration > Identity
Configuration Version	A unique number that is changed whenever this configuration is updated.	
Configuration Modified	This is ticked when any settings have been changed from the last loaded configuration file.	

[2] If the current configuration is corrupted for any reason, the SC300 will revert to this configuration.

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Generic System Types

If the user does not have a suitable configuration file for a new SC300, or he/she needs to change the operating voltage of a system, then the Generic System Types may be used as a starting point.

To select a Generic System Type, in web go to Identity > Software and select an appropriate type.

Suitable settings are then loaded into the SC300.

- *Master Configuration* takes settings back to the last configuration loaded by web or DCTools. This is useful where settings have been incorrectly changed.
- *Factory* wipes settings and resets to the normal ex-factory settings.
- *APS48V / APS24V / EPS48V LVD and EPS48V only load settings that are specific to that voltage or system type. Other settings are left unchanged.*

	The settings loaded using *Generic System Type* may not be suitable for all systems. Where possible, obtain the appropriate configuration file. After selecting a *Generic System Type*, check system operation.
	If the original configuration is corrupt or unknown, this procedure should be followed: 1. Load the Factory configuration 2. Load the appropriate Generic system type.

These are the currently available Generic System Types:

Generic System Type	Action
Unknown	No effect; does not change settings.
Factory	Loads the standard factory settings, except that IP addresses are not changed.
Master Config	Re-loads the last configuration file loaded by DCTools or web and saved by the SC300.
APS48V	Loads standard 48V positive earth settings. Set for 1 LVD only.
APS24V	Loads standard 24V negative earth settings Set for 1 LVD only.
EPS 48V LVD	Loads a standard 48V positive earth settings. Includes an LVD.
EPS48V	Loads a standard 48V positive earth settings. No LVD.

Configuration item:

Parameter	Description	Where to find:
Generic System Type	If a suitable configuration file is not available, select the appropriate system type here. This will load suitable settings into the SC300. *Note: ensure all settings are appropriate for the application.*	Web: Identity > Software DCTools: Configuration > Identity > Software

SC300 Internal Clock

The SC300 has a battery-backed clock for time stamping of log entries and Control Processes.

The time and date is factory set. It can also be set manually using a web browser or can be synchronized (either to a PC clock using DCTools or to an SNTP reference time server).

> *"Hardware time" is an internal value used for diagnostics. It should normally be very close to Controller Time.*

► To view the SC300 time

Either:

- Use the keypad to go to: *Info*.

  > *This time is shown as Universal Coordinated Time (UTC). Web and PowerManagerII convert local PC time to/from UTC for the SC300. For practical purposes UTC is equivalent to Greenwich Mean Time (GMT).*

Or:

- In Web go to: *System* > *Controller Time*.
- In DCTools go to: *Configuration* > *Time*.

  > *This time is set to the SC300 time adjusted to the time zone set in the PC.*

► To set the time using web

1. Connect to the SC300 via a web browser. (See Ethernet Communications on page 104.)
2. Go to *System* > *Time*.
3. Click on the time-date field to select the text.
4. Select the time or date text to be changed and type the correct time/date. *Note: The editing format is not the same as the display format. Enter the new date / time in the format yyyy-mm-dd hh:mm:ss.*
5. Press *Enter* on the keyboard. Then select *Apply* in the *Changes* window.

Time Synchronization

If required, the SC300 time can be synchronized either to the internal time of a PC or laptop, or to a reference time server using SNTP protocol (SC300 must have access to the server).

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► To synchronize the SC300 time using *DCTools*

1. Ensure the time on the PC is correct before synchronizing.

   PowerManagerII can be set to automatically synchronize SC300 clocks.

2. Connect to the SC300 with *DCTools.* (See Communications Options on page 104.)
3. Go to *Configuration* > *Time.*
4. Click *Synchronise* to synchronize the SC300 time to the PC/laptop time.

   DCTools, Web and PowerManagerII convert local PC time to/from UTC for the SC300.

► To synchronize the SC300 time using SNTP

For more information on SNTP, including a list of public SNTP servers, visit www.ntp.org http://www.ntp.org.

Ensure that your network has an internal SNTP server or allows access to an external server. It may be necessary to configure access through your network's firewall.

1. Web: go to *System* > *Time* > *SNTP.*
2. DCTools: go to *Configuration* > *Time* > *SNTP.*
3. Set the following parameters:

Primary Address	IP address of primary SNTP server.
Backup Address	IP address of backup SNTP server.
UDP Port	Assigned by the time server administrator.
Poll Interval	The time between synchronizations.

The time will update a few seconds after any SNTP parameter change.

Internal clock battery

The SC300 uses an internal lithium battery to keep the clock running while the SC300 is not powered up. Predicted life is at least three years. Life depends on the time the SC300 is not powered up, temperature, and battery age.

This battery is monitored by the SC300.

To check the state of the battery:

- Web: go to *Identity* > *Software*.
- DCTools: go to *Configuration* > *Identity*.

Internal Battery Voltage provides a relative indication of battery health, not an exact voltage. A good battery should read at least 100.

If the Internal Battery Voltage is less than 100, then the SC300 will still continue to work correctly and time will be correct until power is lost.

To change the clock battery, please contact your Eaton DC power representative for advice.

Language Options

The SC300 system controller language default is English. Text on the LCD and web pages (see details on page 106) can be shown in other languages by loading the appropriate Translation File (SC300-xx-Vyyy.icp) into the SC300.

Contact Eaton for available Translation Files (see Worldwide Support on page 159).

► **To add a new SC300 display/web page language:**

1. Obtain the appropriate Translation File (SC300-xx-Vyyy.icp) from Eaton.
2. Save the file.
3. Connect to the SC300 via an Ethernet connection. See Communications Options on page 104.
4. Open a web browser and browse to the SC300 IP address.
5. Go to *Tools* > *Firmware Upgrade*.
6. Click on *Browse* and select the Translation File (SC300-xx-Vyyy.icp).
7. Click on *Next* then follow the prompts to add the language.

Language selection

An SC300 can hold multiple language files and any of these can be selected for the LCD and Web pages. English is always available; other languages can be loaded as needed.

► **To see which languages are loaded into an SC300**

Either:

- On the SC300 keypad go to: *Settings* > *Language* > *Edit*.

Or:

- Connect to the SC300 via an Ethernet connection. See Communications Options on page 104.
- On the *Log On* web page, there is a flag icon for each language option available.
- If no flag appears, only English is loaded.

► **To select a new language for the Web pages**

- On the *Log On* web page, click on the flag icon for the language you require.
- The web pages will change to this language.

► **To select a new language for the SC300 display**

Either:

- On the SC300 keypad go to: *Settings* > *Language* > *Edit*.
- Select the required language and press *Save*.

Or:

- In Web go to *Communications* > *Front Panel*.
- In DCTools, go to *Configuration* > *Communications* > *Front Panel.*
- Type the two letter language code in the *Language Code* field.

This code is the "xx" in the file name of the Translation File (SC300-xx-Vyyy.icp). For example: zh = Chinese. Clear the Language Code field (blank entry) to revert to English.

- Click *Apply Changes*. The display language will change.

The message "Waiting for database to become available for update ..." may display for a few seconds.
If an incorrect or unavailable language code is used the display language will remain/revert to English.

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SC300 Firmware Upgrade

If required, the embedded software (firmware) in the SC300 can be upgraded from a PC/laptop via a web browser.

► **To use a web browser for a Firmware Upgrade**

1. Connect to the SC300 via a web browser. (For details see Ethernet Communications on page 104.)
2. Check the SC300 internal clock shows the correct time. If necessary set the correct time. See SC300 Internal Clock on page 19.
3. Go to *Tools*.
4. Select *Firmware Upgrade: Launch*.
5. Select the file (*.icp). Click *Next*, then click *Proceed*.

Some configuration settings may be lost when the firmware in the SC300 is upgraded. Refer to the new firmware Product Release Notes for details of specific configuration settings that are affected. Check the configuration after upgrading.

Before starting the upgrade, back up any changes to the configuration.

Configuration File

The operational settings of the dc power system are stored in a configuration file loaded into the SC300 system controller.

The SC300 is supplied pre-loaded with a configuration file. If this configuration file has been customized for the site then no further configuration changes will be necessary.

Otherwise, it is important that the settings of this configuration file are checked and changed as required for site-specific conditions. In particular, settings that may affect the performance and life expectancy of the battery must be checked and set according to the battery manufacturer's recommendations.

Some settings in the configuration file can be edited using the system controller's keypad (see details on page 9), or all settings can be edited using a PC/laptop with DCTools (see details on page 16) or remotely, see Communications Options on page 104.

The configuration file settings in the SC300 can be saved to (Backup) or loaded from (Restore) a PC/laptop using Web or DCTools. See Backup and Restore on page 23.

Refer to SC300 Identity Information on page 17 for more information on configuration settings and values.

Backup and Restore

The configuration file settings in the SC300 can be saved to (Backup) or loaded from (Restore) a PC/laptop using Web or DCTools.

Backup and Restore can be used to:

- Load a standard (master) configuration file into an SC300 for customization.
- Copy a customized configuration file from one SC300 to others (at similar sites).
- Save a copy of a customized configuration file. This is recommended in case the SC300 has to be replaced.

► **To use Web for Backup**

1. Connect to the SC300 via a web browser. For details see Ethernet Communications on page 104.
2. Go to *Tools*.
3. Select *Backup Tool*.
4. Select the file type:
   - **System Snapshot (*.dcs):** Configuration file including site specific settings.
   - **Configuration (*.dcc):** Configuration file without site specific settings - Site Identity, IP Address, S3P Address, battery characterization data).
5. Click *Proceed* to back up the configuration.

► To use Web for Restore

1. Connect to the SC300 via a web browser. For details see Ethernet Communications on page 104.
2. Go to *Tools*.
3. Select *Restore Tool*.
4. Select the file type:
   - **System Snapshot (*.dcs):** Configuration file including site specific settings.
   - **Configuration (*.dcc):** Configuration file without site specific settings - Site Identity, IP Address, S3P Address, battery characterization data).
   - **Fragment (*.dcf):** Restore part of a configuration file (such as battery characterization data).
5. Click *Next*, and then select a file name to *Restore* a configuration.

► To use DCTools for backup and restore

1. Connect to the SC300 with DCTools. See Communications Options on page 104.
2. In DCTools go to *File* > *ICE Backup/Restore* and follow the prompts.

The saved file does not include site specific settings including Site Identity, IP Address, S3P Address, battery characterization data.

► To load configuration files from SC200 or older SC300 versions

This is useful when it is required to update an SC200 configuration file to use in an SC300.

*Passwords are **not** copied from the SC200. These will need to be re-entered.*

Loading an older configuration file does not clear new configuration items. This means that new items could possibly be set to inappropriate values.
Unless the SC300 is new (in which case the configuration items are set to safe defaults), it is highly recommended to clear the new SC300 items to defaults using this process:

1. In web or DCTools, go to *Identity* > *Software.*
2. Set *Generic System Type* to *Factory*, and apply this change.
3. Restore the old configuration using the web or DCTools as above. The older configuration is automatically updated to SC300 format and loaded.
4. Check the SC300 settings and operation.
5. Backup the new SC300 configuration file using the process above.

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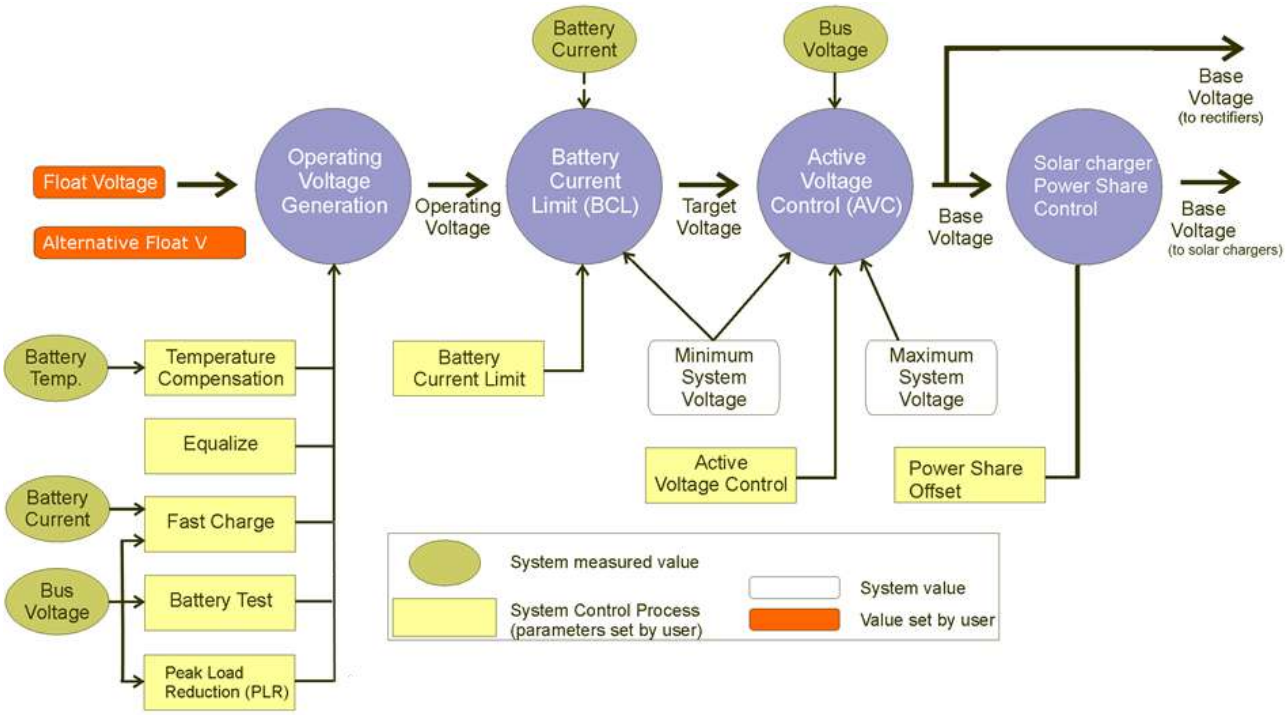
Voltage Control

The output voltage of the rectifiers is controlled by a number of control processes. The following diagram shows the various control processes, measured values and operating values that determine the rectifier output voltage.

If ac fails then any active control process stops. No control process can start until the ac supply is restored.



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Float Voltage

Float voltage is the standard output voltage of the system. This may be modified by the various control processes.

Configuration

Set the following parameter.

Parameter	Description	Where to find:
Float Voltage	Set to the voltage required to maintain optimum battery charge (at the nominal ambient temperature*) as specified by the battery manufacturer. The bus voltage may be adjusted above or below this value by the System Control Processes. **This is the same as the Reference Temperature used by Temperature Compensation. See details on page 35.*	SC300: Control Processes > Voltage Control > Float Voltage Web: Control Processes > Voltage Control DCTools: > Voltage Control
Alternative Float Voltage	When *Alternative Float Smart Alarm* is active, the float voltage is changed to this value.	
Alternative Float Smart Alarm	When *Alternative Float Smart Alarm* is active, the float voltage is changed to *Alternative Float Voltage.*	

The system voltage is limited by maximum and minimum values. The values are viewable in DCTools/Web at Control Processes > Voltage Control. These values are not configurable by Web or DCTools. If these must be changed, contact your Eaton representative for access to ICE software.

Alternative Float Voltage

Alternative Float Voltage is an alternative operating voltage that can be used in particular circumstances, particularly when a special battery charging regime is used.

When *Alternative Float Smart Alarm* is active, *Alternative Float Voltage* will be used instead of Float Voltage.

Configuration

Set the following parameters.

Parameter	Description	Where to find:
Alternative Float Voltage	When *Alternative Float Smart Alarm* is active, the float voltage is changed to this value.	SC300: Control Processes > Voltage Control > Float Voltage Web: Control Processes > Voltage Control DCTools: > Voltage Control
Alternative Float Smart Alarm	When *Alternative Float Smart Alarm* is active, the float voltage is changed to *Alternative Float Voltage.*	

The system voltage is limited by maximum and minimum values. The values are viewable in DCTools/Web at Control Processes > Voltage Control. These values are not configurable by Web or DCTools. If these must be changed, contact your Eaton representative for access to ICE software.

Active Voltage Control (AVC)

Active Voltage Control maintains a constant float voltage under varying load current by monitoring the bus voltage and adjusting the rectifier output voltage to compensate for any voltage drop. This prevents undercharging the batteries during high load demand.

AVC controls both AC rectifiers and solar chargers, so that the same bus voltage is maintained, irrespective of the energy source.

► To enable Active Voltage Control

- Use the SC300 keypad to go to: Control Processes > Voltage Control > AVC.
- Or, in DCTools/Web go to: Control Processes > Voltage Control > Active Voltage Control.

Active Voltage Control is normally enabled. Only disable it if there are particular reasons.

Information

The following information is available about AVC.

Parameter	Description	Where to find:
State	Indicates if AVC is active or inactive.	Web/DCTools: Control Processes > Active Voltage Control
Target Voltage	AVC will set the Base Voltage to attempt to maintain the bus voltage to this value.	
Voltage Offset	The difference between the Base Voltage and the Target Voltage.	

Battery Current Limit (BCL)

Battery Current Limit automatically limits the battery recharge current to:

- Prevent excessive battery charge current in under-loaded systems
- Minimize gas release in VRLA batteries
- Reduce the load on a standby generator.

Two current limit values can be set (both are a percentage of the C10 rating of the battery):

Battery Current Limit (Normal Limit): BCL value for use when utility ac is available.

Engine Run Limit (optional): BCL value for use when ac is supplied by a standby generator. This reduces the load on the generator and allows a smaller generator to be used.

Engine Run Limit applies when the SC300 determines that an ac standby generator is running. If an Engine Run Digital Input is available (see below), then the SC300 uses this to determine if the generator is running. If an Engine Run Digital Input is not available then the SC300 uses other values to determine if the generator is running.

► To enable BCL

- Use the SC300 keypad to go to: *Control Processes* > *Battery Current Limit.*
- Or, in DCTools/Web go to: *Control Processes* > *Battery Current Limit*.

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► **To activate Engine Run BCL**

- If an Engine Run Digital Input is required, connect a voltage free relay contact (that will operate when the standby generator starts) to a Digital Input.
- In Web/DCTools go to *Digital Inputs*.
- Configure the selected Digital Input and set *Function* to *Engine Run*.
- In Web/DCTools go to *Control Processes* > *Battery Current Limit* and set the *Engine Run Limit*.

Information

The following information is available about BCL.

Parameter	Description	Where to find:
State	Indicates if BCL is active or inactive.	SC300: Control Processes > Battery Current Limit. DCTools/Web: Control Processes > Battery Current Limit
Engine Run State	Indicates if Engine Run BCL is active.	DCTools/Web: Control Processes > Battery Current Limit
Voltage Offset	The bus voltage adjustment made by Battery Current Limit is applied to the Operating Voltage to produce the Target Voltage. Target Voltage is used as the input to the AVC function.	

Configuration

Set the following parameters.

Parameter	Description	Where to find:
Battery Capacity	Set to the rated 10 hour capacity of the installed battery strings. Zero means no battery is installed.	SC300: Battery > Battery > Battery Capacity DCTools/Web: Batteries
Normal Limit	BCL maintains the battery current below this value, which is a percentage of the installed C10 Battery Capacity.	DCTools/Web: Control Processes > Battery Current Limit
Engine Run Limit	The Battery Current Limit setting when Engine Run State is active.	

Battery Test

Battery Test is a preventative maintenance tool that monitors the discharge capabilities to ensure that the condition of the battery has not deteriorated over time.

The SC300 temporarily reduces the output voltage of the rectifiers to just below the bus voltage for a set duration. The battery then supplies power to the load. A battery test passes if the battery voltage remains above a predetermined level for the duration of the test.

Battery Tests can be scheduled to occur at regular intervals, and/or can be started/stopped manually, and/or can be started by an external relay contact or switch.

- *Battery Test does **NOT** function during a Fast Charge or Equalize, or during the lock-out period after an ac supply failure.*
- *If a Digital Input has the function "Start Battery Test" then a Battery Test will start when the Digital Input becomes active.*

► To enable Battery Test (or to start or stop a test manually)

- Use the SC300 keypad to go to: *Control Processes* > *Battery Test*.
- Or, in DCTools/Web go to: *Control Processes* > *Battery Test*

► To use an external relay contact to activate a Battery Test (optional)

- Connect a voltage free relay contact or switch to any Digital Input.
- In DCTools/Web go to *Digital Inputs*.
- Configure the selected Digital Input and set *Function* to *Start Battery Test*.

Information

The following information is available about Battery Test.

Parameter	Description	Where to find:
State	Indicates if Battery Test is disabled, locked-out, active or inactive.	SC300: Control Processes > Battery Test DCTools/Web: Control Processes > Battery Test
Next Start Time	The start time of the next scheduled Battery Test. *Time shown on SC300 is UTC. Time on PC running DCTools/Web is local time. See SC300 Internal Clock on page 19.*	
Remaining Time	The time to the end of the currently active Battery Test.	
Battery Test Lockout Remaining	The time remaining until a Battery Test can be started. Battery Tests cannot be started within 48 hours of an ac supply failure. Lockout can be disabled by temporarily setting *Interval* to 0d.	
Voltage Offset	The adjustment to the bus voltage being applied due to the Battery Test. While a Battery Test is running, the rectifiers are turned down to force the battery to carry the load.	

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Configuration

Set the following parameters.

Parameter	Description	Where to find:
First Start Time	The date and time that the first battery test cycle will occur. Subsequent tests will occur at every Battery Test Interval after that.	SC300: Control Processes > Battery Test DCTools/Web: Control Processes > Battery Test
Interval	The time between scheduled battery tests. The interval period begins at the start of a battery test. Zero disables scheduled battery tests. Zero also disables the 48 hour lockout following an ac supply failure, allowing an immediate manual test.	
Test Duration	The maximum time a Battery Test process will be active. The battery test will pass if the bus voltage remains above the Battery Test Termination Voltage for the duration of the test.	
Termination Voltage	If the bus voltage drops below this value during a Battery Test, then the test fails.	
Prevent Battery Test	Choose whether the alarm Battery Fuse Fail should prevent Battery Test starting.	

Equalize

Equalize charges batteries at a higher voltage after they have been fully charged to ensure that all individual cell voltages are the same, that electrolyte is distributed evenly, and that sulfate crystal buildup on the plates is reduced.

Equalize can be scheduled to occur at regular intervals and/or can be started/stopped manually.

- *Refer to the battery manufacturer's instructions before using Equalize.*
- *If a Digital Input has the function "Start Equalize" then a manual equalize cycle will start when the Digital Input becomes active.*

If Equalize cannot start at the scheduled time (for example when there is no ac supply) then its state will be Pending and it will start as soon as conditions allow. Use Stop Equalize to cancel a Pending Equalize.

► To enable Equalize (or to start or stop Equalize manually)

- Use the SC300 keypad to go to: *Control Processes* > *Equalize*.
- Or, in DCTools/Web go to: *Control Processes* > *Equalize*.

► To use an external relay contact to activate an Equalize (optional)

- Connect a voltage free relay contact or switch to any Digital Input.
- In DCTools/Web go to: *Digital Inputs*.
- Configure the selected Digital Input and set *Function* to *Start Equalize*.

► To use a Smart Alarm to activate an Equalize (optional)

- Configure a Smart Alarm as required to activate Equalize.
- Set *Activating Smart Alarm* to the Smart Alarm Number.

Information

The following information is available about Equalize.

Parameter	Description	Where to find:
State	Indicates if Equalize is Disabled, Active, Inactive or Pending.	SC300: Control Processes > Equalize Web: Control Processes > Equalize
Next Start Time	The start time of the next scheduled Equalize. *Time shown on SC300 is UTC. Time on PC running Web is local time. See SC300 Internal Clock on page 19.*	
Remaining Time	The time to the end of the currently active Equalize.	
Voltage Offset	The adjustment to the bus voltage being applied due to the Equalize.	

Configuration

Set the following parameters.

Parameter	Description	Where to find:
First Start Time	The date and time that the first scheduled Equalize will occur. Subsequent Equalize will occur at every Equalize Interval after that.	SC300: Control Processes > Equalize DCTools/Web: Control Processes > Equalize
Interval	The time between scheduled Equalize. The interval period begins at the start of an Equalize. Zero disables scheduled Equalizes.	
Duration	The duration of a scheduled Equalize. Use the value recommended by the battery manufacturer.	
Equalize Voltage	The bus voltage maintained during an Equalize cycle. Use the value recommended by the battery manufacturer. The bus voltage is further adjusted by Temperature Compensation.	
Activating Smart Alarm	If this is set to a number other than zero, this Smart Alarm number will start an Equalize cycle.	

Equalize may also be used to trigger the Generator Control Output. See details on page 79.

Fast Charge

Fast Charge automatically increases the float voltage of the power system to recharge the batteries as quickly as possible after a prolonged battery discharge.

*Fast Charge does **NOT** function during a Battery Test, Equalize or if the battery current sensor fails.*

If Fast Charge is used then Battery Current Limit (BCL) should also be used. See Battery Current Limit on page 28 for details.

If Fast Charge cannot start at the scheduled time (for example when there is no ac supply) then its state will be Pending and it will start as soon as conditions allow. Use Stop Fast Charge to cancel a Pending Fast Charge.

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► **To enable Fast Charge (or to stop Fast Charge manually)**

- Use the SC300 keypad to go to: *Control Processes* > *Fast Charge*.
- Or, in Web go to: *Control Processes* > *Fast Charge*.

Information

The following information is available about Fast Charge.

Parameter	Description	Where to find:
State	Indicates if Fast Charge is Disabled, Active, Inactive or Pending.	SC300: Control Processes > Fast Charge DCTools/Web: Control Processes > Fast Charge
Ah Discharged	The current level of battery discharge. A Fast Charge cycle is started if this value is above the Ah Threshold. *See also Reset Battery State on page 77.*	
Maximum Time Remaining	The maximum time to the end of the currently active Fast Charge.	
Voltage Offset	The adjustment to the bus voltage being applied due to the Fast Charge.	

Configuration

Set the following parameters.

Parameter	Description	Where to find:
Fast Charge Voltage	The SC300 will charge the batteries at up to this voltage until the end of fast charge.	SC300: Control Processes > Fast Charge DCTools/Web: Control Processes > Fast Charge
Boost	If this is enabled, the SC300 will set rectifiers elevated charge voltage until the Fast Charge Voltage is reached. This provides for a slightly faster recharge.	
Voltage Threshold	If the bus voltage drops below this value during an ac supply failure, then *Fast Charge* starts when the ac supply is restored. Fast charge can also be started based on the *Start Ah Threshold*.	
Start Ampere Hours Threshold	If *Ah Discharged* exceeds this value during an ac supply failure, then *Fast Charge* starts when the ac supply is restored. The threshold is given as a percentage of installed C10 battery capacity. *Fast charge* can also be started based on the *Voltage Threshold*.	
Recharge Percentage (%)	The ratio of ampere-hours recharged to the ampere-hours discharged. *Fast Charge* stops either when the Ah recharged equals the Ah discharged x *Recharge Percentage*, or after *Maximum Duration*. *Recharge Percentage* only applies if *Stop Ah Threshold* is set to zero.	
Maximum Duration	Set *Maximum Duration* so that the battery will fully charge but not overcharge.	
Stop Ah Threshold	This value is set so that *Fast Charge* will stop before the battery is fully charged. This is used when *Fast Charge* is used to control a generator and the generator should be stopped before the battery is fully charged (thereby saving fuel). *Stop Ah Threshold* is the discharge percentage at which the charging stops, e.g. 10% means that *Fast Charge* will stop when the battery is 90% charged. If *Fast Charge* is not used to control a generator then this value should be set to zero.	
Battery Capacity	The rated 10 hour capacity of the installed battery strings. Zero means no battery is installed.	SC300: Battery > Battery > Battery Capacity DCTools/Web: Batteries

- *Fast Charge may also be used to trigger the Generator Control Output. See details on page 79.*
- *To avoid excessive fuel use or shortened battery life, it is important that the settings are correct in a hybrid generator/battery power system (cyclic charge/discharge).*
  - *Voltage Threshold* should be set so that when a fully charged battery is discharged, the *Start Ah Threshold* is reached before the *Voltage Threshold*.
  - *Maximum Duration* should be set so that in a typical recharge, *Ah Discharged* reaches zero before *Maximum Duration* is reached.
  - Master Configuration files will typically meet these requirements, but the values must be checked against battery discharge/recharge curves in the cyclic application.

