



PS1 Sinewave Interactive Inverter Charger

User Manual



Document: PC0004
Revision 02

Foreword

Thank you for purchasing a Selectronic PS1 Sinewave Interactive Inverter Charger. The PS1 has been designed and manufactured to exacting ISO9001 standards, by people with many years experience in providing solutions to alternative and remote power needs.

Combined with a suitable generator and batteries the PS1 will provide you with reliable power 24 hours a day. The quality of power the PS1 produces is as good as, if not better than normal grid electricity. A powerful microprocessor combined with low RDS ON MOSFETS utilises Pulse Width Modulation to develop a low distortion precise Sine Wave output.

Componentry used within the PS1 has been generously proportioned to ensure safe and reliable operation for many years.

If not understood the PS1 can be a very complex product, please read this document thoroughly before attempting to use the PS1 or request service.

It is extremely important that you and your installer follow all of the instructions set out in this document; failure to do so may void your warranty.

Ensure you return your warranty information promptly and complete all details.

The PS1 has been thoroughly tested before leaving our factory, however should any damage have occurred during transit please inform your installer/supplier immediately.

We trust you get many years of trouble free operation from your PS1.

Warranty

Your Selectronic PS1 product is warranted by the manufacturer for a period of 12 months from date of purchase to the original purchaser only. The manufacturer will bear the cost of parts and labour to repair any faults found within the terms and period of this warranty. Faulty product or parts must be returned to Melbourne Australia for claim under warranty. No allowance is made for installers labour or travelling time required to disconnect or reinstall faulty parts. Cost of freight to return parts to the customer within Australia only, will be paid by the manufacturer; method of freight used will be determined by the manufacturer.

Unless otherwise specified to the purchaser the benefits conferred by this voluntary warranty are additional to all other conditions, warranties, guarantees, rights and remedies expressed or implied by the Trade Practices Act in your state or territory.

All installation and user conditions as set down in the instruction manual must be strictly adhered to, failure to do so may void your warranty.

This product is not to be used for Life Support equipment.

Any faults caused by lightning, water or moisture ingress, faulty installation, using the product in a manner which it is not intended, vermin infestation, improper voltage, alteration which affects the reliability or performance of the unit but not attributable to faulty manufacture, or faulty generator sets will not be covered under warranty.

In the event of the product being out of service the manufacturer shall bear no responsibility for any consequential losses or expenses.

The manufacturer will not be held responsible for any misleading or incorrect information conveyed by the salesperson or installer.

If service is required please contact your installer/sales company first.

If your installation is signed off by a Selectronic Accredited PS1 installer your 12 month warranty will become 24 months.

If you wish to extend your warranty further please see the warranty form for details.

Refer [Warranty Registration](#)

About This Manual

This User Manual (PC0004) describes the operation of the PS1 Sinewave Interactive Inverter Charger family. Refer to [Appendix H](#) for document and software revision information. A Technical Manual (PC0009) is also available supporting PS1 installation, maintenance and troubleshooting by suitably qualified and trained personnel only.

Appendices contain product specifications, an index to system settings, definition of events and a graphical depiction of the menu system.

A PDF copy of this manual may be downloaded from the Selectronic web site www.selectronic.com.au PDF copy includes many cross-reference [hotlinks](#) (underlined) to facilitate moving around within the document. (If you have clicked one of these links and wish to return to the place where you were previously reading, click on the “Go to Previous View” symbol on the Acrobat Reader toolbar at the top of the document.)



In this manual, the symbol indicates important information such as hazards and warnings.

If you have any suggestions for improvements to either this manual or any Selectronic Australia product please contact us (see Manufacturers Details below).

Warning



The equipment described in this manual may be hazardous. Before operating the equipment please see §1 [Precautions and Safety](#) and ensure that you understand the relevant information in the manual. No procedures in this manual require the PS1 front door to be opened. Only suitably qualified and trained installation, commissioning and maintenance personnel should open the PS1 door or disturb the PS1 wiring.

Selectronic Australia shall have no obligation as to any equipment which has been improperly installed, stored, or handled, or which has not been operated or maintained according to this manual, nor for any operating mistakes and consequences arising therefrom.

This product is not to be used for Life Support equipment.

Manufacturers Details



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1 Precautions and Safety



1.1 PS1

Hazardous voltages and energy are generated by the PS1, are fed into the PS1 by external wiring from multiple sources, and may be stored in capacitors after the PS1 is switched off and disconnected from external wiring. Only suitably qualified and trained personnel should open the PS1 front door. Do not operate with the door open.

No procedures in this manual require the PS1 front door to be opened. For safety reasons, all normal PS1 operations by users are performed with the door closed. This includes the front panel operation of all PS1 pushbuttons, displays and circuit breakers.

The PS1 requires adequate ventilation, away from hot equipment. Do not obstruct the airflow through the ventilation holes in the PS1 case (sides and door top).

The PS1 must be located in a dry place away from water, electrolyte and corrosive aerosols. If the PS1 is wall mounted the mounting method must be in accordance with the installation instructions using the fasteners specified in the PS1 Technical Manual.

The PS1 contains arcing contacts so must not be located where explosive gas mixtures could occur, such as hydrogen from batteries or diesel fuel fumes. Installation requirements are defined in the PS1 Technical Manual.



1.2 PS1 Auto restart

WARNING: The PS1 automatically restarts and may restore power or start the generator at any time.

If a fault or overload is detected the PS1 will shutdown and automatically attempt to restart at varying intervals of up to several hours.

Never work on equipment or investigate a problem without following appropriate safety isolation procedures, including turning off isolating switches and disconnecting the generator start battery.



1.3 Battery

Batteries are very dangerous. Please read the safety information provided by the battery supplier.

Battery acid is dangerous.

Batteries can emit hydrogen gas, which is explosive.

Batteries connected in series can produce hazardous voltages.

Disconnecting a DC power connection (even on one battery cell) can cause dangerous high-energy DC arcs, which can cause serious burns and eject hot particles, and can be difficult to extinguish.

Disconnecting a DC power connection (even on one battery cell) can cause renewable sources to produce large voltages (much larger than the battery voltage) on battery terminals and DC wiring. Such voltages can be lethal. They can also damage the PS1. Only suitably trained and qualified personnel should disconnect any DC power connection, including battery cell connections, and only with suitable procedures and safety precautions. See the PS1 Technical Manual.

2 General Guidelines

Following the guidelines below will help keep the system reliable and maximise the life of the PS1, generator and other components.

- Reduce operating temperatures. All equipment will provide longer and be more reliable service if it is protected from high temperatures and regular wide temperature variations. Generator and PS1 power capacity is reduced operating in high ambient temperatures; battery life is seriously degraded by battery temperatures above 35°C.
- In hot areas a shed or room with a shade roof above and on walls exposed to direct sunlight and with reasonable ventilation will reduce maximum temperatures.
- In areas with wide temperature variation between day and night, insulate the building and fit ventilation controlled by internal room temperature to dispose of excess heat. Electronic equipment should never sit under a single skin metal roof.
- Install the generator in an area with good ventilation and well separated from the PS1 and the batteries. Do not allow heat or exhaust from the generator to heat up the PS1, the battery or other equipment.
- Follow the instructions given under routine monitoring and maintenance. Refer to [§6.1 Routine Monitoring of Operation](#) and [§6.2 Routine Maintenance](#).
- Install a phone connection or other means by which data from the PS1 can be collected and processed. This allows your system integrator to make adjustments to the system settings to optimize performance or eliminate problems. A remote connection can help identify the cause of faults and often allow your system maintainer to remotely fix problems.
- Arrange with your system maintainer to monitor the performance of the system by periodically reviewing the logged data,
- The choice of generator to work with the PS1 is absolutely critical. The PS1 needs to synchronise with the generator. This can only be done with good quality generators in good condition. It is strongly recommended that only diesel generators be used, with a KW rating (kVA x 1.2) of at least 30% greater than the PS1. The method of governing used on the generator is also critical, mechanical governing Class A should be avoided, with a preference to Class B mechanical governing or electronic governing.
- Generators must be maintained in good condition.

3 PS1 - Power System Overview

Selectronic Australia RAPS (Remote Area Power System) inverters are typically used in applications where no mains grid is available. The diagram below shows a typical Power system comprising a PS1 inverter, battery, generator and optional renewable source (solar array, wind generator etc). The power generated from Solar, Wind, Hydro etc will vary with the season, the weather, the time of day or night etc. The site load may similarly vary, and may have short peak loads due to electric motor starting for example.

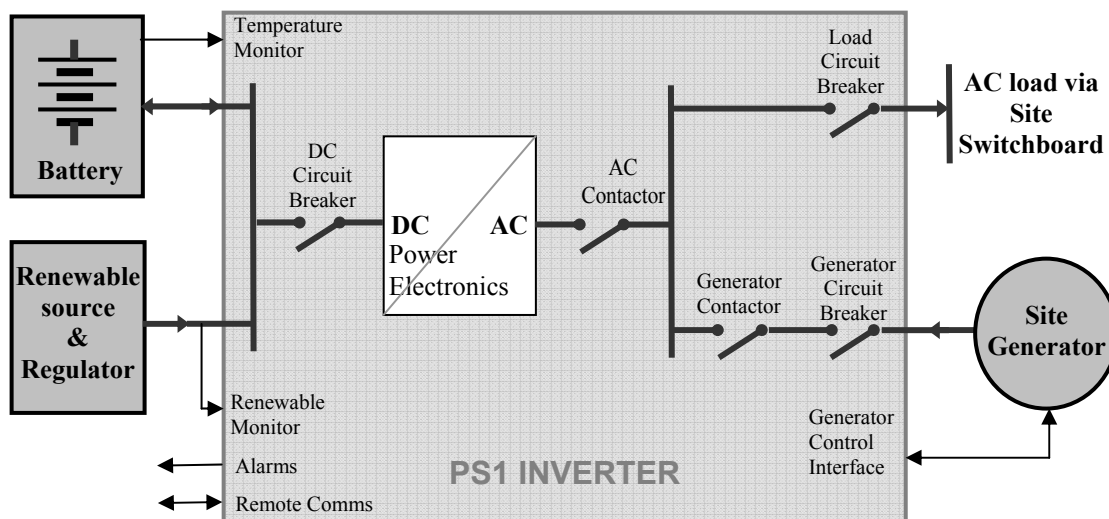


Figure 1 PS1- Power System

The PS1 inverter is the heart of the Power system. It automatically manages the battery, the generator and monitors the renewable resource to efficiently supply the load.

The PS1 can be configured to automatically start and stop the generator. The PS1 will use the generator power to operate the house loads, any excess power will be used to charge the batteries at the same time. If the house loads are greater than the generators output, then the PS1 will add its power to the generator, when the house loads are reduced the PS1 will return to battery charging. The above operation will happen automatically, whilst always maintaining power to the house.

The PS1 uses one internal shunt and an optional external shunt to monitor renewable power sources and loads.

To minimize battery drain when no AC loads are present, the PS1 will go into Power Save mode. The PS1 will turn On and Off as the AC load is turned On and Off.

When the PS1 is switched off or shutdown, the Generator Contactor automatically closes whenever generator voltage is present, enabling the manually started generator to supply the load.

The LCD displays system readings and settings and supports adjustment of PS1 settings. System status, fault and abnormal conditions are displayed on the front panel LEDs. Pushbuttons control which readings and settings are displayed and are also used to manually start or stop the generator.


The PS1 periodically logs (records) power, voltage and current variables, and time/date-tagged events (alarms, generator start/stop, etc) for analysis of system operation and troubleshooting.

The PS1 is protected against fault conditions such as over-voltage and over-current, and on start-up performs a self-test for internal faults. The PS1 can supply short-term overloads larger than its continuous load rating and continues to supply fault over-current for up to 10 seconds to trip external circuit breakers. The PS1 automatically recovers from faults whenever possible.

4 Quick Start

This section contains the basic procedures required to perform the most fundamental PS1 functions. Users should read section 1 and section 3 prior to performing these procedures.


4.1 To switch Inverter ON

1. If not already closed, close the Generator AC Circuit Breaker. (switch Up)
2. If not already closed, close the Load Circuit Breaker. (switch Up)
3. Press the front panel **ON/OFF** button  for one second then release it. All LEDs illuminate briefly then display an upward moving flashing pattern while the PS1 performs a self-test. If the LEDs remain off, the PS1 failed to start. If the PS1 was shut down from an abnormal cause, it may be necessary to operate the **ON/OFF** button again if the PS1 does not start.
4. When the LCD displays "Please close DC CB", close the DC Circuit Breaker if not already closed. (switch Up).

On successful start up the **System OK** LED will be ON and the PS1 will enter Standalone mode (**Inv – Standalone** LED) or Load Search mode (**Inv – Power Save** LED) depending on system settings. The View Readings menu will display as shown below.




4.2 To switch Inverter OFF


1. Press the front panel **ON/OFF** pushbutton  for a second then release it. The internal AC Contactor will automatically open.
2. Unless you want the generator to supply the load via the PS1, open the Generator and Load Circuit Breakers.

The DC Circuit Breaker will disconnect automatically 15 minutes after the PS1 is turned off.


4.3 Starting the Generator from PS1

1. Check that the **Generator Not Available** LED (see [§4.7 Front Panel LEDs](#)) is OFF indicating the generator is available for automatic control.
2. If the LED is ON or flashing the generator has a problem which must be rectified before this procedure will start the generator.
3. Press the front panel OK button  for at least one second then release it.
4. The generator will start and after a short period the **Inv Sync** LED (see [§4.7 Front Panel LEDs](#)) on the front panel will flash. The internal Generator Contactor will automatically close to supply the load. Depending on the time of day, the generator will automatically switch of either with **Gen Min Run Time** or when the batteries are full.

4.4 Stopping the Generator from PS1


1. Check that the **Generator Not Available** LED is OFF indicating the generator is available for automatic control.
2. If the LED is ON control of the generator is switched OFF from the generator controller or switch. This must be switched ON before this procedure will start or stop the generator.
3. Press the front panel OK button  for at least one second then release it.
4. The generator will be disconnected and power will be supplied to the load via the PS1. Note that some generators will continue to run for a short period as a cool down period, this does not affect the PS1.

4.5 Manual Battery Equalise

1. A manual battery equalise can be scheduled for the next generator charging cycle by depressing the MENU button  for at least one second. Repeating this action will cancel the request.

4.6 User Interface

The PS1 Front panel includes a Liquid Crystal Display (LCD) and four associated pushbuttons

↑ ↓ OK MENU for configuration and control of the PS1, plus one **ON/OFF** pushbutton .

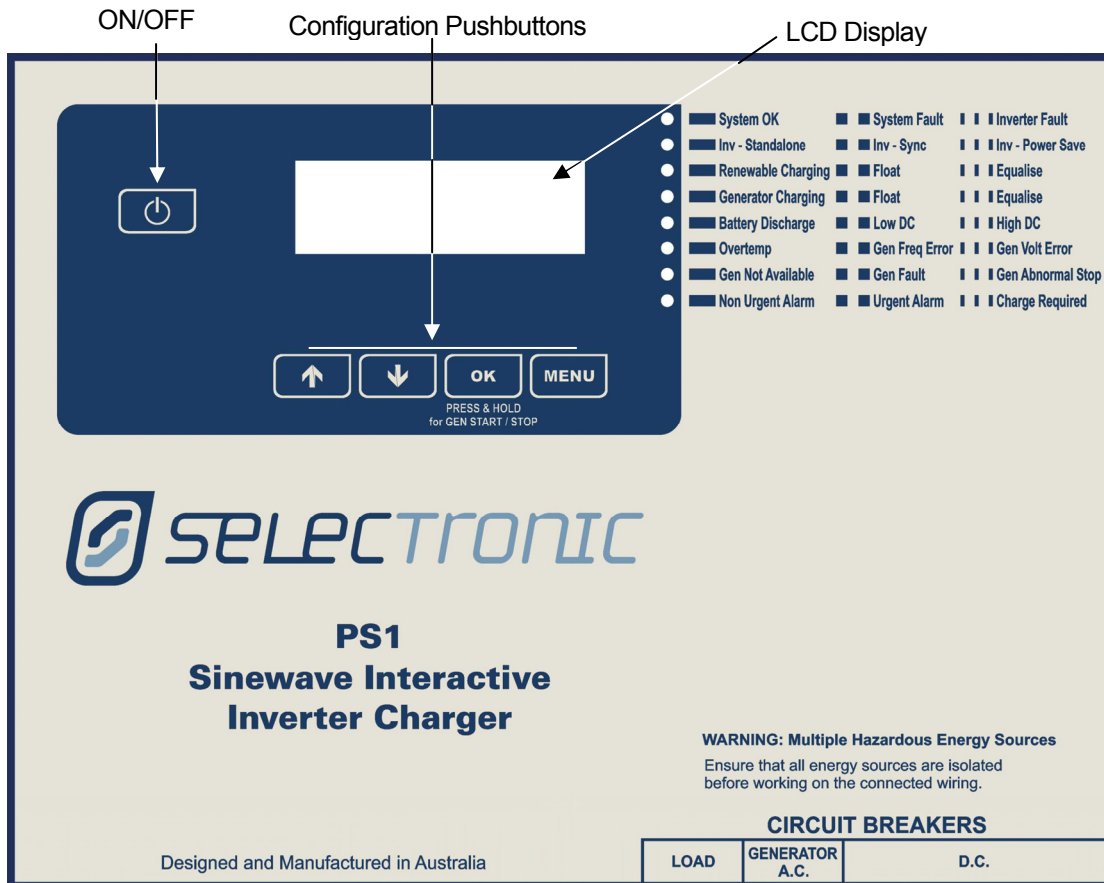




Figure 2 Inverter Pushbuttons




The LCD display and pushbuttons are the main method of managing the PS1, they allow you to:

- View measured and calculated values such as battery voltage and load power Readings (see [§5.2.1 View Readings](#)).
- View Summary Readings of measured system cumulative energy (see [§5.2.2 Summary Readings](#)).
- View system settings (see [§5.2.3 View Settings](#)).
- View and change Generator schedules (see [§5.2.4 Generator Schedules](#)).
- Change settings to adjust the system operation (see [§5 User Edit Menus](#)).
- View system diagnostics such as battery and inverter temperatures and event counters (see [§5.2.1.1 View Diagnostics](#)).
- View logged events (see [§5.2.4 Event Log](#)).
- Manually start and stop the generator (see [§4.6 User Interface](#)).

