



**AUSTRALIAN OWNERS MANUAL**





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## 1. INTRODUCTION

Congratulations on choosing BP Solar and thank you for doing your part for the environment. This will save significant CO<sub>2</sub> emissions over its service life. We are sure you'll enjoy your new Solar Energizer System, which has been designed with your comfort and safety in mind.

System	Energizer 500	Energizer 1000	Energizer 1500
Approximate kilograms of CO <sub>2</sub> savings. (over operating life of 25 years)	14,700kg	34,325kg	49,025kg
Approximate reduction in power bill p.a. (Typical energy efficient home consuming 7kWh/day)	23%	54%	77%

Based on insolation data for Sydney.

Your kit has been carefully designed and engineered to meet your requirements as follows;

- Designed for Australia conditions.
- Designed to Australian codes. (e.g. wind, electrical, installation)
- Flexibility (500, 1000 and 1500 models) to suit your roof size or your budget.
- Adds value to your home – an investment.
- Power security for 20 years +.
- Non- cyclone and cyclone rated. (corrugated metal roof only in cyclonic)
- Easily installed to suit tile or corrugated metal roofs.
- Ultra low maintenance.
- Full warranty.
- Designed and engineered by BP Solar, one of the largest solar companies in the world.

The objective of this Owners Manual is to provide the Owner-Operator of the Solar Energizer power system the information needed for a long system life with high Owner satisfaction and high safety standards.

## 2. HOW TO USE THIS OWNERS MANUAL

Your system is already up and running, generating electricity from the sun, however there are a few things that you should do right away:

1. **Familiarize yourself with the Operating Safety Instructions on page 5.** You will want to review these any time you plan to interact with your Solar Energizer system.
2. **Fill in Important Numbers Installer & Distributor Name and numbers on the next page while the information is easily accessible.** If you are not sure of any of these numbers please ask your BP Solar Installer who installed your system to help you fill this page out. Filling in the Important Numbers will provide you with a quick reference if at a later date you have questions or maintenance needs.

Your Owners Manual contains additional information for you to read at your convenience or on an as needed basis. The Operating Instructions section includes an explanation of the minimal maintenance that your system should require, and a troubleshooting guide for you to follow if you



experience any difficulties with your system. The System Description section includes information to help you better understand your system and how it operates.

Finally, we have included information for technicians and some reference documents that you should keep in order to be able to provide these to BP Solar qualified personnel in case any repairs or maintenance is required on your system.

### 3. IMPORTANT NUMBERS

For your future quick reference we ask that you take a moment and enter the following information. If you are not sure please ask your Installer to do this for you.

Installer Name: \_\_\_\_\_

Installer Phone: \_\_\_\_\_

Distributor Name: \_\_\_\_\_

Distributor Phone: \_\_\_\_\_

Invoice Number\*: \_\_\_\_\_

BP Solar contact 1800 802 762

\* Please be certain to retain your original Invoice.

If you have a question about or problem with your system please call your Installer, the person who installed your system. If for any reason you are having trouble getting answers or service from your installer, please call the Distributor nearest you. BP Solar stands behind our distributors and wants to know that you are getting the quality service that you need.

### 4. YOUR WARRANTY

#### **Product Warranty**

BP Solar provides our standard component warranty on solar panels and the inverter (enclosed with solar panels and inverter).

#### **System Warranty**

BP Solar or its authorized Distributor may offer an optional system warranty. See at the end of this manual for details, if offered.

## 5. OPERATING SAFETY INSTRUCTIONS

BP Solar practices and recommends an ethic of high standards regarding Health, Safety and Environment.

- Solar Energizer power systems are designed to meet applicable standards and codes in the regions they are marketed. It is recommended that experienced and certified contractors be employed to service them.
- All service work must be done in strict accordance with local and national electric codes, and any other pertinent safety standards.
- Review and follow all safety instructions and all other instructions supplied with all the materials and components provided with the Solar Energizer power system before any service work begins.
- Avoid service activity in wet or damp conditions.
- Do not attempt to service the power system unless you are **fully qualified** to do so, and have prepared the site properly.
- Safety notes are used throughout this manual and the other related component manuals.