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So that an incorrect Ah Discharged value does not affect cyclic battery charging in a hybrid generator/battery power system, an incorrect Ah Discharged value will be corrected after one discharge/recharge cycle:

- *Ah Discharged* is set to zero when the recharge reaches *Maximum Duration* (and the battery is assumed to be fully charged).
- *Ah Discharged* is set to the *Start Ah Threshold* when the battery discharges down to the *Voltage Threshold*.
- *Ah Discharged* is limited to a maximum value of Battery Capacity.
- *Ah Discharged* can be set to zero after a Fast Charge or Equalize cycle. See *Batteries Configuration* on page 69.
- *Ah Discharged* can be automatically counted down when the system is in Float state. See *Batteries Configuration* on page 69.
- *Ah Discharged* can be manually reset to zero.

Temperature Compensation

As the ambient temperature of a battery drops (or rises) the voltage required to maintain full charge increases (or decreases). Temperature Compensation automatically varies the float voltage to cancel the effects of changing temperature.

Enable Temperature Compensation for optimum battery life and battery capacity over a wider temperature range.

*Temperature Compensation does **NOT** function during a Battery Test.*

► To enable Temperature Compensation

- Use the SC300 keypad to go to: *Control Processes* > *Temp. Compensation* > *Enable*.
- Or, in DCTools/Web go to: *Control Processes* > *Temperature Compensation*.

Information

The following information is available about Temperature Compensation.

Parameter	Description	Where to find:
State	Indicates if Temperature Compensation is active or inactive.	SC300: Control Processes > Temp. Compensation > Enable DCTools/Web: Control Processes > Temperature Compensation
Voltage Offset	The adjustment to the bus voltage being applied due to the Temperature Compensation. Offset is zero when the battery temperature equals the reference temperature.	
Battery Temperature	The temperature measured by the battery temperature sensor.	SC300: Analogs > Battery Temperature DCTools/Web: Batteries

Configuration

Set the following parameters.

Parameter	Description	Where to find:
Cells Per String	The number of 2V cells per battery string (for example: 24 in a 48V nominal system).	SC300: Battery > Battery Web: Batteries
Slope	Bus voltage adjustment rate. Use the value recommended by the battery manufacturer.	SC300: Control Processes > Temp. Compensation > Enable DCTools/Web: Control Processes > Temperature Compensation
Reference Temp	The temperature where no voltage adjustment is applied. Refer also to Float Voltage on page 27.	
Upper Limit	No additional voltage adjustment is made above this temperature.	
Lower Limit	No additional voltage adjustment is made below this temperature.	

- *If Low Float Tracking is enabled, the **Low Float** alarm threshold will be decreased by the same amount as the temperature compensation offset. This occurs only when temperature compensation decreases bus voltage. There is no effect when temperature compensation increases bus voltage.*
- *If High Float Tracking is enabled, the **High Float** alarm threshold will be increased by the same amount as the temperature compensation offset. This occurs only when temperature compensation increases bus voltage. There is no effect when temperature compensation decreases bus voltage.*

Peak Load Reduction (PLR)

PLR provides a means for a telecom network operator to reduce power consumption at certain times by running on battery rather than AC power. An operator may run on batteries during periods of high AC power grid loading, and receive direct payments from AC grid operators, or reduced power charges. The SC300 is compatible with demand response programmes, either manually controlled, or automatically controlled by software such as Eaton EDREM.

While PLR is active, the SC300 turns down the rectifier voltage to just below the DC bus voltage. The batteries will discharge into the load, while the rectifiers provide a backup if the battery fails.

PLR may be set to ensure that the battery voltage does not drop below a preset voltage, the Low Voltage Limit. This ensures the battery is not discharged so low that its life is significantly reduced. If the Low Voltage Limit is reached, the SC300 maintains the bus voltage at that value by holding the rectifier voltage so that it progressively takes more load as the battery discharges.

There is also an option to start a generator to recharge the battery once the Low Voltage Limit is reached.

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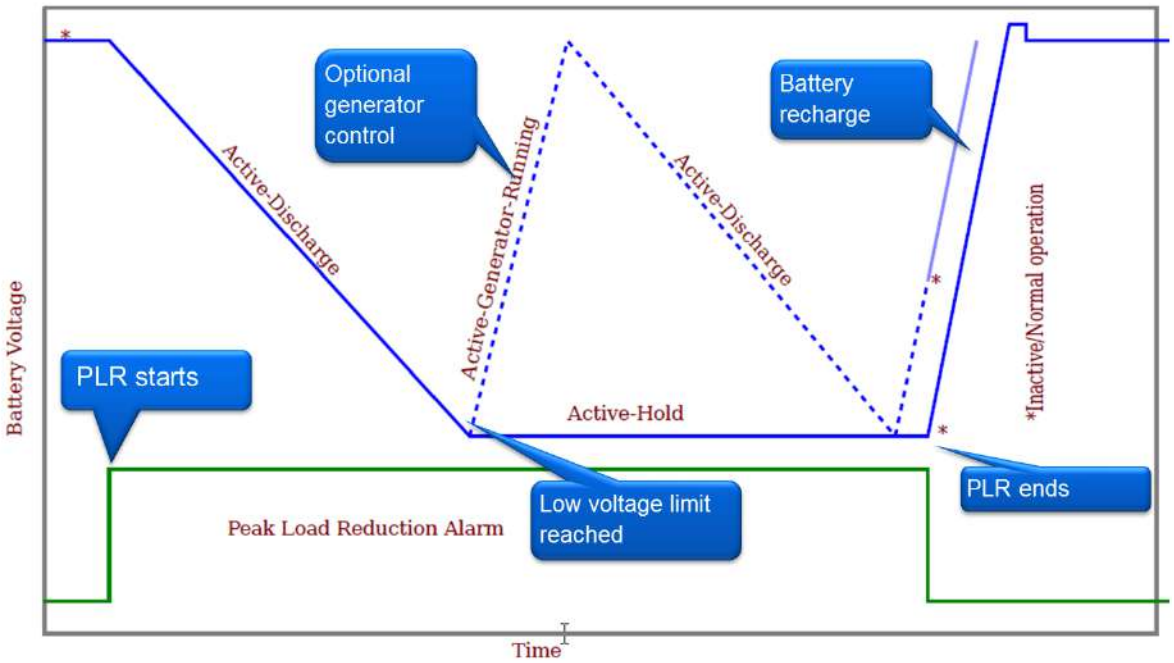

PLR may be triggered manually from the SC300 web interface, automatically from a Smart Alarm, or remotely from EDREM or a similar application.

► **To enable PLR**

- Use the SC300 keypad to go to: *Control Processes* > *Peak Load Reduction*.
- Or, in DCTools/Web go to: *Control Processes* > *Peak Load Reduction*
- Set *Enable* to *Enabled.*
- Set *Maximum Duration* and *Low Voltage Limit* as required.

► **To manually trigger PLR**

- Use the SC300 keypad to go to: *Control Processes* > *Peak Load Reduction*.
- Or, in DCTools/Web go to: *Control Processes* > *Peak Load Reduction*
- Set *Scheduled Start Time* and *Scheduled Duration* as required.

► **To use a Smart Alarm to activate Peak Load Reduction (optional)**

- In DCTools/Web go to: *Alarms* > *Smart Alarms*
- Configure *a* Smart Alarm with the appropriate trigger conditions for PLR. Note the Smart Alarm number.
- Go to: *Control Processes* > *Peak Load Reduction*
- Set *Activating Smart Alarm* to the appropriate Smart Alarm number.

Information

The following information is available about Peak Load Reduction.

Parameter	Description	Where to find:
State	Indicates if PLR is inactive, active, unable to start, or held at minimum bus voltage	SC300: Control Processes > Peak Load Reduction Web: Control Processes > Peak Load Reduction
Time Running	The time that PLR has been running.	
Scheduled Start Time	The start time for PLR. *Time shown on SC300 is UTC. Time on PC running DCTools/Web is local time. See SC300 Internal Clock on page 19.* *Scheduled Start Time and Duration may be manually set, or set by a remote application such as EDREM.*	
Scheduled Duration	The time that PLR will remain active.	
Offset Voltage	The adjustment to the bus voltage being applied due to PLR. While PLR is running, the rectifiers are turned down to force the battery to carry the load.	

Configuration

Set the following parameters.

Parameter	Description	Where to find:
Enable	Enables or Disables PLR.	SC300: Control Processes > Battery Test Web: Control Processes > Battery Test
Scheduled Start Time	The start time for PLR. *Time shown on SC300 is UTC. Time on PC running DCTools/Web is local time. See SC300 Internal Clock on page 19.* *Scheduled Start Time and Duration may be manually set, or set by a remote application such as EDREM.*	
Scheduled Duration	The time that PLR will remain active.	
Activating Smart Alarm	The number of the Smart Alarm that triggers PLR. "0" means no Smart Alarm trigger. *The web view will also show the name of the Activating Smart Alarm.*	

Solar Charger Power Share

Where a DC power system has energy inputs both from AC mains supply (or AC generator) and solar or wind, then the SC300 must share the load power between these sources.

Generally, the preference is for the load to be supplied from the alternative energy source first, and take energy from AC only when there is not enough solar or wind energy.

This is done by increasing the solar charger rectifier voltage slightly. The AC powered rectifiers remain set at the normal float voltage.

Solar charger power share automatically operates when an ASC48-ES solar charger is present.

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- *If a third party solar charge controller is used, this should be set at a higher voltage than the float voltage to ensure that it supplies energy in preference to the AC rectifiers.*
- *The SC300 AVC function controls the overall charge voltage so that the bus is set to the correct voltage setting, even with solar charger offset included.*

► To set the Solar Charger Power Share Offset

- Use the SC300 keypad to go to: *Rectifiers* > *Settings*.
- Or, in DCTools/Web go to: *Rectifiers* > *Configuration*.
- Recommended value is 0.5V to 1.0V.

Configuration

Set the following parameters.

Parameter	Description	Where to find:
Solar Charger Power Share Offset	The solar charger base voltage is increased by this amount relative to the AC rectifier base voltage.	SC300: Rectifiers > Settings DCTools/Web: Rectifiers > Configuration

Rectifiers

The SC300 registers all rectifier modules and solar chargers as they are inserted into the dc power system.

Information

The following information is available about rectifiers.

Parameter	Description	Where to find:
Registered rectifiers	Number of rectifiers controlled by the SC300 *Web only*	SC300: Rectifiers DCTools/Web: Rectifiers
Registered Solar	Number of solar chargers controlled by the SC300	
Failed	Number of failed rectifiers or solar chargers *Web only*	
Comms Lost	Number of failed rectifiers or solar chargers that have lost communications *Web only*	
State	Registered - communicating with the SC300. Un-registered - there is a rectifier compatibility or communications problem.	SC300: Rectifiers > Enter (Use Left and Right keys to scroll to other rectifiers) DCTools/ Web: Rectifiers
Serial Number (S/N)	Rectifier serial number.	
Load Based Run Time	The time the rectifier has been operating since it was registered.	
Input Type	AC (rectifiers) or DC (solar chargers)	
Input Voltage	The voltage measured by the rectifier or solar charger.	
Input Current	The input current measured by a rectifier or solar charger. *Only available from certain ac rectifiers, e.g. APR48-ES and NPR48-ES.*	
AC Frequency	AC frequency as measured by the rectifier. *Only available from certain rectifiers, e.g. APR48-ES and NPR48-ES.*	
Phase Voltages	The ac phase voltages measured by the rectifiers. This is available from rectifiers that can detect their phase and from three phase rectifiers.	
Phase	The input phase number (1,2 or 3) as measured by certain rectifiers. Phase information is only available if the Phase-1 setting has been set to a rectifier serial number, or a three phase rectifier is present.	
Voltage	Rectifier's dc output voltage.	
Current	Rectifier's output current.	
Output Power	The output power from the rectifier	
Power (%)	Rectifier output power as a percentage of Max. Power Limit.	
Heatsink Temp	The measured rectifier heatsink temperature.	
Max Power (Limit)	Rectifier's maximum output power (factory set).	
Max Current Limit	The maximum current limit value of the rectifier. *Adjust Rectifier Current Limit to set a lower operating current limit.*	

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Min OVSD Set Point	The minimum Over Voltage Shut Down set point that the rectifier accepts.	
Max OVSD Set Point	The maximum Over Voltage Shut Down set point that the rectifier accepts.	
Status	Information about rectifier alarms.	
Type	Rectifier manufacturer's model number.	SC300: Rectifiers > Enter (Use Left and Right keys to scroll to other rectifiers) *Not available DCTools/Web*
Software Version	Version of rectifier embedded software.	

Common Rectifier Configuration

The following parameters (common to all rectifiers) can be configured.

Parameter	Description	Where to find:
Phase-1	The serial number of the rectifier assigned as "Phase 1". When this is set correctly, it enables the SC300 to assign a phase number to all rectifiers. *Only applies to rectifiers that support phase detection, including APR48-ES and NPR48-ES.*	SC300: Rectifiers > Rect. Settings Web/DCTools: Rectifiers
Shutdown All Rectifiers Smart Alarm	The SC300 can shut down all rectifiers under control of this Smart Alarm number. Shutdown must be set to Manual for this to work. Zero means no Smart Alarm shutdown.	
Shutdown All Solar Chargers Smart Alarm	The SC300 can shut down all solar chargers under control of this Smart Alarm number. Shutdown must be set to Manual for this to work. Zero means no Smart Alarm shutdown.	
Shutdown	Enable rectifier shutdown. This can be disabled, Manual, or Automatic. Automatic means that LBRS is active.	
OVSD Set Point	Over Voltage Shut Down. A rectifier will shut down if its output voltage exceeds this value. Recommended value is 59.2V for 48V nominal systems, 28.6V for 24V nominal systems.	
Start Up Delay	The delay from ac turn-on before the rectifier output turns on.	
Output Ramp-up slope	The rate the rectifier output voltage increases after start-up as a percentage of maximum current.	
Current Limit	(DC) The output current limit of the rectifier. If set to zero, then the output current limit is maximum.	
AC Current Limit	The input current limit of the rectifier. If set to zero, then the input current limit is maximum.	
Rectifier Current Share	Current Share ensures that the total output power of the power system is evenly shared between all rectifiers. Set to *Enabled* unless there is a specific reason to disable.	
Power Share Offset	The solar charger base voltage is increased by this amount to ensure that the solar charger provides maximum power when connected in parallel with AC rectifiers.	DCTools/Web: Rectifiers

See Voltage Control on page 26 for details of the rectifier's output voltage control.

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Phase Detection

In a three phase system where all rectifiers support phase detection (including APR48-ES and NPR48-ES), the SC300 can automatically detect the AC phase for each rectifier.

Phases are calculated relative to a particular rectifier.

► To enable Phase Detection

On the Web, go to *Rectifiers.*

Set Phase-1 to the serial number of any rectifier that is on AC Phase 1.

After one minute or less, the SC300 will assign phases to all rectifiers.

Phase detection does not work if there are rectifiers that do not support phase detection.

Leave Phase-1 *at 0 for a single phase system.*

Identify a Rectifier

The rectifier's registration number does not correspond to a physical position in the dc power system.

► To identify a rectifier

Either:

- On SC300 keypad go to: *Rectifiers* > *Rectifier number*. Press *Enter*.

  The rectifier details screen appears. Use to scroll to other rectifiers.

- All LEDs on the selected rectifier will flash for 60 seconds, or press *Esc* to stop.

Or:

- In DCTools/Web go to: *System* > *Interfaces* > *RXP* > *RXP Devices*.
- All LEDs on the selected rectifier will flash for 60 seconds.

Rectifier serial numbers are printed on a label on the front of each rectifier.

Rectifier Comms Lost Alarm

When a rectifier is removed (or a fault interrupts rectifier communications), the SC300 will display an alert message and sound an alert alarm (if *Audible Alarms* are enabled). After the *Alarm Recognition Period*, a *Rectifier Comms Lost* alarm will activate.

A Multiple Rectifier Comms Lost alarm will activate (after the Alarm Recognition Period) *if more than one rectifier is affected.*

► To prevent a *Rectifier Comms Lost* alarm when a rectifier is removed

Press any key within the *Alarm Recognition Period*, to cancel the alert.

Rectifier Shutdown

Rectifier shutdown can be disabled, controlled manually, or controlled automatically based on the total rectifier load current (see Load Based Rectifier Shutdown on page 44).

► To disable Rectifier Shutdown

- Use the SC300 keypad to go to: Rectifiers > Settings (tab) > set Rectifier Shutdown to Disabled.
- Or, in DCTools/Web go to: Rectifiers > Configuration> set Shutdown to Disabled.

Manual Rectifier Shutdown

► **To shut down a rectifier**

- In DCTools/Web go to: *Rectifiers* > *Configuration*.
- Set *Shutdown* to *Manual*.
- In the *Rectifiers* table click Shutdown. *This box only appears when Shutdown is set to Manual.*
- The rectifier will shut down and the yellow LED will be on.

> *This function will normally only be used for testing purposes. When the testing is complete, set* Shutdown *back to its previous setting (*Disabled *or* Automatic*).*

Rectifier Restart

► **To restart all shutdown rectifiers**

- Use the SC300 keypad to go to: Rectifiers > Rect. Settings (tab) > Restart All Rectifiers.
- Or, in DCTools/Web go to: *Rectifiers*. Click *Restart All.*

► **To restart individual rectifiers**

- In DCTools/Web go to: *Rectifiers*.
- For each rectifier click Startup.

The rectifier(s) will then resume normal operation.

> *The SC300 will restart any shutdown rectifiers if: ac has failed, or more than one rectifier has failed, or the bus voltage is below the Low Load threshold, or Rectifier Shutdown is set to Disabled, or Rectifier Shutdown is set to Automatic.*

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Load Based Rectifier Shutdown

***Redundancy* = N**

If redundancy is set to N and no batteries are connected, plus the alternative energy source is not producing enough power, then there is a risk of the system load being dropped. Do not set *Redundancy* to N at mission-critical sites.

Load Based Rectifier Shutdown is not available with APR48-3G (prior to PR5), EPR48-3G, APR24-3G and CR48-3G rectifiers.

If Load Based Rectifier Shutdown (LBRS) is enabled by setting *Shutdown* to *Automatic* then the SC300 automatically shuts down rectifiers when the total load current is significantly less than the total rectifier capacity.

This raises the average load on the remaining rectifiers which will then operate at a higher efficiency. This results in a decrease in system power consumption.

The SC300 shuts down APR48-3G PR5 rectifiers before the more efficient APR48-ES and NPR48-ES rectifiers.

The run time of all rectifiers is recorded and the usage within each group of rectifiers is balanced to ensure even aging.

The SC300 will progressively restart rectifiers if the load increases.

The number of rectifiers left running by LBRS depends on the *Redundancy* setting:

- N Plus 2: Two spare rectifiers are always running. Three or more rectifiers are always running.
- N Plus 1: One spare rectifier is always running. Two or more rectifiers are always running.
- N: If an alternative energy source is powering the load, then all rectifiers can be shut down. Otherwise at least one rectifier is always running. There is no redundant rectifier.

Rectifiers shut down by LBRS will have the yellow LED on.

The SC300 will automatically restart all rectifiers if ac supply has failed, or more than one rectifier has failed, or Battery Test / Equalize / Fast Charge are active, or the bus voltage is below the Low Load threshold.

In a three phase system with phase detection, LBRS will shut down rectifiers in such a way as to keep a similar number of rectifiers on each phase.

► To enable Load Based Rectifier Shutdown

- Use the SC300 keypad to go to: *Rectifiers* > *Settings (tab)* > set *Rectifier Shutdown* to *Automatic*.
- Or, in DCTools/Web go to: *Rectifiers* > set *Shutdown* to *Automatic*.

Ensure that Rectifier Start Up Delay is less than 30 seconds. See information on page 42. LBRS will not function correctly if the start-up delay is more than 30 seconds.

Information

The following information is available about Load Based Rectifier Shutdown.

Parameter	Description	Where to find:
Load Based Run Time	The run time of each rectifier	DCTools/Web: Rectifiers
Solar Power	The total power produced by solar chargers	DCTools/Web: Rectifiers > Load Based Rectifier Shutdown
System Power	The percentage of maximum output power that the system is providing. This is used by LBRS to calculate whether to shut down or start up rectifiers	DCTools/Web: Rectifiers > Load Based Rectifier Shutdown

Configuration

The following parameters must be configured to set Load Based Rectifier Shutdown.

Parameter	Description	Where to find:
Shutdown	Set to Automatic to enable LBRS	SC300: Rectifiers > Configuration DCTools/Web: Rectifiers > Configuration
Redundancy	The number of spare rectifiers kept running: N Plus 2: Two spare rectifiers are always running. Three or more rectifiers are always running. N Plus 1: One spare rectifier is always running. Two or more rectifiers are always running. N: If an alternative energy source is powering the load, then all rectifiers can be shut down. Otherwise at least one rectifier is always running. There is no redundant rectifier.	SC300: Rectifiers > Settings (tab) > LBRS DCTools/Web: Rectifiers > Load Based Rectifier Shutdown
High Threshold	LBRS restarts one or more rectifiers if the load is more than this percentage of the total rectifier capacity. Typical: 60%.	
Low Threshold	LBRS shuts down one or more rectifiers if the load is less than this percentage of the total rectifier capacity. Typical: 40%. Shutdown does not occur if shutting down a rectifier would push load percentage above *High Threshold*.	
Interval	The time interval that the SC300 will cycle rectifiers when the LBRS process is active.	
Reset Run Times	Sets the run time of all rectifiers to zero.	

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Low Voltage Disconnect (LVD)

Low Voltage Disconnects may be connected either as load disconnect or battery disconnect depending on the dc power system model. They have two purposes:

- to protect a VRLA battery from deep discharge and premature failure, and/or
- to reduce the load on a battery under discharge so that high priority equipment operates for a longer time after an ac supply failure.

The SC300 has 16 independent LVD control channels (LVD 1 to LVD 16). Each channel can control one or more of up to 16 contactors, with coil voltages from 12V to 48V nominal.

There are two contactor connectors on an IOBGP-00/01 Input / Output board, and three on the IOBGP-10/11. Additional contactors are controlled by additional IOBGP-01 Input / Output boards. If required, refer to the dc power system Installation and Operation Guide for details on how to connect additional IOBGP-01 Input / Output boards to the SC300.

Latched contactors

The IOBGP-10/11/20/21 IO Boards support latched contactors. Latched contactor operation is managed by the IOBGP and does not affect SC300 operation or settings.

Use **Normally Open** settings for latched contactors.

LVD Disconnect Modes

The LVD control channels can have any combination of the following modes of operation:

1. **Voltage Based Disconnect**: The LVD control channel will disconnect its contactor(s) based on the bus voltage.
2. **AC Timer Based Disconnect**: The LVD control channel will disconnect its contactor(s) after a specified period of ac supply failure.
3. **Smart Alarm Disconnect**: The LVD control channel will disconnect its contactor(s) according to the state of a specified *Smart Alarm*. See *Smart Alarm Disconnect* on page 53.

If *Chained to Previous* is enabled, the LVD control channel will only disconnect its contactor(s) if one of its disconnect conditions is *True*, and the preceding control channel has been disconnected for the *Recognition Time*.

Chained to Previous does not apply to LVD 1.

LVD Default and Custom Configuration

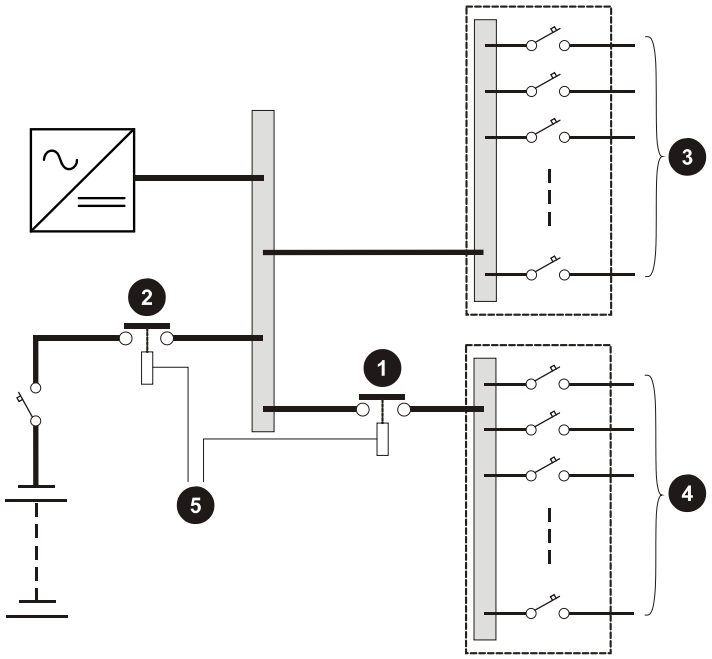
If factory-fitted in the dc power system, the LVD contactors will be characterized and the LVD control channels will have default configuration settings for *Voltage Based Disconnect*. Custom configuration will only be necessary if:

- contactors are connected to the dc power system on site (see LVD Characterization on page 49 and LVD Setup on page 50)
- different disconnect conditions are required (see LVD Configuration on page 52).

Typical LVD Arrangements

The simplest use of an LVD is a single battery disconnect contactor.

The following diagram shows a typical arrangement of two LVDs. This arrangement allows lower priority loads to be disconnected first (contactor controlled by control channel LVD 1), either at a specified battery voltage or a specified time interval after an ac supply failure. This then prolongs battery power for the highest priority loads (contactor controlled by control channel LVD 2). The battery will be disconnected when the battery voltage reaches its minimum preset voltage.



1. Contactor controlled by LVD 1 - low priority load disconnect (disconnects first).
2. Contactor controlled by LVD 2 - battery disconnect (only disconnects after LVD 1)
3. Connections to high priority loads (for example transmission equipment).
4. Connections to low priority loads.
5. Connection to the SC300 system controller via the I/O board.

More complex arrangements with up to 16 contactors and a selection of disconnection criteria are possible with the SC300 system controller. The exact arrangement(s) used in a particular Eaton dc power system will be described in the Installation and Operation Guide.

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Characterization

The LVD Characterization process determines the optimum operating voltages to suit the contactor(s) coil voltage. These values are stored in the SC300 and on the I/O board.

An *LVD Characterization Error* alarm will be activated if the SC300 detects that the characterization values stored in the SC300 and on the I/O board are different. This happens when any of these occurs:

- The SC300 is replaced.
- The I/O Board is replaced.
- Both the SC300 and the I/O Board are replaced.

LVD Characterization Error alarms can only be cleared from the SC300 front panel, not using Web.

- To clear the alarm when the SC300 is replaced, on the SC300 go to *Alarms*, select the *LVD Character. Err.* active alarm and press *Details*, select *Clear* and press *Enter*, select *Characterize with IOB Values* and press *Save*.
- To clear the alarm when the I/O Board is replaced, on the SC300 go to *Alarms*, select the *LVD Character. Err.* active alarm and press *Details*, select *Clear* and press *Enter*, select *Characterize with SC Values* and press *Save*.
- To clear the alarm when both the SC300 and the I/O Board are replaced, go to *Alarms*, select the *LVD Character. Err.* active alarm and press *Details*, select *Clear* and press *Enter*, select *Characterize Contactor* and press *Start*.

  When a contactor is re-characterized it will disconnect and re-connect several times. Refer to Maintenance in the dc power system Installation and Operation Guide for full instructions.

Factory-fitted contactors will be characterized at the factory. If an existing contactor is replaced, characterize the new contactor from the SC300.

In this case, there will be no LVD Characterization Error alarm.

- To characterize the new contactor, go to *Battery*, go to the *LVDs* tab, select the appropriate LVD channel and press *Details*, select the appropriate contactor and press *Edit,* select *Characterization* and press *Enter*, select *Characterize Contactor* and press *Start*.

LVD Operation

► To allow access to LVD functions from the SC300 keypad

- In DCTools/Web go to: *Control Processes* > *LVD*.
- Select the *Allow Front Panel LVD Control* check box.