4.6.1 Pushbuttons & Navigation

Four pushbuttons are used to navigate the menu structure and select settings. The functionality of each button is context sensitive. The LCD displays the button function directly above the relevant

button depending on the particular menu being accessed. In general, the UP and DOWN buttons   are used to scroll through available screens, the OK button  is used to select a particular screen or option and the MENU button  is used to exit the current screen and return to the top level of the particular menu structure.

In screens without button function information displayed (eg within View Readings) the UP and DOWN buttons   may be used to scroll through the available screens, the MENU button  may be used to exit the current menu and return to the associated top level menu.

The OK button  may be used to start/stop the generator (see [§4.3 Starting the Generator from PS1](#)).

4.7 Front Panel LEDs

Several LEDs are provided on the PS1 front panel to indicate operation and system fault conditions as described below. Each LED uses steady state and two flash rates to show various conditions.

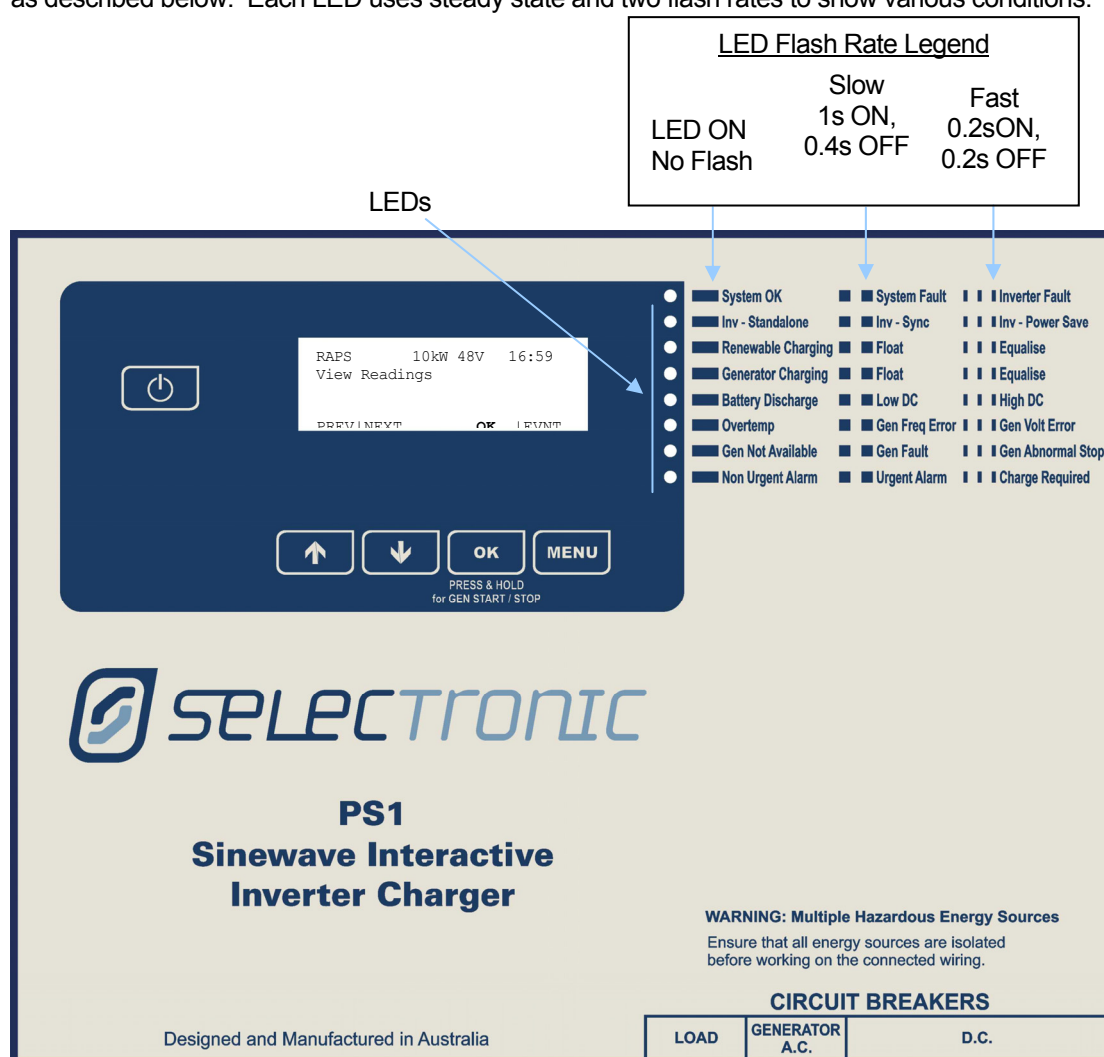


Figure 3 Front Panel LEDs

When the PS1 is switched on via its **ON/OFF** pushbutton, all the LEDs illuminate briefly then display an upward moving flashing pattern while the PS1 performs a self-test to check for internal faults. If the LEDs remain off, the PS1 failed to start.

If the PS1 passes self-test, the top LED is steady illuminated to indicate **System OK**, and the other seven LEDs indicate various operating states according to their panel labels. The indicated states can include successful operation and also abnormalities such as over temperature and shutdown etc, as described in the table below.

If the PS1 self-test detects a fault, it will not pass power, and the top LED on the panel flashes to indicate an **Inverter Fault**. The LCD will display the **Self Test Fail** message and a fault code that identifies the fault. Make a note of the fault code then contact your supplier for further instructions. The panel labelling for the LEDs does not apply in this situation.

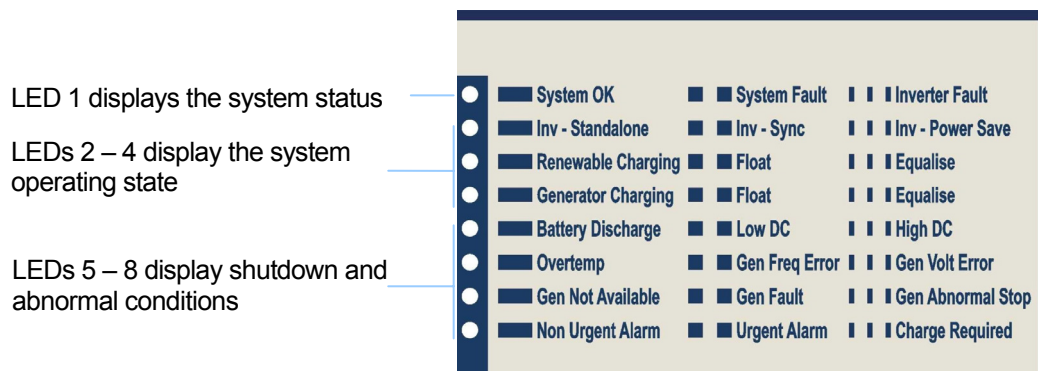























Figure 4 LED Functions

Each LED has three labels on the panel as shown above. In general the top four green LEDs indicate operational states and the lower four red/yellow LEDs indicate system fault conditions. The table below identifies the PS1 system status for each LED condition.

	INDICATION	SYSTEM STATUS	NOTES/SUGGESTED ACTION
LED 1 (Top)	ON ■	System OK. Normal operation	No action required.
	Slow Flash ■ ■	System Fault The PS1 is shutdown and not available to supply the load because it is in a fault state or recovering from an overload.	The lower four LEDs (5 – 8) will show the reason for the shutdown. Refer to notes associated with these LEDs for further recommended action.
	Fast Flash 	Inverter Fault The PS1 has detected an internal fault during self test.	Try to restart the inverter. Record the fault code indicated on the LCD and then contact your supplier for further instructions.
	OFF	The PS1 is switched OFF	

LED 2	ON 	Inverter – Standalone The PS1 is running independent of the attached generator and AC output is available at the terminals.	No action required. Note: the PS1 will remain in Standalone mode and this LED will not flash if the inverter cannot synchronise to the generator because the generator voltage or frequency is out of tolerance (see §A5 Synchronisation). If generator synchronisation is expected and is not achieved see §7 Troubleshooting
	Slow Flash 	Inverter – Sync The PS1 is correctly synchronised to the generator.	No action required.
	Fast Flash 	Inverter – Power Save The PS1 has reverted to standby mode due to no or low power consumption in the house.	No action required.
	OFF	This is not a normal condition for this LED. It may be OFF if an error condition exists.	Refer to other LEDs for error condition.
LED 3	ON 	Renewable Charging The Renewable source is contributing greater than 1 amp charge to the battery. The battery charging process is presently in the Initial, Bulk or Absorption phases of charging.	No action required. See §B1 Battery Charger Operation for details.
	Slow Flash 	Float The Renewable source is contributing charge to the battery. The battery charging process is presently in the Float phase.	No action required. See §B1 Battery Charger Operation for details.
	Fast Flash 	Equalise The Renewable source is contributing charge to the battery. The battery charging process is presently in the Equalise phase.	No action required. See §B1 Battery Charger Operation for details.
	OFF	The Renewable source is contributing less than 1amp charge to the battery.	If Renewable contribution is expected See §7 Troubleshooting
LED 4	ON 	Generator Charging The Generator is contributing charge to the battery. The battery charging process is presently in the Initial, Bulk or Absorption phases of charging.	No action required. See §B1 Battery Charger Operation for details.
	Slow Flash 	Float The Generator is contributing charge to the battery. The battery charging process is presently in the Float phase.	No action required. See §B1 Battery Charger Operation for details.

	Fast Flash 	Equalise The Generator is contributing charge to the battery. The battery charging process is presently in the Equalise phase.	No action required. See §B1 Battery Charger Operation for details.
	OFF	The Generator is not contributing charge to the battery.	If Generator contribution is expected See §7 Troubleshooting
LED 5	ON 	Battery Discharge Indicates the PS1 has shutdown due to excessively discharged battery	See §7 Troubleshooting .
	Slow Flash 	Low DC Indicates the PS1 has shutdown due to battery under-voltage. This usually occurs when the generator is unavailable to charge the battery.	Refer to LED 7 for generator availability. Check the battery voltage in View Readings display. Note: the battery voltage reading may rise substantially higher due to reduced load when the PS1 is shutdown.
	Fast Flash 	High DC Indicates that the PS1 has shut down due to battery over-voltage. The shutdown threshold is set during installation. The PS1 will restart when the voltage falls to within tolerance.	Check the battery voltage and causes for overcharge.
	OFF	Normal Condition	No action required.
LED 6	ON 	Over Temperature Indicates that the PS1 has shut down due to overheating. A heatsink temperature of 100°C or transformer temperature of 130°C will cause a shutdown. It will automatically restart when it has cooled sufficiently.	Overheating may be due to sustained high load, faulty cooling fans, blocked ventilation, or high ambient temperature.
	Slow Flash 	Generator Frequency Error	Check generator operation
	Fast Flash 	Generator Voltage Error	Check generator operation
	OFF	Normal Condition	No action required.

LED 7	ON 	Generator Not Available Indicates that the generator is not available for automatic start-up i.e. the generator GEN_CNTL-ON/OFF switch is in the OFF position (see §A1 Generator Automatic Running).	If the Generator is required to automatically start check the GEN_CNTL-ON/OFF switch is in the ON position. Check that the generator is operational. Check that the Generator AC Circuit Breaker is closed. With the generator GEN_CNTL-ON/OFF switch in the OFF position, try starting the generator manually via the controls at the generator. Is the generator starting battery flat?
	Slow Flash 	Generator Fault Indicates that the PS1 has stopped the generator because the generators GEN FAULT signal indicated a generator fault (see §A4 Generator Control Interface), or the PS1 could not start the generator and will commence a generator restart sequence. §A1 Generator Automatic Running .	Fix the generator problem. Refer to generator manufacturers documentation The PS1 will attempt to restart the generator in 15 minutes then commence a generator restart sequence. §A3 Generator Fault Recovery .
	Fast Flash 	Generator Abnormal Stop Indicates that the generator stopped unexpectedly while running under PS1 control. The most likely cause is that it ran out of fuel.	Fix the generator problem. Refer to generator manufacturers documentation Check whether the generators NO FUEL signal is active (see §A4 Generator Control Interface) which would cause the PS1 to stop the generator. Refill the fuel tank.
	OFF	Normal Condition	No action required.
LED 8	ON 	Non Urgent Alarm Indicates conditions where the PS1 system is functional but may require attention.	Refer to other front panel LEDs, Readings and Diagnostics screens for fault identification. See §4.7 Front Panel LEDs
	Slow Flash 	Urgent Alarm Indicates the PS1 system is non-functional or is likely to shut down in the near future.	Refer to other front panel LEDs, Readings and Diagnostics screens for fault identification. See §4.7 Front Panel LEDs
	Fast Flash 	Charge Required Indicates the battery requires charging but the generator is not available.	Check why generator is unavailable. The GEN_CNTL-ON/OFF switch may be in the OFF position. §A1 Generator Automatic Running
	OFF	Normal Condition	No action required.

5 PS1 Menus

5.1 User Menu Structure

The diagram below shows the User menus for access to the PS1 settings and readings. The View Readings menu is the home menu and will be displayed when the PS1 has completed power up.

Use the four pushbuttons     and associated LCD text to navigate the menu structure. Refer to [Appendix G Menu Navigation](#) and [§4.6.1 Pushbuttons & Navigation](#).

The View Readings, Summary Readings, View Diagnostics, View Settings, Generator Schedules and Event Log menus allow viewing of system settings, readings and event history without the possibility of inadvertent modification. The information provided in these screens is sufficient to monitor the day to day system operation and resolve system problems. See [§5.2 User View Menus](#)

The Change Settings, Advanced Settings and Changes Schedules menu allow modification of the PS1 User settings and generator run schedules. See [§5.3 User Edit Menus](#).

Your maintenance provider may ask you to extract information from these menus for remote diagnostic purposes. Familiarity with this information, while not mandatory for system operation, will greatly enhance your ability to respond to any problems that may arise.

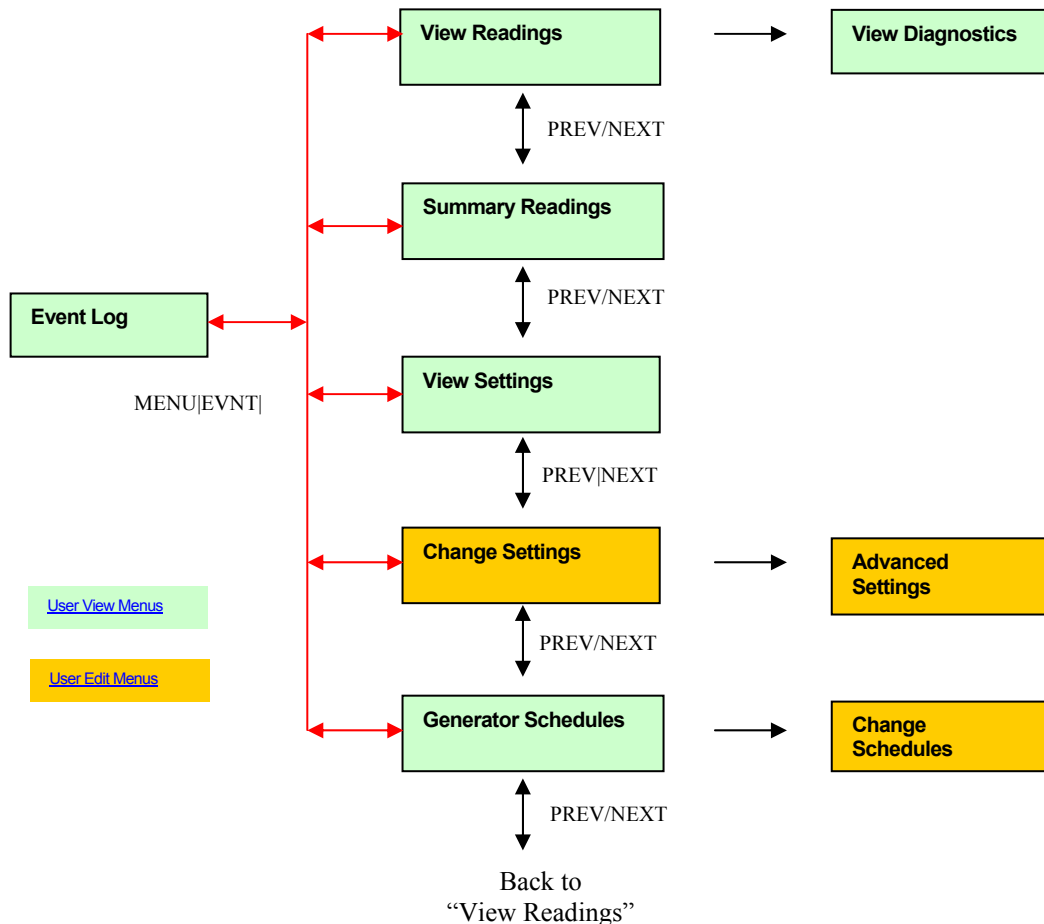


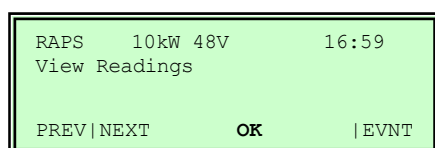
Figure 5 User Menus



5.2 User View Menus

User View Menus allow viewing of the PS1 Readings, Settings and Schedules. To change Settings and Schedules see §[5.3 User Edit Menus](#).

5.2.1 View Readings

The Readings screens provide measured and calculated values of all significant system parameters. Most of the screens show four values. They provide an extensive view of the systems operation and include measured values such as voltages and currents, and values calculated by the PS1 from such measurements. For convenience the readings are grouped with related readings hence some readings are repeated in a number of places. The values shown below are for illustration purposes only, actual values displayed will depend on PS1 operating conditions.