- **WARNING:** A dangerous voltage or condition exists in this area. Use extreme caution when performing these tasks.



- **CAUTION:** This procedure is critical to the safe installation or operation of the application. Follow these instructions closely.



- **NOTE:** This statement is important. Follow instructions closely.

- Remove all jewellery such as rings, bracelets, necklaces, etc. prior to servicing the power system. This will reduce the risk of accidental shock hazards.
- Power may be present at any point in some circuits even though one circuit breaker has been opened.
- PV solar module generate electricity when exposed to light, they should be covered with an opaque material prior to servicing them.
- Take appropriate precaution when working at elevated levels. Local safety regulations may be very specific in this area.
- Do not substitute materials supplied with the Solar Energizer power system.
- **Disclaimer of Liability:** Because the use of this Manual and the conditions or methods of installation, operation, use and maintenance of the power system are beyond the control of BP Solar, BP Solar does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of or in any way connected with the installation, use, or maintenance of the power system.

## 6. SYSTEM DESCRIPTION

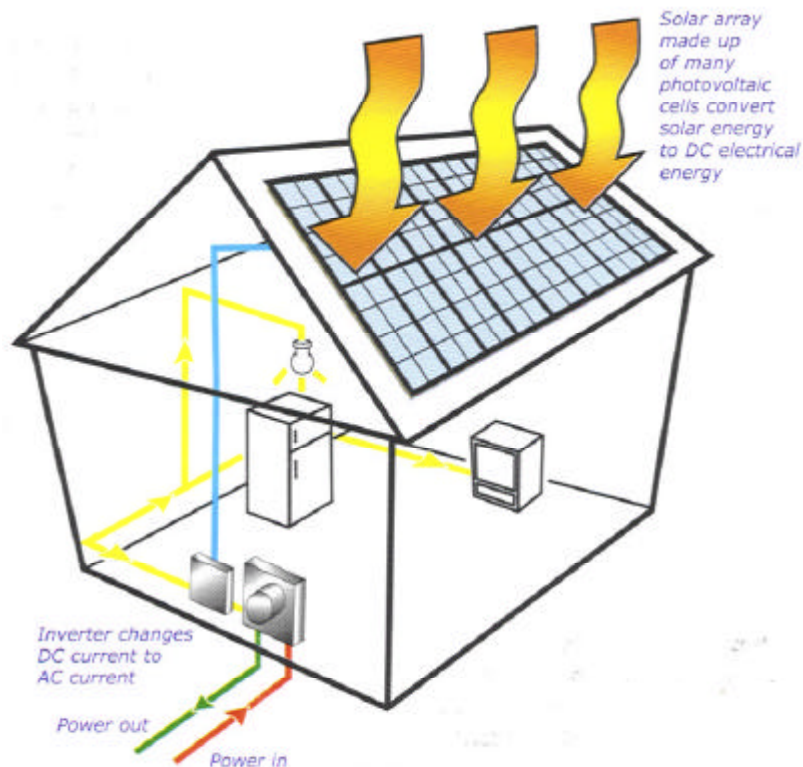
The Solar Energizer power system described here is designed for automatic, unattended operation. Maintenance of the system is very low, and normal operations require no special activities.

### 6.1 SYSTEM ELEMENTS AND NORMAL OPERATION

The major elements included in the solar power system are shown below, and include:

- Roof mounted solar array.
- DC wiring system from the solar array to the inverter location.
- Inverter with any locally necessary, additional, disconnect equipment.
- AC wiring system from the inverter to the residential power center.
- Optional meters or other monitoring and control devices.

The solar array converts sunlight into direct current (DC) electricity. The DC wiring system conducts that electricity to the inverter. The inverter converts the DC electricity into AC electricity compatible with the power utility. The AC wiring system conducts that electricity to the residential switch / meter box. The Power Utility connection is then at the residential switch / meter box.