  If the check box is cleared LVD functions can only be accessed using DCTools/Web.

► To manually connect or disconnect an LVD control channel from the front panel

- Use the SC300 keypad to go to: *Battery* > *LVDs* > *LVD 1 - LVD 16* > *Details* > *Manual Control.*
- Select *Connect or Disconnect* to connect or disconnect the channel (and all mapped contactors).

  The contactor(s) will remain in the selected state until the manual reconnect timeout period is reached or the contactor is manually reconnected.
- Select *Auto* to return the LVD control channel to automatic operation.

► To manually disconnect an LVD control channel using web

- Go to *Low Voltage Disconnect* > *LVD Manual Control*
- Select *Disconnect to* disconnect the channel (and all mapped contactors).

  The contactor(s) will remain in the selected state until the manual reconnect timeout period is reached or the contactor is manually reconnected.

► **To manually disconnect an LVD control channel using DCTools**

- Go to *Control Processes Low Voltage Disconnect* > *Logical LVDs*
- Click on *Remote Manual Control* for the contactor to be disconnected, and select *Apply Changes.*

The contactor(s) will remain in the selected state until the manual reconnect timeout period is reached or the contactor is manually reconnected.

Information

The following information is available about LVD control channels and contactors.

Parameter	Description	Where to find:
LVD Control Channel State	**Connected:** all of the channel's disconnect conditions are false. All mapped contactors are connected (contacts closed). **Disconnected:** one of the channel's disconnect conditions is true. All mapped contactors are disconnected (contacts open). **Manual:** The LVD is under manual control from the SC300 keypad (see previous section). **No Contactors:** there are no contactors mapped to this channel. **Idle:** The LVD has not yet connected or disconnected.	SC300: Battery > LVDs DCTools/Web: Control Processes > LVD
LVD Control Channel Inhibited	Indicates if the LVD cannot change state due to the *Inhibit Period*.	
Contactor State	**Disabled:** contactor cannot be operated **Connected**: contactor is connected (contacts closed) **Disconnected:** contactor is disconnected (contacts open) **Failed:** contactor is not connected to the I/O board or is faulty. **Conflict:** two contactors are mapped to the same I/O board connector. **Not Characterized:** the contactor must be characterized (see details on page 49).	
LVD Remote Manual Reconnect Timer	If the LVD has been manually disconnected, this will count down from the LVD Remote Manual Reconnect Timeout Period until it reconnects at zero.	

LVD Setup

Use the following procedures to enable or add an LVD control channel.

► **To Enable (Add) an LVD using the SC300 keypad**

Control and configuration of LVDs and contactors is only available from the SC300 keypad if Allow Front Panel LVD Control is TRUE. See LVD Operation on page 49.

1. Go to: *Battery* > *LVDs*.
2. If there are no LVDs (LVD 1, LVD 2, ...) listed then go to Step 4.
3. For each LVD select *Details*. Note the contactors operated by each channel.

The contactor numbers (1-1, 1-2, ...) indicate the existing IOB Number - IOB Connector Number combinations.

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4 Go to: *Battery* > *LVDs* > *Add LVD*.

5 From the list of registered I/O boards, select a board connected to a contactor to be operated by this LVD control channel. Select *Next*.

6 For IOBGP I/O boards (see Input /Output Board on page 3) select:

- 1, if the contactor is connected to XH4
- 2, if the contactor is connected to XH5.

Warning: Do not select an existing *IOB Number - IOB Connector Number* combination (see Step 3). This will cause a conflict.

7 Select *Next*.

8 Select contactor type:

- *Normally Open* if contacts are open when coil voltage is zero, or a latched contactor is used.
- *Normally Closed* if contacts are closed when coil voltage is zero.

9 Characterize the contactor (see LVD Characterization on page 49).

10 To add additional contactors to the LVD control channel, go to *Battery* > *LVDs* > *LVD x* > *Add Contactor. Repeat Steps 5-9.*

► **To Enable an LVD using Web / DCTools**

1 In Web go to: *Control Processes* > *LVD*. Expand the *Logical LVDs* table.

2 Select a spare LVD control channel and configure as required. See LVD Configuration on page 52.

3 Expand the *Physical Contactors* table.

4 Select and configure the contactor(s) to be operated by the LVD control channel. See Contactor Configuration on page 53.

General Configuration Settings

Parameter	Description	Where to find:
Inhibit Period	The minimum time an LVD stays connected or disconnected before it can change state. Does not apply to manual operation.	SC300: Battery > LVDs DCTools/Web: Control Processes > LVD
Allow Front Panel LVD Control	Disables LVD control from the system controller front panel.	DCTools/Web: Control Processes > LVD
LVD Remote Manual Reconnect Timeout Period	If an LVD is manually disconnected, it will reconnect again after this time.	Web: Control Processes > LVD *Not available on DCTools*

LVD Configuration

Parameter	Description	Where to find:
Voltage Based Disconnect	If *Enabled*, the LVD will disconnect if the bus voltage has been below the *Disconnect Voltage* for the *Recognition Time* and reconnect if the bus voltage has been above the *Reconnect Voltage* for the *Recognition Time.*	SC300: Battery > LVDs > LVD x > Settings Web: Control Processes > LVD > LVDs
Disconnect Voltage	See *Voltage Based Disconnect*.	
Reconnect Voltage*	See *Voltage Based Disconnect*.	
Recognition Time	See *Voltage Based Disconnect* and *Chained To Previous*.	
AC Timer Based Disconnect	If *Enabled*, then during an ac supply failure the LVD will disconnect after the *AC Timer Delay*, even if the *Disconnect Voltage* has not been reached.	
AC Timer Delay	See *AC Timer Based Disconnect*.	
Smart Alarm Based Disconnect	If *Enabled*, the LVD will disconnect when the *Smart Alarm* specified by *Smart Alarm Index* becomes active. *See Smart Alarm Disconnect on page 53.*	
Smart Alarm Index	See *Smart Alarm Based Disconnect*.	
Chained To Previous (Chaining)	If *Enabled*, the LVD channel will only disconnect if one of its disconnect conditions is true and the preceding LVD channel has been disconnected for the *Recognition Time.* This applies in reverse when reconnecting. *Does not apply to LVD 1.*	

* *If the LVD channel operates contactors used as a load-disconnect, ensure the Reconnect Voltage is set higher than the expected open-circuit recovery voltage of the discharged batteries.*

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Contactor Configuration

Parameter	Description	Where to find:
LVD Num	Set to the number of the LVD control channel that will operate this contactor. *In Web, number is from first column of the* Logical LVDs *table.*	SC300: See LVD Setup on page 50. DCTools/Web: Control Processes > LVD > Physical Contactors
Enable	Set to *Enabled* for this contactor to be operated (connected and disconnected). *If a connected contactor (contacts closed) is Disabled, it will remain connected unless the coil is disconnected from the I/O board or the I/O board loses power.*	
IOB Number (On IOB)	Set to the number of the I/O board from the *I/O Board to Serial Number Mapping* table. *See I/O Board Mapping on page 145.*	SC300: Battery > LVDs > LVD x > Contactors (x-1, x-2, ...) > Edit DCTools/Web: Control Processes > LVD > Physical Contactors
IOB LVD Number (LVD Connector)	For IOBGP I/O boards, set to: 1, if the contactor is connected to XH4 2, if the contactor is connected to XH5. *See Input / Output Board on page 3.*	
Type	Set according to the type of contactor: *Normally Open* if contacts are open when coil voltage is zero, or for latched contactors, which open or close on current pulses. *Normally Closed* if contacts are closed when coil voltage is zero. Normally closed LVD contacts require special system wiring when used to disconnect the battery.	

Smart Alarm Disconnect

An LVD control channel can be set to disconnect if a specified *Smart Alarm* becomes active. For example, a battery LVD can be set to disconnect if the battery temperature is too high, or a load LVD can be set to disconnect when *Ah Discharged* exceeds a defined value.

An unwanted LVD disconnect may occur if *Smart Alarm Disconnect* uses a sensor which becomes faulty or disconnected.

An unwanted LVD disconnect may occur if *Battery Time Remaining* is used as a source for Smart Alarm Disconnect.

► **To configure a Smart Alarm Disconnect**

1. On DCTools/web, go to: *Alarms* > *Smart Alarms*. Configure a *Smart Alarm* as described on page 62.
2. Note the *SA Number* (first column of the *Smart Alarm States* table).
3. Go to: *Control Processes* > *LVD*.
4. For the required LVD control channel:
   - Set *Smart Alarm Index* to the *SA Number* (first column of the *Smart Alarm States* table).
   - Set *Smart Alarm based Disconnect* to *Enabled*.

The LVD control channel will disconnect its contactor(s) if the *Smart Alarm* becomes active.

☐ *Except, if* Chained to Previous *is enabled then the preceding LVD control channel must be disconnected first.*

Alarms

An SC300 supplied with a standard configuration file (see details on page 23) has a standard set of alarms configured and enabled. This will be sufficient for standard dc power system operation.

For specific alarm arrangements all SC300 alarms can be individually enabled or disabled and are configurable.

Types of Alarms

The SC300 provides five types of alarms:

Alarm type	Description	Configuration
System alarms	Generated by the operating values of dc power system (voltages, currents, temperatures, and so on) and the operation of power system modules (rectifiers, circuit breakers, fuses, and so on). The SC300 system alarms are listed in Alarm Descriptions on page 133.	See details on page 57.
Analog Input (AI) High alarms	Activated when the input value of an AI is above the alarm threshold.	See details on page 85.
Analog Input (AI) Low alarms	Activated when the input value of an AI is below the alarm threshold.	See details on page 85.
Digital Input (DI) alarms	Activated when a DI is in its active state.	See details on page 90.
Smart Alarms	Software simulation of logic gates to allow the logical combination of other alarms, time schedules and/or system values.	See details on page 60.

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Active Alarm Indications

All alarms have a configured *Severity:*

Critical Major Minor Warning ✓ Control

The *Severity* determines how an active alarm is indicated:

Severity	Alarm indications	Details
Critical Major	SC300 Major alarm LED will turn on.	See details on page 15.
Minor Warning	SC300 Minor alarm LED will turn on.	See details on page 15.
Critical Major Minor	If the SC300 audible indicator is enabled, it will sound until a key is pressed.	See details on page 15.
Any alarm Critical Major Minor Warning	The alarm name and severity icon will be displayed on the SC300 main screen.	See details on page 8.
	The *Event Log* will record the alarm activation.	See details on page 99.
	If configured, an Email message will be sent to one or more Email addresses.	See details on page 111.
	If configured, an SMS text message will be sent to one or more cell phones.	See details on page 115.
	If configured, PowerManagerII control and monitoring software will be notified by SNMP trap. PowerManagerII can initiate various actions when it receives an alarm notification.	Refer to the PowerManagerII online Help.
	In DCTools/Web (if connected), the alarm name and severity icon will be displayed in the *Alarms* list on the *System* page.	See page 106.
	If configured, an SNMP Trap will be sent to a network management system (NMS).	See details on page 107.
	If configured, a note will be displayed on the SC300 and included in the SNMP trap (if used).	Refer to the alarm's configuration details.
Any alarm or control output Critical Major Minor Warning ✓ Control	If configured, one or two digital outputs (relays) will be operated.	Refer to the alarm's configuration details.

► **To view a list of active alarms**

- Use the SC300 keypad to go to: *Alarms*.
- Or, in DCTools/Web, go to *System*.

Alarm Change Indication

The time and date of the last alarm state change is shown in the web view in *Alarm States, Change* column.

Common Alarm Parameters

The following parameters are shared by several, many, or all alarms.

Parameter	Description	Where to find:
Enable Audible Alarm Indication	Enable or disable the audible alarm indicator.	SC300: Alarms > Alarm Settings > Global Settings DCTools/ Web: Alarms > Alarm Configuration
Alarm Recognition Period	All alarms (except those listed below) are activated only after the alarm condition is present for this period. *These alarms have individual recognition periods: AC Fail, System Overload, Generator Fail.* *These alarms do not have recognition periods: Battery Test Fail, Configuration Error, Missing Hardware, Standby Mode, String Fail, Unknown Hardware, Unmapped IOB Found, and all LVD alarms.*	

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System Alarm Configuration

The following system alarm parameters can be configured.

Parameter	Description	Where to find:
Severity	Set to the required alarm priority. This determines how the alarm is indicated. See details on page 55. If set to *Disabled* then the alarm will not activate.	SC300: Alarms > Alarm Settings (tab) > System Alarm. Select an alarm. *Use ▷ ◁ to scroll to other alarms.* DCTools/ Web: Alarms > Alarm States
DO Mapping A	If required, select a digital output (relay) that will be operated when the alarm is active.	
DO Mapping B	If required, select a second digital output (relay) that will be operated when the alarm is active.	
Send Trap	Depending on this setting, an SNMP Trap will be sent for this alarm, on activation or deactivation or both, if the alarm's Severity matches the setting of the SNMP Trap Level (see details on page 107).	
Notes	Type any required description. When the alarm is active the text will be displayed on the SC300 and included in the SNMP trap (if used). The notes can provide instructions about what action to take when the alarm occurs.	
Recognition Period	The following alarms have individual recognition periods: AC Fail, System Overload, Generator Fail. *All other system alarms either use the standard Alarm Recognition Period or do not have a recognition period. See details on page 56.*	SC300: Alarms > Alarm Settings (tab) > System Alarm. Select an alarm. *Use ▷ ◁ to scroll to other alarms.* DCTools/ Web: Alarms > Alarm Configuration
High or Low Threshold	The following alarms have a high or low threshold: High Float, Low Float, High Load, Low Load, Battery Temperature High, Battery Temperature Low. The alarm will be activated if the measured value is above or below this value, as applicable.	
Enable High Float Tracking	If enabled, the High Float alarm threshold will be increased when the operating voltage is increased by a voltage control process.	
Enable Low Float Tracking	If enabled, the Low Float alarm threshold will be decreased when the operating voltage is decreased by a voltage control process.	
Battery Temperature Alarm Thresholds	The thresholds for Battery Temperature High and Low alarms are configured here.	
AC Alarm Thresholds	Used in three phase systems, where the rectifier phase is known. *See also* Rectifiers *p40.* AC Phase 1/2/3 Fail and AC Phase 1/2/3 Voltage alarms have % deviation thresholds from the *Nominal AC Voltage*. For each of these alarms, a common threshold applies for all phases.	SC300: Alarms > Alarm Settings (tab) > System Alarms DCTools/ Web: Alarms > Alarm Configuration > AC Alarm Thresholds

Nominal AC Voltage	Used by the AC Phase 1/2/3 Fail and AC Phase 1/2/3 Voltage alarms.	SC300: Alarms > Alarm Settings (tab) Web: Alarms > Alarm Configuration > AC Alarm Thresholds

The following system alarms have particular configuration settings:

- System Overload / System Overload B alarm. See details on page 58.
- Battery Mid-point monitoring. See details on page 70.

Alarm Inhibiting

To prevent a single series of faults triggering multiple alarms, an alarm is inhibited by another active alarm if the conditions that trigger the inhibiting alarm include the conditions that trigger the inhibited alarm. However, the inhibiting alarm only inhibits if it is set to a level of severity that is equal to or higher than the alarm being inhibited.

For example, *Partial AC Fail* is inhibited if *AC Fail* is active and *AC Fail* is set to a level of severity that is equal to or higher than *Partial AC Fail*.

Alarm Descriptions on page 133 lists the inhibiting alarms that can inhibit each alarm.

System Overload Alarms

The System Overload and System Overload B alarms activate if the total system load exceeds a percentage of the installed rectifier capacity for a specified period, or if the total system load exceeds a percentage of the installed rectifier capacity minus the capacity of the largest one or two rectifiers if *System Overload Type* is set to *Redundancy N Plus 1 or N Plus 2*. This indicates that additional rectifiers need to be installed. This is useful at sites where there is ongoing installation of additional load equipment.

► To enable System Overload

- From DCTools/ Web go to: *Alarms* > *Alarm States*. Enable and configure *System Overload* (or System Overload B) alarm. See System Alarm Configuration on page 57.
- Go to: *Alarms* > *Alarm Configuration*. Configure the *System Overload* alarm parameters. See details on page 59.

Information

The following information is available about System Overload.

Parameter	Description	Where to find:
System Power	The output power of the system as a percentage of the total nominal power the system is capable of supplying.	SC300: Analogs DCTools/ Web: Analog Inputs

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Configuration

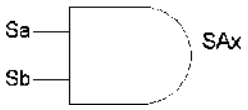
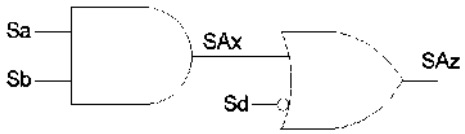
Set the following parameters.

Parameter	Description	Where to find:
System Overload Type	The System Overload alarm can be based on either *Total Capacity* or *Redundancy*. If the system overload type is based on *Total Capacity* then the alarm will trigger when the load is above the *System Overload Threshold* for the *System Overload Recognition Period*. If the system overload type is *Redundancy N Plus 1,* then the alarm will trigger when the load is above the total current capacity of the system minus the current capacity of the largest rectifier, for the *System Overload Recognition Period*. If the system overload type is *Redundancy N Plus 2,* then the alarm will trigger when the load is above the total current capacity of the system minus the current capacity of the largest two rectifiers, for the *System Overload Recognition Period*. *An alarm will always activate if the system overload type is set to Redundancy N Plus 1, when there is only one rectifier installed, or Redundancy N Plus 2, when there are only two rectifiers installed.*	DCTools/ Web: Alarms > Alarm Configuration
System Overload Type B	See System Overload Type above.	
System Overload Recognition Period	The System Overload alarm activates if the load is above the threshold continuously for this time. It is normally set to several hours so that the alarm does not operate during a normal battery recharge. *This setting is common to System Overload and System Overload Type B.*	
System Overload Threshold	The System Overload alarm activates if System Overload Type is set to Total Capacity and the load is above this threshold continuously for the *System Overload Recognition Period*. Measured as a percentage of total rectifier capacity.	
System Overload Threshold B	See System Overload Threshold above.	

Smart Alarms

Smart Alarms are a software simulation of logic gates to allow the logical combination of other alarms, time schedules and/or system values. Up to 32 *Smart Alarms* can be configured.

A single *Smart Alarm* is the equivalent of a multi-input AND, OR or XOR logic gate. More complex logic arrangements are created by using one *Smart Alarm* as an input into another. For example:

Two input AND gate: SAx = Sa AND Sb	
Three input OR gate: SAy = Sa OR Sb OR Sc	
Multi-gate logic: SAz = SAx OR NOT Sd *One input is Smart Alarm SAx (output from another gate). The other input is negated. This is available with Alarm Sources only.*	

Key:

SAx, SAy, SAz are *Smart Alarms* (entered in the *Smart Alarms* table).

Sa, Sb, Sc, Sd are the *Sources* (entered in the *Alarm Sources*, *Schedule Sources, System Value Sources*, or *Manual Sources* tables).

Smart Alarms also have optional activation and deactivation delays. When activated they can cause alarm indications (unless *Severity* is set to *Control*) and can activate one or two digital outputs (in the same way as other alarms).

Smart Alarms may also be used to start and stop control functions, including Equalize, Peak Load Reduction, and LVD.

For more information and application examples contact your Eaton DC product supplier and request Eaton Application Note AN0106, SC200 Advanced Alarm Features. This also applies to SC300.

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Sources

The inputs to *Smart Alarms* are called *Sources.*

Sources can be any combination of:

- **Alarm Sources** (up to 64):

  System Alarms, Analog Input High alarms, Analog Input Low alarms, Digital Input alarms, Other Smart Alarms

  Alarm Sources can either use the alarm's recognition period, or be triggered immediately. Alarm Sources can also be triggered either when the source alarm becomes active or when it becomes inactive.

- **Time Schedules** (up to 20)

  Time schedules can repeat for a fixed number of times, or indefinitely.

- **System Values** (up to 20):

  Bus Voltage, Rectifier Current, Load Current, Battery Current, Battery Temperature, Load Power, System Power, Ah Discharged, Number Of Rectifiers Failed, Number Of Rectifiers Comms Lost, AC Voltage, DC Input Voltage, Rectifier Input Voltage, Battery Time Remaining, Battery Health, Alternative Source Current, Solar Current, Solar Power, Generator Power, Highest Rectifier Heatsink Temperature, Fuel Level, Generator Backup Time, Fuel Remaining Time, Smart Analog, Energy Meter, Power Meter, Current Meter, Voltage Meter.

  System Value Sources are active either when the system value is above or below a defined threshold value.

  Energy Meter, Power Meter, Current Meter, Voltage Meter are the values defined for each meter in the Energy Metering Configuration. For instance, Power Meter 2 is the power associated with Energy Meter 2. Current Meter 2 is the current used to calculate power and energy for Energy Meter 2. It will be invalid if Energy Meter 2 power is read directly from a solar charger.

- **Manual Sources** (up to 20):

  These allow a user to activate or deactivate a Smart Alarm from a button on the web interface.

Smart Alarm Source options

The following parameters affect the operation of Smart Alarm alarm / system value sources:

Parameter	Description	Notes
Trigger Type		
Level	The Smart Alarm is active when the source is active	
Edge Set	The Smart Alarm will become active when the source becomes active, and will remain active even if the source becomes inactive.	Use Edge Set and Reset to give a latching function, as per a Set-Reset flip-flop.
Edge Reset	The Smart Alarm will become inactive when the source becomes active, and will remain inactive even if the source becomes active.	
Active Count	Sets the number of transitions before the Smart Alarm becomes active. E.g. If this is set to 2, then two inactive to active transitions are required before the Smart Alarm becomes active.	For example, set Active Count and Inactive count both to 2. This gives a divide by 2 counter.
Inactive Count	Sets the number of transitions before the Smart Alarm becomes inactive. E.g. If this is set to 2, then two active to inactive transitions are required before the Smart Alarm becomes inactive.	

Smart Alarm Actions

This section provides a means to view and configure control function actions triggered by Smart Alarms.

Not all Smart Alarm control in configured in this section. LVD control is configured in the LVD section.

Smart Alarms may be configured to:

- Trigger an LVD disconnect
- Trigger an equalize cycle
- Trigger Peak Load Reduction (PLR)
- Shut down all rectifiers
- Shut down all solar chargers
- Change voltage control to use *Alternative Float Voltage* rather than *Float Voltage*.

Configuration

Information

The following information is available about *Smart Alarms* and *Sources*.

Parameter	Description	Where to find:
Smart Alarm State	The present state of the *Smart Alarm*. If *Enabled* and active, this will be the alarm's *Severity*. If Dis*abled,* or *Enabled* but inactive, the state is shown as "-".	DCTools/ Web: Alarms > Smart Alarms > Smart Alarm States
Change	The time and date when the Smart Alarm state changed.	
Source Triggered	The present state of the source: Inactive Clear = The source condition is false and the alarm is not triggered. Inactive Armed = The source condition is false and the smart alarm input is active, because the source is set to *Invert*. Active Armed = The source condition is true and the smart alarm input is active. Active Clear = The source condition is true, but the smart alarm input is inactive because the source is set to *Invert*.  = There is an invalid dependency, or the source *Index* is invalid.  = The source is part of a circular dependency.	DCTools/ Web: Alarms > Smart Alarms > Sources
Next Activation	The date and time this schedule will next activate.	DCTools/ Web: Alarms > Smart Alarms > Schedule Sources
Schedule End	The date and time this schedule will activate for the last time.	

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► To create a Smart Alarm

1 Determine the equivalent logic gate arrangement for the *Smart Alarm*.

Smart Alarms can be regarded as logic gates. Each gate (AND, OR or XOR) is an entry in the Smart Alarm States table. The gate inputs are entries in the Alarm Sources, Scheduled Sources or System Value Sources tables.

2 Configure the Smart Alarm(s):

- On the web, go to: *Alarms* > *Smart Alarms*.
- Expand the *Smart Alarm States* table and configure a *Smart Alarm* and configure the following parameters.

To change a setting, double-click and select from drop down list or edit the text.

Parameter	Setting
Name	Type the name of the alarm.
Severity	Set to the required alarm priority. This determines how the alarm is indicated. See details on page 55. If set to *Disabled* then the alarm will not activate.
Operator	Determines how the sources will be logically combined (AND, OR or XOR).
Recognition Period	The alarm will activate when the logical combination of the sources has been true for this period.
Deactivation Recognition Period	The alarm will deactivate when the logical combination of the sources has been false for this period.
Digital Output Mapping A	If required, select a relay that will be operated when the alarm is active.
Digital Output Mapping B	If required, select a second relay that will be operated when the alarm is active.
Send Trap	Depending on this setting, an SNMP Trap will be sent for this alarm, on activation or deactivation or both, if the alarm's *Severity* matches the setting of the SNMP Trap Level (see details on page 110).
Group	Not used. Leave at zero.
Notes	Type any required description. When the alarm is active the text will be displayed on the SC300 and included in the SNMP trap (if used).

► To configure the Source(s) for a Smart Alarm

Configure the following parameters for the source(s) for each *Smart Alarm*.

Every Smart Alarm must have at least one Source assigned to it.

Alarm Sources

Parameter	Setting
SA Num	Type the number (from the *Smart Alarm States* table) of the *Smart Alarm* for which this source is an input.
Status	Set to *Enabled*.
Trigger When Source Is	Set to either: **Triggered** - the Alarm Source will become active immediately when the conditions for this alarm become true (or false when *Logic* is set to NOT). The alarm needs to be enabled and set with any severity, including Control. *Do not use Triggered when Type is set to Smart Alarm.* **Active** - the Alarm Source will become active when the alarm becomes active (or inactive when *Logic* is set to NOT), after the alarm recognition time, and only if the alarm is *Enabled*.
Type	Set to the appropriate source type: *System Alarm*, *Analog Input High*, *Analog Input Low*, *DI*, *Smart Alarm.*
Index	Identify the alarm: *Source Type* = *System Alarm*: Web - select the name of the system alarm from the list. *Source Type* = *AI High/AI Low* - type the alarm number from the *Analog Input High Alarms* or the *Analog Input Low Alarms* table. *Source Type* = *DI* - type the alarm number from the *Digital Input Alarms* table. *Source Type* = *Smart Alarm* - type the alarm number from the *Smart Alarm States* table.
Invert	The source is inverted before it is used to trigger the *Smart Alarm.* The *Smart Alarm* will be triggered when the source becomes inactive.
Active Count	Sets the number of transitions before the Smart Alarm becomes active. E.g. If this is set to 2, then two inactive to active transitions are required before the Smart Alarm becomes active.
Inactive Count	Sets the number of transitions before the Smart Alarm becomes inactive. E.g. If this is set to 2, then two active to inactive transitions are required before the Smart Alarm becomes inactive.
Trigger	Specify how the source is used to trigger the *Smart Alarm.* *Level* – triggered as long as the source is active. *Edge Set* – triggered when the source becomes active. *Edge Reset* – triggered when the source becomes inactive *Edge Latch* – triggered when the source becomes active. The Smart Alarm remains active as long as the source is active.

