



BUNYA SOLAR

RENEWABLE ENERGY SYSTEMS

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Remote area power supply system manual

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Introduction.

Welcome to the operation manual for your solar power system.

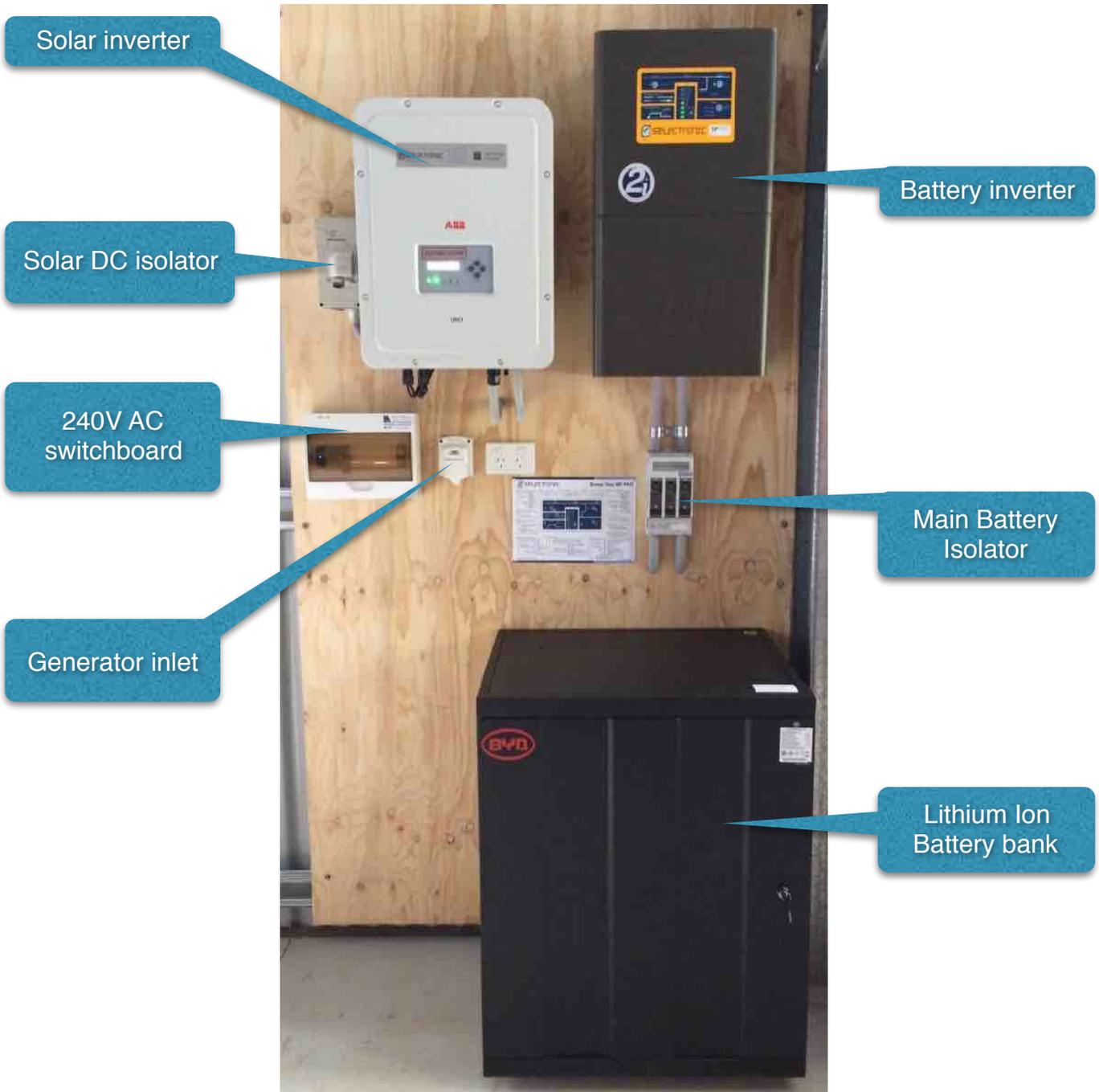
Your system has been designed to supply a certain amount of electricity. If it is run with this in mind it will give many years of trouble free power. If you're not sure how much power you can draw from your system ask your installer for the details. A power system that is over taxed will inevitably develop issues and be a disappointment so it's worth avoiding this outcome.