	<p>View Readings=></p> <p>Batt Volts: measured DC battery voltage.</p> <p>This figure may rise substantially during charging and fall soon after charging ends.</p> <p>Batt Amps: is the net measured battery dc current including inverter current and shunt currents. Positive current charges battery, negative current discharges battery. It is possible for this figure to be negative whilst the generator is running if the inverter and generator are both supplying the load</p> <p>Batt SoC%: is the estimated battery state of charge as a percentage of Batt Size Ah setting. The value is near 100% when the battery is in a high state of charge and will decrease as the battery is discharged. During charging, the value may go above 100%; this will be reset to 100% at completion of the charge cycle. See §B3 Battery State of Charge (SoC).</p> <p>Load kW: is the measured AC power currently delivered to the load. This is regardless of generator or inverter supplying the load.</p>								
<table border="1"> <tr> <td>Batt Volts</td> <td>51.2</td> </tr> <tr> <td>Batt Amps</td> <td>-3.3</td> </tr> <tr> <td>Batt SoC%</td> <td>96.5</td> </tr> <tr> <td>Load kW</td> <td>1.35</td> </tr> </table>	Batt Volts	51.2	Batt Amps	-3.3	Batt SoC%	96.5	Load kW	1.35	
Batt Volts	51.2								
Batt Amps	-3.3								
Batt SoC%	96.5								
Load kW	1.35								
									

↑	<p>View Readings=></p> <p>Load kWh/Day: measured average energy used per day for the past seven days. The lower the number the less fuel you will use. See §5.2.2 Summary Readings for accumulated load energy total.</p> <p>Load kW: is the measured AC power currently delivered to the load. If both the generator and Inverter are supplying the load this figure will be the sum of the two</p> <p>Gen kW: is the measured AC power presently being drawn from the generator (load power plus power to charge battery). See §5.2.2 Summary Readings for accumulated generator energy total.</p> <p>Inv kW: is the measured AC power being produced by the inverter. When no generator is running the figure will always show positive (discharging the batteries). When a generator is operating the figure may be negative to show batteries are being charged or positive when the inverter and generator are providing power to the load</p>							
<table border="1"> <tr> <td>Load kWh/Day</td> <td>1.81</td> </tr> <tr> <td>Load kW</td> <td>1.35</td> </tr> <tr> <td>Gen kW</td> <td>1.68</td> </tr> <tr> <td>Inv kW</td> <td>-0.33</td> </tr> </table>		Load kWh/Day	1.81	Load kW	1.35	Gen kW	1.68	Inv kW
Load kWh/Day	1.81							
Load kW	1.35							
Gen kW	1.68							
Inv kW	-0.33							
↓								

↑	<p>View Readings=></p> <p>Batt SoC: is the estimated battery state of charge as a percentage of Batt Size Ah setting. The value is near 100% when the battery is in a high state of charge and will decrease as the battery is discharged. During charging, the value may go above 100%; this will be reset to 100% at completion of the charge cycle. See §B3 Battery State of Charge (SoC).</p> <p>Inv Amps: is the measured inverter dc current. Positive current charges battery, negative current discharges battery</p> <p>Shunt 1 Amp: is the measured current through Shunt 1. This could be a charging source (eg solar panels) which will show a positive figure, or a discharge source (eg, DC pump or fridge) which will show a negative figure depending on the configuration for Shunt 1. See §5.2.2 Summary Readings for accumulated Shunt 1 energy total.</p> <p>Shunt 2 Amp: is the measured current through Shunt 2. This could be a charging source (eg solar/wind) which will show a positive figure, or a discharge source (eg, DC pump or fridge) which will show a negative figure depending on the configuration for Shunt 2. See §5.2.2 Summary Readings for accumulated Shunt 2 energy total.</p>							
<table border="1"> <tr> <td>Batt SoC%</td> <td>96.5</td> </tr> <tr> <td>Inv Amp</td> <td>3.3</td> </tr> <tr> <td>Shunt1 Amp</td> <td>0.0</td> </tr> <tr> <td>Shunt2 Amp</td> <td>0.0</td> </tr> </table>		Batt SoC%	96.5	Inv Amp	3.3	Shunt1 Amp	0.0	Shunt2 Amp
Batt SoC%	96.5							
Inv Amp	3.3							
Shunt1 Amp	0.0							
Shunt2 Amp	0.0							
↓								




↑	View Readings=> Inv VAC : is the measured inverter AC voltage Inv Hz : is the measured inverter operating frequency Gen VAC : is the measured generator AC voltage Gen Hz : is the measured generator frequency							
<table border="1"> <tr> <td>Inv VAC</td> <td>249</td> </tr> <tr> <td>Inv Hz</td> <td>50.02</td> </tr> <tr> <td>Gen VAC</td> <td>249</td> </tr> <tr> <td>Gen Hz</td> <td>50.02</td> </tr> </table>		Inv VAC	249	Inv Hz	50.02	Gen VAC	249	Gen Hz
Inv VAC	249							
Inv Hz	50.02							
Gen VAC	249							
Gen Hz	50.02							
↓								

↑	View Readings=> Days to Eqlise : the number of days remaining before the battery will be Equalised (see §Appendix B Battery Management).			
<table border="1"> <tr> <td>Days to Eqlise</td> <td>7</td> </tr> <tr> <td>PREV NEXT</td> <td> MENU</td> </tr> </table>		Days to Eqlise	7	PREV NEXT
Days to Eqlise	7			
PREV NEXT	MENU			

5.2.1.1 View Diagnostics



The diagnostics readings provide an insight into the system performance and operating conditions. It will be important to access this data if a fault or shut down occur.



16:59
View Diagnostics
PREV NEXT OK EVNT



Pressing  at this point will return you to the start of the “View Readings” screens, pressing  will return you to the top level menu. Press  to enter the View Diagnostics menu.



↑	View Diagnostics=> Heatsink C : measured PS1 internal heatsink temperature. The PS1 will start the fans at heatsink temperature of 50°C, start the generator and transfer load at 70°C and shut down at a heatsink temperature of 100°C. The inverter will restart at 85°C. Transformer C : measured internal transformer temperature. The PS1 will start the fans at transformer temperature of 70°C, start the generator and transfer load at 100°C and shut down at a transformer temperature of 130°C. The inverter will restart at 115°C. Battery C : measured battery temperature from the battery temperature sensor. The reading is used to compensate battery charge settings. See §B2 Temperature Compensation . Internal C : measured internal temperature. If shutdown temperatures are approached refer to the troubleshooting section.							
<table border="1"> <tr> <td>Heatsink C</td> <td>22</td> </tr> <tr> <td>Transformer C</td> <td>22</td> </tr> <tr> <td>Batt C</td> <td>21</td> </tr> <tr> <td>Internal C</td> <td>22</td> </tr> </table>		Heatsink C	22	Transformer C	22	Batt C	21	Internal C
Heatsink C	22							
Transformer C	22							
Batt C	21							
Internal C	22							
↓								

	See §7.3 Inverter Start/Stop/Shutdown								
<div style="text-align: center;">↑</div> <table border="1"> <tr><td>Inv kW</td><td>-0.33</td></tr> <tr><td>Inv kVAr</td><td>-0.32</td></tr> <tr><td>Gen kW</td><td>0.47</td></tr> <tr><td>Gen kVAr</td><td>0.37</td></tr> </table> <div style="text-align: center;">↓</div>	Inv kW	-0.33	Inv kVAr	-0.32	Gen kW	0.47	Gen kVAr	0.37	<p>View Diagnostics=></p> <p>Inv kW: is the measured AC output power from the inverter.</p> <p>Inv kVAr: is the measured reactive power from the inverter.</p> <p>Gen kW: is the measured AC power from the generator.</p> <p>Gen kVAr: is the measured reactive power from the generator.</p>
Inv kW	-0.33								
Inv kVAr	-0.32								
Gen kW	0.47								
Gen kVAr	0.37								
<div style="text-align: center;">↑</div> <table border="1"> <tr><td>Gen:Avail kW</td><td>8.33</td></tr> <tr><td>Gen kW</td><td>0.47</td></tr> <tr><td>Delta Gen Hz</td><td>0.00</td></tr> <tr><td>Gen Hz</td><td>50.01</td></tr> </table> <div style="text-align: center;">↓</div>	Gen:Avail kW	8.33	Gen kW	0.47	Delta Gen Hz	0.00	Gen Hz	50.01	<p>View Diagnostics=></p> <p>Gen:Avail kW: is the estimated power available from the generator based on the Gen:Max kW setting and the variation of generator output voltage and frequency from nominal. As the generator load increases, the generator's capacity to deliver power at the correct output voltage and/or frequency will reduce. The PS1 will adjust the power drawn from the generator to maintain nominal voltage and frequency.</p> <p>Gen kW: is the measured AC power from the generator.</p> <p>Delta Gen Hz: the estimated variation in generator output frequency.</p> <p>Gen Hz: measured generator output frequency.</p>
Gen:Avail kW	8.33								
Gen kW	0.47								
Delta Gen Hz	0.00								
Gen Hz	50.01								
<div style="text-align: center;">↑</div> <table border="1"> <tr><td>30s Avg kW</td><td>8.50</td></tr> <tr><td>2min Avg kW</td><td>3.57</td></tr> <tr><td>10min Avg kW</td><td>3.12</td></tr> <tr><td>30min Avg kW</td><td>1.45</td></tr> </table> <div style="text-align: center;">↓</div>	30s Avg kW	8.50	2min Avg kW	3.57	10min Avg kW	3.12	30min Avg kW	1.45	<p>View Diagnostics=></p> <p>30s Avg kW: is the measured load power averaged over the last 30 seconds. The resolution is approximately 0.5kW</p> <p>2min Avg kW: is the measured load power averaged over the last 2 minutes.</p> <p>10min Avg kW: is the measured load power averaged over the last 10 minutes.</p> <p>30min Avg kW: is the measured load power averaged over the last 30 minutes.</p> <p>The 10 minute and 30 minute average load power may be set by the installer to trigger a generator starting. See §5.2.3 View Settings</p>
30s Avg kW	8.50								
2min Avg kW	3.57								
10min Avg kW	3.12								
30min Avg kW	1.45								

	<p>View Diagnostics=></p> <p>S/Term Count: the Short Term count is a continuous count of minor abnormal system events. The count is reduced by one every 15 minutes. A high frequency of such events may indicate a system problem.</p> <p>L/Term Count: the Long Term count is a continuous count of minor abnormal system events. The count is reduced by one every 6 hours.</p> <p>Limits may be set for each of these counts. An Urgent alarm will be generated if the S/Term count exceeds the configured limits (see §5.3.2.1 Advanced User Settings). The system will shutdown for 15 minutes and then restart to clear the problem.</p> <p>A Non Urgent alarm will be generated if the L/Term threshold is exceeded. The system will not shutdown due to this threshold.</p> <p>Pressing RESET will clear both counters to zero and clear the alarms.</p> <p>See event information in Appendix F2.</p>
	
<div style="border: 1px solid black; padding: 5px;"> S/Term Count 0 L/Term Count 0 PREV NEXT RESET </div>	

	<p>View Diagnostics=></p> <p>Sys Shtdwn: the System Shutdown will be one if the PS1 is in shutdown state and zero if the PS1 is operational. An automatic system restart will be attempted 15 minutes after shutdown.</p> <p>Ovr/Load Count : the Over Load count is the number of inverter overloads. The counter is reduced by one (1) every 15 minutes and hence is an indication of recent inverter overloads</p> <p>These counters cannot be reset by the user.</p>
	
<div style="border: 1px solid black; padding: 5px;"> Sys Shtdwn 0 Ovr/Load Count 0 PREV NEXT MENU </div>	

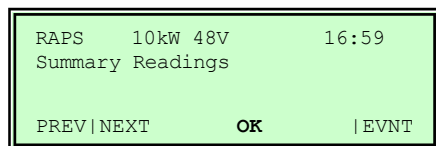
	<p>View Diagnostics=></p> <p>Software version information. This information will be required when reporting any issues.</p>
	
<div style="border: 1px solid black; padding: 5px;"> V1.xx 10kW 48V 16:59 PS1 RAP xx 28-02-05 PREV NEXT MENU </div>	

Pressing  at this point will return you to the start of the “View Readings” screens, pressing  will return you to the top level menu.



After pressing  you can now press  to advance to the next menu

5.2.2 Summary Readings

The Summary Readings screens provide the cumulative measured energy usage/contribution for each of the energy loads and sources over the lifetime of the PS1. The values shown below are for illustration purposes only, actual values displayed will depend on PS1 operating conditions.



<div>↑</div> <table border="1"> <tr> <td>Load kWh</td> <td>1358</td> </tr> <tr> <td>Gen kWh</td> <td>481</td> </tr> <tr> <td>Shunt 1 kWh</td> <td>560</td> </tr> <tr> <td>Shunt 2 kWh</td> <td>-128</td> </tr> </table> <div>↓</div>	Load kWh	1358	Gen kWh	481	Shunt 1 kWh	560	Shunt 2 kWh	-128	<p>Summary Readings=></p> <p>Load kWh: cumulative measured energy supplied to the load.</p> <p>Gen kWh: cumulative measured energy supplied by the generator.</p> <p>Shunt 1 kWh: cumulative net energy measured on shunt 1.</p> <p>Shunt 2 kWh: cumulative net energy measured on shunt 2.</p> <p>Note: Shunts may be configured as DC Load (negative kWh) and/or Renewable (positive kWh).</p>
Load kWh	1358								
Gen kWh	481								
Shunt 1 kWh	560								
Shunt 2 kWh	-128								
<div>↑</div> <table border="1"> <tr> <td>Batt In kWh</td> <td>1025</td> </tr> <tr> <td>Batt Out kWh</td> <td>1005</td> </tr> <tr> <td>Gen Run Hrs</td> <td>56</td> </tr> </table>	Batt In kWh	1025	Batt Out kWh	1005	Gen Run Hrs	56	<p>Summary Readings=></p> <p>Batt In kWh: cumulative measured energy supplied to the battery.</p> <p>Batt Out kWh: cumulative measured energy supplied by the battery.</p> <p>Gen Run Hrs: cumulative generator running time.</p>		
Batt In kWh	1025								
Batt Out kWh	1005								
Gen Run Hrs	56								

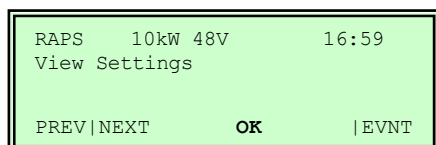
Pressing  at this point will return you to the start of the “Summary Readings” screens, press  will return you to the top level menu.



After pressing  you can now press  to advance to the next menu



5.2.3 View Settings

The View Settings screens provide access to see settings that control the PS1 operation. They provide an extensive view of the systems current configuration. To prevent unintended changes, settings cannot be changed in the View Settings menus.





The majority of settings are configured as part of the installation procedure and are not alterable by the User. User alterable settings are indicated in the text. To change these settings access the Change Settings menus (see §5.3.2 [Change Settings](#)).





 <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <table> <tr> <td>Batt Size Ah</td> <td style="text-align: right;">1000</td> </tr> <tr> <td>Gen:Max kW</td> <td style="text-align: right;">8.00</td> </tr> <tr> <td>Sync Tol VAC</td> <td style="text-align: right;">30</td> </tr> <tr> <td>Float:Hold V</td> <td style="text-align: right;">54.0</td> </tr> </table> </div> 	Batt Size Ah	1000	Gen:Max kW	8.00	Sync Tol VAC	30	Float:Hold V	54.0	<p>View Settings=></p> <p>Batt Size Ah: is the battery size in ampere-hours configured in the system. It is typically set to the 10 hour (C10) battery rating.</p> <p>Gen:Max kW: is the maximum generator power configured in the system. It is the maximum power the PS1 will draw from the generator. Note: this parameter is set in kW which is typically 0.8 times the kVA rating of the generator.</p> <p>Sync Tol VAC: is the maximum generator AC voltage excursion the PS1 will tolerate before switching to standalone mode.</p> <p>Float:Hold V: is the battery voltage maintained by the PS1 after charging whilst still synchronised to the generator.</p>
Batt Size Ah	1000								
Gen:Max kW	8.00								
Sync Tol VAC	30								
Float:Hold V	54.0								



<div style="text-align: center;"></div> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"><table><tr><td>Gen:Start V1</td><td>46.4</td></tr><tr><td>Gen:Start V2</td><td>44.4</td></tr><tr><td>Inv:Shtdwn V1</td><td>44.4</td></tr><tr><td>Inv:Shtdwn V2</td><td>42.4</td></tr></table></div> <div style="text-align: center;"></div>	Gen:Start V1	46.4	Gen:Start V2	44.4	Inv:Shtdwn V1	44.4	Inv:Shtdwn V2	42.4	<p>View Settings=></p> <p>The purpose of this group of settings is to prevent over-discharge of the battery</p> <p>Gen:Start V1: is the battery voltage at which the generator will be started on load less than 10% of inverter power rating.</p> <p>Gen:Start V2: is the battery voltage at which the generator will be started on load more than 10% of inverter power rating.</p> <p>Inv:ShtdwnV1: is the battery voltage at which the PS1 will shut down on load less than 10% of inverter power rating.</p> <p>Inv:ShtdwnV2: is the battery voltage at which the inverter will shut down on load more than 10% of inverter power rating.</p> <p>Note: On heavier loads the battery voltage is expected to be less than on lighter loads. If the PS1 is in shutdown the measured battery voltage may rise above these shutdown values due to the decreased load. The PS1 will restart when the battery voltage rises above the restart voltage set during installation.</p>
Gen:Start V1	46.4								
Gen:Start V2	44.4								
Inv:Shtdwn V1	44.4								
Inv:Shtdwn V2	42.4								