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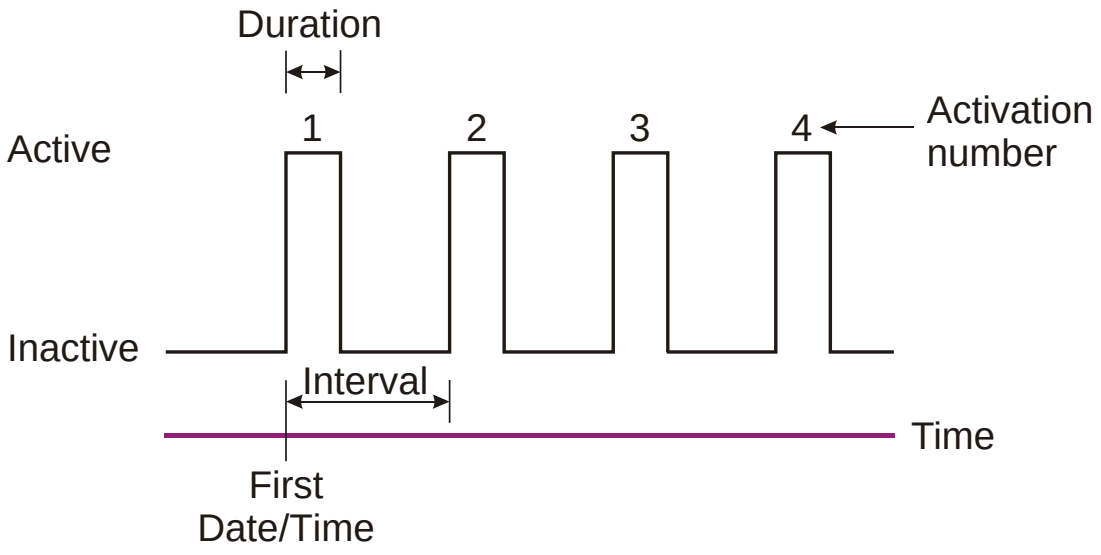
Schedule Sources

Parameter	Setting
SA Num	Type the number (from the *Smart Alarm States* table) of the *Smart Alarm* for which this source is an input.
Status	Set to *Enabled*.
First Activation	Set to the date and time when the *Schedule Source* will activate for the first time (see the diagram below).
Duration	Set to the length of time that the *Schedule Source* will remain active each time it activates (see the diagram below).
Interval	Set to the time interval between the start of each activation (see the diagram below).
Number of Activations	Set the number of activations. *If set to zero then there is no limit to the number of activations.*
Invert	The source is inverted before it is used to trigger the *Smart Alarm*. The *Smart Alarm* will be triggered when the source becomes inactive.
Trigger	Specify how the source is used to trigger the *Smart Alarm*. *Level* – triggered as long as the source is active. *Edge Set* – triggered when the source becomes active. *Edge Reset* – triggered when the source becomes inactive *Edge Latch* – triggered when the source becomes active. The Smart Alarm remains active as long as the source is active.

Scheduled Sources Operation



System Value Sources

Parameter	Setting
SA Num	Type the number (from the *Smart Alarm States* table) of the *Smart Alarm* for which this source is an input.
Status	Set to *Enabled*.
System Value	Set to the required value (*Bus Voltage, Rectifier Current, Load Current, Battery Current, Battery Temperature, Load Power, System Power, Ah Discharged, Number Of Rectifiers Failed, Number Of Rectifiers Comms Lost, AC Voltage, DC Input Voltage, Rectifier Input Voltage, Battery Time Remaining, Battery Health, Alternative Source Current, Solar Current, Solar Power, Generator Power, Highest Rectifier Heatsink Temperature, Fuel Level, Generator Backup Time, Fuel Remaining Time, Smart Analog, Energy Meter, Power Meter, Current Meter, Voltage Meter, Operating Voltage*).
System Value Index	Where the System Value is in a table of values, the position in this table. *This applies to Smart Analog, Energy Meter, Power Meter, Current Meter, and Voltage Meter items.*
Threshold Type	Set to either: **High** - the System Value Source will be true when the System Value goes above the Threshold. **Low** – the System Value Source will be true when the System Value goes below the Threshold.
Threshold	The System Value Source will be true when the System Value goes above or below (depending on the Threshold Type) this value.
Hysteresis	Determines when an active *System Value Source* will become false: If *Threshold Type* is set to *Low* the *System Value Source* will become false when the *System Value* goes above *Threshold* + *Hysteresis*. If *Threshold Type* is set to *High* the *System Value Source* will become false when the *System Value* goes below *Threshold* - *Hysteresis*.
Invert	The source is inverted before it is used to trigger the *Smart Alarm.* The *Smart Alarm* will be triggered when the source becomes inactive.
Invert	The source is inverted before it is used to trigger the *Smart Alarm.* The *Smart Alarm* will be triggered when the source becomes inactive.
Active Count	Sets the number of transitions before the Smart Alarm becomes active. E.g. If this is set to 2, then two inactive to active transitions are required before the Smart Alarm becomes active.
Trigger	Specify how the source is used to trigger the *Smart Alarm.* *Level* – triggered as long as the source is active. *Edge Set* – triggered when the source becomes active. *Edge Reset* – triggered when the source becomes inactive *Edge Latch* – triggered when the source becomes active. The Smart Alarm remains active as long as the source is active.

Manual Sources

Parameter	Setting
SA Num	Type the number (from the *Smart Alarm States* table) of the *Smart Alarm* for which this source is an input.
Status	Set to *Enabled*.

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Invert	The source is inverted before it is used to trigger the *Smart Alarm.* The *Smart Alarm* will be triggered when the source becomes inactive.
Trigger	Specify how the source is used to trigger the *Smart Alarm.* *Level* – triggered as long as the source is active. *Edge Set* – triggered when the source becomes active. *Edge Reset* – triggered when the source becomes inactive *Edge Latch* – triggered when the source becomes active. The Smart Alarm remains active as long as the source is active.

Smart Alarm Actions

Parameter	Setting
AC Peak Load Reduction Smart Alarm	To trigger Peak Load Reduction (PLR) from a Smart Alarm, set this number to the Smart Alarm number.
Equalize Smart Alarm	To trigger Equalize from a Smart Alarm, set this number to the Smart Alarm number.
Shutdown all rectifiers Smart Alarm	Shuts down all ac input rectifiers.
Shutdown all Solar Smart Alarm	Shuts down all dc input solar chargers.
Off-Normal Smart Alarm	When this is active, logs run at the Off-normal rate.
Alternative Float Smart alarm	When this is active, batteries are charged at the *Alternative Float Voltage*.

Example : AC High and AC Low Alarms

AC High and AC Low are examples of useful alarms that can be set up using *Smart Alarms*.

► To Create an AC High Smart Alarm

1 Configure a *Smart Alarm* with the following parameter settings:

Name: AC High

Operator: OR

Severity: Minor (or a different severity if required).

Set other parameters as required (see details on page 62).

2 Configure a *System Values Source* with the following parameter settings:

SA Num: The number of the *Smart Alarm* configured in step 1.

Status: *Enabled*

System Value: *AC Voltage*

Threshold Type: *High*

Threshold: 275 (or a different value if required)

Hysteresis: 5 (or a different value if required)

Invert:	-
Trigger:	Level

► **To Create an AC Low Smart Alarm**

1 Configure a *Smart Alarm* with the following parameter settings:

Name:	AC Low
Operator:	OR
Severity:	Minor (or a different severity if required).

Set other parameters as required (see details on page 62).

2 Configure a *System Values Source* with the following parameter settings:

SA Num:	The number of the *Smart Alarm* configured in step 1.
Status:	*Enabled*
System Value:	*AC Voltage*
Threshold Type:	Low
Threshold:	185 (or a different value if required)
Hysteresis:	5 (or a different value if required)
Invert:	-
Trigger:	Level

Batteries

The following information is available about the batteries connected to the dc power system.
See also Battery Time Remaining *on page 74.*

Parameter	Description	Where to find:
Battery Charge State	**Charge** - the battery current is above the *Battery State Threshold.* **Discharge -** the battery current is below -1 * *Battery State Threshold.* **Float -** the battery current is between ± *Battery State Threshold.* **Unavailable** - the battery current is not available. *See SC300 or Web displays ??? or N/A on page 123.*	SC300: Battery > Battery DCTools/Web: Batteries
Battery Temperature	The temperature measured by the battery temperature sensor.	
Ah Discharged	The current level of battery discharge. *See also Reset Ah Discharged on page 77.*	

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Batteries Configuration

The following battery parameters must be configured.

Parameter	Description	Where to find:
Cells Per String	The number of 2V cells per battery string (for example: 24 in a 48V nominal system).	SC300: Battery > Battery (tab) DCTools/Web: Batteries
Battery Capacity	Set to the rated 10 hour capacity of the installed battery strings.	
Battery State Threshold	Used to determine the *Battery Charge State*. See *Battery Charge State* on page 68.	DCTools/Web: Batteries
Battery Type	An optional text field for the name or type of battery.	
Ah Discharged Float Reset Rate	When the system is in float charging state, the Ah Discharged figure is every hour decreased by (Ah Discharged Float Reset Rate * Battery State Threshold). The default is 0.5 Ah / hour.	
Battery Current Sensor Fail Recognition Period	An optional battery current sensor fail delay. Set if momentary battery current sensor fail conditions stop battery related control processes.	
End of Charge Action	Set Ah Discharged to zero after Equalize and Fast Charge, after Fast Charge only, or after Equalize only. Use this option to allow Equalize and / or Fast Charge to reset Ah Discharged, particularly in a cyclic charge situation where Ah Discharged will drift over time.	
Battery Installed Date	If required, this date can be entered for future reference.	
Battery Design End of Life Date	If a date is entered here, and the *Battery End of Life* alarm is enabled, the *Battery End of Life* alarm will become active at this date.	
Site Backup Time	Where a site has a known back-up time, enter that time here. During a discharge, Site Backup Time Remaining will count down from this figure. This gives users a quick view of the expected time left before the site power fails.	

Battery Mid-point Monitoring (MPM) and Quarter-point monitoring (QPM)

- *The SC300 uses the same settings for MPM and QPM.*
- *Where text refers to MPM or Mid-point monitoring below, it includes quarter-point monitoring unless otherwise stated.*

Battery Mid-point monitoring and Quarter-point monitoring provide cost-effective methods for the early detection of internal battery faults.

The voltages of the two halves or quarters of a battery string are measured and the system controller generates an alarm signal if a voltage imbalance is detected.

A voltage imbalance is an indication that one or more cells has an internal fault. Further investigation can then isolate the faulty cell(s) and action can be taken to correct the problem and prevent a total battery failure.

To connect Battery Mid-point Monitoring see details in the dc power system Installation and Operation Guide. If a *String Fail* alarm is generated see Troubleshooting on page 122.

To ensure reliable operation MPM / QPM operate only when the battery is in float charge and after a configurable lockout period since the last battery discharge, Fast Charge, Equalize or Battery Test.

- *Quarter-point monitoring requires the one of these IO Boards : IOBGP-10/11/20/21.*
- *The IOBGP-00/01 only supports mid-point monitoring.*

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► To enable *Battery Mid-point Monitoring (MPM) or Quarter-Point Monitoring (QPM)*

If any of the mid-point monitoring analog inputs are used for Reverse Battery Detection (see details on page 78) then they are not available for MPM/QPM.

1. Connect the mid-point monitoring sense wires to the batteries. Refer to the dc power system Installation and Operation Guide.

   There are four mid-point / quarter-point monitoring analog inputs on an IOBGP Input / Output board. Up to 20 additional battery strings can be monitored if additional IOBGP Input / Output boards are connected. Refer to the dc power system Installation and Operation Guide for details on how to connect additional IOBGP Input / Output boards to the SC300.

2. In DCTools/Web go to *Batteries*.
3. Set *Cells Per String* to the number of 2V cells per string (for example: 24 for 48V nominal system).
4. Expand the *Mid-point Monitoring* table.
5. Set *MPM Enable* to *Enabled* and check the configuration settings (see details on page 73).
6. Go to *Analog Inputs* and *Enable* the mid-point / quarter-point monitoring analog inputs as required.

   The string name is taken from the name of the string mid-point as configured in analogue inputs. For instance "Batt Cab A string 1".

   For Mid-point monitoring, battery strings 1-4 will typically be connected to IOB Number 1, IOB AI Numbers 2-5. Battery strings 5-8 will be connected to IOB Number 2, IOB AI Numbers 2-5. And so on, as required up to string 24.

   For quarter-point monitoring, each string requires a Battery First Quarter Point, a Battery Midpoint, and a Battery Third Quarter Point input to be connected. Each IO Board can measure quarter-points for one string, plus one spare input. For instance, four strings requires 12 analog inputs, which can be achieved with three IO Boards.

   ***Ensure that mid-points and quarter-points appear in order in the analogue inputs table**. E.g. string 1 QP1, string 1 MP, string 1 QP3, string 2 QP1, string 2 MP, string 2 QP3…. The SC300 uses the order to determine what quarter points and mid-points belong together. The string name will be taken from the mid-point analogue input name.*

7. Go to *Alarms* > *Alarm States*. Enable and configure the *String Fail* alarm. See System Alarm Configuration on page 57.

► To clear a *String Fail* alarm

1. On the web, go to *Batteries* > *Mid-point Battery Monitoring* (expand the table).
2. Click on *Clear String Fail*.

Information

The following information is available about MPM / QPM:

Parameter	Description	Where to find:
MPM State	**Disabled:** MPM is *Disabled*. **Unable To Start:** MPM is *Enabled* but either: *Cells per String* is zero; the bus voltage sensor has failed; ac supply has failed; the battery is in discharge state; Fast Charge, Equalize or Battery Test is active; or the battery fuse has failed. **Locked Out:** MPM is within the *MPM Lockout Period*. No *String Fail* alarm will become active in this period.	

Parameter	Description	Where to find:
	Converging: MPM is outside the *MPM Lockout Period* but is within *MPM Convergence Period*. **Stable:** MPM is outside the *MPM Convergence Period*.	SC300: Battery > MPM DCTools/Web: Batteries > Mid-point Monitoring
Time In This State	The time period MPM has been in the current state.	
Current MPM Threshold	When MPM state is *Converging* this value is between *MPM Start Threshold* and *MPM Stable Threshold*. When MPM state is *Stable* this value is the *MPM Stable Threshold*.	
Reference Voltage	The calculated mid-point reference voltage (50% of the bus voltage for even number of cells).	
String State	**OK:** MPM is in the state *Converging* or *Stable* and the string's *Imbalance* is below the current threshold. **Unavailable:** The MPM is not in state *Converging* or *Stable*, or the string's mid-point voltage is unavailable. **Pending Fail:** The string's *Imbalance* is above the current threshold, but has not yet been so continuously for the *String Fail Recognition Period*. **Fail:** The string's *Imbalance* has been above the *Current MPM Threshold* for longer than the *String Fail Recognition Period*. This will activate a *String Fail* alarm. **Not Configured:** No analog input is mapped to this string.	
¼ Point Voltage	Shows the first quarter-point voltage reading for the string or *N/A* if no analog input channel is mapped to this string. *Only shown if an analog input is configured as Battery First Quarter Point.*	
Mid-point Voltage	Shows the mid-point voltage reading for the string or *N/A* if no analog input channel is mapped to this string.	
¾ point Voltage	Shows the third quarter-point voltage reading for the string or *N/A* if no analog input channel is mapped to this string. *Only shown if an analog input is configured as Battery Third Quarter Point.*	
Imbalance	The percentage imbalance of the *Mid-point Voltage*, or the worst imbalance of the ¼, mid and ¾ point if QPM is in use.	

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Configuration

Set the following parameters.

Parameter	Description	Where to find:
String Fail alarm parameters	See System Alarm Configuration on page 57.	Web: Alarms > Alarm States
MPM Lockout Period*	Time from when MPM is able to start until the start of the *MPM Convergence Period*.	SC300: Battery > MPM > Settings Web: Batteries > Mid-point Monitoring
MPM Convergence Period*	Time from the end of the *MPM Lockout Period* until *MPM State* is *Stable*. During this period the *Current MPM Threshold* is calculated using linear interpolation between *Start Threshold* and *Stable Threshold* and the *MPM State* is defined as *Converging*. After this period the *MPM State* is defined as *Stable* and the *MPM Stable Threshold* applies.	
String Fail Recognition Period	If the mid-point / quarter point *Imbalance* percent of a battery string exceeds the *MPM Threshold* for this period of time the *String State* is set to *Fail* and the *String Fail* alarm is activated.	
MPM Start Threshold*	Mid-point / quarter point *Imbalance* percent threshold at the start of the *MPM Convergence Period*.	
MPM Stable Threshold*	Mid-point / quarter point *Imbalance* percent threshold after the convergence period.	

* A dynamic alarm threshold is used to give the best possible battery fault detection:

1. After the end of a discharge, Fast Charge or Equalize cycle, MPM does not start until the end of the *MPM Lockout Period*, to ensure the system is in float charge.
2. At this point, the battery cell voltages are expected to be widely spread, so the alarm threshold is set high (*MPM Start Threshold*).
3. The alarm threshold is then progressively reduced over the *MPM Convergence Period*.
4. After the end of the *MPM Convergence Period*, cell imbalance is assumed to be stable, and a fixed threshold is used (*MPM Stable Threshold*).

Battery Time Remaining

The SC300 obtains characterization data from every full battery discharge, to a specified end voltage.

During a battery discharge, the SC300 uses this characterization data to calculate an estimated time until the battery will reach the specified end voltage.

- *If a battery disconnect LVD is fitted then the end voltage will usually be the voltage at which the LVD disconnects the battery.*
- *Battery Time Remaining is designed for a constant power load. The accuracy of the time remaining calculation will be reduced if the dc power system is connected to a predominantly resistive (constant current) load.*
- *The time remaining calculation will not be correct if a non-essential load is disconnected during the battery discharge.*
- *Battery Time Remaining cannot be used for very small battery strings (<20Ah) due to limits in current resolution.*
- *Battery characterization and Battery Time Remaining are not recommended under these conditions:*
  - With a battery C10 capacity of less than 30Ah
  - If load current is less than twice the Battery State Threshold setting.
  - If load current is less than 10A.

Configuration

It will take at least 10 hours to characterize a battery.

When a battery is characterized it is fully discharged. The bus voltage will gradually reduce to the battery end voltage. Ensure that this will not affect the operation of any equipment connected to the dc power system.

Use the following procedure to configure *Battery Time Remaining* for the first time, or if a previously characterized battery is changed.

- *Battery Characterization is not necessary if a previously saved battery characterization data file is available. Refer to Characterization Data Management on page 77. Only use characterization data for an identical type and size of battery.*

► To configure *Battery Time Remaining*

1. Check that all battery strings are connected and all LVD contactors (if any) are connected.
   - *During a battery characterization, LVD contactor disconnection is inhibited. If any LVD contactor is configured to connect during a battery discharge then set it to Manual Connect to prevent operation during the battery characterization.*
2. Check that all battery strings are fully charged.
   - *When a battery is fully charged, the Battery Charge State will be Float and Ah Discharged will be zero. See Batteries on page 68.*
3. Check that all battery parameters are set to the correct values. See Batteries Configuration on page 69.
4. Check that the load current is at least 10% of the C10 capacity of the batteries (*Battery Capacity*) and at least 150% of the *Battery State Threshold*. See Batteries Configuration on page 69.
   - *If the load current is less than 10% of the C10 capacity of the batteries, then Battery Characterization will take longer than 10 hours.*

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5 From the Web go to *Batteries* > *Battery Time Remaining,* or use the SC300 keypad to go to *Battery*. Set *End Voltage* to the voltage per cell when the battery is regarded as fully discharged.

In general set the end voltage to the same value as for the LVD Disconnect Voltage (see LVD Configuration on page 52). End Voltage must be at least 0.02V/Cell above the Minimum System Voltage (per cell). The Minimum System Voltage is viewable on the web at Control Processes. It is not configurable from web.

6 Enable *Battery Current Limit* (see details on page 28).

► To Characterize the Battery

1 Either:

- Manually start a Characterization:
  On the SC300 go to: *Battery* > *Characterize* > *Start*.
  On DCTools/web go to: *Battery* > *Battery Time Remaining*. Click *Characterize*.

If "Characterize" is not present on the SC300 or the "Characterize" button is inactive in Web, then check all configuration settings. In Web, the hover text will indicate why the characterization cannot start.

- Or, use *Automatic Characterization to start a characterization automatically when all conditions are correct and stable*:
  On the web, to: *Battery* > *Battery Time Remaining*.
  Set *Automatic Characterization* to *Enabled* and set *Automatic Characterization Delay* to the required time that the conditions must be stable.

2 The characterization process will take at least 10 hours, depending on the load current.

During characterization the rectifier output voltage is varied to maintain a constant power discharge.

3 When the characterization has finished, the *Characterization Result* will be *Updated*.

If any other Characterization Result is shown, refer to BTR Operation on page 76.

4 The rectifiers will return to float voltage and the battery will start to recharge. If required, start a manual Equalize (see details on page 31) to reduce the battery recharge time.

5 Restore any changed LVD operation back to the original settings. If no longer required, disable *Battery Current Limit*.

Battery Time Remaining is now operational. During any battery discharge an estimate of time remaining will be displayed.

Operation

The following information is available about *Battery Time Remaining*.

Parameter	Description	Where to find:
Time Remaining	During a battery discharge, this is the estimated time until the battery voltage will be equal to the *End Voltage,* at the present battery current. Time remaining will be re-calculated if the load current varies during discharge (for example, when a load disconnect LVD operates). *Time Remaining is only available when Battery Time Remaining State is Active*.	SC300: Battery Web/DCTools: Batteries
Battery State Of Health	The approximate battery capacity measured during the last battery characterization, as a percentage of the configured *Battery Capacity*.	Web/DCTools: Batteries
State	**Inoperative:** The battery characterization data is not loaded, *End Voltage* is below the characterization end point, or the bus voltage or battery current is unavailable. **Inactive:** *Battery Charge State* is *Float* or *Charge*. *See* Battery Charge State on page 68. **Characterizing:** Battery characterization is in progress. **Active:** The battery has been characterized and *Battery Charge State* is *Discharge.* *See* Battery Charge State on page 68.	
Lowest End Voltage	The end voltage used for the last battery characterization.	
Characterization Result	**Not Yet Run:** The battery has not been characterized since the last restart of the SC300. **Active:** The SC300 is collecting the characterization data. **Complete:** The SC300 has collected the characterization data and is updating its database. **Updated:** The SC300 has updated its database. **Sensor Failed:** Data from the last characterization was not saved because the bus voltage sensor failed or the battery current became unavailable. **Not Fully Charged:** Characterization did not start because the battery was not fully charged when discharge started. **Unstable Battery Current Pending:** The battery current has varied more than the tolerance for an accurate characterization. Characterization will continue if the battery current is in tolerance within two minutes. Otherwise, data from this discharge will not be saved. **Unstable Battery Current:** Data from the last characterization was not saved because the battery current varied more than the tolerance, for more than two minutes. **Voltage Step Detected:** Data from the last	SC300: Battery Web/DCTools: Batteries > Battery Time Remaining

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characterization was not saved because of a change in the bus voltage (possibly caused by a load disconnect).

Canceled: Data from the last characterization was not saved because the characterization was stopped manually.

Characterization Data Management

Battery characterization data can be saved to file for later use. This is useful if several sites use batteries of the same type and size. However, characterization of each battery will provide the most accurate estimate of *Time Remaining*.

► To save characterization data to a file

1. In Web go to *Batteries* > *Battery Time Remaining*.
2. When the battery characterization is completed, click on *Characterization Data: Download*.
3. Click *Save*. Type a file name (*.dcf) and browse to the required location. Click *Save*.

   DCTools cannot save the characterization data.

► To load battery characterization data into the SC300

Use Web to restore the *.dcf (configuration fragment) file previously saved. Refer to Backup and Restore on page 23.

Reset Ah Discharged

The SC300 monitors battery discharge and maintains a value called *Ah Discharged*. In a new SC300 *Ah Discharged* is set to zero. During operation of the dc power system the value is increased as the battery is discharged, and reduced as the battery is recharged.

The value of *Ah Discharged* is used to start the *Fast Charge* control process. See details on page 32.

► To view current value of Ah Discharged

- Use the SC300 keypad to go to: *Battery* > *Battery* > *Ah Discharged*
- On the web, the Ah Discharged value is shown next to the battery icon.
- Or go to: *Batteries*.

If a battery or the SC300 is changed, then reset the value of *Ah Discharged* to zero (when the battery is fully charged).

► To set the value of Ah Discharged back to zero

- Use the SC300 keypad to go to: *Battery* > *Reset State* > *Enter* > *Reset.*
- Or, on the web or DCTools, go to: *Batteries*. Click *Reset Ah Discharged.*

  Any active or pending Fast Charge or Equalize will be cancelled.

Reverse Battery Detection

If *Reverse Battery Detection* is enabled and a battery is connected with the incorrect polarity, the SC300 will:

- Activate a *Wrong Battery Polarity* alarm, and
- Prevent any LVD from connecting.

> *Reverse Battery Detection uses the battery mid-point monitoring (MPM) analog inputs on an IOBGP Input / Output board. Any of the mid-point monitoring analog inputs used for Reverse Battery Detection are not available for MPM or QPM (see details on page 70).*

► To enable *Reverse Battery Detection*

1. Before the batteries are connected to the dc power system, connect the mid-point monitoring sense wires to the battery sides of the battery fuses/disconnect devices (leave the fuses/disconnect devices open). Refer to the dc power system Installation and Operation Guide.

   > *There are four mid-point monitoring analog inputs on an IOBGP Input / Output board (for four battery fuses/disconnect devices). Up to 20 additional battery fuses/disconnect devices can be connected if additional IOBGP Input / Output boards are connected. Refer to the dc power system Installation and Operation Guide for details on how to connect additional IOBGP Input / Output boards to the SC300.*

2. On DCTools/web, go to *Analog Inputs* and for each mid-point monitoring analog inputs used (one per battery fuses/disconnect devices) set the following parameters.

   > *To change a setting, double-click and select from drop down list or edit the text.*

Parameter	Setting
Status	Set to *Enable*.
Name	Set to: *Battery Polarity Detect 1*, *Battery Polarity Detect 2*, ...
Function	Set to *Reverse Battery Detect*.
Units	Set to *Volts*.
IOB Number	Set to 1 for battery fuses/disconnect devices 1-4. Set to 2 for battery fuses/disconnect devices 5-8. ...
IOB AI Number	Set to 2 for battery fuses/disconnect devices 1, 5, 9 ... Set to 3 for battery fuses/disconnect devices 2, 6, 10 ... ...
Gain	Set to 1.
Offset	Set to 0.
Group	Set to 0 unless using Groups in PowerManagerII. See PowerManagerII online help for details.

3. On DCTools/web, go to Alarms > Alarm States table, and check the Wrong Battery Polarity alarm is enabled.
4. If necessary, expand the table and enable the Wrong Battery Polarity alarm.

Wrong Battery Polarity Alarm

If *Reverse Battery Detection* is connected and enabled, the SC300 will activate a *Wrong Battery Polarity* alarm if it detects that one or more of the batteries are connected with the wrong polarity.

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Generator Control

Generator Control is used to delay the start of a standby ac generator until the batteries are partially discharged (rather than immediately after the ac supply fails). This can save fuel by preventing the generator running during short ac supply failures. It can also be used to control a generator in a hybrid power system (cyclic charge/discharge).

Generator Control uses a digital output (relay) which is connected in series with the generator run signal of the generator controller. The relay contacts interrupt the generator run signal until the *Generator Control* is active.

The *Generator Control* output is activated and deactivated depending on the *Start Generator* settings. The options are:

- *Start generator on fast charge* - The controller will activate the generator control relay while *Fast Charge* is active or pending, and deactivate it when the *Fast Charge* cycle ends.
- *Start generator on equalize* - The controller will activate the generator control relay while *Equalize* is active, and deactivate it when the *Equalize* cycle ends.
- *Start generator on AC Peak Load Reduction* - The controller will activate the generator control relay when *PLR* is active, and the battery has discharged down to the PLR *Low Voltage Limit* and deactivate it when the battery is fully charged (as indicated by Ah Discharged is zero).
- *Start generator on mains failure* – The controller will activate the generator control relay when an ac supply failure is detected, and deactivate it when the ac supply is restored.

A *Generator Fail* alarm is activated if the SC300 does not detect that the ac supply is present (rectifiers have turned on) after the *Generator Fail Alarm Recognition Period* following *Generator Control* becoming active.

The generator can also be started and stopped manually.

The SC300 detects that the generator is running from a digital input. There must be a digital input connected that is active when the generator is running. This should be configured with *Function* = *Engine Run.*

► To manually start the generator

- Make sure that *Maximum Run Time* has been set to a value greater than zero.
- Use the SC300 keypad to go to: Control Processes > Generator Control > Settings (tab) and select *Start Manual Run*.
- On DCTools/web, go to Control Processes > Generator Control > Manual Run and click *Start*.

► To manually stop the generator after a manual start

- Use the SC300 keypad to go to: Control Processes > Generator Control > Settings (tab) and select *Cancel Manual Run*.
- On DCTools/web, go to Control Processes > Generator Control > Manual Run and click *Cancel*.