If you have the time it's well worth giving the equipment manuals a quick run through. Most issues can be dealt with easily with the information they contain. If you don't have the correct manuals for your gear contact your installer and ask for copies. Alternatively just about all the manuals are available online from the manufacturers.

To keep your batteries in good condition they should be charged to 100% at least once per week. The Selectronic battery inverter display can be used to check if your batteries are full. At 100% all the battery lights will be lit and the "Float" light will be on. It's best to check this mid afternoon after a sunny day. If you experience a cloudy week you may have to use the generator to achieve 100% full batteries.

The battery display shows the usable power that you can draw from the batteries. As more power is used the display lights progressively go out. Once all the lights are out the power will cut off to protect the batteries from excessive discharge that will shorten their life. See the trouble shooting section of this manual if power is lost. If you are experiencing power loss due to low batteries more than 4 times per year you need to speak to your installer to sort out this issue before battery damage occurs.

Key components of your system.



Battery Maintenance.

Always remember that a battery is a form of energy storage which, under fault conditions, can release its energy instantaneously, with explosive consequences. The battery bank should only be accessible to people that understand its functioning and are responsible for its maintenance. There should be restricted access for other people, especially children. As far as possible, the area should be animal and vermin proof. Restricting access to the batteries will be the first and best safety measure.

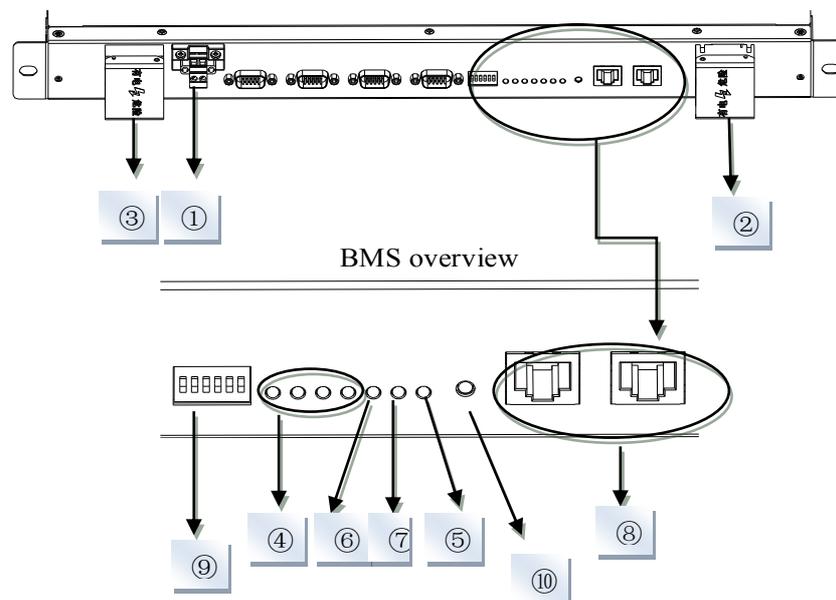
Every 3 months:

As part of regular maintenance, a thorough visual inspection of the battery bank is required. This inspection should include:

- Cleanliness of batteries
- Battery displays
- Condition of battery terminals
- Signs of any electrolyte spillage indicating a possible battery leak
- Condition of battery containers

Lithium batteries are almost maintenance free. The BYD lithium batteries have a small group of display lights that give an indication of SOC (State of Charge) and various other functions.

It's worth checking this display every three months to make sure all is well with the cells.