<div></div> <table border="1"> <tr> <td>Level 1 SoC%</td> <td>90</td> </tr> <tr> <td>Level 2 SoC%</td> <td>70</td> </tr> <tr> <td>Level 3 SoC%</td> <td>60</td> </tr> <tr> <td>Inv:Shtdwn SoC%</td> <td>50</td> </tr> </table> <div></div>	Level 1 SoC%	90	Level 2 SoC%	70	Level 3 SoC%	60	Inv:Shtdwn SoC%	50	<p>View Settings=></p> <p>See §A1.1 Generator Control based on SoC.</p> <p>Level 1 SoC%: the battery state of charge below which the generator will start in the preferred generator run hour. The preferred run hour starts at the Begin Lvl 1 Hr and extends for 1 hour. Level 1 is normally set highest of the three SoC% levels. A setting of zero disables this level.</p> <p>Level 2 SoC%: the battery state of charge below which the generator will start during the preferred generator run period. This period starts at the Begin Lvl 2 Hr and extends to the Begin Lvl 3 Hr. Level 2 is normally set as the mid SoC% level.</p> <p>Level 3 SoC%: the battery state of charge below which the generator will start during the non-preferred generator run period. This period starts at the Begin Lvl 3 Hr and extends to the Begin Lvl 2 Hr. Level 3 is normally set as the lowest SoC% level. A setting of zero disables this level.</p> <p>Inv:Shtdwn SoC%: is the battery state of charge below which the PS1 will be shut down to prevent over-discharge of the battery. A value of zero means that state of charge is not used to trigger PS1 shutdown.</p> <p>See §A1 Generator Automatic Running</p> <p>Note: These settings are configured at the time of installation and cannot be changed from the User menus.</p>
Level 1 SoC%	90								
Level 2 SoC%	70								
Level 3 SoC%	60								
Inv:Shtdwn SoC%	50								



<div style="text-align: center;">  </div> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: 80%;"> <div style="text-align: right;">16:59</div> <table> <tr> <td>Begin Lvl 1 Hr</td> <td style="text-align: right;">17</td> </tr> <tr> <td>Begin Lvl 2 Hr</td> <td style="text-align: right;">12</td> </tr> <tr> <td>Begin Lvl 3 Hr</td> <td style="text-align: right;">21</td> </tr> </table> </div> <div style="text-align: center;">  </div>	Begin Lvl 1 Hr	17	Begin Lvl 2 Hr	12	Begin Lvl 3 Hr	21	<p>View Settings=></p> <p>See §A1.1 Generator Control based on SoC.</p> <p>Begin Lvl 1 Hr: Begin Level 1 Hour sets the beginning of the preferred run hour which is a one hour period when it is most preferable to have the generator running. This would normally be set around 5 or 6 PM to charge the battery for overnight use. The preferred hour is within the preferred period (see Begin Lvl 2 Hr below).</p> <p>Begin Lvl 2 Hr: Begin Level 2 Hour sets the beginning of the preferred period when it is preferred to run the generator if the battery state of charge warrants it. The preferred period includes the preferred hour.</p> <p>Begin Lvl 3 Hr: Begin Level 3 Hour sets the beginning of the non-preferred period when it is not desirable to run the generator. This would normally include overnight or other times when generator noise may be an issue, for example. However, the generator will start in this period if the battery state of charge warrants it.</p> <p>Note: Each of these settings can be changed from the Change Settings menus. See §5.3.2 Change Settings.</p>		
Begin Lvl 1 Hr	17								
Begin Lvl 2 Hr	12								
Begin Lvl 3 Hr	21								
<div style="text-align: center;">  </div> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: 80%;"> <table> <tr> <td>Init:Chrg V</td> <td style="text-align: right;">55.2</td> </tr> <tr> <td>Bulk:Chrg V</td> <td style="text-align: right;">56.1</td> </tr> <tr> <td>Absorb:Chrg V</td> <td style="text-align: right;">57.2</td> </tr> <tr> <td>Eqlise:Chrg V</td> <td style="text-align: right;">58.1</td> </tr> </table> </div> <div style="text-align: center;">  </div>	Init:Chrg V	55.2	Bulk:Chrg V	56.1	Absorb:Chrg V	57.2	Eqlise:Chrg V	58.1	<p>View Settings=></p> <p>Init:Chrg V: is the set point voltage during the Initial stage of the charging cycle.</p> <p>Bulk:Chrg V: is the set point voltage during the Bulk stage of the charging cycle.</p> <p>Absorb:Chrg V: is the set point voltage during Absorption stage of the charging cycle.</p> <p>Eqlise:Chrg V: is the set point voltage during Equalisation stage of the battery charging cycle.</p> <p>See §B1 Battery Charger Operation</p> <p>Note 1: Charge settings will automatically compensate when the battery temperature varies from 20°C (see §B2 Temperature Compensation).</p> <p>Note 2: These settings are configured at the time of installation and cannot be changed from the User menus.</p>
Init:Chrg V	55.2								
Bulk:Chrg V	56.1								
Absorb:Chrg V	57.2								
Eqlise:Chrg V	58.1								



	<p>View Settings=></p> <p>Init:Chrg A: is the maximum possible charge current during the Initial stage of the battery charging cycle</p> <p>Bulk:Chrg A: is the maximum possible charge current during the Bulk stage of the battery charging cycle</p> <p>Absorb:Chrg A: is the maximum possible charge current during the Absorption stage of the battery charging cycle</p> <p>Eqlise:Chrg A: is the maximum possible charge current during the Equalisation stage of the battery charging cycle</p> <p>See §B1 Battery Charger Operation</p> <p>Note 1: These currents are the total charge current to the battery from both the generator and the renewable source combined.</p> <p>Note 2: These settings are configured at the time of installation and cannot be changed from the User menus.</p>
	


Init:Chrg A	100
Bulk:Chrg A	80
Absorb:Chrg A	30
Eqlise:Chrg A	10

	<p>View Settings=></p> <p>Init:Time mins: time in the Initial stage of the battery charging cycle once Init:Chrg V is reached.</p> <p>Bulk:Time mins: minimum time in the Bulk stage of the battery charging cycle once Bulk:Chrg V is reached.</p> <p>Absorb:Time mins: minimum time in the Absorption stage of the battery charging cycle once Absorb:Chrg V is reached.</p> <p>Eqlise:Time hrs: time in the Equalisation stage of the battery charging cycle.</p> <p>See §B1 Battery Charger Operation</p> <p>Note: Equalisation Time elapses when the battery voltage is between Eqlise:Chrg V and Eqlise:Limit V.</p> <p>Note: These settings are configured at the time of installation and cannot be changed from the User menus.</p>
	

Init:Time mins	10
Bulk:Time mins	20
Absorb:Time mins	40
Eqlise:Time hrs	3.0

	<p>View Settings=></p> <p>Chrg:End A/15m: Charge End Amperes per 15 minutes.</p> <p>A slow rate of charge of the battery charging current is an indicator that the battery is no longer able to absorb much of the charge current. If the rate of change of the battery charge current falls below this level the Bulk and Absorption stages of the battery charging cycle will end and the charge cycle will enter the next stage.</p> <p>Eqlise:Limit V: Equalise Limit Voltage. During battery equalization the battery voltage will not be allowed to exceed this limit.</p> <p>Chrg:Max Hrs: maximum time allowed for each battery charge cycle to complete. After this duration the current charge cycle stage will be terminated.</p> <p>See SB1 Battery Charger Operation</p> <p>Note: These settings are configured at the time of installation and cannot be changed from the User menus.</p>						
<table border="1"> <tr> <td>Chrg:End A/15m</td> <td>20</td> </tr> <tr> <td>Eqlise:Limit V</td> <td>63.6</td> </tr> <tr> <td>Chrg:Max Hrs</td> <td>20</td> </tr> </table>		Chrg:End A/15m	20	Eqlise:Limit V	63.6	Chrg:Max Hrs	20
Chrg:End A/15m		20					
Eqlise:Limit V	63.6						
Chrg:Max Hrs	20						
							

	<p>View Settings=></p> <p>30s Start kW: 30 second average load power setting to start the generator. This is a fixed system setting.</p> <p>2min Start kW: 2 minute average load power setting to start the generator. This is a fixed system setting.</p> <p>10min Start kW: 10 minute average load power setting to start the generator.</p> <p>30min Start kW: 30 minute average load power setting to start the generator.</p> <p>Note 1: The generator will run for at least the minimum generator run time (Gen:Min Run min) and until the average power level is below the threshold.</p> <p>Note 2: These settings are configured at the time of installation and cannot be changed from the User menus.</p>								
<table border="1"> <tr> <td>30s Start kW</td> <td>12.0</td> </tr> <tr> <td>2min Start kW</td> <td>10.0</td> </tr> <tr> <td>10min Start kW</td> <td>8.0</td> </tr> <tr> <td>30min Start kW</td> <td>4.0</td> </tr> </table>		30s Start kW	12.0	2min Start kW	10.0	10min Start kW	8.0	30min Start kW	4.0
30s Start kW		12.0							
2min Start kW	10.0								
10min Start kW	8.0								
30min Start kW	4.0								
									



	
Gen:Min Load kW	7
Gen:Min Run min	22
Load Search W	20
DDVV / IDVVV I MDDMTT	



View Settings=>

Gen:Min Load kW: the minimum load that must be drawn from the generator for it to continue to run. This parameter is set at the time of installation and cannot be changed from the User menus.

Gen:Min Run min: the minimum generator run time. If the generator is started it will run for at least this time. To change this setting access the Change Settings menus (see [§5.3.2 Change Settings](#)).

Load Search W: the minimum AC load that must be drawn in the house to take the PS1 from Power Save mode to continuous operation. To change this setting access the Change Settings menus. See [§5.3.2 Change Settings](#)).

Pressing  at this point will return you to the start of the “View Settings” screens, pressing  will return you to the top level menu.

After pressing  you can now press  to advance to the next menu

5.2.4 Generator Schedules

A comprehensive generator schedule is supplied as another means of starting the generator when required. The generator run times can be scheduled to meet regular heavy load periods such as meal times or other periods of high demand. Two schedule types are available each with four configurable start times and durations. A normal Gen Run Schedule (**Gen Run Schedule Start Time A - D**) for daily generator running and a Gen Backup Schedule (**Backup Run Schedule Time A - D**) for emergency generator running if the PS1 shuts down for an extended period.



For further details of Generator Schedules see [§A1.2 Generator Scheduling](#).



The Generator Schedules screens provide access to **view** configured generator run and backup schedules. All of these settings may be changed by the User. To change any of these settings access the Change Schedule submenu (see [§5.3.1 Change Generator Schedules](#)).

RAPS	10kW 48V	16:59
Generator Schedules		
PREV NEXT	OK	EVNT





	Generator Schedules=> Start Time A: scheduled generator start time A. Run Dur A hrs: generator run duration from start time A. Start Time B: scheduled generator start time B. Run Dur B hrs: generator run duration from start time B. Note 1: Zero duration disables the associated start time unless Auto Stop is enabled in which case the generator will run until the battery charge cycle is complete and all other stop criteria are met. See §A1.4 Generator Automatic Stopping . Note 2: The Start Time must be used in sequence. An unused Start Time disables subsequent start times.

	<p>Generator Schedules=></p> <p>Start Time C: scheduled generator start time C.</p> <p>Run Dur C hrs: generator run duration from start time C.</p> <p>Start Time D: scheduled generator start time D.</p> <p>Run Dur D hrs: generator run duration from start time D.</p> <p>Note 1: Zero duration disables the associated start time unless Auto Stop is enabled in which case the generator will run until the battery charge cycle is complete and all other stop criteria are met. See §A1.4 Generator Automatic Stopping.</p> <p>Note 2: The Start Times must be used in sequence. An unused Start Time disables subsequent Start Times.</p>							
<table border="1"> <tr> <td>Start Time C</td> <td>--:--</td> </tr> <tr> <td>Run Dur C hrs</td> <td>--:--</td> </tr> <tr> <td>Start Time D</td> <td>--:--</td> </tr> <tr> <td>Run Dur D hrs</td> <td>--:--</td> </tr> </table>		Start Time C	--:--	Run Dur C hrs	--:--	Start Time D	--:--	Run Dur D hrs
Start Time C	--:--							
Run Dur C hrs	--:--							
Start Time D	--:--							
Run Dur D hrs	--:--							
								

	<p>Generator Schedules=></p> <p>Backup Time A: generator start time A in case of PS1 shutdown.</p> <p>Run Dur A hrs: generator run duration from backup start time A.</p> <p>Backup Time B: generator start time B in case of PS1 shutdown.</p> <p>Run Dur B hrs: generator run duration from backup start time B.</p> <p>Note 1: Backup schedules are used to start the generator to maintain essential power when PS1 is in shutdown.</p> <p>Note 2: Zero duration disables the associated start time.</p> <p>Note 3: The Backup Times must be used in sequence. An unused Backup Time disables subsequent Backup Times.</p>							
<table border="1"> <tr> <td>Backup Time A</td> <td>--:--</td> </tr> <tr> <td>Run Dur A hrs</td> <td>--:--</td> </tr> <tr> <td>Backup Time B</td> <td>--:--</td> </tr> <tr> <td>Run Dur B hrs</td> <td>--:--</td> </tr> </table>		Backup Time A	--:--	Run Dur A hrs	--:--	Backup Time B	--:--	Run Dur B hrs
Backup Time A	--:--							
Run Dur A hrs	--:--							
Backup Time B	--:--							
Run Dur B hrs	--:--							
								

<div style="text-align: center;">↑</div> <div style="border: 1px solid black; padding: 5px;"> <table> <tr><td>Backup Time C</td><td>-:--</td></tr> <tr><td>Run Dur C Hrs</td><td>-:--</td></tr> <tr><td>Backup Time D</td><td>-:--</td></tr> <tr><td>Run Dur D hrs</td><td>-:--</td></tr> </table> </div>	Backup Time C	-:--	Run Dur C Hrs	-:--	Backup Time D	-:--	Run Dur D hrs	-:--	<p>Generator Schedules=></p> <p>Backup Time C: generator start time A in case of PS1 shutdown.</p> <p>Run Dur C hrs: generator run duration from backup start time C</p> <p>Backup Time D: generator start time D in case of PS1 shutdown.</p> <p>Run Dur D hrs: generator run duration from backup start time D.</p> <p>Note 1: Backup schedules are used start generator to maintain essential power when PS1 is in shutdown.</p> <p>Note 2: Zero duration disables the associated start time.</p> <p>Note 3: The Backup Times must be used in sequence. An unused Backup Time disables subsequent Backup Times.</p>
Backup Time C	-:--								
Run Dur C Hrs	-:--								
Backup Time D	-:--								
Run Dur D hrs	-:--								

Pressing  at this point will return you to the start of the “Generator Schedules” screens, pressing  will return you to the top level menu.

After pressing  you can now press  to advance to the next menu

5.3 User Edit Menus

This series of three menus allow you to change system settings and generator start/stop schedules. The settings provided in these screens are sufficient to tailor the day to day system operation. Familiarity with the use of these settings will allow you to meet your changing system needs.

The menus are Change Settings, Advanced Settings and Change Schedules.

Settings may be changed by selecting EDIT while in the appropriate setting screen.

A ^ symbol will appear near the setting to be changed.

Use the INC (increase) and DEC (decrease) keys to change the setting

Use the OK key to implement and store the change

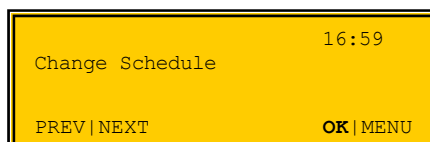
Use the CNCL (cancel) key to reject the change.

If no key is pressed for 10 seconds the EDIT screen will be exited without changing the setting.

5.3.1 Change Generator Schedules

The generator run times can be scheduled to meet regular heavy load periods such as meal times or other periods of high demand. Two schedule types are available each with four configurable start times and durations. A normal Gen Run Schedule (**Gen Run Schedule Start Time A - D**) for daily generator running and a Gen Backup Schedule (**Backup Run Schedule Time A - D**) for emergency generator running if the PS1 shuts down for an extended period.

For further details of Generator Schedules see §[A1.2 Generator Scheduling](#). This submenu allows access to **change** the generator run schedule and the backup schedule.



```

Gen Run Schedule
Start Time A      -:--
>                0.00, <      24.00
PREV|NEXT          EDIT|MENU

```

```

Gen Run Schedule
Start Time A      ^-.-
>                0.00, <      24.00
INC|DEC           OK |CNCL

```

Generator Schedules=>Change Schedule

Gen Run Schedule - Start Time A: This menu allows a regular generator start schedule to be set. The generator will start at the set time and run for **Run Dur A** duration (see next menu).

There are three other identical menus **Start Time B**, **Start Time C** and **Start Time D** allowing four run periods per day.

Note 1: The Start Time must be used in sequence, A to D. An unused Start Time disables subsequent start times.

```

Gen Run Schedule
Run Dur A        -:--
>                0.00, <      4.00
PREV|NEXT          EDIT|MENU

```

```

Gen Run Schedule
Run Dur A        ^-.-
>                0.00, <      4.00
INC|DEC           OK |CNCL

```

Generator Schedules=> Change Schedule

Gen Run Schedule - Run Dur A: Run Duration A sets the run duration for **Start Time A** generator schedule.

There are three other identical menus **Run Dur B**, **Run Dur C** and **Run Dur D** allowing four run periods per day. The generator will run for at least the configured duration and may keep running past the scheduled stop depending on the **Scheduled Gen Run - Auto Stop** setting (see next setting).

Note 1: If **Scheduled Gen Run - Auto Stop** is disabled, a zero duration disables the associated start time.

Note 2: If **Scheduled Gen Run - Auto Stop** is enabled, a zero duration will allow the generator to start at the scheduled time and auto stop on completion of a battery charge cycle and system load conditions no longer require the generator to run.

Scheduled Gen Run	
Auto Stop	Disabled
PREV NEXT	EDIT MENU

Scheduled Gen Run	
Auto Stop	^ Disabled
INC DEC	OK CNCL

Generator Schedules=> Change Schedule

Scheduled Gen Run - Auto Stop: Options Enabled, Disabled

If Auto Stop is disabled then the generator will run for the scheduled duration regardless of other factors.

If Auto Stop is enabled the generator may continue to run for longer than the configured duration (including zero duration) until the battery charge cycle is complete cycle and system load conditions no longer require the generator to run.

See [§A1.4Generator Automatic Stopping](#).