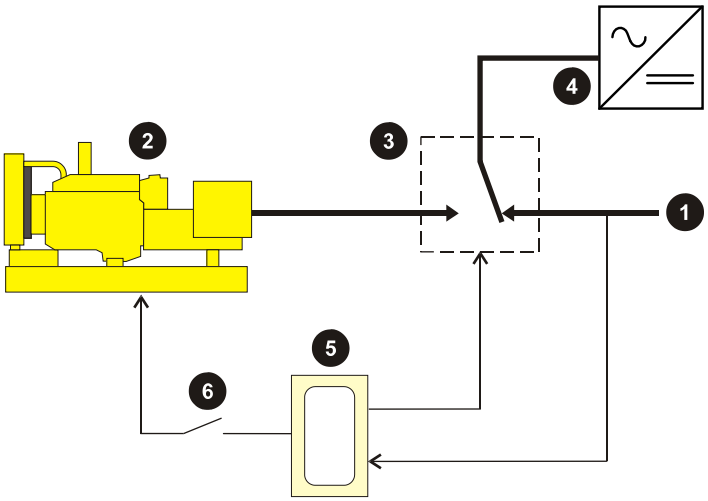
This will not stop the generator if it is running due to a Fast Charge, Equalize, or AC failure.

When the generator has been started manually, *Generator Run Time Remaining* shows the time remaining for the generator to run.

► To view Generator Run Time Remaining

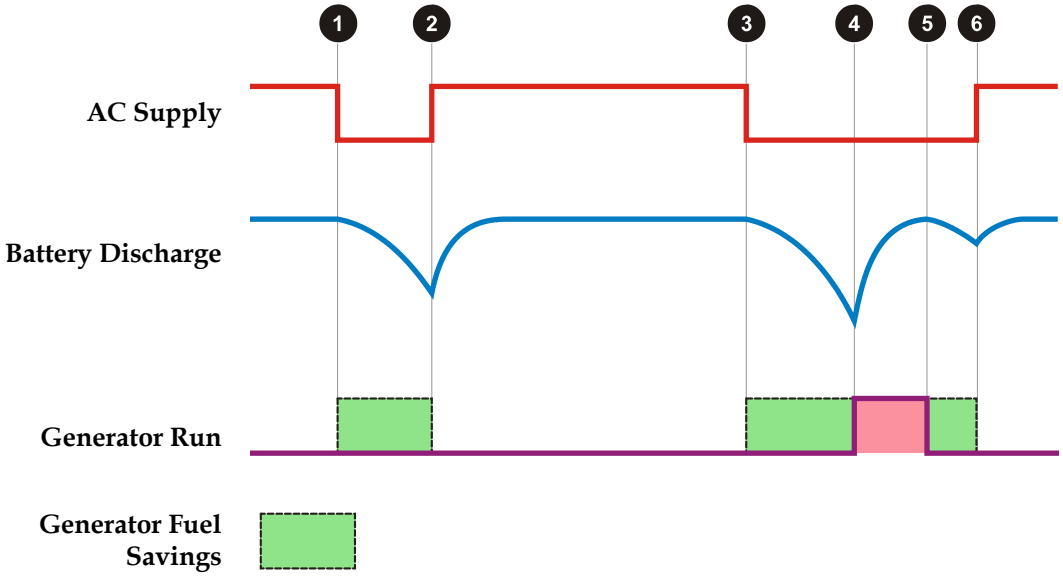
- Use the SC300 keypad to go to: Control Processes > Generator Control.
- On DCTools/web, go to Control Processes > Generator Control.

Single line diagram



1. AC utility supply
2. Generator
3. AC change-over switch
4. Rectifiers
5. Generator control panel
6. Normally open (NO) relay contacts on I/O board interrupt Generator Run signal.

Typical operation for systems with an ac supply



1. AC supply failure. Battery starts to discharge.
2. AC supply restored. Battery begins to recharge. Battery discharge did not reach the Ah Threshold. The Generator Control output was not active (relay contacts did not close) so the generator did not run.
3. AC supply failure. Battery starts to discharge.
4. Battery discharge reaches the Ah Threshold. The Generator Control output becomes active and the relay contacts close. The Generator Run circuit is completed allowing the generator to start. Battery begins to recharge.
5. Battery recharge is complete. The Generator Control output becomes inactive and the relay contacts open. The Generator Run circuit is interrupted causing the generator to stop. Battery begins to discharge.
6. AC supply restored. Battery begins to recharge. Battery discharge did not reach the Ah Threshold. The Generator Control output was not active (relay contacts did not close) so the generator did not run.

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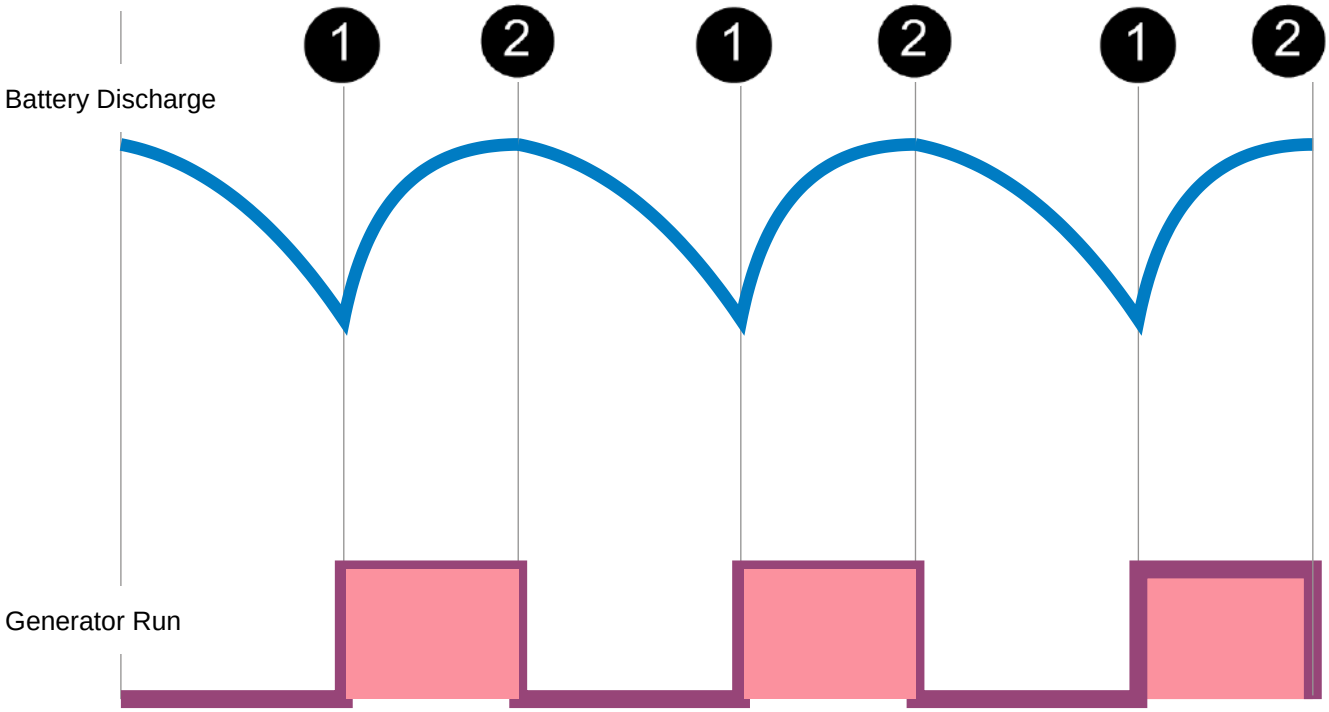
Typical operation for hybrid power systems



1. Battery discharge reaches the Ah Threshold. The Generator Control output becomes active and the relay contacts close. The Generator Run circuit is completed allowing the generator to start. Battery begins to recharge.
2. Battery recharge is complete. The Generator Control output becomes inactive and the relay contacts open. The Generator Run circuit is interrupted causing the generator to stop. Battery begins to discharge.

Configuration

► **To set up Generator Control:**

- Connect from the normally open (NO) contacts of an unused digital output relay on the I/O board to the generator run circuit.

  Ensure that no alarms are mapped to this relay.

- On the web, go to *Digital Outputs* and configure the digital output as *Active State Energized*. See Digital Outputs on page 91.
- Connect a spare digital input to a volts free contact that closes when the generator is running. Configure this with *Function = Engine Run.*

  This contact tells the SC300 that the generator is actually running, and allows it to determine if the generator has failed.

- Check that *Fast Charge* is enabled, and check the Fast Charge configuration settings. See Fast Charge Configuration on page 34.
- Set the following parameters:

Parameter	Description	Where to find:
Start generator on fast charge	The controller will activate the generator control relay while *Fast Charge* is active or pending, and deactivate it when the *Fast Charge* cycle ends.	SC300: Control Processes > Generator Control > Settings (tab) DCTools/Web: Control Processes > Generator Control
Start generator on equalize	The controller will activate the generator control relay while *Equalize* is active, and deactivate it when the *Equalize* cycle ends.	
Start generator on AC Peak Load Reduction	The controller will activate the generator control relay when *PLR* is active, and the battery has discharged down to the PLR *Low Voltage Limit* and deactivate it when the battery is fully charged (as indicated by Ah Discharged is zero).	
Start generator on mains failure	The controller will activate the generator control relay is an AC supply failure is detected, and deactivate it when the ac supply is restored.	
Control Relay	The relay used to control the generator startup and shutdown. If this is set to None, the generator control process is disabled.	
Startup wiring	Set to Direct Start if the SC300 has full control of generator start. Set to Indirect Start if the system is wired so that the generator will automatically start when ac fails unless the Control Relay is opened by the SC300.	
Maximum Run-Time	The maximum time the generator is permitted to run following a manual start.	
Battery capacity	The rated 10 hour (C10) capacity of the installed battery strings.	SC300: Battery > Battery or DCTools/Web: Batteries.
Generator Fail Alarm Recognition Period	A *Generator Fail* alarm is activated after this time if the Generator Control output is active but the ac supply has not been restored.	SC300: Alarms > Settings (tab) DCTools/Web: Alarms > Alarm Configuration

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Fuel Management

The SC300 can monitor the use of fuel by a standby generator.

► **To set up fuel management**

- Connect a fuel level sensor to an analog input. The fuel level sensor should have a 0 to 10V output if connected to an IOBSS or IOBGP analog input.
- On the web, go to: *Analog Inputs*.
- Configure the selected Analog Input and set *Function* to *Fuel Level*.
- Go to: *Control Processes* > *Generator Control* and set *Fuel Tank Volume*.

The following information is available about fuel usage.

Parameter	Description	Where to find:
Fuel Level	The volume of fuel in the generator's fuel tank.	SC300: Control Processes > Generator Control Web: Control Processes > Generator Control
Generator Refuel Date	The time and date the generator was last refueled.	
Last Refuel Volume	The amount of fuel added to the generator's fuel tank during the last refuel.	
Generator Backup Time	The estimated time for which the generator could continuously run based on the current fuel level and historical fuel consumption.	
Tank Empty Estimate	The best current estimate of the date the fuel tank will run dry if the current characteristics of generator usage and fuel consumption do not change. This is useful for installations that run the generator regularly and with a reasonably constant duty cycle.	

The time remaining estimates will not be accurate if the generator has been replaced or if the typical usage pattern has changed. If this happens, the fuel consumption history can be cleared manually.

Clearing the fuel consumption history will cause the time remaining estimates to be inaccurate or not available until enough information about the new generator has been collected.

► **To clear the fuel consumption history**

- On the web, go to: *Control Processes* > *Generator Control* > *Clear Fuel Consumption History*.

Smart Alarms based on System Value Sources can be used to configure alarms based on:

- Fuel Level.
- Generator Backup Time.
- Fuel Remaining Time (this is the estimated *Tank Empty Date*).

See Smart Alarms on page 60 for details of how to set Smart Alarms.

Input/Output (I/O)

The following section describes the I/O functions available with a single IOBGP I/O board.

Also see I/O Board Mapping on page 145.

Optional SiteSure-3G Input / Output (I/O) modules or additional IOBGP I/O boards can be connected to the SC300 to provide additional I/O to monitor and control external devices. For details refer to the SiteSure-3G Installation Guide (see Related Information on page i).

Identify an I/O Board

Input /Output (I/O) boards and SiteSure-3G modules are referenced by their serial numbers.

► **To identify a particular I/O board or SiteSure-3G module**

Either:

- On SC300 keypad go to: *Settings* > *IOBs* and select a module or board. Press *Enter*.

  The I/O board details screen appears. Use to scroll to other I/O boards.
- The Power-on LED on the selected I/O board or SiteSure-3G module will flash for 60 seconds (or press *Esc* to stop).

Or:

- On the web, go to: *System* > Interfaces > *RXP* > *RXP Devices*.
- Web: click on *Start Identifying*.
- The Power-on LED on the selected I/O board or SiteSure-3G module will flash for 60 seconds.

Analog System Values

The SC300 provides access to the following system analog values.

Parameter	Description	Where to find:
Bus Voltage	The average of all analog inputs configured as *Bus Voltage*. Otherwise, the system bus voltage is determined from the rectifier output voltages.	SC300: Analogs DCTools: Analog Inputs > System Values Web: Analog Input / Output > Analog Inputs > System Values
Load Current	The sum of any analog inputs configured as *Load Current*. Otherwise, if *Battery Current* is available, the *Load Current* is calculated as *Rectifier Current* + *Alternative Source Current* - *Battery Current*. Otherwise it is unavailable.	
Rectifier Current	The sum of any analog inputs configured as *Rectifier Current*. Otherwise, if there are *Battery* and *Load Currents*, the *Rectifier Current* is calculated as *Battery Current* + *Load Current* - *Alternative Source Current*. Otherwise, *Rectifier Current* is determined as the sum of all reported rectifier output currents.	
Battery Current	The sum of any analog inputs configured as *Battery Current*. Otherwise, if *Load Current* is available, the *Battery Current* is calculated as *Rectifier Current* + *Alternative Source Current* - *Load Current*. Otherwise it is unavailable. If positive, the battery is being charged.	

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Solar Current	The total current produced by Solar Chargers controlled by the SC300. *Only visible if there are Solar Chargers present.*
Alternative Source Current	The total current measured by all analog inputs configured as Function = Alternative Energy Source Current, plus the total current of all solar chargers controlled by the SC300. *Only visible if there are Alternative Energy Sources present.*
Sum of Reported Rectifier Currents	The sum of the currents reported by all rectifiers. Where there is no analog input configured as *Rectifier Current*, this will be the same value as *Rectifier Current*.
Load Power	The power being supplied to the load. *Load Current* x *Bus Voltage.*
System Power	The output power of the system as a percentage of the total nominal power of the registered rectifiers.
Solar Power	The total power produced by all solar chargers controlled by the SC300. *Only visible if there are Solar Chargers present.*
Phase 1	The AC input phase 1 voltage *Only visible if the SC300 is measuring ac input phases.* *Refer to* Phase Detection *on page 43.*
Phase 2	The AC input phase 2 voltage *Only visible if the SC300 is measuring ac input phases.* *Refer to* Phase Detection *on page 43.*
Phase 3	The AC input phase 3 voltage *Only visible if the SC300 is measuring ac input phases.* *Refer to* Phase Detection *on page 43.*
AC Voltage	The average of the ac voltage measured by single-phase rectifiers. Or, if 3-phase rectifiers are fitted then the average of the ac phase voltages is shown.
Highest Rectifier Heatsink Temperature	The highest temperature reported by any rectifier.
Fuel level	The calculated fuel tank level if *Fuel Tank Volume* has been set.
Battery Temperature	The average of all analog inputs configured as *Battery Temperature*.

Analog Inputs

The analog inputs (AI) monitor variable dc voltages (bus voltage sense, general purpose analog inputs, current sensors or temperature sensors). See Specifications on page 129 for details.

Generally, the system analog inputs (as indicated by the "Function" field) are configured at the factory and do not need to be changed.

► To configure an analog input

1 On DCTools/web, go to *Analog Inputs*. Expand the *Analog Inputs* table.

The table shows the maximum number of analog inputs. The actual number of analog inputs available depends on the number of I/O boards or modules connected.

2 Select an Analog Input. The analog inputs are mapped to specific I/O connectors and are of three types (voltage/general purpose, current or temperature). See mapping tables on page 145.

If needed, more than one analog input can be mapped to the same connector so that the sensor can trigger more than one Analog Input High and/or Low Alarm. In this case, no more than one analog input can be assigned to a system function.

3 Configure the following parameters to suit the application.

To change a setting, double-click and select from drop down list or edit the text.

Parameter	Setting
Status	Set to *Enabled*.
Name	Type the name of the input or use the default value.
Function	Set to *User Defined*, or to a particular system function if the input is to be associated with that function.
Function Index	Where *Function* is set to *Fan Temperature* or *Smart Analog*, this specifies which input applies.
Units	Select the units to match the type of analog value.
IOB Number	The number of the I/O board or module. *Generally, do not change this mapping. See point 2.*
IOB AI Number	The number of the AI on the I/O board or module. *Generally, do not change this mapping. See point 2.*
Gain	A scaling factor applied to the raw measured value.
Offset	A fixed value added to the raw measured value (after any Gain is applied).
Group	Set to 0 unless using Groups in PowerManagerII. Refer to PowerManagerII online help.

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Analog Input High and Low Alarms

Any analog input that is *Enabled* in the *Analog Inputs* table can activate a high and/or low alarm.

The Alarm Recognition Period (see details on page 56) applies to analog input alarms.

Configure the following parameters in the *Analog Input High Alarms* and/or *Analog Input Low Alarms* tables to suit the application.

To change a setting, double-click and select from drop down list or edit the text.

Parameter	Setting
Severity	Set to the required alarm priority. This determines how the alarm is indicated. See details on page 55. If set to *Disabled* then the alarm will not activate.
Threshold	An analog input high/low alarm is activated if the scaled input is greater than/less than or equal to this value.
Hysteresis	The amount of hysteresis applied to the input before an active alarm is deactivated.
Digital Output Mapping A	If required, select a relay that will be operated when the alarm is active.
Digital Output Mapping B	If required, select a second relay that will be operated when the alarm is active.
Send Trap	Depending on this setting, an SNMP Trap will be sent for this alarm, on activation or deactivation or both, if the alarm's *Severity* matches the setting of the SNMP Trap Level (see details on page 110).
Notes	Type any required description. When the alarm is active the text will be displayed on the SC300 and included in the SNMP trap (if used).

Smart Analogs

Smart Analogs provides a means to add, average or multiply analog input or system values.

For instance:

- Add the current to three outputs to give total "Load A" current.
- Average two temperature readings to give "Average cabinet temperature".
- Subtract outside temperature from inside temperature to give "Temperature rise"
- Multiply Bus Voltage times Alternative Energy Input Current to give Wind Generator Power

Smart analogs are not visible on the SC300 front panel, unless the Main Screen values have been set to Smart Analog. *Refer to* Main Screen Parameters, *page 14 for more details.*

Smart Analogue Values

Parameter	Description	Where to find:
Smart Analog	The value of the Smart Analog calculated by the SC300.	DCTools: Analog Inputs > Smart Analogs Web: Input /
Smart Analog Average	The average value over the last Smart Analog log interval.	

Smart Analog Min	The minimum value over the last Smart Analog log interval.	Output > Smart Analogs
Smart Analog Max	The maximum value over the last Smart Analog log interval.	
Units	The units of the Smart Analog. The SC300 takes the units from the first analog input mapped to this *Smart Analog* for Addition and Average. For Multiplication, units are kilowatts.	

► **To configure a Smart Analog**

1. Create an entry in the Smart Analogs table for each sum, product or average value to be calculated.
2. For each of the analog input values to be added, multiplied or averaged, create an entry in the Analog inputs table and set *Function = Smart Analog*. Set *Index = Smart Analog* number as above.
   All the Analog inputs mapped to the same Smart Analog are then added, multiplied or averaged according to the *Type* setting.
3. For each of the system values to be added, multiplied or averaged to produce the Smart Analog value as above, create an entry in the System Values Mapping table.

   In the Analog Inputs table, more than one analog input table entry can be mapped to the same physical input. This allows you to create an entry to map an input to a Smart Analog, even if it is already used for another Function.

   To subtract an analog value, create an entry in the Analog Input table with a negative gain. This will make the value negative, so it will be subtracted from the other positive value(s).
4. Configure the Smart Analog values as below:

Parameter	Description
Name	Type the name of the *Smart Analog*.
Function	Maps a Smart Analog to a particular function. e.g. Set to *Smart Analog* to use this value as an input to another Smart analog. Set to Load Current to use this Smart Analog value as the system load current value.
Func Index	In some cases, an index will apply to the Function. e.g. Smart Analog requires an index.
Type	Set to: • Average to average them • Addition to add all the analog inputs mapped to this *Smart Analog* • Multiplication to multiply them together. • kMultiplication to multiply them together and multiply by 1000. *Useful for instance where output is to be in kW* • Max to set the Smart Analog to the maximum input • Min to set the Smart Analog to the minimum input

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Gate	This limits values to a particular range: • Normal – no limit • Positive only – positive values only; negative values become zero. • Negative only – negative values only; positive values become zero. • Absolute – absolute value. Converts negative values to positive. • Change – sets the Smart Analogue to a rate of change.
Use	This allows the Smart Analogue value minimum, maximum or average over the last log period to be used.
Smart Alarm Index	• If this is zero, the Smart Analog is not affected. • If this is non-zero, the value will be N/A when this Smart Alarm is inactive, and normal if it is active.
Group	Do not use

System States

The SC300 monitors the following system states to provide an overview of the dc power system's operation. States displayed will depend on the dc power system model. Some states will only be displayed if there is a digital input configured for this function. For instance, the state *Fan* will only be displayed if there is a digital input configured with Function = ACD Fan Fail or Cabinet Fan Fail.

Name	Description	Where to find:
Fan	Indicates if any digital input with *Function* set to "ACD Fan Fail" is active (only used in systems with ac distribution fans).	SC300: Digitals DCTools: Digital Inputs Web: Input / Output > Digital Inputs
Cabinet Fan	Indicates if any digital input with *Function* set to "Cabinet Fan Fail" is active (only used in systems with cabinet fans).	
Mains Fail	Indicates if any digital input with *Function* set to "AC Fail" is active.	
MOV	Indicates if any digital input with *Function* set to "MOV Fail" is active (only used in systems with MOV surge protection).	
Load Fuse	Indicates if any digital input with *Function* set to "Load Fuse Fail" is active.	
Battery Fuse	Indicates if any digital input with *Function* set to "Battery Fuse Fail" is active.	
Phase	Indicates if any digital input with *Function* set to "Phase Fail" is active.	

Notes:

1 See the related Alarm Descriptions on page 133.

2 A value of *Unavailable* indicates that a System State is not configured for this dc power system.

3 A value of *Missing* indicates that the I/O board has been disconnected or is faulty, or the connector mapping is incorrect.

Digital Inputs

The Input / Output (I/O) board is fitted with a number of configurable digital inputs (DI) which can monitor external voltage-free relay contacts or switches. See Input / Output Board on page 3 for details.

► To configure a digital input

1 On DCTools/web, go to *Digital Inputs*. Expand the *Digital Inputs* table.

- *The number of digital inputs available for user digital inputs depends on the IO Board version. Refer to the I/O Board (IOBGP-xx) Connector Pin-outs on page 138 for IO Board input numbers.*
- *If additional I/O boards and/or SiteSure-3G modules are connected, there will be more configurable Digital Inputs. See details in the dc power system Installation and Operation Guide.*

Some digital inputs are normally configured as Digital System States (see details on page 89). Only use these inputs if you do need need to use them as Digital System State Inputs.

2 Select a configurable Digital Input.

3 Configure the following parameters to suit the application.

- *To change a setting, double-click and select from drop down list or edit the text.*

Parameter	Setting
Status	Set to *Enabled*.
Name	Type the name of the input.
Function	Set to *User Defined*.
IOB Number	The number of the I/O board (or SiteSure-3G module if connected). Do not change.
IOB DI Number	The number of the DI on the I/O board (or SiteSure-3G module if connected). Do not change.
Active State	Select the state of the input that will activate the DI.
Group	Set to 0 unless using Groups in PowerManagerII. See PowerManagerII online help for details.

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Digital Input Alarms

Any digital input that is *Enabled* in the *Digital Inputs* table can activate an alarm.

Configure the following parameters in the *Digital Input Alarms* table to suit the application.

To change a setting, double-click and select from drop down list or edit the text.

Parameter	Setting
Severity	Set to the required alarm priority. This determines how the alarm is indicated. See details on page 55. If set to *Disabled* then the alarm will not activate.
Recognition Period	The alarm will activate only after the digital input is active for this period.
Deactivation Recognition Period	The alarm will deactivate only after the digital input is inactive for this period.
Digital Output Mapping A	If required, select a relay that will be operated when the alarm is active.
Digital Output Mapping B	If required, select a second relay that will be operated when the alarm is active.
Send Trap	Depending on this setting, an SNMP Trap will be sent for this alarm, on activation or deactivation or both, if the alarm's *Severity* matches the setting of the SNMP Trap Level (see details on page 110).
Notes	Type any required description. When the alarm is active the text will be displayed on the SC300 and included in the SNMP trap (if used).

Digital Outputs

The Input / Output (I/O) board is fitted with a number of digital outputs (relays) which can control external equipment or alarm systems. See Input / Output Board on page 3 for details.

Digital outputs are operated by a mapping from a digital input alarm (see details on page 90), an analog input high or low alarm (see details on page 85), or a system alarm (see details on page 54).

► To set the DO Control Timeout Period

- On DCTools/web, go to *Digital Outputs*:
    - Set DO Control Timeout Period to the required value. This sets the maximum time that a digital output will remain in manual control. After that time it reverts to automatic control.

► To manually control a digital output

Either:

- On DCTools/web, go to *Digital Outputs*:
    - Expand the *Digital Outputs* table.
    - In the *Control State* column of the required digital output, select *Active* or *Inactive*.
- Or, use the SC300 keypad to go to *Digital Outputs*:
    - Select the required digital output. Press *Edit*.
    - Select *Active* or *Inactive*. Press *Save*.
- The *DO Manual* alarm (if enabled) will activate.
- The corresponding digital output will Energize or De-Energize, as selected in the *Active State* column of the *Digital Outputs* table.

The digital output will revert to Automatic after the DO Control Timeout Period.

While Active *or* Inactive is selected, t*he DO will not be operated by any active alarms mapped to it. Set Control State back to Automatic to allow mapped alarms to operate the digital output.*

► To set the state of a digital output from PowerManagerII

- In *Web*, set the *Group* of one or more digital outputs to a non-zero value.

  Only digital outputs with a non-zero Group are visible in PowerManagerII
- In *PowerManagerII* select the SiteManager group item.
- Click on the *Realtime* tab.
- From the drop down list beside the digital output select *Active Manual* or *Inactive Manual*.
- The *DO Manual* alarm (if enabled) will activate.
- The corresponding digital output will Energize or De-Energize, according to its *Active State.*

While Active Manual *or* Inactive Manual is selected, t*he DO will not be operated by any active alarms mapped to it. Set Control State back to Automatic to allow mapped alarms to operate the digital output.*

► To configure a digital output

1. On DCTools/web, go to *Digital Outputs*. Expand the *Digital Outputs* table.
2. Select a Digital Output. Refer to the I/O Board (IOBGP-xx) Connector Pin-outs on page 138 for IO Board output numbers.

   Other Digital Outputs will be available if additional I/O boards and/or SiteSure-3G modules are connected. See details in the dc power system Installation and Operation Guide.
3. Configure the following parameters to suit the application.

   To change a setting, double-click and select from drop down list or edit the text.

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Parameter	Setting
Control State	Set to *Automatic*.
Status	Set to *Enabled*.
Name	Type the name of the output.
IOB Number	The number of the I/O board (or SiteSure-3G module). Do not change.
IOB DO Number	The number of the DO on the I/O board (or SiteSure-3G module). Do not change.
Active State	Select the state of the output when the DO is active*.
Group	Set to 0 unless using Groups in PowerManagerII. See PowerManagerII online help for details.

