

VOYAGER

**HIGH PERFORMANCE
SINE WAVE INVERTER**

OPERATION & INSTALLATION MANUAL



MODELS: SEAP-12-1K3A
 SEAP-24-1K7
 SEAP-48-1K7

SERIAL NO: _____

MODEL NO: _____

SOLAR ENERGY AUSTRALIA PTY LTD ACN 081 639 938

SYDNEY. 4 BEAUMONT RD MT KURING-GAI NSW 2080 TEL (02) 9457 2277 FAX (02) 9457 2255

MELB. 1/15 NICOLE CLOSE BAYSWATER NTH VIC 3153 TEL (03) 9761 5877 FAX (03) 9761 7789

EMAIL sales@solaraustralia.com.au

WEB SITE www.solaraustralia.com.au



GENERAL INFORMATION

Thank you for choosing to purchase another quality inverter from Solar Energy Australia. This product has been developed to provide you with many years of trouble free operation. Your SEA inverter provides True Sinewave output with power quality and voltage regulation equal to or better than grid electricity.

It is important to us that you get the best out of your Inverter, so please take a few minutes to read this manual carefully as it could save you from frustration. If you have any comments regarding our products and / or service, please do not hesitate to contact us to discuss your thoughts.

Remember: Please complete and return your warranty card NOW. This will enable us to efficiently handle any service enquiries you may have and keep you updated with any relevant information.

Cards may be faxed on ++ 61 3 9761 7789 or emailed to sales@solaraustralia.com.au

CONTENTS	
GENERAL INFORMATION	2
WARRANTY	3
PRE INSTALLATION INFORMATION BATTERY TERMINOLOGY	4
MECHANICAL REQUIREMENTS ELECTRICAL REQUIREMENTS	5
SYSTEM CONNECTION DIAGRAM	6
LIGHTNING PROTECTION	7
INSTALLATION	8
CONTROLS & DISPLAYS	9
LOAD SENSE FEATURE & ADJUSTMENT IMPENDING SHUTDOWN ALARM CONTACTS	10
REMOTE ON / OFF TROUBLESHOOTING	11
TECHNICAL SPECIFICATIONS	13
MOUNTING DIMENSIONS	14

FEATURES INCLUDE:

- TRUE SINEWAVE AT 50HZ
- TOTAL HARMONIC DISTORTION (THD) <4.0%
- HIGH SURGE CAPACITY
- EXTREMELY HIGH OVERALL EFFICIENCY
- INTELLIGENT OVERLOAD CONTROL
- SHORT CIRCUIT PROTECTED
- QUICK RESPONSE STAND-BY FUNCTION
- INBUILT BATTERY PROTECTION
- DESIGNED FOR HARSH CLIMATIC CONDITIONS
- MANUFACTURED IN SMD-TECHNOLOGY
- ALL ALUMINIUM CHASSIS
- M.E.N. COMPATIBLE
- AC & DC EMC ATTENUATION
- INTEGRATED DC CIRCUIT BREAKER
- LARGE CAPACITY DC BATTERY CABLES

SOLAR ENERGY AUSTRALIA WARRANTY Terms and Conditions

Solar Energy Australia considers reliability of your power system/inverter as absolutely critical. We would rather avoid any potential inconvenience by being proactive. Many external influences can affect the reliability of an inverter, none of which are under the control of Solar Energy Australia. For these reasons we request that you register your warranty within 60 days of purchase. Warranties that are not registered receive a 6 month warranty.

These terms and conditions do not exclude your rights under the statutory or implied warranty within your state or territory.

Solar Energy Australia warrant this product against defects in material or workmanship, to the original purchaser only for an initial period of 6 months from date of purchase, when in normal use and service. The warranty period will be extended to a total of two (2) years when you register your warranty within 60 days of purchase. No warranty will be provided on units, which have not been paid for in full.

This warranty does not extend to products which have been opened, altered or repaired by persons other than authorised by Solar Energy Australia or to products which become defective due to acts of God, fire, sabotage, vandalism, contaminated fluids, negligence or failure to operate, house and maintain the product in accordance with instructions provided in this manual.