Backup Run Schedule	
Start Time A	-:--
>	0.00, < 24.00
PREV NEXT	EDIT MENU

Backup Run Schedule	
Start Time A	^ -:--
>	0.00, < 24.00
INC DEC	OK CNCL

Generator Schedules=> Change Schedule

Backup Run Schedule - Start Time A: This menu allows an emergency generator start schedule to be set. This schedule is active only when the PS1 is in a shutdown state for an extended period due to some abnormal condition as may be the case if the PS1 is unattended for long periods. The generator may be periodically run to power vital appliances such as refrigerator or freezer etc.

The generator will start at the set time and run for **Run Dur A** duration (see next menu).

There are three other identical menus **Start Time B**, **Start Time C** and **Start Time D** allowing four run periods per day.

Note 1: The Start Time must be used in sequence, A to D. An unused Start Time disables subsequent start times.

Backup Run Schedule	
Run Dur A	-:--
>	0.00, < 4.00
PREV NEXT	EDIT MENU

Backup Run Schedule	
Run Dur A	^ -:--
>	0.00, < 4.00
INC DEC	OK CNCL

Generator Schedules=> Change Schedule

Backup Run Schedule - Run Dur A: Run Duration A sets the run duration for **Start Time A** generator schedule.

There are three other identical menus **Run Dur B**, **Run Dur C** and **Run Dur D** allowing four run periods per day.

Note 1: Zero duration disables the associated start time.

5.3.2 Change Settings

These menus provide the primary user interface to configuration of system operational settings. There is a top level menu (Change Settings) to access the most frequently used settings and a submenu (Advanced User Settings) containing other less used settings.

RAPS	10kW 48V	16:59
Change Settings		
PREV NEXT	OK	EVNT

Time:Set Hour	9
> 0, <	23
PREV NEXT	EDIT MENU

Time:Set Hour	^ 9
> 0, <	23
INC DEC	OK CNCL

Change Settings=>

Time:Set Hour;

Sets the system time hour. The system time is the basis of many system functions. It should be set to the correct local time of day.

Time:Set Min	22
> 0, <	59
PREV NEXT	EDIT MENU

Time:Set Min	^ 24
> 0, <	59
INC DEC	OK CNCL

Change Settings=>

Time:Set Min;

Sets the system time minutes. The system time is the basis of many system functions. It should be set to the correct local time of day.

Begin Lvl 1 Hr17	23
> 0, <	23
PREV NEXT	EDIT MENU

Begin Lvl 1 Hr^ 17	23
> 0, <	23
INC DEC	OK CNCL

Change Settings=>

See [§A1.1 Generator Control based on SoC](#).

Begin Lvl 1 Hr: Begin Level 1 Hour sets the beginning of the **preferred run hour** which is a one hour period when it is most preferable to have the generator running. This would normally be set around 5 or 6 PM to charge the battery for overnight use. It should always be set during the Level 2 time (i.e. any time from **Begin Lvl 2 Hr** to **Begin Lvl 3 Hr**).

If the battery state of charge falls below **Level 1 SoC%** during the level 1 hour then the generator will be started and will run to completion of a charge cycle. Setting this parameter to zero will disable charging based on **Level 1 SoC%**. Charging based on SoC% can be totally disabled using **Set SoC%**

Begin Lvl 2 Hr12	
> 1, <	23
PREV NEXT	EDIT MENU

Begin Lvl 2 Hr^ 12	
> 1, <	23
INC DEC	OK CNCL

Change Settings=>

See [§A1.1 Generator Control based on SoC](#).

Begin Lvl 2 Hr: Begin Level 2 Hour sets the beginning of the **preferred period** when it is preferred to run the generator if the battery state of charge warrants it. In a system using solar as the renewable energy source this would normally be set to begin mid afternoon to allow the opportunity for the solar to charge the battery.

The Level 2 period includes the Level 1 hour.

If the battery state of charge falls below **Level1 2 SoC%** during the level 2 period then the generator will be started and will run to completion of a charge cycle. Charging based on SoC% can be totally disabled using **Set SoC%**

Begin Lvl 3 Hr21	
> 0, <	23
PREV NEXT	EDIT MENU

Begin Lvl 3 Hr^ 21	
> 0, <	23
INC DEC	OK CNCL

Change Settings=>

See [§A1.1 Generator Control based on SoC](#).

Begin Lvl 3 Hr: Begin Level 3 Hour sets the beginning of the **non-preferred period** when it is not desirable to run the generator. This would normally include overnight or other times when generator noise may be an issue, for example. However, the generator will start in this period if the battery state of charge warrants it.

If the battery state of charge falls below **Level1 3 SoC%** during the level 3 period then the generator will be started and will run until the **Level1 2 SoC%** is reached and the minimum generator run time has expired (**Gen:Min Run min**). Setting this parameter to zero will disable charging based on **Level1 3 SoC%**. Charging based on SoC% can be totally disabled using **Set SoC%**

Gen:Min Run min30	
> 5, <	240
PREV NEXT	EDIT MENU

Gen:Min Run min30	
> 5, <	240
INC DEC	OK CNCL

Change Settings=>

Gen:Min Run min: Generator Minimum Run minutes sets the minimum time the generator will run if it is automatically started for any reason. This prevents excessive starting and stopping of the generator that can be detrimental to its reliability and efficiency.

This minimum run time should be set according to the generator manufacturers' recommendation.

5.3.2.1 Advanced User Settings

Advanced Settings		16:59
PREV NEXT	OK	MENU

Load Search	Disable
PREV NEXT	EDIT MENU

Load Search	^ Disable
INC DEC	OK CNCL

Change Settings=>Advanced Settings=>

Load Search: Options Enable, Disable

Enabling Load Search places the PS1 into Power Save mode. The PS1 pulses the load every second and switches ON the AC output continuously when a load exceeding **Load Search W** is detected.

Load Search W	20
PREV NEXT	EDIT MENU

Load Search W	20
INC DEC	OK CNCL

Change Settings=>Advanced Settings=>

Load Search W: Load Search Watts sets the load power level that will cause the PS1 to supply continuous voltage to the load.

Load Search must be enabled (refer previous menu) for this setting to take effect.

Alarm Out	Urgent+NU
PREV NEXT	EDIT MENU

Alarm Out	^ Urgent+NU
INC DEC	OK CNCL

Change Settings=>Advanced Settings=>

Alarm Out: Options Urgent + NU, Urgent

Set the alarm to be output via the PS1 relay to an external audible and/or visual alarm. Only urgent alarms or both urgent and non urgent (NU) alarms may be selected. Enabling output of the NU alarm allows it to be used with the generator in manual control mode to signal when a generator run is required to charge the battery.

See [§Appendix D Inverter External Alarm](#).

S/Term Limit	15
> 1, <	50
PREV NEXT	EDIT MENU

S/Term Limit	^ 15
> 1, <	50
INC DEC	OK CNCL

Change Settings=>Advanced Settings=>

S/Term Limit: Short Term Limit sets the number of minor abnormal events within a short period that will trigger an PS1 shutdown and assert an Urgent alarm. Excessive such events in a short period may be indicative of potential system problems. The PS1 will automatically restart after 15 minutes. The current event count (**S/Term Count**) can be viewed and reset in the View Diagnostics menu.

The **S/Term Count** is a continuous count, capped at the **S/Term Limit** value and reduced by one every 15minutes.

L/Term Limit	15
> 1, <	50
PREV NEXT	EDIT MENU

L/Term Limit	^ 15
> 1, <	50
INC DEC	OK CNCL

Change Settings=>Advanced Settings=>

L/Term Limit: Long Term Limit sets the number of events within a long period that will assert a Non Urgent alarm. The current event count (**L/Term Count**) can be viewed and reset in the View Diagnostics menu.

The **L/Term Count** is a continuous count to (**L/Term Limit + 2**) reduced by one every 6 hours.

Inv:SoC Cntl	Enabled
PREV NEXT	EDIT MENU

Inv:SoC Cntl	^Enabled
INC DEC	OK CNCL

Change Settings=>Advanced Settings=>

Inv:SoC Cntl: Inverter State of Charge Control enables or disables generator automatic starting based on the battery state of charge. If disable is selected it overrides and disables the settings for parameters **Begin Lvl 1 Hr**, **Level 1 SoC%**, **Begin Lvl 2 Hr**, **Level 2 SoC%**, **Begin Lvl 3 Hr** and **Level 3 SoC%**.

```

Inv:Hrs to OFF72
>                0, <                120

PREV|NEXT          EDIT|MENU

```

```

Inv:Hrs to OFF^ 72
>                0, <                120

INC|DEC            OK |CNCL

```

Change Settings=>Advanced Settings=>

Inv:Hrs to OFF: Inverter hours to OFF sets the number of hours the PS1 control electronics will remain powered up while in the shutdown. The PS1 consumes a small standby current in the shutdown state.

The control electronics must remain operational to enable the Backup Schedule. To prevent excessive battery discharge, the PS1 will trip the DC circuit breaker and completely power down after the battery voltage falls below the nominal battery voltage for the time set by this parameter.

```

Passcode          0
>                0, <                255

PREV|NEXT          EDIT|MENU

```

```

Passcode          0
>                0, <                255

INC|DEC            OK |CNCL

```

Change Settings=>Advanced Settings=>

Passcode: Extended installer access.

5.4 Event Log

The Event log may be accessed from any top level menu using the EVNT function key. The log contains 32 events beginning with the most recent event. Use the UP key may be used to scroll backwards (in time) through the log, the DOWN key to scroll forward through the log. The forward scroll, (DOWN) halts at the most recent event.

```

RAPS    10kW 48V    16:59
From Any Top Level Menu

PREV|NEXT          OK          |EVNT

```

```

Hi Load:Gen Start

#20    Day#225 14:22:22
E048   I12 S02 G00 C01

```

Hi Load:Gen Strt: This is the event name.

#20: This is the event sequence number in the 32 event log.

Day#225: This is the day the event occurred. (Factory initialized to day of the year)

14:22:22: This is the time the event occurred.

E048: This is the event identification number. Refer to [Appendix F2 Event Definitions](#) for more information.

I12, S02, G00, C01: Selectronic use only.

5.4.1.1 Using the Event Log

The event log in conjunction with the menus system is an invaluable tool in the diagnosis of system issues and monitoring system performance. The log is a circular list of 32 events starting at event #1. Generally, by the time the log is full the oldest event is no longer of interest and the next event replaces it in the log. (Note: events are stored in an internal data log and may be retrieved by service personnel if required).

The most recent event is first to be displayed when the event log is accessed.

Use the event name and time stamp of the most recent sequence of events to gain an understanding of system behaviour. Each event may have a number of different causes, for example Hi Load Gen Strt may be due to one of four load levels. The event cause identification number (E048 in the example) provides more information on the cause of the event (see [§Appendix F2 Event Definitions](#)).

Regularly reviewing the event log to understand normal sequences of events for your system will enhance your capability to respond to system problems.

6 User Operating Procedures

6.1 Routine Monitoring of Operation

The following items should be monitored on a regular basis:

- Battery Voltage, this should NEVER be below the nominal system voltage, e.g. 24v, 48v or 120v
- Battery SoC%, a high average figure will maintain battery life
- The average daily energy supplied to the load (**Load kWh/Day**), the lower this figure is, the less re charging will have to take place, this will maximize battery life
- Event Log – expected events
- Event Log – unexpected events
- System temperatures, the lower the better
- Short Term and Long Term event counts

6.2 Routine Maintenance

- Cleaning vents
- Five yearly refurbishment

6.3 Changing Configuration Settings

The following is recommended when adjusting system settings:

- Record existing settings for the parameters about to be changed
- Change the minimum set of parameters at any one time then check for expected results.

6.4 System Shutdown

If the system is to be left unattended with the power off:

- Turn off the inverter
- Isolate battery from the inverter.
- Isolate the solar array or other renewable from the inverter.

Your installer will provide details of how to do this.

6.5 Operating Without the Generator

If the generator is not available the following recommendations should be followed to conserve the battery:

- Turn on Load Search (see [§5.3.2.1Advanced User Settings](#)). The PS1 will pulse the output voltage and only supply continuous voltage when the load exceeds a defined limit. If present, renewable energy will recharge the battery.
- Switch off the PS1 when ever possible to reduce the load on the battery, allowing the battery to be recharged even by small renewable power.
- If the battery becomes heavily discharged, the PS1 will automatically stop supplying AC power to the load, to prevent battery degradation or damage. Switching the PS1 briefly off then back on via the **ON/OFF** pushbutton, will restart the inverter for a short time at the expense of discharging the battery even more deeply.

Note: The PS1 internal electronics are powered from the DC (battery) side, not from the AC (generator) side. Therefore if the battery is excessively discharged, the electronics may not be able to start up until the battery is partially recharged, from renewable power for example.

7 Troubleshooting

7.1 General

If the system is not operating correctly, perform a general check as follows:

Check if the front panel LEDs indicate a problem, and take the recommended action as described in [§4.7 Front Panel LEDs](#). Switch the PS1 off via the **ON/OFF** pushbutton for a few seconds then back on. If this does not restore normal operation, check if the front panel LEDs now indicate a problem, and take the recommended action as described in [§4.7 Front Panel LEDs](#).

7.2 Generator Starting/Stopping Problems

The generator starts because the load is high or the battery is discharged. It stops when the load falls to lower levels, the battery is recharged or, if level 3 charge mode is set up, when the generator has run for the minimum run time and the load is sufficiently low. Daily patterns of generator operation will change as the load supplied each day changes and as any renewable input such as solar increases or decreases from day to day or season to season.

Use the View Readings menu to check measured values and inspect the event log to determine the reasons for generator starts and stops. Refer to [§5.4 Event Log](#) on using event data to monitor and diagnose performance.

If the generator runs more often than normal or expected:

There are several possible causes:

1. The system average load has increased:
Check the **Load kWh/Day** in the View Readings menu and compare it with the value displayed when the system was operating satisfactorily.
Compare the **Load kWh/Day** against the system design value which should have been supplied by the installer.
If loads have significantly increased identify any new electrical equipment that has been added
2. The system peak loads are very high:
Check the **30sec, 2min, 10min and 30min Avg kW** in the View Readings menu while operating any new appliance has been added. The associated **Start kW** setting (see [§5.2.3 View Settings](#)) may need adjustment by your supplier.
3. The load during the Level 3 time, typically late night and early morning, is higher than expected but not high enough to keep the generator running permanently there may be multiple starts and stops as the battery becomes discharged and is partly recharged:
Increase the generator minimum run time to increase the amount of battery recharge before stopping hence reduce the number of starts and stops
Check the load levels to see if they have increased during the level 3 part of the day.
4. The battery is not operating correctly (see [§7.5 Battery Problems](#)).

If the generator runs longer than normal or expected:

This is generally because system load has increased or the renewable input from solar has decreased. It could also be because the battery efficiency has fallen off with age or cell failure in the battery.

Use the event log to establish load levels and reasons for generator starts and stops (see [§5.4 Event Log](#)).

Use the View Readings menu to check measured values, particularly the accumulated battery energy in and energy out totals. These will have to be recorded over a week to see the change in the accumulated values.

It may be doing an Equalise charge which can take some hours to complete; check if the **Equalise** LED is flashing.

There may be a sustained load on the system. Check to see that appliances have not been left on. The [§5.2.1 View Readings](#) and [§5.2.1.1 View Diagnostics](#) provide information regarding the load power.

Check the generator schedule settings (see [§5.2.4 Generator Schedules](#)).

If the generator restarts a minute or so later then the battery is discharged, the battery volts are low or a load is present. You can shut the generator down permanently by switching the GEN_CNTL-ON/OFF switch on the generator to OFF.

If the generator runs for more total hours than normal or expected:

There are several possible causes:

The system average load has increased:

Check the **Load kWh/Day** in the View Readings menu and compare it with the value displayed when the system was operating satisfactorily.

Compare the **Load kWh/Day** against the system design value which should have been supplied by the installer.

If loads have significantly increased identify any new electrical equipment that has been added

The system minimum load has increased:

7.3 Inverter Start/Stop/Shutdown Problems

PS1 will not Start

If the LEDs remain dark when the PS1 is switched on as per [§4.1 Quick Start](#) the PS1 did not start up. Retry the procedure, if it continues to fail contact your supplier for further instructions.

If the PS1 starts with the **Inv Fault** indication (see [§4.7 Front Panel LEDs](#)) record the fault code indicated on the LCD and contact your supplier for further instructions.

PS1 Shuts Down

Whenever the PS1 shuts down, it attempts to restart once per 15 minutes.

The PS1 shuts down automatically for the following conditions, which should be investigated:

- Overload
- DC over-voltage and under-voltage
- Excessive battery discharge
- Over-temperature

Check if the PS1 front panel LEDs indicate a problem, and take the recommended action as described in [§4.7 Front Panel LEDs](#). The [§5.2.1 View Readings](#) and [§5.2.1.1 View Diagnostics](#) may provide information regarding the shutdown cause. If the problem continues record the front panel LED status and contact your supplier for further instructions.

DC Circuit Breaker Trips

DC Circuit Breaker trip may be due to battery under-voltage. It may also be caused by a combination of low battery voltage and a sustained AC overload. Check if the front panel LEDs indicate a problem, and take the recommended action as described in [§4.7 Front Panel LEDs](#).

The DC Circuit Breaker trip may be due to a very high DC current which cannot be controlled electronically. The PS1 will stop operating, and may be faulty. Record the front panel LED status and contact your supplier for further instructions.

7.4 AC Power Problems

If the power fluctuates, lights go bright or dim but don't go out.

- Check the PS1 front panel LEDs and Event log for information on the cause.
- The generator output may be varying due to poor generator condition or switching on and off heavy loads. Check the generator voltage reading (**Gen VAC**) via the PS1 LCD.
- The PS1 output may be varying due to switching on and off heavy loads. Check the output voltage reading (**Inv VAC**) via the LCD.