Optional metering and monitoring accessories are available for the Solar Energizer system. Some power utility companies may require additional equipment that is compatible with the solar power system.

The solar power system generates electricity in proportion to the amount of sunlight on the solar array, generating no electricity at night. The peak generation of power is on a clear day when the sun is at a normal angle to the solar array. Clouds, seasonal variation of solar angle, array soiling, off-azimuth orientation, and any incidental shading decrease that performance.

The net annual expected electricity generation considering all those factors is understood and calculable. The following table is an estimation of annual expected generation of the following Australian capital cities.

Location	Estimate average power production from the					
	Energizer 500 kWh per		Energizer 1000 kWh per		Energizer 1500 kWh per	
	year	day	year	day	year	day
Sydney	588	1.61	1373	3.76	1961	5.37
Melbourne	535	1.46	1247	3.42	1782	4.88
Brisbane	639	1.75	1492	4.09	2131	5.84
Adelaide	647	1.77	1509	4.13	2156	5.91
Perth	667	1.83	1557	4.27	2225	6.10
Darwin	706	1.93	1648	4.52	2354	6.45
Canberra	656	1.80	1531	4.19	2178	5.97

## 6.2 SYSTEM PERFORMANCE AND ENERGY MANAGEMENT

Your energy usage may not follow the increases and decreases in output from the Solar Energizer power system, and it doesn't have to. Your Solar Energizer power system is connected to the utility grid. When the Solar Energizer power system is generating more power than you need, the excess energy is sold back to the utility. When the Solar Energizer power system is not generating enough to meet your energy requirements, the utility provides the difference. In this way, the utility acts like a storage medium, accepting excess production and providing for any shortfalls.

A common practice among utilities is to allow energy generated by small solar systems to spin the revenue meter backward when excess solar generation is sent to the utility. This "net-metering" arrangement allows all of the solar generation to fully offset the energy cost that the utility would have charged had the solar system not been there. This means that the energy you generate is given the same value as the energy provided by the utility (as long as the amount of energy you generate over a billing period is less than or equal to the amount you use during that period).

If on average, a 1kWp system can generate about 3.5 kWh/day, with lower production in the winter months and higher production in the summer months and for the average family in an energy efficient house of 4 consuming 213 kWh of energy per month, the system can be expected to provide about 50% of the energy needs or about 106 kWh/month. The money that your Solar Energizer power system saves you each month depends on the amount of electricity the system generates and the cost of electricity in your area. Your BP Solar Installer can provide you with further details about your local rules for net metering.



The solar power system generates electricity in proportion to the amount of sunlight on the solar array, generating no electricity at night. The peak generation of power is on a clear day when the sun is at a normal angle to the solar array. Clouds, seasonal variation of solar angle, array soiling, and any incidental shading decrease that performance. Your BP Solar Installer can provide you with a more detailed projection of annual energy production, considering your location, rooftop orientation, and amount of solar shading.

### **6.3 ENERGY CONSERVATION AND THE ENVIRONMENT**

Your Solar Energizer power system represents a significant investment in your energy future and the environment. Unlike conventional sources of electricity that are a major cause of problems like smog, acid rain, and global warming, a Solar Energizer power system produces no air or water pollution while it is generating electricity.

A Solar Energizer 1000 power system will prevent about 25 tons of carbon dioxide (global warming) emissions over its life. That is equivalent to planting an acre of trees or taking a car off the road. The actual amount depends on where you live

A Solar Energizer power system will provide partial energy independence with some protection from raising costs of electricity. While adding additional capacity to a Solar Energizer power system can further decrease your dependence on the utility company, a more cost effective means is to first implement energy conservation.

Modern homes built with energy efficient building techniques, materials, and appliances have achieved electricity demands as low as 200-300 kWh/month, without any changes in life-style, comfort, or cost. Substantial reductions in electricity demand can be made for existing homes. Refrigerators built to post 1993 energy efficiency standards can operate on as little as 500-600 kWh/year. If your refrigerator is old, you should seriously consider investing in a new one. Contact your local utility to check on programs for subsidizing the cost of purchasing a new energy efficient refrigerator.