Display and communicate interface

No.	Interface	Mark	Function
①	B+	B+	Connects battery positive cable to power the BMS
②	B-	B-	Positive terminal of BMS
③	P-	P-	Negative terminal of BMS
④	SOC LED	SOC	Indicates state of capacity of battery
⑤	RUN LED	RUN	Indicates the Plus is running status
⑥	ERR LED	ERR ADDR	Indicates error status
⑦	Alarm LED	Alarm	Indicates alarm status
⑧	RJ45 terminal	RS485	Communication ports
⑨	Address	ADDR	When parallel connection, address needs setting.
⑩	Reset (ON/OFF)	Reset (ON/OFF)	Activating battery when no external power add on battery.

Solar module maintenance.

The solar array (a number of solar modules mounted together) is quite often referred to as being maintenance free. This can be the case in many situations, however, with occasional maintenance and inspection, the performance of all the solar modules in the array can be assured.

The most common maintenance task for solar modules is the cleaning of the glass area to remove excessive dirt.



In most situations cleaning is only necessary during long dry periods when there is no rain to provide natural cleaning. To remove a layer of dust and dirt from the modules, simply wash the module with water and a soft brush. If the module has thick dirt or grime, which is harder to remove, wash with warm water and a sponge. Washing the modules is similar to washing glass windows but detergents should not be used. The modules should be cleaned when they are not excessively hot, typically early in the morning or late in the afternoon

After the modules have been cleaned, a visual inspection of the modules can be done to check for defects such as cracks and chips. If any obvious defects are found, note their location so these can be monitored in future in case further deterioration affects the modules output. When inspecting the solar modules, the condition of the array mounting frame should also be noted. Items to observe should include the array mounting bolts and checks to ensure that the frame and modules are firmly secured. Remember to call your installer if you are not totally confident about climbing onto and around your roof.

Inverter and regulator maintenance.

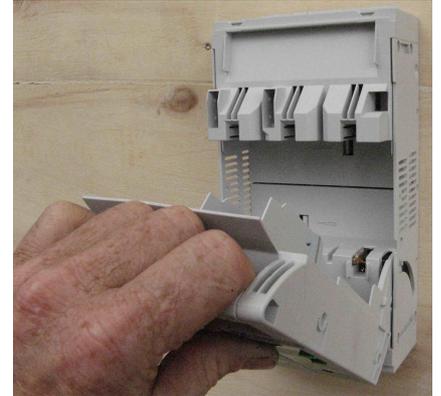
Inverters, solar regulator, battery chargers etc.

In general, these devices require no maintenance other than stopping insects and creatures from building nests in or on them. The warmth generated by these items makes them attractive to horrible rodents. Animal and insect wastes can seriously corrode sensitive electronics. Mud wasp nests in heat fins will reduce their efficiency possibly leading to overheated inverters etc. If creatures do move in the system should be shut down and the offenders evicted as soon as possible. Precautions should be taken to avoid them taking up residence again, i.e. fly screens over openings.

If you have suffered a close lightning strike it may be necessary to check system settings as these can be changed or lost after such events. If you notice any odd behaviour after lightning surges it's best to get in contact with your installer to run through any settings that may need checking.

Main battery isolator.

The Main Battery Isolator is a fuse and switch in one device. It is operated by grasping the handle and pulling out. This opens the Isolator and disconnects the main current path from the batteries to the system. This isolator should only be opened if an entire system shut down is performed.



There will be three fuses inside the Isolator. One for the positive battery connection, one for the negative battery connection and a spare middle fuse. These fuses can be blown by over current. When they blow a small spring will pop up on the end of the fuse.



This small spring pops up

The fuses are removed from the Isolator by sliding them up and then out. It is important to know what fault caused the fuse to blow before replacing it with another of the same value.

Possible reasons for main fuses blowing are;

- Lightning strike nearby
- Too much power being drawn from inverter
- Faulty inverter or other equipment

Standard shut down procedure

The power system can be safely shut down by the following procedure.