If the power goes off for short periods (1 second to a few minutes)

- Check the PS1 front panel LEDs and Event log for information on the cause.
- The PS1 may be in Power Save mode and the load is too small to detect. In this mode the PS1 pulses the output until a load is detected. Check the PS1 front panel LEDs and settings **Load Search** and **Load Search W.**
- The PS1 may be shutting down due to overload or low DC voltage and periodically attempting restarts. If the PS1 is shutting down switch off any heavy loads that may be causing the shut down. If the PS1 is shutting down due to low DC voltage, check generator availability and reasons for the generator not starting such as flat start battery or no fuel

If the power goes off for longer periods (10 minutes to many hours)

- Check the PS1 front panel LEDs and Event log for information on the cause.
- PS1 shutdown due to low DC voltage and no generator available to charge
- **S/Term Count** may be exceeding limit due to some system problem. Check **S/Term count** and Event log for information. Reset **S/Term Count** if necessary.

7.5 Battery Problems



Batteries are very dangerous. Please read the safety information provided by the battery supplier and the information in [§1 Precautions and Safety](#).

Battery does not charge properly

- Check that the battery charging requirements are correctly set up in the PS1 (see [§Appendix B Battery Management](#)).
- Check that the solar regulator is correctly set up.

If the solar does not appear to be doing much

The solar regulator may be set too low. Check LEDs and readings

The battery is not operating correctly:

Physically inspect the battery check for loose connections. Monitor the battery voltage as heavy loads supplied by the PS1 are turned on and off.

Check the voltage on each battery making up the battery bank to see if there are cells not fully charged or not accepting charge. Measure voltages on each cell/battery at different times in the charge discharge cycle. Just after charge has started say after 10 minutes, in mid charge, just before end of charge, ten minutes after discharge starts, mid discharge and just before recharge starts.

Appendix A Generator Management

For generator details, please refer to the documentation supplied with it.

The PS1 connects to the generator via Generator Control Interface as described in [§A4 Generator Control Interface](#). The PS1 may be configured to automatically control the generator as required to supply the load and charge the attached battery or to allow manual control of the generator by the user. Generally automatic control of the generator is recommended for daily operation.

Typically, as part of the installation, the PS1 settings are configured to automatically run the generator to:

- Limit the depth of battery discharge, for maximum battery life.
- Deliver energy efficiently by supplying sustained large loads direct from the generator.
- Load the generator to the highest possible level while running, to efficiently convert fuel to electricity.
- Not frequently start and stop the generator, which would reduce its life and increase maintenance.
- Avoid noise by starting the generator late at night only for heavy loads or a deeply discharged battery.

A1 Generator Automatic Running

In the PS1 RAPS system, the PS1 automatically runs the generator for the following reasons:

- Battery conditions, in particular state of charge (SoC), require the generator to charge the battery (see [§A1.1 Generator Control based on SoC](#)).
- Time Schedules are set to regularly run the generator at times of expected peak loads or at convenient times (see [§A1.2 Generator Scheduling](#)).
- Backup Schedules are set to run the generator in case of PS1 shutdown to power vital equipment (see [§A1.2 Generator Scheduling](#)).
- Load conditions are such that the PS1 ratings are exceeded or a sustained load is large enough to efficiently load up the generator hence running the generator will be the most efficient method to supply the load. For loads exceeding the generator rating the PS1 draws power from the battery, adding its power output to that of the generator. (see [§A1.3 Generator Start - AC Load](#)).

A1.1 Generator Control based on SoC

The PS1 may be configured to start the generator to charge the battery based on the battery **State of Charge (SoC)**. This method of generator control is recommended to efficiently and reliably maintain the battery charge.

The battery SoC is estimated by the PS1 and displayed as a percentage of the battery capacity and represented throughout this manual and in the menu system by the symbol SoC%. See §B3 [Battery State of Charge \(SoC\)](#) for a details of state of charge estimation.

A daily profile of preferred generator start times and battery charge levels may be configured to allow the PS1 to automatically start and stop the generator. The profile provides the flexibility to accommodate for individual site characteristics such as renewable availability, usage patterns and generator noise considerations.

Several PS1 settings are configured to divide the day into three periods (refer [Figure 6](#)):

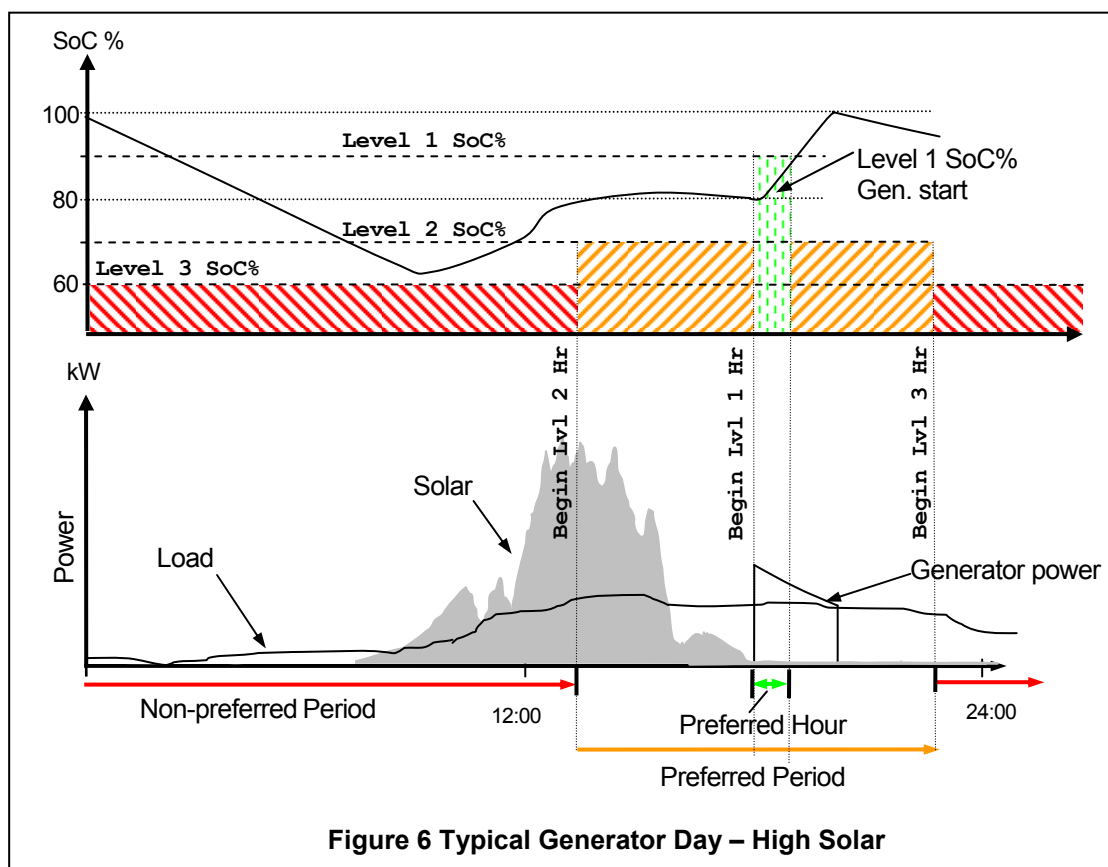
- **Preferred Hour:** The one hour when it is most preferable to run the generator. This is a period starting at **Begin Lvl 1 Hr**, typically about 5 or 6pm. During this period the generator is started if the battery is discharged below **Level 1 SoC%** to charge the battery for overnight.
- **Preferred Period:** The period when you prefer to run the generator if the battery state of charge warrants it. The preferred period includes the preferred hour. This period starts at **Begin Lvl 2 hr** and typically includes a large part of the day.
- **Non-Preferred Period:** The period from **Begin Lvl 3 Hr** to **Begin Lvl 2 Hr**, when you prefer the generator **not** to run. This period is usually overnight to avoid noise. During this period the generator will be started only if the battery is seriously discharged (below **Level 3 SoC%**) or if sustained heavy load occurs.

If the PS1 starts the generator within the non-preferred period it will run the generator for time determined by the **Gen:Min Run min** setting. At other times, once the generator is started, it is run until the battery is fully charged **and** the load drops to below the level set by the **Gen:Min Load kW** setting.

If power is available from a renewable source, the generator is started only if the battery continues to be discharged (the load exceeds the renewable supply). Typically the generator runs for a short time infrequently.

The starting time for each of the periods (**Begin Lvl 1 Hr**, **Begin Lvl 2 Hr** and **Begin Lvl 3 Hr**) can be set via the User menus. The battery state of charge levels (**Level 1 SoC%**, **Level 2 SoC%** and **Level 3 SoC%**) are set by the installer at the time of installation.

The generator starting strategy depends on individual site requirements. In systems with high solar contribution the **Begin Lvl 2 hr** could be delayed until later to provide an opportunity for solar to charge the battery (see Figure 6 below).



In a generator/charger system, or systems with low solar contribution, this period would begin early in the morning to start the generator and replace the charge used overnight (see [Figure 7](#) below).

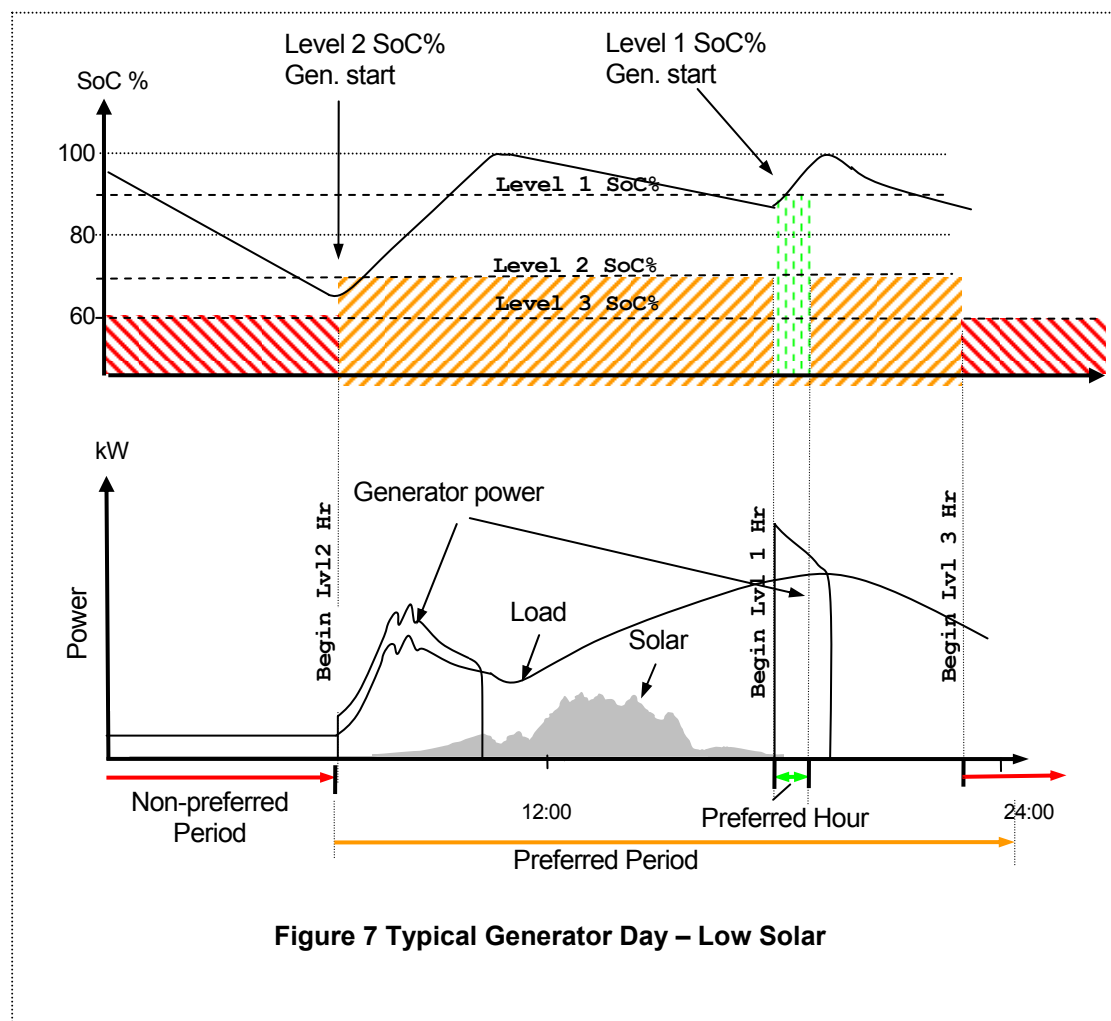
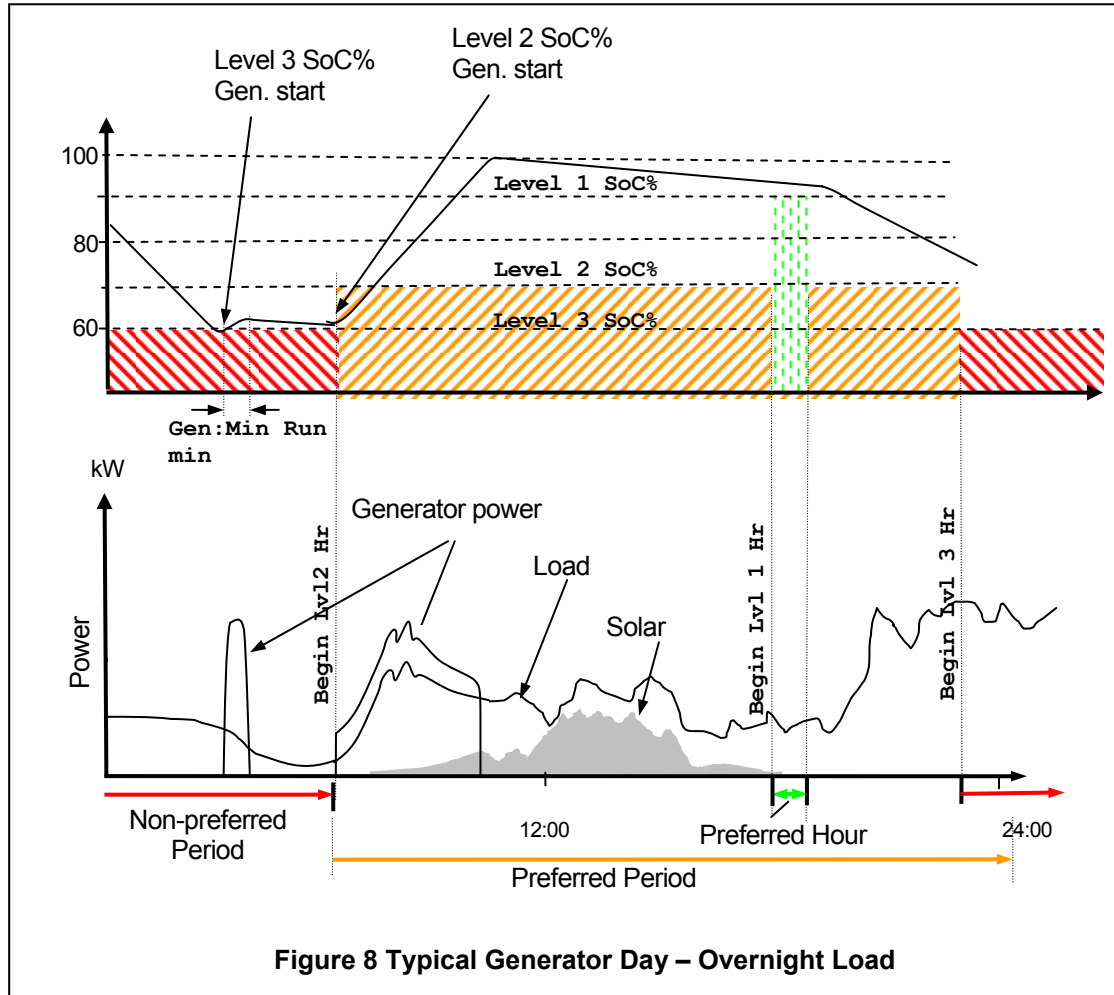


Figure 8 illustrates a system with levels and times unsuited to the load requirements resulting in failure to charge the battery adequately to accommodate the overnight load. The battery SoC falls below the Level 3 threshold and the generator is started during the night to stop the battery becoming excessively discharged. A better generator run strategy would be set the Level 1 or Level 2 settings to cause a charge late in the day to fully charge the battery before the Level 3 period starts thus averting the generator start overnight.



A1.2 Generator Scheduling

Two schedule types are available each with four configurable start times and durations.

- **Gen Run Schedule (Gen Run Schedule)** for daily generator running intended to accommodate day to day peak load periods. While the SoC method of generator control (see [§A1.1 Generator Control based on SoC](#)) is recommended to efficiently and reliably maintain the battery charge, generator schedules may be used as an alternative generator control method or as an adjunct to SoC control to cater for expected loads.
- **Backup Run Schedules (Backup Run Schedule)** for emergency generator running intended for use when the PS1 is in a shutdown state for an extended period due to some abnormal condition as may be the case if the PS1 is unattended for long periods. The backup schedule will periodically run the generator to power vital appliances such as refrigerator or freezer etc.

Setting Run Schedules

Both Gen Run Schedules and Backup Run Schedules are configured by setting up to four start times and associated run durations (see [§5.2.4 Generator Schedules](#)).

The start times may be set to any time but must be used in sequence; an unused start time disables subsequent start times. For example, if two generator run periods per day are required **Start Time A** and **Start Time B** must be used.

For each start time a generator run duration (**Run Dur A - D**) may be set in 15 minute increments. The generator will run for the set duration regardless of other settings (except for a duration of zero, see below). If start time/duration combinations cause an overlap in generator run periods the generator will continue to run through both periods.

The run duration may be set to zero. The resultant operation differs for each schedule type as follows:

Setting a Gen Run Schedule duration to zero either;

disables the associated start time if **Scheduled Gen Run - Auto Stop** is disabled,

or,

allows the generator to start at the scheduled time and automatically stop on completion of a battery charge cycle and/or load power requirements if **Scheduled Gen Run - Auto Stop** is enabled.

Setting a Backup Run Schedule duration to zero disables the associated start time (PS1 is in shut down so cannot run a charge cycle).