Replacing high use light bulbs with high frequency compact fluorescent bulbs is another way to conserve. The high frequency bulbs come very close to incandescent bulbs in quality of light. The compact fluorescent bulbs are significantly more expensive, but they use about one third the amount of energy for the same level of lighting, resulting in a reduced life cycle cost. Compact fluorescent bulbs should be used for lights used at least 3 hours or more per day. Replacing a 100 Watt incandescent bulb used 4 hours/day with a compact fluorescent of equal intensity is equivalent to adding about 65 watt of solar capacity.

Replacing high wattage bulbs with lower wattage bulbs is another good way to conserve energy. If the room normally feels brighter than needed, reduce the wattage of the light bulbs. Replacing a single 100-watt light bulb used about 4 hours/day with a 60-watt bulb is equivalent to adding about 40 watts of solar capacity.

## 7. OPERATING INSTRUCTIONS

The BP Solar power system is designed for automatic, unattended operation. The technology is simple, has no moving parts and requires no user intervention.

### 7.1 INVERTER STATUS GUIDE

When inspecting the inverter, the front panel should be examined and the LED situation should be noted down and interpreted as follows:

LED status

- LED ON                      ○ LED OFF                      \* LED flashing

LED colour and operational meaning

GREEN Diode = Operating Indicator  
RED Diode = Ground Failure Indicator  
YELLOW Diode = Fault Indicator

Refer to the inverter manual for further detailed information.

#### 7.1.1 Normal operation

**Night operation**

The inverter is automatically disconnected during the night or when the DC voltage is less than ~ 50V

Indications	Description	Action
○ GREEN ○ RED ○ YELLOW	All LEDs are OFF.	Wait until the sunlight is stronger before continuing.

**Transition state**

In this state the solar power is sufficient to provide power to the inverters internal circuits, but it is not sufficient to supply the mains. This is likely to occur at dusk & dawn (sunrise & sunset).

Indications	Description	Action
● GREEN ● RED ● YELLOW	All the LEDs are ON.	Wait until the sunlight is stronger before continuing.

Following on from the above state the inverter LED's will change to indicate that it is either waiting for the solar power to be sufficient to supply mains when communication with the inverter is possible, or the inverter has been manually stopped.

Indications	Description	Action
* GREEN ○ RED ○ YELLOW	The upper LED (green) is flashing. The middle LED (red) is OFF The lower LED (yellow) is OFF	Wait until the sunlight is stronger before continuing, or return inverter to operation.

**Daytime operation**

Inverter is supplying the mains.

Indications	Description	Action
<ul style="list-style-type: none"> <li>● GREEN</li> <li>○ RED</li> <li>○ YELLOW</li> </ul>	The upper LED (green) is ON. The middle LED (red) is OFF The lower LED (yellow) is OFF	Inverter is "OK" and outputting.

**7.1.2 Failure**

If any of the following failures occur, note the status of the inverter and contact a licensed electrical contractor or BP Solar.

**Mains supply failure**

The inverter is automatically disabled under the following conditions:

- A) if there is no mains supply voltage,
- B) the mains supply impedance is too high (if this test function is activated) or,
- C) the inverter has been isolated from the mains.

When the mains supply is re-established, the inverter is automatically re-enabled. If this is not the case, then fault finding will need to be carried out.

Indications	Description	Action
<ul style="list-style-type: none"> <li>○ GREEN</li> <li>○ RED</li> <li>* YELLOW</li> </ul>	The upper LED (green) is OFF. The middle LED (red) is OFF The lower LED (yellow) is flashing. This LED will flash from 2 to 3 times after 5 seconds, will remain off for some 3 seconds and will then flash again.	Wait for the mains supply to be re-established and check that the inverter returns to the normal operating condition. This will take about 1 minute from mains reconnection. Interrogate the inverters via the SBC or SDC to confirm.