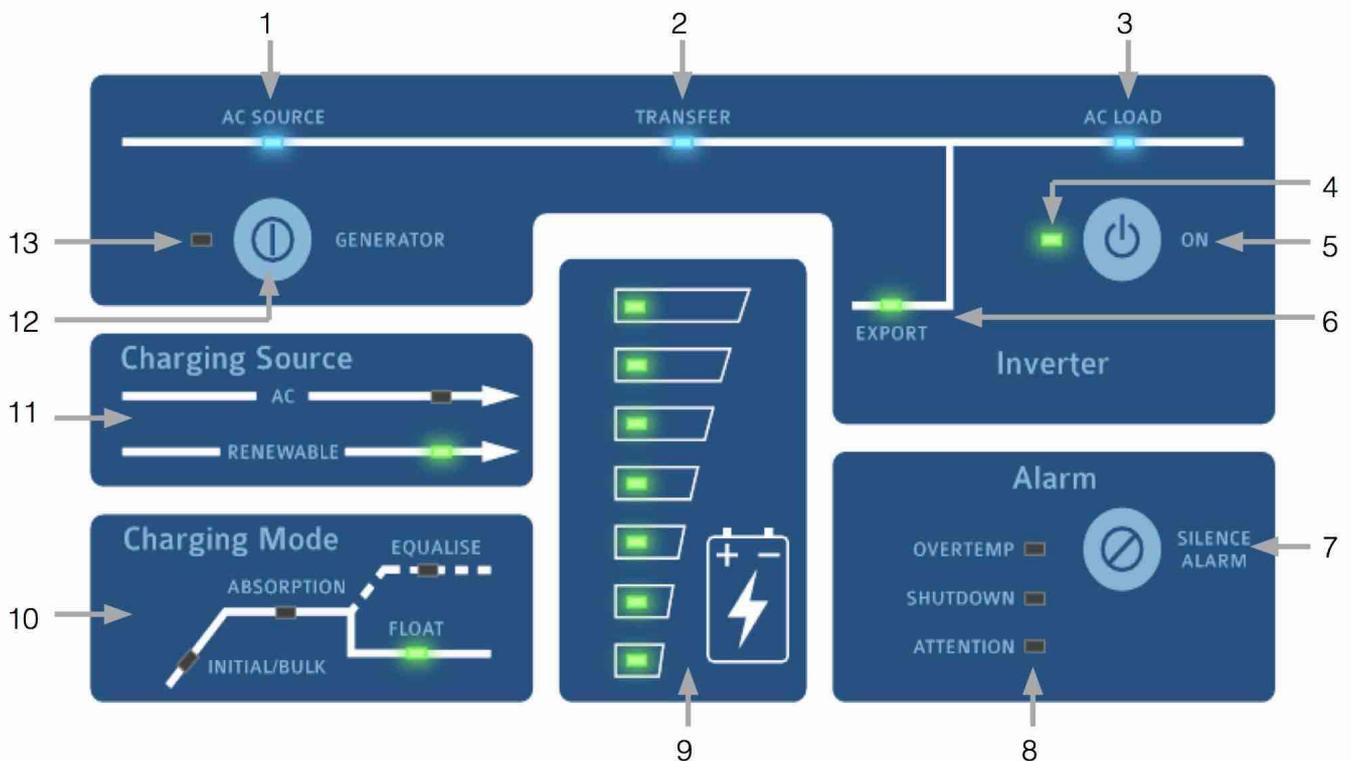
1. Ensure that all sensitive equipment powered by the system is turned off.
2. If you have an auto start generator switch it to manual / off mode.
3. Move all 240V AC breakers to the off / down position.
4. Turn off the Solar DC isolator located next to the ABB solar inverter.
5. Turn off the Selectronic battery inverter by pressing the “On” button for one second.
6. Open the battery enclosure and use a small pointed device to hold in the On/Off or Reset button on the battery management unit until the display lights turn off.
7. Pull the handle on the Main Battery Isolator located below the Inverter. This action requires a fair degree of force. The handle pulls out and then down. The mechanism is hinged on its lower edge and can be removed if needed.

The power system is now entirely shut down. While the batteries and solar panels are still sources of energy, they are no longer connected to the system.

Standard start up procedure

The system can be safely powered up by the following procedure.