Note: The Generator Schedule will override the generator minimum run time setting (**Gen:Min Run min**). Consider the generator manufacturer's recommendation regarding minimum run time when setting schedules.

A1.3 Generator Start - AC Load

The PS1 will automatically start and stop the generator based on the average power delivered to the load over the time period of the limit. Two factory-configured and two installer configurable settings determine the power levels at which the generator will be started.

- The 30 second limit is factory set at 120% of the PS1 rating.
- The 2 minute limit is factory set at 100% of the PS1 rating.
- The 10 minute and 30 minute limits are installer configurable.

The generator will continue to run until the average load power falls below all start limits and all other stop criteria are met (see [§A1.4 Generator Automatic Stopping](#)).

A1.4 Generator Automatic Stopping

The PS1 will automatically stop the generator when it is not required for charging the battery or supplying the load.

If the generator is automatically started in the preferred period, the PS1 will stop it after completion of a battery charge cycle unless:

- A generator scheduled run is in progress (see [§A1.2 Generator Scheduling](#)).
- The average load kW exceeds one of the four configured start limits (see [§A1.3 Generator Start - AC Load](#)).
- The minimum generator run time (**Gen:Min Run min**) has not expired (see [§5.3.2 Change Settings](#)).

To prevent the generator running on light loads where efficiency is low the PS1 will stop the generator if the power supplied by the generator to charge the battery and supply the load falls below minimum value set by **Gen:Min Load kW**.

If the generator is automatically started in the non-preferred period, the generator will be stopped after the minimum generator run time set by **Gen:Min Run min**.

A2 Generator Manual Running

The generator can be manually controlled via:

- The generator local controls. The PS1 automatic control enable signal (GEN_CNTL-ON/OFF) from the generator switch must be in the OFF position.
See [§A4 Generator Control Interface](#).

Note: To prevent reverse power flow into the generator, before manually stopping the generator it is advisable to open the Generator AC Circuit Breaker and wait until the PS1

LEDs no longer indicate **Inv Sync** (see §4.7 Front Panel LEDs) . After the generator is stopped, close the Generator Circuit Breaker ready for the next generator start. .

- The **OK** pushbutton on the front panel (see §4 Quick Start). The PS1 automatic control enable signal (GEN_CNTL-ON/OFF) from the generator switch must be in the ON position. See §A1.2 Generator Scheduling.
- A **Remote Run** input that can be wired from the PS1 to a switch in a convenient location such as in a residence. Several such switches can be wired in parallel. The PS1 automatic control enable signal (GEN_CNTL-ON/OFF) from the generator switch must be in the ON position. See §A1.2 Generator Scheduling.

The **Remote Run** switch operates as follows:

- A switch closure longer than 0.5 seconds and shorter than 2 seconds causes the PS1 to start the generator. Another such closure stops it, else it is stopped automatically when the battery reaches full charge and any sustained large load ceases. The switch is typically a non-latching pushbutton.
- A switch closure longer than 2 seconds causes the PS1 to start the generator, and stop it when the switch is opened. The switch is typically a latching toggle.

Regardless of how the generator is started (manually or automatically), while the generator is running the PS1 automatically charges the battery whenever sufficient generator power is available, and when fully charged will hold the battery in float charge.

A3 Generator Fault Recovery

If the PS1 fails three consecutive times to detect significant generator voltage for one minute after a generator start or, if voltage is detected but fails to synchronise for five minutes, a Generator Fault alarm will be asserted. The PS1 will then use the following sequence of generator start attempts:

- After 15 minutes
- After 1 hour
- Daily at the **Begin Lvl 1 Hr** (or 12 noon if **Begin Lvl 1 Hr** is disabled)

A Gen Fail event will be generated and logged each time a start attempt fails.

Note: To allow the PS1 to immediately restart the generator switch the generator GEN_CNTL-ON/OFF switch to OFF then back to ON, use the **OK** pushbutton to start the generator, or manually start the generator.

A4 Generator Control Interface

The PS1 starts and stops the generator via the control signals shown below. The signals are wired between the PS1 and the generator local control equipment. The PS1 supports several different generator start/stop schemes, using some or all of the signals. The system supplier may modify the generator local control equipment to create the signals, which may have different names within the generator local control equipment.

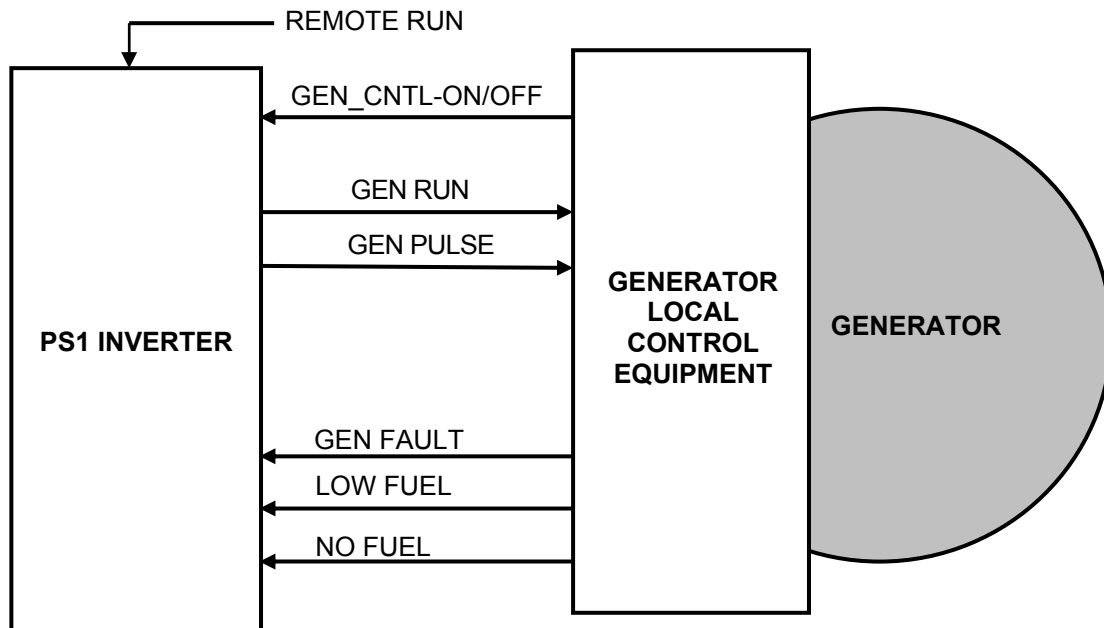


Figure 9 Generator Control Signals

Below is a description of the interface operation;

Generator Control On/Off Signal:

The Generator Control On/Off signal (GEN CNTL ON/OFF) indicates to the PS1 if the generator is **available** for automatic control (ON) or **not available** (OFF). The signal typically comes from a switch (often named AUTO/MAN or similar) on the generator local control equipment however, it may come from other types of control equipment.

In the OFF position the generator is controlled locally via its own controls, and the PS1 will not try to start or stop it. The front panel LEDs will indicate Gen Not Available (see [§4.7 Front Panel LEDs](#)).

In the ON position the generator is available for automatic control by the PS1 (see [§A1 Generator Automatic Running](#)), for manual control via the PS1 **OK** pushbutton, and remote control via the **Remote Run** input signal (see [§A2 Generator Manual Running](#)).

Note: The PS1 may have been set up to not use this signal and assume the generator is always available for control and hence will ignore this signal.

Generator Start/Stop Signals:

The PS1 uses the GEN RUN and GEN PULSE signals to start and stop the generator. One or both of these signals may be used, depending on the generator local control equipment and PS1 setup:

- If used, the GEN RUN signal remains active while the generator is to run, and remains inactive while the generator is not to run.
- If used, the GEN PULSE signal becomes active for a short period ("pulse") to start and to stop the generator, and is otherwise inactive. The duration of the pulse (typically several seconds), and the relative timing between the GEN RUN and GEN PULSE signals where both are used, is determined by PS1 settings configured during installation. Refer to the PS1 Technical Manual for further details.

Generator Status Signals:

The GEN FAULT signal indicates a generator fault such as low oil pressure or overheating. The actual conditions and recommended action should be listed in the generator or site documentation. If the signal becomes active, the PS1 stops the generator. The PS1 front panel LEDs will indicate Gen Fault (see [§4.7 Front Panel LEDs](#)). When the generator fault is fixed and the GEN FAULT signal becomes inactive the PS1 will restart the generator (see [§A3 Generator Fault Recovery](#)).

The LOW FUEL signal indicates that the fuel tank needs filling as soon as possible. If the signal becomes active, the PS1 raises a Non Urgent alarm (see [§Appendix D Inverter External Alarm](#)).

The NO FUEL signal indicates that the generator is out of fuel. If the signal becomes active, the PS1 stops the generator and raises an Urgent alarm (see [§Appendix D Inverter External Alarm](#)).

The PS1 front panel LEDs will indicate Gen Abnormal Stop (see [§4.7 Front Panel LEDs](#)).

A5 Synchronisation

Whenever the generator and PS1 are both operating, the PS1 automatically synchronises to the generator (adjusts its AC voltage and frequency to match the generator output) and controls the power flow as described below. This occurs regardless of how the generator started (manually or automatically). The PS1 will not synchronise to the generator, nor close its relevant contactor, if the generator AC voltage or frequency is out of tolerance.

Once synchronised, the PS1 will close the Generator Contactor and the front panel LEDs will show **Inv:Sync**. If the generator AC voltage or frequency become out of tolerance the PS1 will switch to standalone mode and try to resynchronize. If unsuccessful for 5 minutes a Generator Fault alarm is asserted and an automatic restart sequence started.

To prevent the PS1 trying to stay synchronised to a generator that is spinning down, before manually stopping the generator it is advisable to open the Generator Circuit Breaker and wait until the PS1 LEDs no longer show **Inv Sync**. Similarly, if the PS1 automatically stops the generator it will not try to re-synchronise to the generator for several minutes while it spins down. After this period if generator voltage is still detected at the PS1 resynchronization will be attempted.

A6 System Power Flow

A1.5 No Generator/PS1 switched ON

While the PS1 and generator are both off, the AC Contactor and Generator Contactor are both open. If the PS1 is then switched on (see [§4.6 Inverter ON/OFF Pushbutton](#)) it draws power from the renewable and battery to generate AC voltage at nominal voltage and frequency, and closes its AC contactor to supply the load.

A1.6 PS1 ON/ Generator Started

While the PS1 is on with no generator voltage present, the AC Contactor remains closed and its Generator Contactor remains open. If generator voltage is detected by the PS1 (e.g. due to generator start-up), it synchronises to the generator voltage (adjusts its AC voltage and frequency to match the generator output) then closes its Generator Contactor. At this stage all of the load power is supplied from the PS1 and zero power is drawn from the generator. The PS1 then gradually transfers load onto the generator over a period of 30 to 90 seconds until the power supplied by the inverter is zero. Power is then drawn from the generator to charge the battery.

A1.7 Generator ON/PS1 switched ON

If the generator is running with the PS1 switched off, the AC Contactor is open, and the Generator Contactor is closed while generator voltage is present, so the generator supplies the load. If the PS1 is then switched on, it synchronises to the generator voltage (adjusts its AC voltage and frequency to match those of the generator) then closes its AC Contactor, and draws generator power to charge the battery.

A1.8 Load Sharing

While the PS1 and generator are both on and synchronised, the PS1 charges the battery while the load is below the generator power rating. If the load exceeds the generator rating, the PS1 does not charge the battery but draws power from it, adding its power output to that of the generator to supply the load, and limiting the power drawn from the generator.

A1.9 Reverse Power

If the generator trips while running, for example due to running out of fuel or being manually stopped, then AC power may flow into the generator. This is not a desirable condition. The PS1 detects this condition and opens its Generator Contactor.

A1.10 Reactive Power

Reactive power flow (kVAr) occurs when the AC current in a circuit is out of phase with the AC voltage. Reactive power flow consists of energy flowing back and forth in consecutive AC half cycles. It performs no useful function, and increases the current above that due to real power flow (kW) alone, so causing increased power loss and heating which may limit the real power available.

Reactive power flow occurs in reactive system loads such as induction motors. The PS1 shares such reactive flows with the generator, by controlling the AC output voltage.

The amount of reactive power flow can be monitored using parameters **Inv kVAr** and **Gen kVAr** (see [§5.2.1.1 View Diagnostics](#)).

Appendix B Battery Management



Please refer to the battery manufacturer's documentation for recommendations regarding settings for your particular battery. Inappropriate settings may have a detrimental affect on your battery life and performance.

The PS1 provides comprehensive battery management settings to allow a charge regime to achieve optimal battery life.

PS1 battery management features include:

- Five stage charge cycle: Initial, Bulk (0-90%), Absorption (90%~100%), Float and Equalise.
- Charging capability to PS1 continuous rating.
- Charging initiated by battery voltage, battery state of charge, or both.
- Shutdown on very low battery voltage, battery state of charge, or both.
- Temperature compensation of charging voltage based on battery temperature.

The PS1 may be configured to automatically start the generator when a battery charge cycle is required. Refer to [§A1.1 Generator Control based on SoC](#) for details of automatically running the generator to charge the battery based on the state of charge.

B1 Battery Charger Operation

The PS1 charges the battery in a five-stage cycle with each stage controlled by voltage, current and time settings. These settings are fully configurable in your unit however they should not require changing after initial installation unless some aspect of the battery installation changes. The configured value of each setting can be viewed on the LCD display (see [§5.2.3 View Settings](#)).

During stage 1 (initial), the PS1 charges at the initial charging current (**Init:Chrg A**) until the battery voltage rises to the Initial Charge voltage (**Init:Chrg V**), holds this voltage for **Init:Time mins**, then starts the Bulk stage.

During stage 2 (Bulk), the PS1 charges at the bulk charge current (**Bulk:Chrg A**) until the Bulk Charge voltage (**Bulk:Chrg V**) is reached, then holds this voltage for at least **Bulk:Time mins** and until the battery is approaching a high state of charge as indicated by the rate of change of charging current falling to **Chrg:End A/15m**). The Absorption stage is then started.

During stage 3 (Absorption), the PS1 supplies a constant current **Absorb:Chrg A** to the battery while ensuring **Absorb:Chrg V** is not exceeded. The Absorption stage will continue for **Absorb:Time mins**. At completion of this stage the charger will enter the Float stage unless a battery Equalise cycle is due, in which case an Equalise cycle will complete before entering Float.

During stage 4 (Float), the PS1 attempts to hold the battery voltage at **Float:Hold V**.

Periodically, as set by **Eqlise:Freq Day**, the PS1 performs a equalise charge in which the battery is held at a higher voltage between **Eqlise:Chrg V** and **Eqlise:Limit V** for several hours (**Eqlise:Time hrs**). This restores to full charge any partially discharged cells in the series battery bank. To disable the Equalise function **Eqlise:Time hrs** may be set to zero. The Equalise cycle will be automatically delayed by one day for each day the battery has been in Float for time set during installation.

B2 Temperature Compensation

The PS1 monitors the battery temperature via the sensor provided and compensates the charge voltage set points for improved battery management. This improves battery performance and prevents battery overheating. The battery temperature sensor is mounted in thermal contact with the centre of the side of a battery. The compensation applied is $-5\text{mV}/^{\circ}\text{C}/\text{cell}$ with zero compensation at 20°C .

B3 Battery State of Charge (SoC)

The PS1 may be configured to automatically start the generator and initiate a charge cycle based on the battery state of charge (SoC). The PS1 has no direct means of measuring the battery state of charge; it uses measurements of the currents flowing in and out of the battery to estimate the charge remaining in the battery. The resultant net current is expressed as a percentage of the battery size set in the PS1 (**Batt Size Ah**).

Current into the battery during a charge cycle and current measured on either of the shunts, when configured as Renewable, add to the battery state of charge estimate.

Current out of the battery to supply the load and current measured on either of the shunts, when configured as Load, deduct from the battery state of charge estimate.

If the shunt is configured as Renewable (+) and Load (--) the net result is added to the battery state of charge estimate.

At completion of charge cycle the battery SoC based on the estimation will be close to 100%, if it is greater the estimate will be adjusted to 100%.

It is important that the battery manufacturer's recommendation be adhered to for ongoing monitoring and maintenance of batteries.

Appendix C Renewable Management

The PS1 feeds renewable power to the AC load, and any excess is stored in the battery for later usage. If the battery is fully charged and the DC load is not on, the excess is wasted (the renewable power is reduced or disconnected by the regulator). Such waste can be reduced by reducing the level to which the generator charges the battery, or particularly for solar renewable, by not running the generator in the morning.

If battery charging is in progress and renewable output increases sufficiently to cause the generator charge power to become negative when averaged over 2 minutes, the PS1 terminates the charge cycle. If equalize charging was in progress, it is terminated and rescheduled for the next day. Such conditions occur when renewable output exceeds the sum of the load demand plus the required charge power.

C1 Renewable Connection

As shown in the diagram below, the regulator output and the battery are connected in parallel, via the PS1 Shunt 1 which may be used to measure the renewable current.

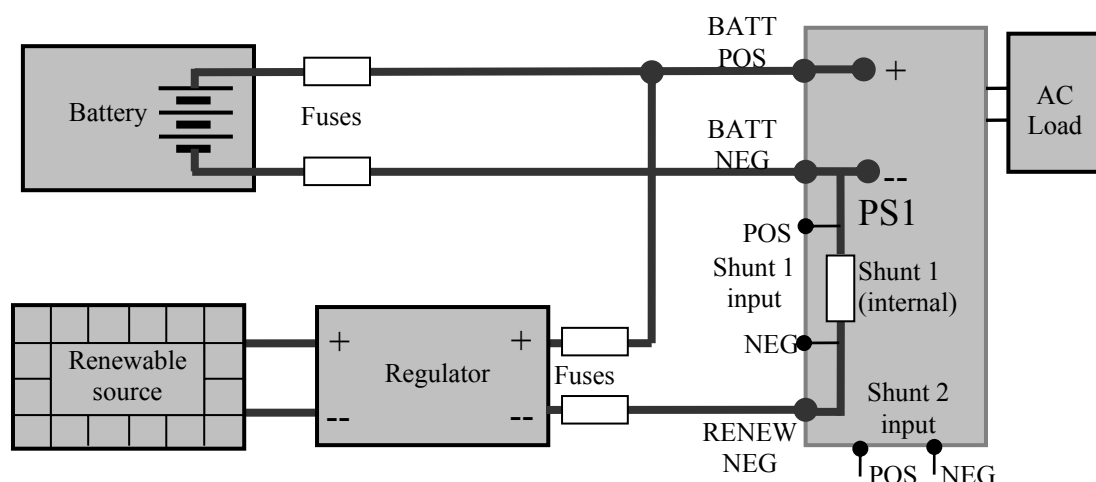


Figure 10 Renewable Connection

Appendix D Inverter External Alarm

The PS1 provides a single alarm output which can be wired to an external alarm buzzer or light etc. An urgent alarm is indicated by a continuous ON condition and a non-urgent alarm is indicated by a slow intermittent ON condition. If the PS1 is shutdown or OFF the urgent alarm output is asserted.