**Inverter failure**

The inverter is suffering from a non-specific failure that is preventing normal operation

Indications	Description	Action
<ul style="list-style-type: none"> <li>○ GREEN</li> <li>○ RED</li> <li>* YELLOW</li> </ul>	The upper LED (green) is OFF. The middle LED (red) is OFF The lower LED (yellow) is flashing. This LED will flash 5 times after 5 seconds, will remain off for some 3 seconds and will then flash again.	Call the telephone number that is given in the basic maintenance guide. Interrogate the inverters via the SBC or SDC to confirm the warning or error message.

**Insulation failure**

There is an insulation failure in the solar power DC wiring connection, or at least one of the varistor / thermal breaker combinations on the dc side has excessive resistance (is defective).

Indications	Description	Action
<ul style="list-style-type: none"> <li>○ GREEN</li> <li>● RED</li> <li>○ YELLOW</li> </ul>	The upper LED (green) is OFF. The middle LED (red) is ON. The lower LED (yellow) is OFF	Determine if it is an earth fault or defective varistor. If the problem is an earth fault, isolate the fault & repair or replace.



## 7.2 MAINTENANCE

The Solar Energizer power system is characterized as “ultra low maintenance” partly due to having no moving parts. The regular maintenance is essentially inspection for damage with some simple cleaning activity.

If after following the suggestions below your system still does not appear to be working or if you have any questions please call your BP Solar Installer, the person who installed your system. You should have their number listed on page 4 of this manual (Important Numbers). If for any reason you are having trouble getting answers or service from your installer please call the BP Solar distributor nearest you.

## 7.3 SOLAR ARRAY

Periodically inspect for broken module glass, shading, and excessive soiling.



**WARNING: Do not attempt to clean or otherwise come in contact with the surface of a solar module with a broken glass face; this could result in a dangerous shock.**

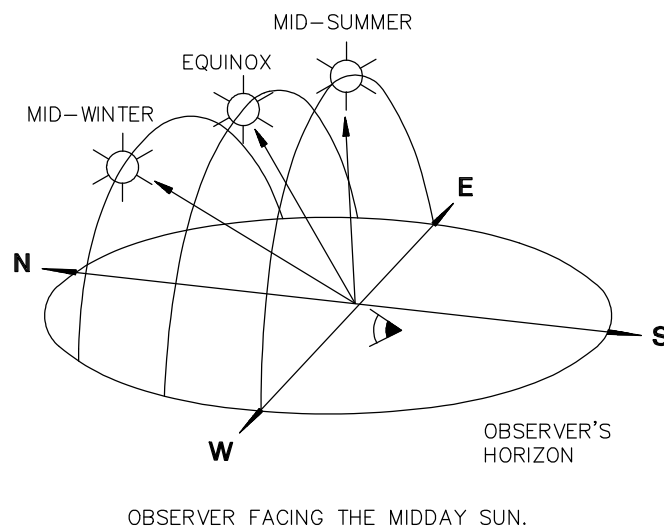
The system will loose about 4-8% production from dirty modules if cleaning is not accomplished, depending on local conditions. Flushing down with a water hose should remove accumulated dust and dirt. Cleaning with a sponge and soapy water may become necessary if bird guano build up occurs.

Incidental shading of the solar array by vegetation or other objects is to be avoided.

## 7.4 SYSTEM GENERAL INSPECTION

A semi-annual inspection of fasteners, mounting hardware and incidental corrosion is suggested. This should not require any exposure to live electrical equipment. In general, the wiring system, the Inverter, and the Metering device should not need any maintenance or further inspection unless system production or power drops from expected values and cannot be brought back up with module cleaning.

Also important in the inspection is to detect and mitigate incidental shading due to vegetative or other growth. The picture below shows the seasonally variable daily track of the sun. For the Northern Hemisphere, the observers' perspective is simply reversed with the same track variation extremes.



If further problems are detected, the homeowner should contact the BP Solar Installer for assistance.