1. Ensure that all sensitive equipment powered by the system is turned off.
2. Ensure that all AC and DC breakers are off.
3. Ensure that the solar DC isolator is off.
4. Open the battery enclosure/s and ensure that there are no lit displays on any of the battery cells. If there are follow the shutdown procedure to turn them off.
5. Close the handle on the Main Battery Isolator located below the battery inverter. This action requires a fair degree of force. The mechanism is hinged on its lower edge. The handle pushes back into the receiving cradle.
6. Use a small pointed device to hold in the On/Off or Reset button on the battery management unit until the display lights turn on. After a short while any other connected cells will also come to life when they detect that one cell has been turned on.
7. The Selectronic battery inverter should run through a power up check by lighting all the front panels displays one after another.
8. If the blue indicator on the top right of the Selectronic inverter does not light up after one minute it can be activated by pressing the "On" button on the front panel for one second. (button 5)
9. Move all 240V AC breakers to the on / up position.
10. Turn on the Solar DC isolator next to the ABB solar inverter.
11. Reset any shut down generators, return to "Auto" mode etc.
12. Reset any appliances turned off before Start Up.



Battery Inverter display.

Trouble shooting - no power.

It is important to NOT use the Main Battery Isolator as a means of resetting the system if the power goes off. Opening the isolator will reset the battery inverter making it forget what the battery state of charge is and where it is in the charge cycle. Damage to batteries may result.

Please refer to the following if you encounter problems with your power system.

No Power. Check the following

- Check that the Selectronic battery inverter is still producing power. Look for the blue “AC Load” light on the front of the inverter, top right. If this light is on then the inverter is producing mains power. Check all 240V AC switchboards for tripped breakers. There may be multiple switchboards in your system, i.e. one near the inverter and one in the house.
- If the blue “AC Loads” light is off then the inverter is not producing mains power. Check the battery level indicator in the centre of the display. If only the bottom light is on and it is red the inverter will have turned off due to low battery charge. There will also be a “Shutdown” light in the Alarm section of the display. You must now ensure that mains or generator power is connected to the system to start battery recharging. There is no other option here. Once the inverter has turned off solar charging may also have been disabled so don't leave it and hope that the sun will recharge the system as it may not. Mains or generator power must be used to restart the inverter. This feature helps protect your valuable battery bank from being damaged due to over discharge. Once the mains power has been connected for a few minutes a green “AC” light should come on under the “Charging Source” display to indicate that the generator is now charging the batteries. Mains power should also be fed through to the house.
- If the blue “AC Loads” light is off and the battery display shows green lights check the light next to the “On” button. If it's flashing yellow then you should be able to restart the inverter by pressing the “On” button for one second. Shortly after this you should hear a clunk as the internal contactor connects the inverter. If the inverter turns off immediately there may be an excessive load connected to the power system somewhere that causes the inverter to shut down due to overload. If the “On” light stays constant green then power should now be available.

Trouble shooting - Battery charging.

- The “Charging Source” section of the battery inverter display shows where battery charging is coming from. “AC” indicates that generator or mains power is charging the batteries. “Renewable” indicates that your solar system is charging the batteries.
- These two lights only come on when actual battery charging is taking place. There will be times when charging sources are operating but the household loads consume all the available power so no battery charging takes place, i.e. the solar is producing 2000 Watts but there is a 2400W kettle running in the house. The inverter will pass 2000W from the solar straight through to the kettle and take the extra 400W from the batteries so no actual charging is taking place. The same thing can happen with generator or mains power. If the mains power is not sufficient to run the loads then the extra power will come from the batteries so no charging.

Trouble shooting - Solar charging. AC coupled solar.