NON-URGENT conditions can be prevented from raising the alarm, via the LCD displays (see [§5.3.2.1 Advanced User Settings](#) **Alarm Out** setting).

The URGENT and NON-URGENT alarms are also separately indicated on the front panel LEDs (see [§4.7 Front Panel LEDs](#)). Short term and long term event counters are provided and the users may set limits for each to generate alarms. Refer to settings **S/Term Count** and **L/Term Count** ([§5.2.1.1 View Diagnostics](#)) and **S/Term Limit** and **L/Term Limit** [§5.3.2.1 Advanced User Settings](#).

Appendix E Specifications

E1 Product Specifications

Parameter	Product				
	PS1 5/24	PS1 6/48	PS1 10/48	PS1 12/120 (11/108 ¹)	
Inverter Mode					
Battery voltage nominal	24V DC	48V DC	48V DC	108V DC	120V DC
Battery voltage default range	22-34V DC	44-68V DC	44-68V DC	98-170V DC	
Continuous output power @ 25°C	5kW	6kW	10kW	11kW	12kW
Continuous output power @ 30°C	4.5kW	5.5kW	9kW	10kW	11kW
Continuous output power @ 40°C	4kW	5kW	8kW	9kW	10kW
Continuous output power @ 50°C	3.2kW	4kW	6.4kW	7.2kW	8kW
Continuous output power @ 60°C	2kW	2.5kW	4kW	5kW	5.5kW
Max output power five minutes @ 25°C (initial power <1kW)	6.5kW	8kW	13kW	14kW	16kW
Maximum overload 0~5 seconds	8kW	10kW	16kW	20kW	22kW
Maximum continuous output - interactive mode @ 25°C	5kW + generator output	6kW + generator output	10kW + generator output	11kW + generator output	12kW + generator output
Maximum continuous AC output current	21A + generator current (max 63A)	25A + generator current (max 63A)	42A + generator current (max 125A)	46A + generator current (max 125A)	50A + generator current (max 125A)
Maximum continuous DC input/output current	250A DC	150A DC	250A DC	120A DC	
DC input inverter in auto search, no AC load	0.6A/15W	0.3A/15W	0.3A/15W	0.12A/15W	
DC Input inverter ON, no AC load	< 2.5A/60W	< 1.35A/65W	< 1.9A/90W	< 105W	
Auto search sensitivity range	5-40W	5-40W	5-40W	5-40W	
Output voltage/frequency - invert mode, zero to max load	240 +1-4%, 50Hz +/- .01%	240 +1-4%, 50Hz +/- .01%	240 +1-4%, 50Hz +/- .01%	240 +1- 4%, 50Hz +/- .01%	
Total harmonic distortion, zero to max load	<4%				
Interactive Mode					
Changeover time, invert to generator	zero				
Maximum supported generator capacity	10kVA	15kVA	20kVA	30kVA	
Load switched to generator in fault mode	Yes	Yes	Yes	Yes	
Max inverter charge rate, adjustable	0-200A	0-120A	0-200A	0-100A	
Max inverter charge power	Continuous output power of inverter (ref above)				
No of charge stages	Four stages plus equalise				
Charge type	Unity PF: 4-state constant voltage with current and power limiting				
Charge settings	Adjustable to suit all battery types				

¹ Configurable via Settings Menu

Generator Start Parameters					
	4 x time of day, 3 x state of charge				
	2 x adjustable power limits, 4 x back up times				
	Battery voltage, inverter shutdown				
	Inverter temperature				
Generator start method	2 or 3 wire, pulsed and/or run signal (adjustable)				
General					
Weight	72kg	73kg	87kg	93kg	
Weight packed	79kg	80kg	94kg	100kg	
Dimensions	585H, 400W (430 incl. mtg flanges), 420D (mm)				
Communications serial interface	RS232 x 2400 bps				
Memory retention of settings and logged data	Permanent via on board battery backed RAM, and EEPROM				
Number of shunts	One x 100A internal / one optional external				
Circuit breaker for generator input	63A	63A	125A	125A	
Circuit breaker for AC output	63A	63A	125A	125A	
Circuit breaker for DC battery input	250A	125A with electronic trip	250A with electronic trip	125A with electronic trip	
Standby battery current, inverter shutdown (DC CB closed)	400mA	245mA	245mA	120mA	
Battery current, DC CB tripped	20mA	20mA	20mA	20mA	
Standards	Ctick, AS3100				
Efficiency @10% nominal Load	87.0%	85.0%	91.0%	90.0%	90.0%
@30% nominal Load	91.0%	93.0%	96.0%	95.0%	95.0%
@50% nominal Load	91.0%	93.0%	96.0%	96.0%	96.0%
@100% nominal Load	90.0%	92.0%	93.0%	94.0%	94.5%
Safety isolation	AC output to chassis & battery 5kV, battery to chassis 1kV				
Power factor charging	Unity				
Power factor inverting	0 to 1				
Enclosure rating	IP40				
Cooling method	Thermostatically controlled fans				
Protection	Circuit breakers on all external power connections, plus electronic trip of DC breaker* providing reverse battery protection				
On board log	Records over 200 events, alarms and data which can be accessed remotely via serial port/modem. Current day on LCD				
Four line alphanumeric backlit LCD displays:	Configuration parameters, Batt Volts, Net Batt Amps, AC Load kW, Gen kW/Volts/Freq, Av daily kWh, Shunt 1 & 2 Amps, Event log, Charge Amps, State of Charge				
* no electronic breaker trip on 24V model					

E2 Standards Compliance

AS/NZS 3100:2000 Approval and Test Specification – General Requirements for Electrical Equipment

AS/NZS 1044:1995 Limits and methods of measurements of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and similar electric apparatus.
Amendment 1:1997
Amendment 2:2000

Ctick Australia

Appendix F Definitions

F1 Settings Index

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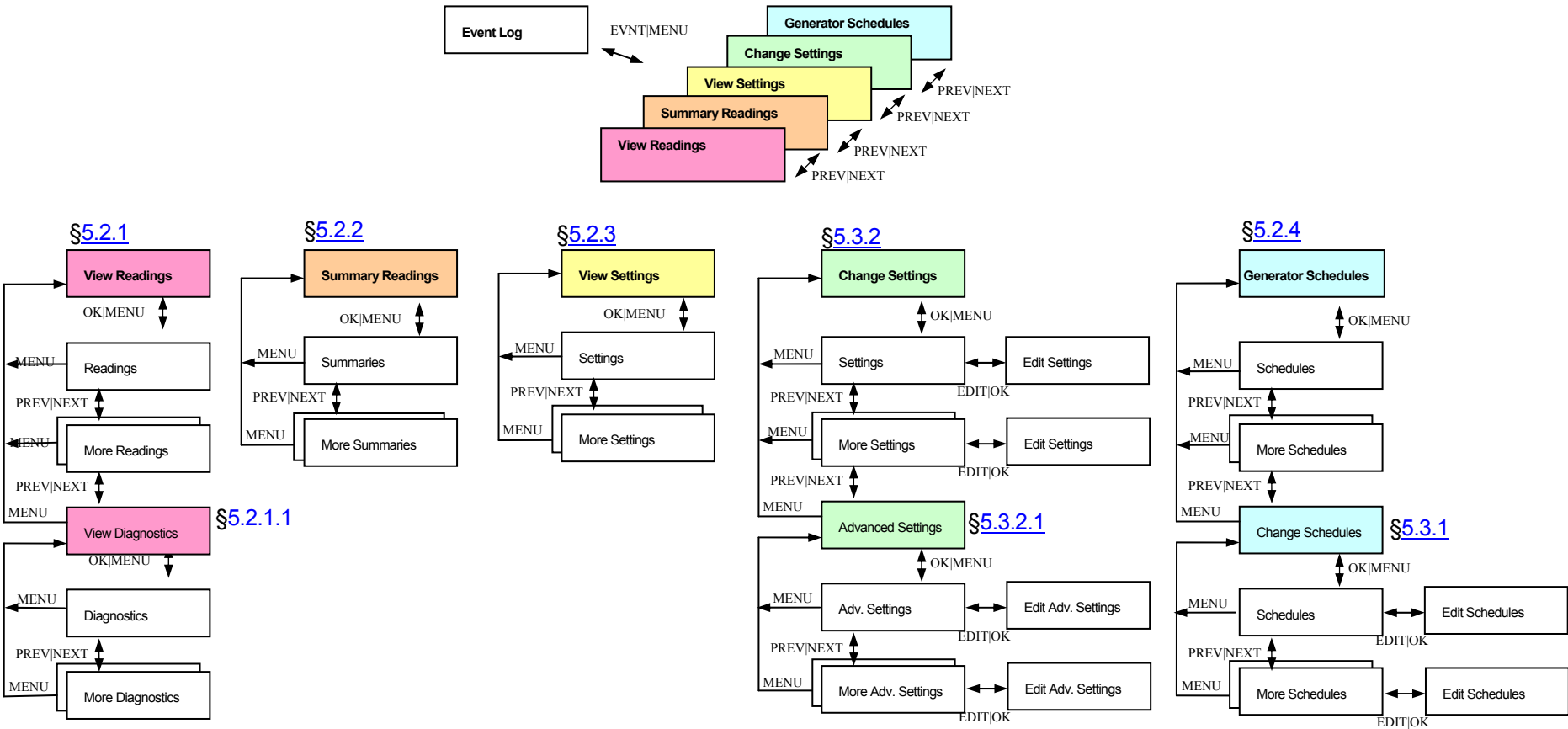
F2 Event Definitions

- 1 Generator did not start when required
- 2 Generator started but inverter could not synchronise
- 3 Illegal Scheduler state - Reset Scheduler
- 4 Illegal Generator Control state - Reset Generator Control
- 5 Illegal Inverter state - Reset inverter
- 6 Generator did not shutdown when required
- 7 Generator manually started via front panel control
- 8 Generator manually stopped via front panel control
- 9 Generator not under inverter control
- 10 Generator under inverter control
- 13 Hardware DC over current
- 14 Hardware bridge over current shutdown
- 15 Hardware DC over voltage shutdown
- 17 Control PCA initiated shutdown
- 18 Software initiated shutdown
- 19 Power PCA initiated shutdown
- 20 Sustained shutdown input
- 21 Recurring shutdown input
- 22 I2T 10 sec overload shutdown
- 23 Sustained current limit shutdown
- 25 Command port overflow
- 26 I2T 32 sec overload shutdown
- 27 AC overvoltage shutdown
- 31 Generator start on low DC volts, high load
- 34 Battery volts high shutdown
- 35 Battery volts were high now OK
- 38 Generator controller, shutdown on fault input
- 39 Generator controller, retry generator start
- 40 Generator controller, no start after 3 retries
- 41 Generator started using remote start
- 42 Generator stopped using remote start
- 43 Generator controller, no pulse signal, volts present
- 45 Generator start on low DC volts, low load
- 46 Scheduler generator start on 30 sec load
- 47 Scheduler generator start on 2 min load
- 48 Scheduler generator start on 10 min load
- 49 Scheduler generator start on 30 min load
- 50 Scheduler start on level 2 SoC
- 51 Scheduler start on level 1 SoC
- 52 Scheduler start on level 3 SoC
- 53 Low battery restart with AC volts
- 54 Generator disconnect due to reverse power
- 55 Generator disconnect due to bad ACV or Freq
- 56 Generator disconnect due to current limit
- 57 Generator disconnect due to very low AC volt
- 61 Low battery reset with renewable recovery
- 63 Fuel Low Alarm
- 64 Fuel Low Alarm reset
- 65 Fuel Empty Generator shutdown
- 66 Fuel Empty reset
- 67 System restart by internal reset
- 69 Generator started, 14 days since last run

- 70 Generator stopped during charge cycle
- 73 Generator shutdown - midnight low load
- 83 Setting store corrupt, reloaded default values
- 84 First block of setting store bad - restored from parameter ram
- 85 Second block of setting store bad - restored from parameter ram
- 86 Setting store missing or bad settings, reloaded default values
- 87 Restart after power up or micro reset
- 88 Equalise manually initiated
- 89 Equalise or Generator run manually stopped
- 90 Generator disconnect due to sustained power error
- 91 Generator supplying load, inverter inhibited
- 92 Settings loaded OK
- 93 Setting store failed
- 94 Setting edit timed out, setting unchanged
- 95 Setting modified
- 98 Equalise terminated on max time
- 99 Equalise terminated normally
- 100 Equalise charge started
- 101 Equalise automatically initiated
- 103 Initial charge started
- 104 Over temperature shutdown
- 106 Permanent data erased
- 109 State of charge shutdown
- 110 Low battery voltage shutdown
- 111 Self test completed OK
- 112 Renewable battery float achieved, equalisation deferred one day
- 118 Generator start from OK pushbutton
- 119 Generator stop from OK pushbutton
- 120 Time of day changed
- 122 Data logging restarted
- 123 Remote start Generator command
- 124 Remote stop Generator command
- 125 Remote initiate Equalise command
- 126 Remote finish Equalise command
- 134 Generator start, high temp
- 135 Generator start, overload shutdown
- 138 Shutdown repetitive minor events
- 139 Non urgent alarm asserted
- 144 Generator shutdown due to frequency shift
- 146 Normal generator shutdown
- 151 Abnormal charge end, excess Ahr
- 152 Normal charge end
- 154 Abnormal Equalise end, excess Ahr
- 155 Abnormal charge end, reverse Generator power
- 174 Run time completed in non-preferred period
- 175 Generator run request after overload shutdown
- 176 Emergency reset & Generator run, battery very low
- 180 Skipped midnight shutdown, load high
- 181 Skipped midnight shutdown, equalise in progress
- 195 DC Circuit Breaker open, inverter shutdown
- 197 Scheduled generator start
- 200 Inverter fault shutdown - 15V supply fail
- 201 Power board MOSFET control shutdown
- 202 CB open shutdown - current sustained after disable

- 203 Heatsink temperature high shutdown
- 204 TX temperature high shutdown
- 206 Generator contactor fault
- 207 Processor turning power off
- 210 Overcharge adjusted
- 211 Undercharge adjusted
- 215 Battery temperature sensor FAILED
- 216 Battery temperature sensor OK
- 220 Scheduled Generator stop
- 221 Backup Generator start
- 222 Backup Generator stop
- 223 Self test fail
- 226 Generator request ignored - Generator not in auto
- 227 Setting store - detected write failure
- 228 Setting store - cleared write failure
- 229 Inverter out of service
- 230 Bulk charge started
- 231 Absorb charge started
- 232 Absorb charge complete
- 233 Charge stage timeout
- 234 Equalise state aborted
- 240 Manual mode Inverter auto disconnect from Generator
- 241 Over temperature Generator Start

Appendix G Menu Navigation



Appendix H Revisions and Changes

H1 Revisions to this Document

<i>Revision</i>	<i>Date</i>	<i>Description</i>
01	31 Mar 2005	Initial release
02	31 May 2005	Updated specification, manual equalise.

H2 Software Version Applicability

This manual is applicable to the following software versions:

<i>Versions</i>	<i>Description</i>
2.AD, 2.BD, 2.CD, 2.DD	Initial release

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Important: Warranty Registration

Selectronic Australia considers the reliability of your power system as one of our primary objectives. Registering your warranty NOW will allow any service related issues to be addressed in the most efficient manner. Registration now, will allow us to provide you with the very best after sales service and we can keep you and your dealer informed of any applicable product updates. It is a requirement that you register your warranty. We also invite you to provide us with a little information so that we can constantly monitor and improve our products and services.

The information you provide us will not be used for any purpose other than outlined above, our database of information will in no way be copied, distributed or sold.

Unit Purchased:	PS1	5/24	6/48	10/48	12/120 (please circle one)	Serial No:	
Name:							
Address:							
Town:				State/Territory		Postcode	
Phone:				Fax			
Mobile:				Email			

Warranty Period or Extension

Your PS1 is warranted for 12 months. Installations performed by a Selectronic accredited installer will receive an additional 12 months warranty and the option to purchase an extended warranty. See table below for prices, prices include GST. Extended warranty option is restricted to Australian installations only.

As electricity is an essential service, we urge you to discuss a regular maintenance plan with your installer or Selectronic.

Available when installed by a Selectronic Accredited Installer	PS1 5/24	PS1 6/48	PS1 10/48	PS1 12/120
Additional 1 year (3 yrs total)	\$225	\$275	\$425	\$625
Additional 2 years (4 yrs total)	\$540	\$660	\$1020	\$1500
Additional 3 years (5 yrs total)	\$990	\$1200	\$1870	\$2750

You must register your warranty within 30 days of installation; you can only purchase an extended warranty at time of registration. Please send your payment for warranty extension when registering your warranty. Visa, MasterCard or Bankcard can be accepted, call us on toll free 1800-006-474 to provide us with your details.

To be completed by Installer	Installed By:		Installation Date:	
Battery size & type:				
Solar Array size:		Is a MPPT being used:		
Generator size & type and governor type if known:				
Is a modem installed:		Modem Phone No:		
This installation has been carried out in accordance with the manufacturer's recommendations.	Installers Signature:			
Selectronic Accreditation No:				

Please post or fax this document directly to Selectronic within 30 days of installation