4 * One digital output is also used as the Monitor Fail alarm relay. Refer to the I/O Board (IOBGP-xx) Connector Pin-outs on page 138 for the output number. This output will de-energize if the I/O board loses power or loses communication with the SC300.

Alternative Energy Input Metering

The SC300 can meter currents supplied to the DC bus from alternative energy sources such as solar or wind. This means that it can calculate currents to and from the DC bus correctly, even when both rectifiers and alternative energy sources are providing power.

Currents from Eaton Solar Chargers (ASC48-ES) are automatically measured.

► **To set up alternative energy input metering**

- For each alternative energy source, connect a current sensor from the energy source to a current shunt input or analog input.
- On DCTools/web, go to: *Analog Inputs*.
- Configure the selected Analog Inputs and set *Function* to *Alternative Energy Source Current*.

The Alternative Source current is calculated as the sum of the currents of all analog inputs configured as *Alternative Energy Source Current*, plus the total current from all solar chargers controlled by the SC300.

Smart Alarms based on System Value Sources can be used to configure alarms based on the *Alternative Energy Source Current*.

See Smart Alarms on page 60 for details of how to set Smart Alarms.

The System Schematic shown in the SC300 web page displays the source current values (rectifiers and alternative energy sources) and load current values (load and batteries). If one of these values is not available, it is calculated from the other system current values. DCTools does not show solar / alternative energy sources on its system view, but the values are available in the analogue inputs page.

Energy Metering

The SC300 can be configured with up to 20 energy meters.

Each energy meter can meter energy, power, minimum power, and maximum power.

The meters can measure load currents, alternative energy inputs, system values, and any other energy flow that can be connected to the SC300s through the IOBGP or IOBSS IO boards.

Power is calculated as voltage multiplied by current, except where power is directly measured by the solar charger, in which case that power value is used.

Energy is calculated as power continuously multiplied by time.

Several energy sources can be combined into a single meter. For example, this can be used to meter both individual loads and total load.

► To configure an Energy Meter

1 In *Meter Configuration* > *Meter Names*, enter the name of the meter.

2 Enter the input sources for the meter. These may be either Analog Inputs or System Value Inputs:

Analog Inputs

In Meter Configuration > Analog Inputs, enter the inputs for this meter:

- Meter number
- Analog input number for the energy source.
- Analog input function: current or voltage as appropriate.

  If there is no analog input with Function = Voltage, the SC300 will use Bus Voltage for its calculations.
- To add more energy sources to the same meter, configure them as extra lines in *Meter Configuration* > *Analog Inputs.* The meter power and energy will be the total of all inputs mapped to the same meter.

System Value Inputs

The energy meter may also use the power, voltage, or current from a *System Value.*

- In Meter Configuration > System Value Inputs, enter the inputs for this meter.
- For each input, set the System Input (and Index, where applicable).

*If the System Value is a **power** value, this will be used directly as the meter power.*

*If the System Value is a **current** value, this will be multiplied by a voltage value mapped to the energy meter (or the Bus Voltage if there is no voltage mapped) to give the meter power.*

*If the System Value is a **voltage** value, a current value will also need to be mapped to the same meter (otherwise power will be measured as zero).*

A System Value may be another energy meter. So it is possible to add two or more energy meters together to make a "Total Energy" meter.

► To reset an Energy Meter Power Minimum and Maximum values

In *Meter Configuration* > *Meters*, click on the appropriate reset button.

Energy meter power minimum / maximum can be reset per meter, or all at once.

► To reset an Energy Meter Energy value

In *Meter Configuration* > *Meters*, click on *Reset all Energy Meters.*

Press enter to confirm you wish to reset all energy value.

Energy values can only be reset all at once.

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Information

The following information is available about energy metering.

Parameter	Description	Where to find:
Energy	The total energy in kWh measured by this meter. Energy continuously increases, except when manually reset.	SC300: Analog Inputs > right arrow > Energy Meter. *Down arrow to select next energy meter if more than one.* DCTools: Meters Web: Applications > Energy Metering > Meters
Current	The current used in calculating this energy meter power. *Current will show as zero if the power measurement comes directly from a system value (e.g. solar charger power).*	
Voltage	The voltage used in calculating this energy meter power.	
Power	The energy meter power at present. This is calculated as Voltage * Current, except where it is directly measured by a solar charger or other device.	
Power (Min)	The minimum power since the meter started, or the last time the power was reset.	
Power (Max)	The maximum power since the meter started, or the last time the power was reset.	
Meter Reset Date	The last time the meter power was reset. *13:00:00 01 Jan 70 GMT+13 means that this meter has never been reset.*	

Configuration

Set the following parameters.

Parameter	Description	Where to find:
Name	User-specified energy meter name.	SC300: Not available. DCTools: Meters Web: Web: Applications > Energy Metering > Meter Names
Group	Set to 0.	
Analog Input Meter Number	The meter that uses this analog input value.	SC300: Not available. DCTools: Meters Web: Applications > Energy Metering > Meter Configuration > Analog Inputs
Analog input number	The analog input value that is used in this meter.	
Function	Tells the SC300 whether to treat this value as a voltage (V), current (A), or power (W or kW) for the power calculation.	
System Value Meter Number	The meter that uses this system value.	SC300: Not available. DCTools: Meters Web: Applications > Energy Metering > Meter Configuration > System Value Inputs
System Input	The System Value Input that is used in this meter.	
Index	The System Value Index, where appropriate. *For instance, Power Meter 1*	
Power Gain	This is a scaling factor applied to the power input value. Use this where the input has to be multiplied by a constant value.	SC300: Not available. DCTools: Meters Web: Applications > Energy Metering > Meters
Power Offset	This is an offset applied to the power input value.	

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Fan Controller

The SC300 can manage one FC100 Fan Controller module.

The FC100 can control up to 8 fans, with one or two independent proportional control modules.

For more information, see *FC100 Fan Controller Install and Operation*, available from Eaton.

The SC300 provides these features when used with the FC100:

- Configure primary and secondary control profiles for controller 1 and Controller 2.
- Set fan controller mode.
- Switch from primary to Secondary control profiles by Smart Alarm control
- Manual speed control over-ride.
- View temperature inputs
- View fan speeds
- Report fan controller alarms and values remotely.

► To connect a Fan Controller

☐ *The FC100 fan controller is an RXP device and must be registered with the SC300 before it will communicate with it.*

1. Connect the FC100 communications port (RJ-45) to the RXP bus using an RJ-45 patch cable..

   ☐ *Generally there will be a spare RXP connection on the VFN board.*

2. In web, go to *System* > *Interfaces* > *RXP*.
3. In DCTools, go to *Configuration* > *RXP*.
4. The RXP Devices table should show the FC100.
5. Copy the FC100 serial number into the next available position in the IO Board to Serial Number Mapping table.
6. Click on *Apply Changes.*

► To configure a Control Profile

☐ *The control profile specifies how fan control power percentage (and hence speed) varies with temperature.*

☐ *It consists of six temperature / power settings. The FC100 will smoothly increase fan speed as temperature increases from one point to the next.*

☐ *The control profile will be pre-determined according to the enclosure and fan characteristics. Unauthorized changes could cause over-heating.*

7. Select the required profile to enter.

   ☐ *Generally this will be Controller 1, Primary Profile.*

8. Enter and apply values for all six temperature / power pairs.

► To set fan controller mode

Set *Mode* to any of these values:

Single Controller

☐ *All fans are driven from temperature sensor 1 and controller 1 profile.*

Dual Controller

☐ *Temperature sensor 1 drives both controllers with their own profiles.*

Independent Controller

☐ *The two controllers work independently with their own temperature sensors.*

► To change profile by Smart Alarm

For example, use a Smart Alarm schedule to set a different control profile at night.

1. Configure a Smart Alarm as required. When this Smart Alarm is active, the fan controllers will change from using Primary Profiles to using Secondary Profiles.
2. Set Secondary Profile Activating Smart Alarm to the Smart Alarm number.

► To manually control the fans

The fans can be run under manual control for testing. They will revert back to automatic control after the time set by Fan Voltage Period.

Set *Fan Power* as required. Range is 0 to 100%.

Set *Fan Power Period* to the required value.

Click on *Force* to run the fans at the required manual power setting.

Information

The following information is available about the fan controller:

Parameter	Description	Where to find:
Temperature	The temperature measured by each fan controller temperature sensor.	SC300: Not available DCTools: Fan Controller > State Web: Applications > Fan Controller > State
Fan Power	The percentage of full power the fan is set to.	
Mode	The FC100 operating mode	
Status	"-" if the FC100 is running normally, otherwise any active fan controller alarms.	
Running Profile	The control profile currently in use.	

Configuration

Set the following parameters.

Parameter	Description	Where to find:
Set Fan Power	Manually set the fan control power.	SC300: Not available. DCTools: Fan Controller > Manual Speed Control Web: Applications > Fan Controller > Manual Speed Control
Mode	The fan controller mode. *See details above.*	SC300: Not available. DCTools: Fan Controller > Configuration Web: Applications > Fan Controller > Configuration
Secondary Profile Smart Alarm	When this Smart Alarm activates, it will cause the FC100 to change from Primary Secondary control profile. Zero means no Smart Alarm control.	
Temperature / Power	The temperature / power pairs specify how the fan speed changes with temperature for each control profile.	

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Data Logging

The SC300 has the following data logging functions.

All log files are readable by Excel or similar spreadsheet programs.

- *When opening a log file, Excel gives the message "The file you are trying to open, …, is in a different format than specified by the file extension. Verify that the file is not corrupted and is from a trusted source before opening the file. Do you want to open the file now?". Click* Yes.
- *The SC300 has several combined log files. These include a large amount of data, and will take significantly longer to download than a single log.*
- *All logs can be downloaded using web. However, DCTools can only download the Event, Data and Energy Logs.*

Event Log

The Event Log records every system event. See System Event Types on page 143 for a description of event log entries.

- *The most recent Event Log entries are shown by the SC300 web view, on the Log screen. See Communication via Web Browser on page 106.*

Data Log

The Data Log records several system parameters (AC Voltage, Bus Voltage, Load Current, Rectifier Current, Battery Current, Battery Temperature and Ah Discharged) at specified intervals. The rate of recording increases (interval is reduced) when the bus voltage differs from the float voltage by more than a specified value.

Data log entries are also written whenever a system event occurs (as for the Event Log).

- *The most recent Data Log entries are also shown in the SC300 web view, on the Log screen. See Communication via Web Browser on page 106.*

Data Min/Max Log

This log records the minimum and maximum values of the logged inputs during each log interval.

Data and Events Log

This log shows data and events in a single log file. This is useful for fault –finding, as it shows alarms and analog values on the same time scale.

Energy Log

The Energy Log records the energy reading for all configured energy meters at the specified Energy Meters Log Interval.

Power Log

The Energy Log records the power reading for energy meters at the specified Power Meters Log Interval. It includes for each interval:

- Power
- Power Minimum
- Power Maximum

All Meters Log

The Meters Log is a combination of the Energy Log and Power Log. It includes all records from both these logs.

Smart Analogues Log

The Energy Log records the values of all configured Smart Analogues at the configured Smart Analogues Log Interval.

- *To log any analog input, simply configure a Smart Analog mapped to the required input.*

Generator Log

This records the fuel level, fuel refill and generator state at the specified Generator Log Interval.

Fan Controller Log

This logs data from an FC100 Fan Controller logger option.

Operating Voltage Log

This logs the current working voltage of the system, including any temperature compensation correction and the effects of Fast Charge, Equalize or Battery Test.

All Logs

This log combines all the above logs into a single file.

- *This log file may be large and slow to download.*
- *If the various log intervals are different, there may be a large number of blank entries.*

Raw log binary

This log is included for future use.

► To download a log using Web

Go to *Logs* > *Download* and click on *Download* next to the required log.

Wait for the log entries to download from the SC300.

After the download finishes, Excel gives the message "The file you are trying to open, …, is in a different format than specified by the file extension. Verify that the file is not corrupted and is from a trusted source before opening the file. Do you want to open the file now?".
Click *Yes*.

► To download a log using DCTools

Go to *Event Log*, *Data Log* or *Energy Log*. Downloading will start immediately.

When downloading finishes, click on *Save to File*.

Type a file name, select a file type, and browse to a location to save the file.

Excel gives the message "The file you are trying to open, …, is in a different format than specified by the file extension. Verify that the file is not corrupted and is from a trusted source before opening the file. Do you want to open the file now?".
Click *Yes*.

► To clear all logs

In Web go to *Logs* > *Download*.

In DCTools, go to *Controller Log* > *Configuration*.

Click *Clear Logs*.

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This will clear all log data.

► **To configure the Data Log using Web or DCTools**

Go to *Logs* > *Log Configuration*.

Check and set the following parameters:

Parameter	Description	Where to find:
Log Interval *for each log type*	The time between each log record. This log interval applies when logging is at normal speed. When logging is at off-normal, and *Use Off Normal* is selected for a log, it records at *Off-Normal Interval*.	Web: Logs > Configuration DCTools : Logs > Configuration
Use Off Normal *for each log type*	If this item is selected, the log records at Off-Normal Interval when in off normal condition.	
Off Normal Interval	In off normal condition, all logs record at this interval.	
Off-Normal Offset Voltage	*Off-Normal Interval* will apply when bus voltage is outside the range: *Float Voltage* ± *Off-Normal Offset Voltage*. Off-normal condition transitions are recognized within 10 seconds.	

Log Storage

The SC300 logs all share a common memory space. When this log is full, the earliest log records are deleted to make room for new records.

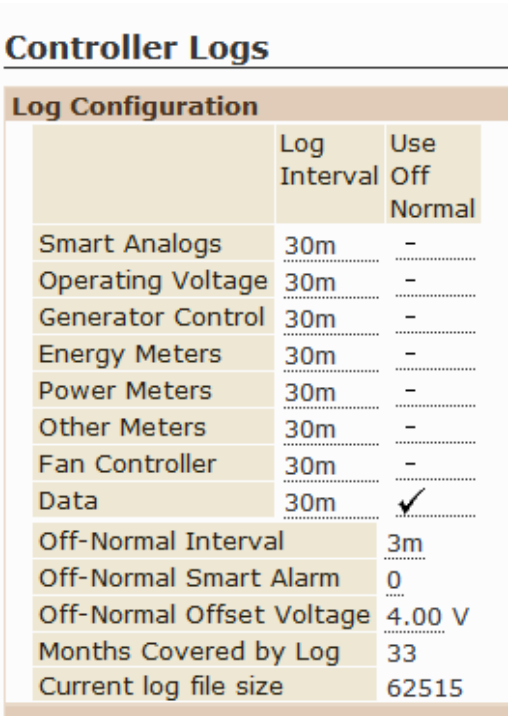
Each log type occupies a different amount of memory:

- Data log consumes the most space
- Event log consumes very little space
- Other logs are in between.

With a typical setting of 30 minutes interval between all log records, and no alarms, the log will fill in about 3 years.

With data logging set to 1 minute, the log will fill in about 1 month. To avoid losing data, it would be necessary to download and save the logs at intervals less than one month.

The SC300 estimates the time to fill the log and displays it on the web under Log Management.



These estimates assume no alarms are active, and no Smart Analogs, Generator or Fan Controller are configured. These will add data and reduce the time to fill the logs.

Set the log intervals for the required time resolution, bearing in mind the time to fill the logs.

Standby Mode

Two SC300s may be connected in the same power system to the same RXP bus.

One of the SC300s will operate as normal (Active SC300) and the other will act as a backup unit (Standby SC300).

If the Active SC300 fails or is removed, then the Standby SC300 will become Active after two to three minutes, and then control the power system in the usual way.

The *Standby Mode* alarm indicates that an SC300 is or has been in Standby mode.

When a standby unit is present, the Active SC300 will show an Unknown Hardware alarm.

Configuration

Ensure that both Active and Standby SC300s have identical configuration settings, except for *Standby Mode at Startup*, *IP address* and Identity settings.

It is recommended that Site Name be used to distinguish between the normally Active and Standby SC300s. For instance, "Site A Active" and "Site A Standby".

► To Test Standby Mode operation

- Start the system as normal.
- Remove power on the Active SC300, or reset it using the web or front panel.
- After 1 minute or less, the Standby SC300 should become Active.

► To reset the Standby Mode alarm

Go to *Alarms* and press *Reset Standby Mode* alarm.
On the front panel, select the alarm and press Clear.

Configuration

► To configure two SC300s to work in Standby mode

- Configure both SC300s with the same settings, except for identity and address settings.
- Connect both SC300s to the system RXP bus.

  Normally this is done by connecting both back to the VFN board using and RJ-45 patch cable.
- Choose which SC300 is to be the Standby unit.
- Set *Standby Mode at Startup* for this unit to Yes.

  This only affects operation when both SC300s start at the same time; the SC300 configured to Start in Standby Mode will delay start-up and allow the other SC300 to start in Active mode.

Parameter	Description	Where to find:
Standby Mode at Startup	This setting tells the SC300 to startup in Standby mode if it is starting at the same time as the other SC300. It will not affect operation otherwise.	SC300: Setup Web: System > Interfaces> Standby Mode
Reset Standby Mode Alarm	Resets this alarm.	SC300: Alarms > Standby Alarm DCTools/Web: Alarms

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Overview

Topic	Page
Communications Options	104
Direct (USB) Communications	104
Ethernet Communications	104
Serial (RS-232) Communications	114
Communications Security	117
CSP	120

Communications Options

The SC300 system controller has a type AB Micro-USB interface, an RS-232c serial, and an Ethernet 100BaseT interface (XS31) for communication with a local or remote PC or laptop, or a Network Management System (NMS). See the diagrams on page 2 for locations of these connectors.

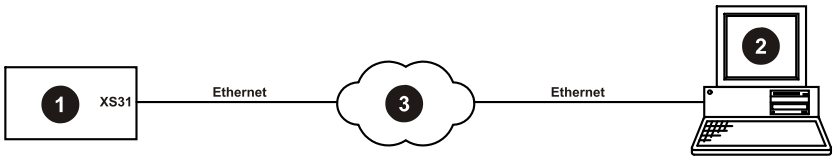
The standard communications options for an SC300 system controller are described in the following sections. For other communications options contact your Eaton dc product supplier or see Worldwide Support on page 159.

Direct (USB) Communications

See SC300 Operation Using a PC/Laptop on page 16.

Ethernet Communications

Connections



1. SC300 system controller
2. PC/laptop with:
   - PowerManagerII (see details on page 106), and/or
   - DCTools, and/or
   - Web browser (see details on page 106), and/or
   - Network Management System using SNMP (see details on page 107), and/or
   - Building management System using Modbus-TCP (see details on page 112).
3. Communications network. Protocol: TCP/IP

MAC Address

► To view the MAC Address of the SC300

Either:

- Use the SC300 keypad to go to: *Info*

Or:

- With DCTools/web , go to *System* > *Interfaces*> *Physical Ports* > *Ethernet*

The Media Access Control (MAC) address is the SC300's unique Ethernet address assigned by the manufacturer.

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SC300 Setup

The network administrator may assign a unique IP address to each SC300 to be connected to the TCP/IP network.

Alternatively, use DHCP or Auto IP to automatically assign an IP address.

► To configure an SC300 for Ethernet communications from the keypad

- Go to *Settings* > *Setup*
- Enter the *IP Address*, *Subnet Mask* and *Gateway Address* assigned by the network administrator.
- If *IP Address*, *Subnet Mask* and *Gateway Address* are both left at 0.0.0.0, the SC300 will automatically be assigned an IP address using DHCP or Auto IP.
- If required, set *HTTP Access* to *Enabled* for web browser access, or set *HTTPS Access* to *Enabled* for secure web access.

► To configure an SC300 for Ethernet communications using *USB*

- Ensure DCTools is installed.

  If DCTools is working correctly with the SC200, it should also work correctly with SC300.
- Connect using USB (see details on page 16).
- DCTools should open automatically and show the SC300 view. If not, open a new connection in Connection Manager, and at *Connect Using*, select a new Comm port.
- Go to *Configuration* > *Communications* > *Ethernet*.
- Set *IP Address Config*, *Subnet Mask Config* and *Gateway Address Config* as assigned by the network administrator.
- If *IP Address Config, Subnet Mask Config and Gateway Address Config* are all left at 0.0.0.0, and AutoIP is set to Enabled, the SC300 will automatically be assigned an IP address using DHCP or Auto IP.
- If required, under *HTTP (Web)*, set *HTTP Access* to *Enabled* for unsecured web browser access.

► To view the IP address using web

- Go to *System* > *Interfaces* > *Ethernet Auto.*
- This section shows the current IP address settings, whether they are set manually or by DHCP / Auto IP.

► To manually change the IP settings using web

- Go to *System* > *Interfaces* > *Ethernet.*
- Set *IP Address Config*, *Netmask Config* , and *Gateway Address Config* as required.

PowerManagerII Communications Setup (if required)

► **To connect to the SC300 with PowerManagerII:**

1. Install PowerManagerII on the PC/laptop.
2. Double-click the PowerManagerII icon to open the connection manager.
3. Go to *Connection* > *New* to open a new connection dialog box.
4. Enter:

Connection Name:	<as required>
Comms Enabled:	True
Protocol:	S3P
Connect Using:	Ethernet
S3P Address:	0 (0 = Broadcast, 1-65279 = individual address)
Server IP Address:	Allocated by network administrator
Server Port:	Allocated by network administrator
Telnet	Cleared

5. Press OK. PowerManagerII will now connect to the SC300.
6. If required, access to the SC300 via PowerManagerII can be password controlled. See Write Access Password on page 117.

Communication via Web Browser

Web security

The SC300 is supplied with the following default user name and password:

User name "SC300"

Password "Factory300".

Use these for the first web login to the SC300.

A blank user name and password are not accepted.

To ensure secure operation, this password should be changed after first login to a secure new user name and password. Ensure that network administrators are aware of the new user name and password.

The SC300 system controller has an in-built web server. This allows a PC/laptop with a standard web browser to control and monitor the SC300 via an IP network.

► **To connect to the SC300 with web browser:**

1. Set up Ethernet communications and connect the SC300 to the IP network. See Ethernet Communications on page 104.
2. Open a web browser window.
   - *Recommended web browsers: Microsoft Internet Explorer 10 or later, Mozilla Firefox 3.0 or later, Chrome V63 or later.*
   - *Internet Explorer 10/11: Ensure that Compatibility Mode is turned off. Go to Tools > Compatibility View Settings.*
3. Type the IP Address of the SC300 into the address bar of the browser.

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- *SC300 web communications is set by default to http disabled and https enabled. If necessary, type "https://" before the IP Address.*

4 If https is being used, and this is the first connection to that SC300, the browser will ask whether you to "confirm a security exception", or similar. You will need to add an exception, accept the certificate. and then continue. The exact details will depend on the browser.

5 The SC300 web server *Log On* page will appear.

6 Type a Logon ID and Password.

- See the warning above if this is the first logon.
- *Administration of Logon IDs and Passwords is available in Web.* See Web Access Security on page 118.

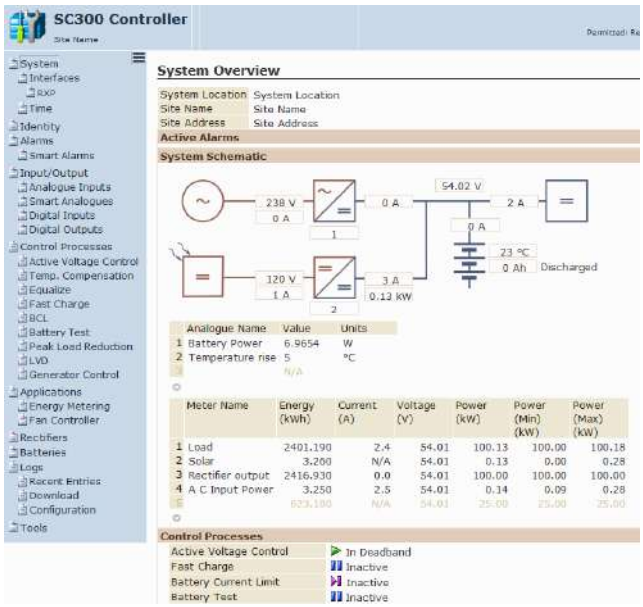
7 Click *Log On*. The SC300 web system page will be displayed.

8 Click on the appropriate menu item on the left.

9 To change a setting click the text field, type the new value, then press *Enter* on the PC keyboard. Then click *Apply* in the *Changes* window.

- *Hold the mouse pointer over any field for help.*

10 Click *Log Off* (top right of window) to log out.



Communication via a Network Management System using SNMP

The SC300 system controller can be configured to allow access by a Network Management System (NMS), and/or to send alarms as SNMP traps to up to eight different SNMP trap receivers on an NMS.

► To download the SNMP MIB file

This feature is not available in DCTools.

1. In the web view, go to Tools.
2. Right click on *SNMP V1/2 SNMP MIB Download.*

► To allow SNMP access to the SC300

Note: for SNMP V3 access, see To communicate using SNMP V3 *on page 109.*

1. Set up Ethernet Communications (see details on page 104).
2. On the web, go to *System* > *Interfaces* > *Remote Access Protocols* > *SNMP*.
3. In DCTools, go to *Communications* > *Remote Access Protocols* > *SNMP*
4. Set the following parameters:

SNMP Access:	**Disabled:** NMS access to the SC300 is not allowed. **All:** the NMS has full access to the SC300. **Read Only:** the NMS has read only access to the SC300. **V3 Only:** only SNMP v3 access is allowed.
Read Community, Write Community:	Do not change the default settings unless requested by the network administrator.
V3 Privacy Password	Only used with SNMP v3 and if an authentication password is set. This password is needed only if the NMS uses encryption.
System Object ID:	**Only change this if required by the system administrator.** This is a unique Object Identifier that allows the NMS to identify the type of device (in this case a power system) on the network. Objects are named in the iso.org.dod.internet.private.enterprises (1.3.6.1.4.1) sub-tree for enterprise-specific objects. The default Object Identifier for an SC300-based dc power system is: 1.3.6.1.4.1.1918.2.14 A network administrator can specify a new Object Identifier within the (1.3.6.1.4.1) sub-tree, if required. Do not enter the sub-tree integers 1.3.6.1.4.1 into the System Object ID field.

To communicate using SNMP V3

Compete the steps in

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Communication via a Network Management System using SNMP above, then:

1. In web, go to *System* > *Interfaces* > *Users.*
2. Expand the table to the right.
3. Select an existing user to configure for SNMP V3 access, or create a new user.
4. Set the following parameters for each SNMP V3 user:

logon ID	Ensure the logon ID matches the SNMP V3 user name.
Password	Set this to the SNMP V3 authentication password.
SNMP V3	Set to the appropriate SNMP V3 access rights for this user.

For SNMP V3 security, the default user should be disabled or have its rights restricted.

To send alarms as SNMP traps

1. Set up Ethernet Communications (see details on page 104).
2. In web go to *System* > *Interfaces* > *Remote Access Protocols* > *SNMP*.
3. In DCTools, go to *Communications* > *Remote Access Protocols* > *SNMP*
4. Set the following parameters:

System Object ID:	See: To Allow NMS Access to a SC300 on page 108.
Trap Version:	Set to *SNMP V1*, *V2*, *V3* as required.
Trap Format:	Set to *Eaton* or *X.733* as appropriate . X.733 format uses a single trap number for all alarm sources. "Eaton" format uses different trap numbers according to the alarm source.
Enable Generic Traps	If enabled, the SC300 will send traps on system events such as restart.
Trap Repeat Trap Repeat Rate	Enable trap repeat if the network is not reliable enough to ensure that traps get through the first time.
Enable Heartbeat Trap Heartbeat Trap Period	The heatbeat trap (if enabled) is sent periodically to tell the NMS that the SC300 is still “alive” and communicating.