## 7.5 SYSTEM CIRCUIT BREAKERS

The Homeowner should consider the Solar Power System AC Circuit Breakers in the same fashion as any other residential circuit breakers. They are highly developed safety devices and are safe to operate if in doubt. Solar Power System AC Breakers are located in the residential switch / meter box, and possibly next to the inverter depending on its location.

Solar power system AC breakers can open automatically due to transients experienced in the utility grid interconnection. When a solar power system circuit breaker is found to be "off" (or open), simply move the breaker to the "on" (or closed) position. If a problem does exist, the breaker will quickly open again. The Homeowner should contact the BP Solar Installer at that time.



## 7.6 SYSTEM PERFORMANCE

The Solar Energizer system operating is displayed at the Inverter via an LCD screen (if installed) and at the Meter Display (depending on meter). These will indicate how much power is being generated by the Solar Energizer power system. With time and experience, the Homeowner will become familiar with the normal operating performance, as described earlier (a function of season, cloud cover, array soiling and shading).

If under performance is suspected, and is not improved by washing the solar array (or removing debris), the Homeowner should contact the BP Solar Installer.



### **WARNING !!**

BP Solar expressly recommends that Homeowners **NOT** explore the wiring systems or components beyond the level they are accustomed to as they encounter in the usual residential power systems and appliances.

## 8. SERVICE INFORMATION FOR QUALIFIED TECHNICIANS



**WARNING:** *This section is intended to provide a troubleshooting guide for qualified personnel experienced in power conversion systems, power electronics, and DC power circuits. Use appropriate electrical safety procedures when performing test which expose live electrical parts. Remember, whenever a solar module is exposed to light it is generating electricity. Always record all steps and results in the trouble shooting process.*

When the solar power system seems to be not operating properly, follow these steps:

- Refer to the Inverter Installation and Operation Manual.
  - Check the Inverter display for trouble codes.
  - Perform actions indicated by the troubleshooting guidelines.
- If the Inverter troubleshooting process indicates a problem at the solar array:
  - Verify that there is sufficient sunlight for the system to be operating. Night time and very overcast days may prevent solar electricity generation.
  - Verify that no extraneous material has come to reside on the solar array. Debris must be removed.
  - Visually check the solar array for broken modules. Any broken modules must be replaced.



**WARNING:** *Do not attempt to clean or otherwise come in contact with the surface of a solar module with a broken glass face; this could result in a dangerous shock.*

- If the solar array must be further investigated.
  - Open all solar power system related AC breakers.
  - Open all solar power system related DC breakers and fuses.



**WARNING:** *The PV source circuits will be live (during daylight hours) from the solar array even when the DC isolator is open. A shock hazard exists in this area.*

- Verify integrity of the isolator. If found to be open, reset or replace with same type as installed.
  - Perform the Start Up procedure Inverter Installation and Operation Manual.
- Check open circuit voltage at each of the PV source circuits.
  - Open all PV source circuit isolators
  - Each source circuit should be showing the same voltage characteristics (+/- 5 vdc). Under variable solar radiation conditions, perform the measurements repeatedly and rather quickly to determine consistency.



**WARNING:** *The PV source circuits will be live (during daylight hours) from the solar array even when the DC isolator is open. A shock hazard exists in this area.*

- If the voltage test indicates a problem in the solar array:



**WARNING:** *Working at elevations above grade requires safe working procedures. Consult your local Safety Regulations authority, and use recommended safety equipment.*

- On the roof, determine the location of the Array Junction Box.
- Check the connectors for all the PV source circuits.
  - If found to have loose connections, tighten them and re-check the voltage tests at the Array DC isolator junction box.
- Locate and replace the low voltage module(s).
- Test open circuit voltage on the leads into the Inverter DC isolator – (Inverter end).



**9. APPENDIX**

*Add a copy of the solar panels warranty here for your records.*

*Add a copy of the inverter manual (which includes inverter warranty,) here for your records.*

*(Attach optional System Warranty here if offered.)*