- Your solar panels charge the batteries through the ABB solar inverter. The ABB inverter converts solar power to normal mains power and feeds it straight into your house wiring. Appliances in your house will run from this power first. Any excess power will be used to charge your batteries back through the Selectronic battery inverter. If you are not seeing a green “Renewable” light under the Charging Source section on the inverter display then no solar charging of the batteries is taking place. As mentioned above this may be because your appliances are using all of the available solar power first. If you believe that there should be enough solar power to run the house and charge the batteries and no green “Renewable” light is on check the following.
- Is it day time with sun on the panels?
- Is there a display or indicator light on the solar inverter? If not the Solar DC Isolator may have been turned off. The “Solar DC Isolator” is located near the solar inverter. Make sure this is on. These isolators are switches - not breakers - so they will only be disconnected if someone has physically turned them off. There is another isolator on the roof as part of the solar array.
- Also check the Solar AC breakers as these may have been tripped. The Solar AC breaker is located in the 240V AC switch board. If your solar inverter is mounted away from your battery system then there may be two solar AC breakers, one at the inverter end and one at the battery end.
- Once the solar inverter is up and running again it may take a few minutes to communicate with the Selectronic battery inverter before it starts to produce power.
- If all of the above measures do not get the solar charging working again call your installer and ask for further advice.

Trouble shooting - Entire system shut down.

- If you find that the entire system has shut down there are a few things to check before calling your installer.
- A system shut down means that there are no lights or power indicators on any equipment - no displays are working.
- Follow the Standard Shut Down Procedure as outlined on a previous page.
- Once the Main Battery Isolator has been opened check the large battery fuses as shown on a previous page . If you find that one of the fuses is blown you need to work out why it blew and make a decision as to whether or not to replace it with the spare centre fuse. These are serious fuses and they only blow if there's been a considerable fault. If in doubt call your installer and discuss the situation.
- If the fuse does get replaced follow the Standard Start Up Procedure as outlined on a previous page.
- If you cannot get the system powered up again you can get generator or mains power through to the house by turning on the Main Switch in the 240V AC switchboard. Then start the generator. Call your installer now.
- Under **no** circumstances should the inverter be reset by holding down the buttons on the front panel. This action will load the default settings into the inverter and it will not work again until it is reprogrammed by the installer.

Generator operation - manual start.

1. In this situation the generator must be started and stopped manually by the user as needed. The red light above the shed door will show when to start and stop the generator. The light turns on when the battery state of charge (SOC) falls to 20%. The system will shut down to protect the batteries when the SOC falls to 15%.
2. Plug the generator into the generator inlet with a 15A lead. Caravan lead etc.
3. Ensure that the generator breaker is in the off / down position in the 240V AC switchboard.
4. Start the generator and let it warm up for 1 minute.
5. Switch the generator AC breaker to the on / up position
6. You should see the blue "AC source" light come on on the Selectronic battery inverter display. If you do not see this light make sure that any breakers or switches associated with the generator have not tripped or been turned off.
7. After approximately 1 - 2 minutes the blue "Transfer" light will come on to indicate that generator power has been sent through to the house. Battery charging will also start shortly after this. If this light does not turn on after 4 minutes the power coming from the generator is not within tolerance and has been rejected by the inverter. Call your installer.
8. If the generator stays running and all seems fine the system can be left to charge the batteries and run the house. Consider turning the generator off when the red light above the shed door turns off. The batteries will be back up to 70% state of charge at this point.
9. If the generator surges and the inverter makes clunking noises the power coming from the generator is not suitable for use in this system. The inverter needs to know the size of the generator so as not to overload it. This size setting is entered when the inverter is first installed. It can be changed at any time by calling your installer. This setting may not suit the generator presently plugged into the system and the inverter may be overloading it. Turn the generator off and call your installer if this happens.
10. To stop the generator. Switch the generator AC breaker to the off / down position.
11. Turn the generator motor off.

If you'd like more system information.

The Selectronic battery inverter is the heart of your system and keeps comprehensive records of system performance and current operating data. There are a number of options if you'd like access to this data.

- Connect a windows style laptop or computer to the inverter. Selectronic provide free software to allow windows computers to access the inverter information. Once you have this software installed on your laptop you can plug it into the inverter using the supplied USB cable. You may need your installer to show you how to do this for the first time.
- Internet based system monitoring. An add on device is available from Selectronic to connect your system to the internet to allow you to access the information from any web browser.
- There are a few other options available that are site specific. If you'd like this feature give your installer a call.