For each SNMP trap receiver (up to 8) , configure the following parameters:

Parameter	Configuration Guidelines
Name	Type the name of the SNMP trap receiver (20 bytes maximum). *This allows 20 ASCII characters, but less for languages with multi-byte characters.*
Level	SNMP Trap Level – controls reporting of specific events for each receiver: • Select **All Alarms And Warnings** to receive Critical, Major and Minor alarms, and Warnings. (Typically Warnings are status messages such as Equalize Active.) • Select **Minor And Above** to receive Critical, Major and Minor alarms. • Select **Major And Above** to receive only Critical and Major alarms. • Select **Critical Only** to receive only Critical alarms. • Select **Disabled** to disable notifications to the receiver. *To prevent an SNMP Trap for an individual alarm, set Send Trap to False in the alarm's configuration.*
IP Address	IP address of the trap receiver assigned by the network administrator.
Port	The default setting is 162. Do not change this setting, unless requested by the network administrator.
Trap Community	A form of password used with SNMP V1 and V2c. Use **public**, unless the network administrator has assigned a new password.
Mode	Select: • **Normal Traps** for sending traps to any network management system, except *PowerManagerII* • **Acknowledged Summary Trap** for sending traps to *PowerManagerII* only

To change SNMP trap sending options by trap source

To make the SC300 send a trap only on an alarm activation or deactivation, or to stop the SC300 sending any traps when a particular alarm occurs:

1. Go to the *Send Trap* setting for that particular alarm. *Send trap* settings are present in the Alarm States Table, Analog Input Alarms tables, and Digital input alarms table.
2. Change the setting from *Both* to :
   - *None* for no traps sent of that alarm
   - *Activation*, for traps sent only when the alarm becomes active.
   - *Deactivation*, for traps sent only when the alarm becomes inactive.

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Communication via Email

The SC300 system controller can be configured to send Email alarm messages when an alarm is activated or de-activated.

► **To set up Email communications:**

1. Set up Ethernet communications and connect the SC300 to the IP network. See Ethernet Communications on page 104.
2. On the web, go to *System* > *Interfaces* > *Remote Access Protocols* > *Email Notifications*.
3. In DCTools, go to *Communications* > *Remote Access Protocols* > *Email Notifications*.
4. Enable *Email Notifications*.
5. Set the following parameters:

SMTP Server IP Address and Port:	The details of the mail server that will be used to send the Emails.
Return Address:	If not blank, any delivery failure notifications will be sent to this address.
Address Use	The setting specifies when the address above is used: Address only – the address appears in the From line Use Address – the return address is shown in the From line along with other information. Failure notification only – the address is only used in delivery failure notifications.
Subject Prefix:	An optional Email subject prefix that will be added to each Email's subject to allow automatic processing of the Email.

6. For each Email recipient (up to 6), set the following parameters:

Address:	The recipient's Email address.
Level:	The severity of alarms that are to be reported to this recipient. • Select *Warnings And Above* to send an Email when an alarm with a severity of *Warning* or above changes state. • Select *Minor And Above* to send an Email when an alarm with a severity of *Minor* or above changes state. • Select *Major And Above* to send an Email when an alarm with a severity of *Major* or above changes state. • Select *None* to send no Emails. • Select *Critical Only* to send an Email when an alarm with a severity of *Critical* changes state.
Delay:	The alarm Email will be delayed by this length of time. During this delay, the SC300 will collate all the events that occur into a single Email.

Test Emails can be sent to test the Email Communication setup.

► **To send a test Email:**

1. On the web, go to *System* > *Interfaces* > *Remote Access Protocols* > *Email Notifications*.
2. In DCTools, go to *Communications* > *Remote Access Protocols* > *Email Notifications*.
3. Click the *Send Test Email* button on the row of the Email address to be tested.

► **Diagnostics**

1. On the web, go to *System* > *Interfaces* > *Remote Access Protocols* > *Email Notifications*.
2. In DCTools, go to *Communications* > *Remote Access Protocols* > *Email Notifications*.
3. The result of the most recent SMTP operation affecting each recipient is shown on the row containing the recipient's Email address. The last three digits represent the SMTP reply codes defined in RFC 821 and its extensions. A code of 250 indicates that the most recent email was delivered successfully. The SC300 will set the result to 9999 if communication with the SMTP server has failed.

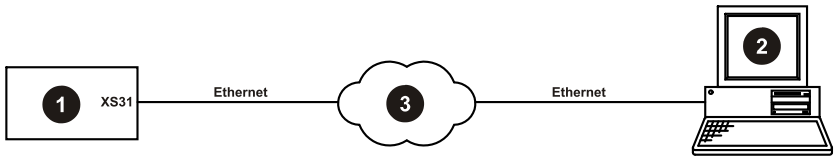
Modbus-TCP Communications

The SC300 can be configured to accept Modbus queries and commands from a Modbus Building Management System or other Modbus master.

For details of the Modbus registers supported by the SC300, please request Application Note AN0107 from your Eaton dc product supplier.

Modbus-TCP* Connections

The SC300 can accept one or more Modbus connections on the reserved Modbus-TCP port of 502.



1. SC300 system controller
2. PC/laptop with Building Management System using Modbus-TCP.
3. Communications network. Protocol: TCP/IP

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SC300 Setup

1. Setup Ethernet Communications (see details on page 104).
2. Set the following Modbus-TCP* parameters:

Parameter	Description	Where to find:
Modbus Access	Set to *Enabled*.	SC300: Settings > Modbus Web: System > Interfaces > Remote Access Protocols > Modbus DCTools: Communications > Remote Access Protocols > Modbus
Address	Set to 1 for Modbus-TCP.	

** The SC300 also supports Modbus-RTU via the RS-232c serial port (XS1). For details request Application Note AN0149 from your Eaton dc product supplier.*

Diagnostics

The following diagnostic information is available.

Parameter	Description	Where to find:
Bus Message Count	Number of messages. Does not include messages with bad CRC.	Web: System > Interfaces > Remote Access Protocols > Modbus > Diagnostics
Bus Communication Error Count	Number of CRC errors.	
Slave Exception Error Count	Number of exception errors.	
Slave Message Count	Number of messages to the SC300.	
Slave No Response Count	Number of messages received for which no response was sent.	
Bus Character Overrun Count	Number of messages received with more than 256 characters.	

All counts are since the last SC300 restart or since counter was reset.

Serial (RS-232) Communications

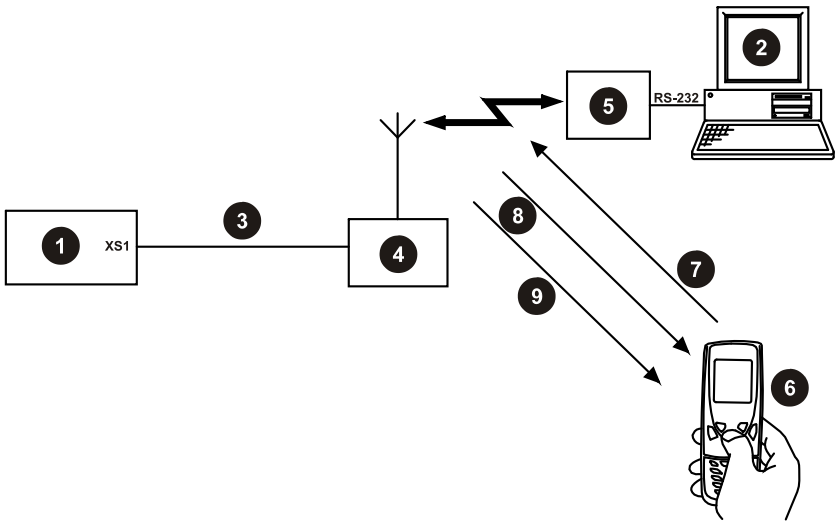
The parameters of the RS-232 serial port can be configured, if required, for a specific RS-232 device. However, for most applications use the default settings.

Parameter	Description	Where to find:
Baud Rate	Default: 19200	SC300: Settings > Serial Port Settings Web: System > Interfaces > Physical Ports > Serial > Port Settings DCTools : Communications > Physical Ports > Serial > Port Settings
Parity	Default: None	
Stop Bits	Default: One	

GSM Modem Communications

A GSM modem may be added allow the SC300 to send SMS alarm messages.

Connections



1. SC300 system controller
2. PC/laptop with web browser and SC300 web driver
3. RS-232 modem cable (straight-thru). If access to XS1 is restricted use a DB9 ribbon cable extension (Farnell part number 869-6411).
4. GSM modem
5. **Optional:**
6. SMS text capable GSM cell phone or SMS-Email Gateway (if available)
7. SMS text message "P" or "p"
8. Power status text messages
9. Alarm text messages

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SC300 Setup

Not all modems are suitable. If your modem does not operate correctly check the modem setup string. Contact your Eaton dc product supplier or Eaton for further assistance. See Worldwide Support on page 159.

► To enable modem communications

1. Connect to the SC300:
2. On web, go *Interfaces* > *Physical Ports* > *Serial.*
3. In DCTools, go to *Communications* > *Physical Ports* > *Serial* > *Modem.*
4. Click on **+** to expand **Serial**. Configure the following settings:

Enable Modem:	Enabled
Modem Power Reset:	Optional. If this is enabled, then the SC300 will attempt to reset a non-operating modem by turning its power supply off and on using digital output 2.
Modem Set Up String:	The string sent to the modem on reset. The modem AT command should not be included as it is automatically sent. The Auto-Answer Rings parameter is also sent, so it does not need to be included here. For complete details of appropriate commands, consult your modem documentation.
Modem Auto Answer Rings:	Number of rings before an incoming call is answered. Setting this parameter to zero disables incoming calls (the modem can still be used for alarm reporting).

SMS Text Messaging Setup

For additional information see Application Note AN0112. To receive application notes see Worldwide Support on page 159.

► To enable SMS alarm messages

1. On web, go to *System* > *Interfaces* > *Physical Ports* > *Serial* > *SMS Notifications.*
2. In DCTools, go to Communications >*Physical Ports* > *Serial* > *Modem* > *SMS Notifications.*
3. For each cellphone to receive SMS alarm messages set the *Phone Number* and other details as required.
4. Type the required *Prefix* string if alarm messages are to be sent to an email address.

   This requires a GSM-Email Gateway connected to the GSM network. Contact the GSM network operator for details of the Prefix string required at the beginning of the SMS message.

   Emails can also be sent via an IP network. See details on page 111.

► **To check the dc power system status using SMS**

1. From any cellphone write a SMS (text) message starting with "P" or "p" (any following characters are ignored).
2. Send the message to the SC300 GSM modem telephone number.

The SC300 will reply with a dc power system status message. This will include: Number of active alarms, bus voltage, load current, ac voltage, battery current, battery temperature, battery time remaining (if available).

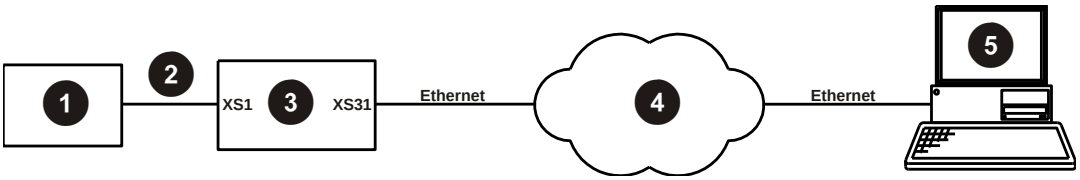
Serial Server

The SC300's Serial Server function makes the SC300's RS-232 port available to any software via Ethernet.

For example, use Serial Server to connect Winpower to a Matrix Controller connected to the SC300.

For details request AN0117, Communicate with Matrix Controllers through an SC200, from your Eaton dc product supplier. Details in this AN also apply to SC300.

Connections



1) External device.
2) RS-232 modem cable. For the SC300's RS-232 port, see details on page 137. For details of the external device's RS-232 port and whether the cable should be straight-through or crossed (null modem), see the external device's documentation.
3) SC300 system controller.
4) Communications network. Protocol TCP/IP.
5) PC/laptop with PowerManagerII, or other software with a port redirector.

► **SC300 Setup**

1. Configure the SC300 for Ethernet communications. See details on page 104.
2. Either:
   - On the SC300 keypad go to *Settings* > *Setup* > *Serial Server*. Select *Enabled*.
     Or:
   - Use Web to go to *System* > *Interfaces* > *Remote Access Protocols* > *Serial Server*, or
   - In DCTools, go to *Communication* > *Interfaces* > *Remote Access Protocols* > *Serial Server*
   - Set *Access* to *Enabled.*

PowerManagerII Setup

Use similar settings for other software.

1. Install PowerManagerII on the PC/laptop.
2. Double-click the PowerManagerII icon to open the connection manager.
3. Go to *Connection* > *New* to open a new connection dialog box.

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4 Enter:

Connection Name:	<as required>
Comms Enabled:	True
Protocol:	S3P
Connect Using:	Local Network
S3P Address:	0 (0 = Broadcast, 1-65279 = individual address)
Server IP Address:	The IP Address of the SC300. Allocated by network administrator.
Server Port:	15000
Telnet	Cleared

5 Press OK. PowerManagerII will now connect to the device connected to the SC300's RS-232 port.

Communications Security

SC300 settings cannot be changed if:

- All communications are disabled (see SMNP Communications on page 108, and HTTP/HTTPS Access on page 118), and
- Keypad access (see details on page 13) is *Read Only*, or PIN Protected and the keypad access PIN is lost.

In this situation the SC300 will continue to function, but no configuration changes can be made. Contact your Eaton dc product supplier or Eaton for advice (see Worldwide Support on page 159).

Serial Communications (USB / RS-232 / Ethernet) Security

S3P Access

S3P is the serial communications protocol used by the SC300 to communicate with *PowerManagerII* via the USB, RS-232 or Ethernet port.

S3P Protocol is not used by the web server.

► To Enable/Disable S3P access

- On the SC300 keypad go to *Settings* > *Setup* > *S3P*. Select *Enabled* or *Disabled*.

Or:

1 Connect to the SC300 (see details on page 104).

- Web: go to *System* > *Interfaces* > *Remote Access Protocols* > *S3P*.
- DCTools: go to *Configuration* > *Communications* > *Remote Access Protocols* > *S3P*.

2 Set *Access* to *Enabled* or *Disabled*.

Write Access Password

The Write Access Password prevents unauthorized changes to the SC300 configuration (using *PowerManagerII*).

When a Write Access Password is set serial communications access to the SC300 (using PowerManagerII) is read only. The password must be entered before any setting can be changed.

If a Write Access Password is lost, clear it from the SC300 keypad and change it via the Web.

► To set a Write Access Password

1. Connect to the SC300 with Web (see details on page 104).
   - Web: go to *System* > *Interfaces* > *Remote Access Protocols* > *S3P*.
   - DCTools: go to *Configuration* > *Communications* > *Remote Access Protocols* > *S3P*.
2. Type a password into the *Write Access Password* field.
   Passwords are case sensitive, maximum 32 characters.
3. Click the *Apply Changes* button.

► To clear or change a Write Access Password

1. Connect to the SC300 :
   - Web: go to *System* > *Interfaces* > *Remote Access Protocols* > *S3P*.
   - DCTools: go to *Configuration* > *Communications* > *Remote Access Protocols* > *S3P*.
2. Type a new password into the *Write Access Password* field or leave the field blank for no password control.
3. Click the *Apply Changes* button.

► To clear a Write Access Password from the SC300

1. Use SC300 keypad to go to *Settings* > *Setup* > *Clear Write Access Password*
2. Press *Enter*.
   The password is now permanently cleared. If required, reset the password with Web.

Web Access Security

Server Access

Access to the SC300 web server can be disabled or set for secure access using Secure Sockets Layer (SSL) protocol.

SSL is a protocol for transmitting encrypted data over the Internet. URLs that require an SSL connection start with https: instead of http:. If the network is insecure, Eaton recommends that you disable HTTP Access.

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► To change access to the web server

Set the following parameters as required.

Parameter	Description	Where to find:
HTTP Access	Enable to allow un-encrypted access to the SC300 web server. Disable to prevent un-encrypted access to the SC300 web server. **Caution: only use http in a secure network.**	SC300: Settings > Setup DCTools: Configuration > Communications > Remote Access Protocols > HTTP (Web) Web: System > Interfaces > Remote Access Protocols > HTTP (Web)
HTTPS Access	Enable to allow encrypted access to the SC300 web server. *HTTPS access will be slower than HTTP because of the encryption process.* Disable to prevent encrypted access to the SC300 web server.	

User Setup

► To setup specific users and control their access levels

For each user, set the following parameters as required.

If there are no active users then web access is disabled.

Parameter	Description	Where to find:
User Name	This is not used in the login process (except for "Default User"). It is displayed at the top-right of the Web view screen.	Web: System > Interfaces > Remote Access Protocols > HTTP (Web) DCTools: Configuration > Communications > Remote Access Protocols > HTTP (Web)
Logon ID*	The logon name of the user.	
Password*	The password of the user. *Lost passwords cannot be recovered.*	
Read	Allows the user to view configuration settings only.	
Write	Allows the user to change configuration settings.	
Backup	Allows the user to download configuration or snapshot files.	
Restore	Allows the user to upload configuration or snapshot files.	
Execute Commands	Allows the user to stop and start control processes.	
Upgrade Firmware	Allows the user to upgrade firmware.	
Edit User List	Allows the user to edit the user list and change user access settings.	

**Leave both fields blank to allow Default User (anonymous) log on.*

RADIUS Authentication

The SC300 can be configured to authenticate web and SNMP communications using RADIUS.

Remote Authentication Dial In User Service

The SC300 supports both RADIUS authentication and accounting.

► To configure RADIUS

Set the following parameters as required.

Parameter	Description	Where to find:
Authentication Server IP Address	The IP address of the RADIUS authentication server.	SC300: Not available Web: System > Interfaces > Remote Authentication > RADIUS DCTools: Configuration > Communications > Remote Access Protocols > RADIUS > Advanced
Authentication Server Secret	The authentication server shared secret.	
Accounting Server IP Address	The IP address of the RADIUS accounting server.	
Accounting Server Secret	The accounting server shared secret.	
Timeout	The SC300 will wait this number of seconds for a reply from the server.	SC300: Not available Web: Interfaces > Remote Access Protocols > RADIUS > Advanced DCTools: Configuration > Communications > Remote Access Protocols > RADIUS > Advanced
Retries	If the server has not replied, the SC300 will try again this number of times.	
Deadtime	The RADIUS protocol deadtime in seconds.	

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Overview

- The dc power system contains hazardous voltages and hazardous energy levels. Before undertaking any maintenance task refer to the Warnings in the dc power system Installation and Operation Guide.
- If a maintenance task must be performed on a "live" system then take all necessary precautions to avoid short-circuits or disconnection of the load equipment, and follow any "live-working" instructions applicable to the site.
- Only perform the maintenance tasks described in the Maintenance chapter. All other tasks are classified as Servicing. Servicing must only be performed according to specific instructions and only by personnel authorized by Eaton. This includes disassembly and/or servicing of any modules.
- For further information on Servicing contact your local Eaton dc product supplier, or refer to the contact details on page 159.

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Troubleshooting

Use the table to troubleshoot minor installation and operational problems. For additional assistance see contact details on page 159. Return items for replacement or repair with a completed Equipment Incident Report on page 157.

Problem	Possible Cause	Required Action
SC300 displays a dc power system alarm message.		See Alarm Descriptions on page 133.
SC300 LCD is blank and green Power On LED is off.	RXP/power cable is disconnected from the SC300.	Connect cable from connector YS11 to the dc power system voltage feed module (see Connections on page 5). Wait for start-up to complete.
	The ac supply is off and the batteries are not connected because the Low Voltage Disconnect (LVD) has disconnected.	None. The power system including the SC300 will return to normal operation when the ac supply is within its specified voltage range.
	Faulty Voltage Feed Module (VFM) or faulty SC300.	Replace faulty unit.
SC300 LCD is blank and green Power On LED is on.	SC300 is in start-up mode	Wait for start-up to complete. See Starting the SC300 on page 8.
	Faulty SC300	Replace faulty SC300.
SC300 Red LED or Yellow LED is on.	An alarm is active.	Check the type of alarm on the LCD or with *Web* or *PowerManagerII*. See Alarm Descriptions on page 133.
Unable to change settings from SC300 keypad.	Keypad access is set to *Read Only* or *PIN Protected*.	See Keypad Access Security on page 13.
Rectifier does not shutdown when LBRS is enabled.	Load Based Rectifier Shutdown is not available with APR48-3G (prior to PR5), EPR48-3G, APR24-3G and CR48-3G rectifiers.	See Load Based Rectifier Shutdown on page 44.
Monitor OK relay (RY6) is de-energized.	An active alarm, digital input or analog input is mapped to this relay.	Check relay mapping. See Digital Outputs on page 91.
	Problem with power or communications to I/O board.	Check all connections (see Connections on page 5).
	SC300 or I/O board software corrupt or hardware fault.	Replace faulty unit.
Incorrect battery or load current readings.	Bus voltage sense polarity is incorrect.	Check the bus voltage sense polarity and correct if necessary.
	Incorrectly configured shunt inputs.	Check shunt mapping and gain is correct.
	Current is within the *Battery State Threshold*. See details on page 69.	None, normal operation.

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Problem	Possible Cause	Required Action
Battery test will not run. The cause indicated in Web is "Alarms Active" but there are no active alarms.	Battery test will not run if a relevant alarm is active or pending even if the alarm is disabled. Examples of relevant alarms are: *Battery Fuse Fail*, *Rectifier No Load* and *System Overload.*	Clear the cause of the alarm.
	Battery test will not run if the *System Overload* alarm is set to "Redundancy" and only one rectifier is installed.	Set the *System Overload* alarm to "Total Capacity" or install another rectifier.
SC300 or Web displays **???** or **N/A**	Failed, disconnected or unconfigured sensor.	Replace, connect or configure sensor.
	Faulty or disconnected voltage feed module.	Replace or connect voltage feed module.
	Incorrect I/O board mapping.	Check I/O board mapping. See details on page 145.
Modem /RS-232 communications problem.	Incorrect, disconnected or faulty cable.	Check an RS-232 straight-thru cable is plugged into XS1 and the modem. Replace faulty cable.
	Access to RS-232 connector XS1 is restricted.	Use a DB9 ribbon cable extension (Farnell part number 869-6411).
	Incorrect communications settings.	See PSTN Modem Communications on page 114 or GSM Modem Communications on page 114.
	Incorrect modem setup string.	Refer to the AT command section in the modem's manual.
	Modem not powered or other modem problem.	Refer to the modem's manual.
	Incompatible modem.	Contact your Eaton dc product supplier or Eaton for advice. See Worldwide Support on page 159.
	Password required to change settings.	See Write Access Password on page 117.
Serial communications are disabled	*S3P Access* is disabled.	*Set S3P Access* to Enabled. See details in the System Controller Operation Handbook.
Ethernet communications problem	Incorrect, disconnected or faulty cable.	Check a network patch cable is connected from XS31 to a live network outlet. Replace faulty cable.
	Ethernet link is not active.	On the Ethernet connector (XS31) check: - Yellow LED is continuously lit to show link is active. - Green LED flashes to show traffic is reaching the SC300. See the diagrams on page 2 for position of the Ethernet connector.
	Incorrect communications settings.	See Ethernet Communications on page 104.

Problem	Possible Cause	Required Action
	SC300 serial communications are disabled.	Check *S3P Access* is enabled. See details on page 117.
	Password required to change settings (using PowerManagerII).	See Write Access Password on page 117.
Web communications problem	Ethernet communications problem.	See previous entry.
	Cannot connect to web server.	Check IP address and other settings in SC300 are correct. Check correct IP address is used in web browser address bar. See Ethernet Communications on page 104. Check *HTTP Access* or *HTTPS Access* is enabled. See Web Access Security on page 118.
	Cannot log on to web server.	Incorrect Logon ID or Password, or no active users setup. Use SNMP to set up an active user. See Web Access Security on page 118.
	Web communications lost (*Comms Lost* error message).	Check that the SC300 is operating. Check the Ethernet communications connections. See previous entry. Check web browser type and version. See Compatible Software on page 6.
	Default User log on is not available.	*Default User* is not setup or not active. Use SNMP to set up a *Default User*. See Web Access Security on page 118.
	A user cannot change settings, Backup or Restore, Execute Commands, Upgrade Firmware, or Edit User List.	Check the user's access levels. See Web Access Security on page 118.
USB communications problem	Incorrect, disconnected or faulty cable.	Check a micro USB cable is plugged into the USB port and a PC USB port. Replace faulty cable.
	SC300 serial communications are disabled.	Check *S3P Access* is enabled. See details on page 117.
	USB driver not loaded	Use Device Manager to check that the driver is correctly installed.
SC300 time/date is incorrect	Time/date is different on SC300 compared to Web.	None. Time shown on SC300 is UTC. Time on PC running Web or DCTools is local time.
	Time needs to be set.	See SC300 Internal Clock on page 19.
	SC300 time can be set, but is incorrect when SC300 restarts.	Internal battery is dead. Return SC300 for service. (If removed, the battery must be disposed of according to the manufacturer's instructions.)

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Problem	Possible Cause	Required Action
String Fail Alarm	The Battery Mid-point Monitoring system has detected a voltage imbalance in one of the battery strings.	See Battery Mid-point Monitoring in the dc power system Installation and Operation Guide.
	A Battery Mid-point Monitoring sense wire is disconnected.	Check the sense wires.
I/O board Power/Comms OK LED is off	I/O board is not powered or faulty.	Check connection to YH3 on I/O board. See Connections on page 5. Replace I/O board if faulty.
I/O board Power/Comms OK LED is flashing.	I/O board is responding to an *Identify* command from the SC300.	None, this is normal operation. See details on page 84.
LVD Status LED(s) (on I/O board) are on.	LVD contactor is energized.	None, this is normal operation.
LVD Status LED(s) are off (I/O board Power On LED is on).	LVD contactor is de-energized.	None, this is normal operation.
LVD Status LED(s) flashing.	The contactor is in the wrong state (SC300 internal state does not match signal from contactor auxiliary switch).	Check the electrical and mechanical operation of the contactor and auxiliary switch. Check all wiring and connectors. See Connections on page 5.
	LVD Type setting is incorrect.	Check *LVD Type* setting.
LVD contactor(s) not operating.	LVD settings incorrect.	Check LVD is enabled and set to correct values. See details on page 52. Check that the LVD manual control is set to AUTO. See details on page 49. Check that the contactor is correctly configured and mapped to the I/O board. See details on page 53.
	Contactor is disconnected.	Check the control and dc power cables are connected. See details on page 5.
System has no dc output (rectifiers are on).	Load fuse or disconnect device open.	Check for open fuse or disconnect device.
	LVD contactor has disconnected the load.	Use the web to check LVD is enabled and set to correct values. (LVD status LED on the I/O board is on when contactor is energized.) Check that the I/O board is connected (Power LED is on). Check that the LVD control and power cables connections on page 5. Check the connections from the load bus to the LVD.
System has no battery input	Battery disconnect device or fuse open.	Check for open battery disconnect device or fuse.
	LVD has disconnected the battery because ac supply is off and the battery is fully	None. The battery will be automatically reconnected when the ac supply is restored.

Problem	Possible Cause	Required Action
	discharged.	
	LVD contactor is open.	Use DCTools/Web to check LVD is enabled and set to correct values. (LVD status LED on the I/O board is on when contactor is energized.) Check that the I/O board is connected (Power LED is on). Check that the LVD control and power cables are connected. See Connections on page 5. Check the connections from the battery bus to the LVD.

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Replacing the System Controller or I/O Board

The SC300 system controller or the I/O board can be replaced without switching off the dc power system and disconnecting the equipment it powers.

If the system is configured for only one IO Board, the SC300 will automatically detect the IO Board and assign it as IOB 1 (address 1).

If more than one IO Board is to be installed, refer to I/O Board or Fan Controller serial number mapping on page 145.

The specific procedures depend on the system configuration. Refer to the dc power system Installation and Operation Guide.

Refer also to:

- Application Note AN0145 Replace SC200 in a Live System
  Note: this also applies to SC300.
- Application Note AN0146 Replace IO Board in a Live System

SC300 system controller

Communications

USB	Type:	USB 2.0
	Connector:	USB Micro type AB
RS-232	Interface:	RS-232 (DTE)
	Connector:	DB9M
RS-485 (some versions only)	Connector:	DB9M
Ethernet	Interface:	100baseT
	Connector:	RJ45
	Protocols:	TCP/IP, SNMP, S3P over IP, http (Web), https (secure Web), SMTP, Modbus-TCP, Serial Server
	MAC Address:	See details on page 104.
	Web browser:	Microsoft Internet Explorer 11[3] or later, Mozilla Firefox 3.0 or later.

IOBGP I/O Board

The following specifications apply to a single IOBGP I/O board connected to the SC300 system controller.

Digital Outputs/Alarm Relays (IOBGP)

Number of Digital Outputs/Relays
(one also used for Monitor OK alarm)*

IOBGP-00/ 01	6
IOBGP-10/11	10
IOBGP-20/21	8

Contact Arrangement	One changeover contact per relay
Contact Rating	0.1A @ 60V dc maximum
Connectors	Screwless terminal blocks
Wire Size	0.5 - 2.0mm^2 [20 - 14 AWG]
Maximum Cable Length	20m (65 feet)
Isolation	Relay connections are isolated to 500V dc from all other circuitry, earth and system common.

** Digital Output 6 is also used as the Monitor Fail alarm relay. It will de-energize if the I/O board loses power or loses communication with the SC300.*

[3] IE11 must have Compatibility mode disabled.

Battery Mid-point Monitoring

Number of Strings	Standard: Maximum:	4 24 (with additional IOBGP-00/01/10/11/20/21 I/O boards)
Range	–35V to +35V	
Resolution	<30mV	
Accuracy	±0.5% at 25°C [77°F], ±1% over rated temperature range	
Maximum Cable Length	20m (65 feet)	

Battery Quarter-Point Monitoring

Number of Strings	Standard: Maximum:	1 16 (with additional IOBGP-10/11/20/21 I/O boards)
Range	–60V to +60V	
Resolution	<30mV	
Accuracy	±0.5% at 25°C [77°F], ±1% over rated temperature range	
Maximum Cable Length	20m (65 feet)	

Digital Inputs (IOBGP)

Number of Digital Inputs	
IOBGP-00/01	6
IOBGP-10/11/20/21	9
Connectors	Screwless terminal blocks
Wire Size	0.5 - 2.0mm^2 [20 - 14 AWG]
Maximum Cable Length	20m (65 feet)
Input Types	Voltage-free switch or relay contacts only
Input Range	Live Bus to Live Bus + 5V
Input Common	Same bus as used for current shunts (Live bus is standard)
Input Protection	Protected against damage from short circuit to live or common bus

Temperature Sense Inputs (IOBGP)

Number of Temperature Sense Inputs	2 *One only connected as standard. Second input available (requires additional temperature sensor).*
Range	2.53V to 3.43V (-20 to +70°C [-4 to +158°F])
Resolution	< 0.01V (< 1°C [1.8°F])
Accuracy	±1°C [1.8°F] at 25°C [77°F], ±2°C [3.6°F] over rated temperature range

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Maximum Cable Length	20m (65 feet)
Connector	RJ45

Current Sense Inputs (IOBGP)

Number of Current Sense Inputs	3
Range	–50 to +50mV
Resolution	<50µV
Accuracy	±0.5% at 25°C [77°F], ±1% over rated temperature range
Maximum Cable Length	10m (32 feet)
Connector	RJ45

Bus Voltage Sense Input (IOBGP)

Number of Bus Voltage Sense Inputs	1
Range	–60V to +60V
Resolution	30mV
Accuracy	±0.5% at 25°C [77°F], ±1% over rated temperature range
Maximum Cable Length	3m (10 feet)
Connector	MTA156 (2-way)

Low Voltage Disconnect (IOBGP)

Number of contactor connections	
IOBGP-00/ 01	2
IOBGP-10/11	3
IOBGP-20/21	2
Number of LVD channels	16
Contactor Type	Normally Open (NO) with auxiliary contacts only.
Contactor Coil Voltage (nominal)	12V, 24V or 48V
Maximum Hold-in Current	1.2A (per contactor)
Maximum Cable Length	3m (10 feet)
Connector	MTA156 (4-way)

Power and RXP Comms

Maximum Cable Length (from Voltage Feed Module)	24V Systems - 100m (325 feet) 48V Systems - 200m (650 feet)
Connector	RJ45

Alarm Descriptions

AC Fail	All rectifiers report ac supply failure or a digital input with *Function* set to "AC Fail" is active.
AC Phase 1/2/3 Fail	Phase 1/2/3 of the ac input has failed, i.e. it deviates from the *Nominal AC Voltage* by more than the *AC Phase Fail Threshold*. Only available in systems where ac phase voltage is measured.
AC Phase 1/2/3 Voltage	Phase 1/2/3 of the ac input deviates from the *Nominal AC Voltage* by more than the *AC Phase Voltage Threshold*. Only available in systems where ac phase voltage is measured.
ACD Fan Fail	The ac distribution cooling system or fan controller has failed (indicated by an active digital input with *Function* set to "ACD Fan Fail".
Battery Current Limit	Battery Current Limit (BCL) is active. See Battery Current Limit on page 28.
Battery End of Life	If *Battery End of Life date* has been set, then this alarm will activate when that date is reached.
Battery Fuse Fail	A battery fuse has blown or a battery disconnect device has operated (indicated by an active digital input with *Function* "Battery Fuse Fail").
Battery Temperature High	The analog input with *Function* set to "Battery Temperature" has a value above the *Battery Temperature High Threshold*. This alarm indicates either thermal runaway of the batteries or that the batteries are operating at a temperature that may cause reduced battery life.
Battery Temperature Low	The analog input with *Function* set to "Battery Temperature" has a value below the *Battery Temperature Low Threshold*. This alarm indicates a risk to the standby power system battery as lower temperatures reduce the battery capacity.
Battery Test	The Battery Test control process is active. See Battery Test on page 30.
Battery Test Fail	The batteries do not have the required capacity or are not fully charged. See Battery Test on page 30.
Cabinet Fan Fail	A cabinet fan has failed (indicated by an active digital input with *Function* set to "Cabinet Fan Fail").
Characterizing Battery	The SC300 is running a battery characterization, which is a full depth test battery discharge. See details on page 74.
Configuration Error	One of the following is true: • The Rectifier Current Limit is set higher than the Maximum Current Limit of all the registered rectifiers. See details on page 42. • The OVSD Set Point is out of the range of any registered rectifiers. See details on page 42. • More than one digital output are mapped to the same relay on an I/O board or SiteSure-3G Module. See details on page 91. • An LVD contactor is in *Conflict* state. See details on page 53. • *Smart Alarm Based Disconnect* is *Enabled*, but the corresponding *Smart Alarm* is *Disabled*. See details on page 53. • A *Smart Alarm* source has an invalid *Source Triggered* setting. To see the cause of this alarm: • Web – go to *Alarm Info* at the end of the Alarms Table • Front panel – press up arrow to show alarm list. Scroll down to the bottom.

DC Input Fail	One or more solar chargers has no DC input voltage.
DO Manual	A digital output is set to manual control (control state is set to *Active* or *Inactive*). See Digital Outputs on page 91.
Equalize	The Equalize control process is active. See Equalize on page 31.
Fast Charge	The Fast Charge control process is active. See Fast Charge on page 32.
Generator Fail	*Generator Control* is active but the SC300 has not detected that the ac supply is present (rectifiers have not turned on) after the *Generator Fail Alarm Recognition Period*.
High Float	The bus voltage is above its normal range (set by the *High Float Threshold*). *If High Float Tracking is enabled, the High Float threshold will increase when the bus voltage increases due to temperature compensation. The threshold change will be the same as the bus voltage change.*
High Load	The bus voltage is higher than the safe range for the load and/or battery (set by the *High Load Threshold*).
IOB Comms Lost	The SC300 has lost communication with a mapped I/O board or SiteSure-3G module. Or, an input or output is mapped to an invalid I/O board or SiteSure-3G module. See I/O Board Mapping on page 145.
In Discharge	*Battery Charge State* is *Discharge* (see details on page 68).
Load Fuse Fail	A load fuse has blown or a load disconnect device has operated (indicated by an active digital input with *Function* "Load Fuse Fail").
Low Float	The bus voltage is below its normal range (set by the *Low Float Threshold*). *If Low Float Tracking is enabled, the Low Float threshold will decrease when the bus voltage decreases due to temperature compensation. The threshold change will be the same as the bus voltage change.*
Low Load	The bus voltage is lower than the safe range for the load and/or battery (set by the *Low Load Threshold*).
LVD Characterization Error	An LVD contactor must be characterized. See Low Voltage Disconnect on page 49.
LVD Disconnected	An LVD contactor has disconnected the battery or load. See Low Voltage Disconnect on page 49.
LVD Fail	An LVD contactor is faulty or the control cable from the I/O board is disconnected. See Low Voltage Disconnect on page 49.
LVD Manual	An LVD is set to MANUAL CONNECT or MANUAL DISCONNECT. See Low Voltage Disconnect on page 49.
MOV Fail	One or more MOV cartridges have failed and must be replaced (indicated by an active digital input with *Function* set to "MOV Fail").
Multiple Rectifier Comms Lost	More than one rectifier has lost communications. See also Rectifier Comms Lost on page 135.
Multiple Rectifier Fail	Multiple rectifiers are faulty or their ac supply has failed without causing partial or total ac supply failure. Inhibited by: *AC Fail* and *Partial AC Fail* (if no more than one rectifier has failed while still detecting the AC supply). See details of Alarm Inhibiting on page 58.
Normal Charge	The DC power system is in normal float charging mode.
Partial AC Fail	A digital input with *Function* set to "Phase Fail" is active, or more than 20% of single-phase rectifiers are reporting ac supply failure, or all 3-phase rectifiers are reporting loss of the same phase. Inhibited by: *AC Fail*. See details of Alarm Inhibiting on page 58.

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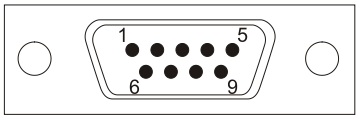
Peak Load Reduction	The system is running in PLR mode, with the rectifiers turned down and the load being supplied from the batteries. For more details, see Peak Load Reduction on page 36.
Rectifier Comms Lost	Normally this alarm indicates that a rectifier has been removed during routine maintenance. However, faulty rectifier communications or losing the rectifier communications bus can also trigger this alarm. If removing multiple rectifiers triggers this alarm, reset it from the keypad before it triggers an external alarm. Inhibited by: *Multiple Rectifier Comms Lost*. See details of Alarm Inhibiting on page 58.
Rectifier Current Limit	Rectifier(s) in current limit.
Rectifier Fail	A rectifier is faulty or its ac supply has failed without causing partial or total ac supply failure. Inhibited by: *Multiple Rectifier Fail*, *AC Fail* and *Partial AC Fail* (if no rectifiers have failed while still detecting the AC supply). See details of Alarm Inhibiting on page 58.
Rectifier No Load	The total rectifier current is less than 2% of the maximum system output current or is less than 2A. Inhibited by: *AC Fail*. See details of Alarm Inhibiting on page 58.
Rectifier OverTemperature	Rectifier(s) operating in temperature turndown mode, because of high ambient temperature or low ac supply voltage.
Sensor Fail	The current, temperature or voltage sensing system is faulty, or the I/O board mapping is incorrect.
Site Backup Time Remaining	The power system has been running in AC fail from batteries for more than the time specified by *Site Backup Time.*
Solar Fail	At least one solar charger has failed.
Standby Mode	The SC300 is on but inactive. Another system controller controls the dc power system. If the other system controller fails or is disconnected then the SC300 in Standby Mode will become active (after a short delay).
String Fail	There is a voltage imbalance in one of the battery strings. See Battery Mid-point Monitoring on page 70.
System Overload	The power system is operating close to its maximum capacity and more rectifiers are needed. The System Overload threshold is configurable. See System Overload Alarm on page 58. Inhibited by: *AC Fail*. See details of Alarm Inhibiting on page 58.
System Overload B	This is identical to *System Overload.* This alarm is enabled when another system overload alarm is needed with different settings.
Unknown Hardware	The SC300 has detected an unknown type of device on the RXP bus. Contact your Eaton DC product supplier for advice.
Unmapped IOB Found	An I/O board or SiteSure-3G module is connected to the SC300, but its serial number is not in the *I/O Board to Serial Number Mapping* table. See I/O Board Mapping on page 145.
Wrong Battery Polarity	An analog input with *Function* set to "Reverse Battery Detect" has a value above the *Bus Voltage*. This alarm indicates the battery is connected with wrong polarity. See Reverse Battery Detection on page 78.

System Controller Connector Pin-outs

Connector	Type	Purpose	Pin	Description
XS1	DB9M	RS-232 / RS485 Serial Interface	1	-
			2	RD (Receive Data)
			3	TD (Transmit Data)
			4	DTR (Data Terminal Ready)
			5	Common (Ground)
			6	-
			7	RTS (Request to Send)
			8	RS-485A
			9	RS-485 B
XS31	RJ45	Ethernet Interface	1	Rx
			2	Rx
			3	Tx
			4	-
			5	-
			6	Tx
			7	-
			8	-
YS11	RJ45	RXP System Communications	1	System Positive 24/48V
			2	System Positive 24/48V
			3	CANL (some versions only)
			4	RS485-A (some versions only)
			5	RS485-B (some versions only)
			6	CANH (some versions only)
			7	System Negative 24/48V CAN ground
			8	System Negative 24/48V
USB	USB micro AB	USB Serial Interface	1	VCC (+5 V dc)
			2	Data -
			3	Data +
			4	ID
			5	Ground



RS-232 D9M and RJ45 connector pin-outs **RJ45 plug pin-outs**

I/O Board (IOBGP-xx) Connector Pin-outs

See input and output specifications on page 129.

Connector	Type	Purpose	Pin	Description
XH4	MTA 156	LVD 1 Interface	1	Coil -
			2	Coil +
			3	LVD 1 auxiliary switch
			4	Auxiliary switch common
XH5	MTA 156	LVD 2 Interface	1	Coil -
			2	Coil +
			3	LVD 2 auxiliary switch
			4	Auxiliary switch common
XH3	MTA 156	LVD 3 Interface *IOBGP-10/11 only*	1	Coil -
			2	Coil +
			3	LVD 2 auxiliary switch
			4	Auxiliary switch common
XH6	RJ45	Current Sense Inputs *Current sensor must be on system live. Sensor signal is referenced to live bus.*	1	Current Input 1 Common
			2	Current Input 1
			3	+12V out
			4	Current Input 2 Common
			5	Current Input 2
			6	0V out
			7	Current Input 3 Common
			8	Current Input 3
XH7	RJ45	Temperature Sense Inputs *Sensor signal is referenced to live bus.*	1	-
			2	-
			3	-
			4	Temp Sense 1+
			5	Temp Sense 1-
			6	-
			7	Temp Sense 2+

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Connector	Type	Purpose	Pin	Description
			8	Temp Sense 2-
XH8	MTA 156	LVD Power	1	Bus live
			2	Bus common
XH9	MTA 156	Bus Voltage Sense Input	1	Controller reference (Bus live)
			2	Controller sense (Bus common)
XH12A	MTA 156	Battery Mid-point Monitoring sense inputs *Sensor signal is referenced to live bus.*	1	String 1 Mid-point / Quarter-point 1
			2	String 2 Mid-point / Quarter-point 2
			3	String 3 Mid-point / Quarter-point 3
			4	String 4 Mid-point / Quarter-point 4
XH15A		Digital inputs D1-D3 *Digital input signals are referenced to live bus.*	1	D1 input
			2	0V
			3	D2 input
			4	0V
			5	D3 input
			6	0V
XH15B		Digital inputs D4-D6 *Digital input signals are referenced to live bus.*	1	D4 input
			2	0V
			3	D5 input
			4	0V
			5	D6 input
			6	0V
XH15D		Digital inputs D10-D13 *IOBGP-10/11 only* *Digital input signals are referenced to live bus.*	1	D11 input
			2	0V
			3	D12 input
			4	0V
			5	D13 input
			6	0V
XH16/XH17		Digital relay outputs 1-2 *Digital outputs are voltage-free.*	1	Relay 1 normally closed (NC)
			2	Relay 1 normally open (NO)
			3	Relay 1 Common (COM)
			4	Relay 2 normally closed (NC)
			5	Relay 2 normally open (NO)
			6	Relay 2 Common (COM)
XH18/XH19		Digital relay outputs 3-4 *Digital outputs are voltage-free.*	1	Relay 3 normally closed (NC)
			2	Relay 3 normally open (NO)
			3	Relay 3 Common (COM)
			4	Relay 4 normally closed (NC)

Connector	Type	Purpose	Pin	Description
			5	Relay 4 normally open (NO)
			6	Relay 4 Common (COM)
XH20/XH21		Digital relay outputs 5-6* *Digital outputs are voltage-free.*	1	Relay 5 normally closed (NC)
			2	Relay 5 normally open (NO)
			3	Relay 5 Common (COM)
			4	Relay 6 normally closed (NC)
			5	Relay 6 normally open (NO)
			6	Relay 6 Common (COM)
XH22/XH23		Digital relay outputs 7-8 *IOBGP-10/11/20/21 only* *Digital outputs are voltage-free.*	1	Relay 7 normally closed (NC)
			2	Relay 7 normally open (NO)
			3	Relay 7 Common (COM)
			4	Relay 8 normally closed (NC)
			5	Relay 8 normally open (NO)
			6	Relay 8 Common (COM)
XH20/XH21		Digital relay outputs 9-10 *IOBGP-10/11only* *Digital outputs are voltage-free.*	1	Relay 9 normally closed (NC)
			2	Relay 9 normally open (NO)
			3	Relay 9 Common (COM)
			4	Relay 10 normally closed (NC)
			5	Relay 10 normally open (NO)
			6	Relay 10 Common (COM)
YH3	RJ45	DC power system digital inputs *Digital input signals are referenced to live bus.*	1	Load Fuse Fail
			2	Battery Fuse Fail
			3	+12V out
			4	AC Distribution Fan Fail
			5	AC Distribution MOV Fail
			6	0V out (system live - protected)
			7	-
			8	System common - protected
YH11/ YH11A (*IOBGP-10/11/20/21 only)*	RJ45	RXP System Communications	1	System Positive 24/48V
			2	System Positive 24/48V
			3	-
			4	RS485-A
			5	RS485-B
			6	-
			7	System Negative 24/48V
			8	0V

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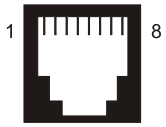
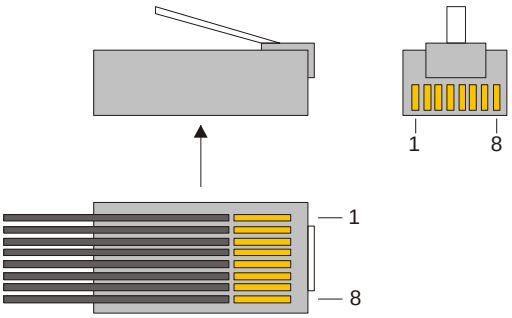
** Digital Output 6 is also used as the Monitor Fail alarm relay. It will de-energize if the I/O board loses power or loses communication with the SC300.*



RJ45 connector pin-outs



RJ45 plug pin-outs

Event Type	Description	Additional Event Information
AI High Activation	An analog input high threshold alarm has become active.	Analog input name
AI High Deactivation	An analog input high threshold alarm has become inactive.	Analog input name
AI Low Activation	An analog input low threshold alarm has become active.	Analog input name
AI Low Deactivation	An analog input low threshold alarm has become inactive.	Analog input name
Alarm Activation	An alarm has become active.	Alarm number
Alarm Deactivation	An alarm has become inactive.	Alarm number
Clock Change From	The clock was changed to this new Event Log Time from the old Event Information time. When the clock is changed, two event log entries are recorded. The first is the Clock Change To event and the second is the Clock Change From event.	
Clock Change To	The clock was changed to the new Event Information time from the old Event Log Time. When the clock is changed, two event log entries are recorded. The first is the Clock Change To event and the second is the Clock Change From event.	
Configuration Change	The configuration database was changed.	
DI Activation	A digital input alarm has become active.	Digital input number name
DI Deactivation	A digital input alarm has become inactive.	Digital output number, name
DO Control Manual Active	A digital output has been manually activated.	Digital output number, name
DO Control Manual Inactive	A digital output has been manually deactivated.	Digital output number, name
DO Control Automatic	A digital output has been set to Automatic.	Digital output number, name
Logs Cleared	The event and data logs have been cleared.	

Event Type	Description	Additional Event Information
Manual Equalize Start	An Equalize cycle has been manually started.	
Manual Equalize Stop	An Equalize cycle has been manually stopped.	
Manual Fast Charge Stop	A Fast Charge cycle has been manually stopped.	
Rectifier Restart	A rectifier was started manually. This excludes events where a rectifier starts due to Load-Based Rectifier Shutdown or after the removal of a fault condition.	
Rectifier Shutdown	A rectifier was shut down manually. This excludes events where a rectifier shuts down due to Load-Based Rectifier Shutdown or a fault condition.	
Battery State Reset	The battery state has been reset, setting the value of Ah Discharged back to zero.	
Start Up	Records when the controller started running.	
Smart Alarm Activation	A smart alarm has become active.	Smart Alarm name
Smart Alarm Deactivation	A smart alarm has become inactive.	Smart Alarm name
Generator Start	The generator has been started.	
Generator Stop	The generator has been stopped.	
Peak Load Reduction Start	The PLR process has been started.	
Peak Load Reduction Stop	The PLR process has been stopped.	
Reset System	The SC300 has been reset.	
Control Process Start	An SC300 control process has started.	
Control Process Stop	An SC300 control process has stopped.	

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The SC300 uses mappings to allow it to associate internal functions, alarms and physical I/O devices.

A default mapping is set at the factory before delivery. Usually this default mapping will not need to be changed.

I/O Board Mapping

The serial numbers of an I/O board, SiteSure-3G modules, and Fan Controllers, and the physical connectors on the board/modules are mapped to logical numbers in the SC300. This allows the physical inputs and outputs (including LVD contactors) to be recognized by the SC300.

I/O Board or Fan Controller serial number mapping

Each I/O board serial number must be mapped to a logical *IOB Number*.

Usually, I/O board serial number mappings only need to be changed if:

- The I/O board is changed or added. See details on page 127.
- The SC300 is changed and/or a new configuration file is loaded into the SC300. See details on page 127.

This mapping is not included in configuration files.

If the system is configured for only one IO Board, the SC300 will automatically detect it and assign it as IOB 1. If more IO Boards are installed, or in a new system with more than one IO board, or if an SC300 is changed or loaded with a new configuration file, the IO Board mapping must be set. Input/output, sensors and most voltage control processes are only available if this mapping is set.

► To manually map I/O boards or Fan Controllers

Either:

- Use the SC300 keypad to go to: *Settings* > *IOBs*. The serial numbers of registered Input / Output boards are displayed.
- Select an unmapped Input / Output board or Fan Controller (identified as *New*). Press *Enter*. Identity information is displayed and the I/O board LED will flash.
- Press *Map* and select an unused IOB Number (or one marked as *Missing,* if replacing an I/O board). Press *Enter*.

Or:

- Use the SC300 keypad to go to Alarms (as a shortcut, simply press the up arrow  and select *Unmapped IOB*.
- Press *Clear*.
- Select the IOB number to map to.
- Press *Save*

Or:

- On web, go to: *System* > *Interfaces* > *RXP*.
- In DCTools, go to *Configuration* > *RXP*.
- Copy the I/O board serial number(s) from the *RXP Devices* table to the *I/O Board to Serial Number Mapping* table to map an *IOB Number* to each I/O board (overwrite an existing serial number if required).

  If multiple SiteSure-3G modules are installed use the I/O board Identify function to physically identify each board. See details on page 84.

I/O connector mapping

Each I/O connector (analog input, digital input and digital output) on an I/O board must be mapped to a logical *IOB Number* and *IOB AI*, *IOB DI* or *IOB DO Number*.

► To map I/O connectors

See Analog Inputs on page 85, Digital Inputs on page 90 and Digital Outputs on page 91.

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The following tables show the default connector mappings for the first IO Board:

Analog Input	Name	Function*	IOB Number	IOB AI Number	Connector
1	XH9 Bus Voltage	Bus Voltage	1	1	XH9
2	XH12 Mid-point 1	Battery Mid-point / Quarter-point[4]	1	2	XH12A
3	XH12 Mid-point 2	Battery Mid-point/ Quarter-point	1	3	XH12A
4	XH12 Mid-point 3	Battery Mid-point/ Quarter-point	1	4	XH12A
5	XH12 Mid-point 4	Battery Mid-point/ Quarter-point	1	5	XH12A
6	XH6 Battery Current	Battery Current	1	6	XH6
7	XH6 Current 2	User Defined	1	7	XH6
8	XH6 Current 3	User Defined	1	8	XH6
9	XH7 Battery Temp	Battery Temperature	1	9	XH7
10	XH7 Temperature 2	User Defined	1	10	XH7

[4] Quarter-point inputs are only available with IOBGP-10/11/20/21.

Digital Input	Name	Function*	IOB Number	IOB DI Number	Connector
1	Digital Input 1	User Defined	1	1	XH15A
2	Digital Input 2	User Defined	1	2	XH15A
3	Digital Input 3	User Defined	1	3	XH15A
4	Digital Input 4	User Defined	1	4	XH15B
5	Digital Input 5	User Defined	1	5	XH15B
6	Digital Input 6	User Defined	1	6	XH15B
7	Load Fuse Fail	Load Fuse Fail	1	7	YH3
8	Battery Fuse Fail	Battery Fuse Fail	1	8	YH3
9	ACD Fan Fail	ACD Fan Fail	1	9	YH3
10	MOV Fail	MOV Fail	1	10	YH3
11#	Digital Input 10	User Defined	1	11	XH15D
12#	Digital Input 11	User Defined	1	12	XH15D
13#	Digital Input 12	User Defined	1	13	XH15D

* *Function* is an internal analog or digital input value used by the SC300 for voltage control processes, and/or to generate System States, and/or to generate system alarms.

Digital inputs 10, 11, 12 are only available with IOBGP-10/11/20/21

Digital Output	Name	IOB Number	IOB DO Number	Connector
1	Summary Non Urgent	1	1	XH16
2	Low/High Load	1	2	XH17
3	Rectifier Fail	1	3	XH18
4	AC Fail	1	4	XH19
5	Load/Batt Disconnect	1	5	XH20
6	IOBGP 1 RY6/Mon OK	1	6	XH21
7 #	Digital output 7	1	7	XH22
8 #	Digital output 8	1	8	XH23
9 #	Digital output 9	1	9	XH24
10 #	Digital output 10	1	10	XH25

Digital outputs 7 to 10 are only available with IOBGP-10/11/20/21 or IOBSS-10.

Digital outputs are activated by mappings from alarms (see Digital Output (Relay) Mapping on page 149) or by a test (see Digital Outputs on page 91).

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LVD connector mappings

For details refer to LVD Configuration on page 52.

Digital Output (Relay) Activation

Any alarm can activate one or two digital outputs (A and B).

► **To map digital outputs**

- See System Alarms on page 57, Smart Alarms on page 60, Analog Inputs on page 85, Digital Inputs on page 90 and Digital Outputs on page 91.

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SC300 Controller

Last Revised Date: 13 August 2019

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Powering Business Worldwide

EQUIPMENT INCIDENT REPORT

Please enter as much information as you can. Send the completed form, together with the item for repair to your nearest authorized service agent. NOTE: Only one fault to be recorded per form.

For further information contact your local Eaton dc product supplier or Eaton (see contact details on page 159).

Date: _____

Customer Information

Company: _____

Postal Address: _____

_____

Return Address: _____
(Not PO Box)
_____

Telephone: _____ Fax: _____ Email: _____

Contact Name: _____

Location of Failure

Product code: _____ Serial number: _____ Document number: _____

System type installed in: _____ Serial number: _____

Site name or location: _____

Fault discovered

☐ Delivery ☐ Unpacking ☐ Installation
☐ Initial test ☐ Operation after _____ years ☐ Other _____

Failure source

☐ Design ☐ Manufacturing ☐ Documentation
☐ Transportation ☐ Installation ☐ Handling
☐ _____

Effect on system operation ☐ None ☐ Minor ☐ Major ☐ _____

INFORMATION (fault details, circumstances, consequences, actions)

_____

_____

_____

_____

_____

Internal use only.

Reference No: _____ RMA: _____ NCR: _____ Signature: _____ Date: _____

INFORMATION continued (fault details, circumstances, consequences, actions)

SG/03 ISS06

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