It is extremely important that all installation and operating instructions contained within this manual are strictly adhered to. Failure to do so will void your warranty. Units, which are to be permanently installed/used within 1km of the coast should use the marine version of our product, this will help to avoid corrosion problems, which are not covered under the terms of this warranty.

Solar Energy Australia will use the information you supply to carry out a system check, to attempt to avoid any problems before they occur. Solar Energy Australia will repair or replace the defective product in accordance with its best judgement. For service under warranty, the buyer or installer must contact Solar Energy Australia to obtain appropriate paper work and shipping instructions before returning the unit. To make a warranty claim you must produce proof of purchase when returning the unit. Units returned without prior authorisation or warranty registration will be delayed. The buyer will pay all charges incurred in returning the product to the factory including, installers time. Solar Energy Australia will pay return freight charges, if the product is found to be defective, within the terms of the warranty. Repair or replacement of any unit does not extend the original warranty terms in any way.

This warranty does not cover repairs made necessary due to the product coming in contact with dirt, abrasives, moisture, rust, corrosion, varnish or other similar, insufficient system maintenance, failure due to poor quality or poor condition batteries, failure to use the appropriate AC transfer switch or wiring carried out by inappropriately qualified personnel. Solar Energy Australia will in no way be held responsible for any losses incurred due to the malfunctioning or failure of a product.

Suitably qualified personnel must carry out all AC & DC permanent wiring. Failure to do so will void warranty.

To register your warranty you must do the following:

- ❖ Return your completed warranty registration card within 60 days of purchase.
This can be faxed to ++61 3 9761 7789 or mailed to: Solar Energy Australia Pty Ltd,
Unit 2 / 4 Beaumont Road, Mount Kuring-Gai, NSW, 2080.
- ❖ Fixed installations must provide a picture of the installation from a distance of 1 metre; household installations must supply a second picture showing the structure housing the inverter.
- ❖ Circuit diagram of installation. This can be obtained from your installer and may be a generic diagram.

Circuit diagrams and pictures can be emailed to sales@solaraustralia.com.au or posted.

If the above items are not received, they may be requested before work can commence on any faulty units, but please be aware, Solar Energy Australia is here to help. Help us to help you.

These measures are put in place to ensure you have years of trouble free service from your Solar Energy Australia inverter. If you have any questions about this warranty please do not hesitate to contact us.

PLEASE COMPLETE AND RETURN YOUR WARRANTY CARD

SYSTEM REQUIREMENTS & PRE INSTALLATION INFORMATION

Before installing your Sine Wave Inverter, it is important that you have appropriately sized batteries. A battery which is too small will not allow the inverter to perform to its full specification. Battery performance will vary between different styles of batteries. For example, a Deep Cycle battery will tolerate deep discharges on a regular basis much better than a cranking battery, whereas a cranking battery may provide higher Volts when high battery current is being drawn (e.g. your Inverter is starting a motor or Television). Where possible, we prefer the use of high quality gel batteries.

The table below gives a guide to the minimum battery capacity required:

MINIMUM BATTERY CAPACITY REQUIRED

MODEL	RECOMMENDED MINIMUM BATTERY CAPACITY	MAXIMUM DC CURRENT DRAW OF INVERTER	SUGGESTED BATTERY FUSE (MOTOR START)
SEAP-12-1K3	250Ah	300Amps DC	200 Amp
SEAP-24-1K7	300Ah	180Amps DC	160 Amp
SEAP-48-1K7	300Ah	100Amps DC	100 Amp

BATTERY TERMINOLOGY

For home power systems batteries must be installed in accordance with AS4086

I = Current

This is the measure of electrical power flowing. This is expressed in Amps. For example, **I = 6A** means 6 Amps.

Ah = Ampere Hours

This is the amount of energy a battery can store. In theory this means a 600Ah battery could supply 1 Amp for 600 hours or 600 Amps for 1 hour.

CCA = Cold Cranking Amps

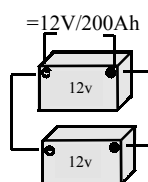
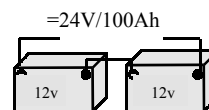
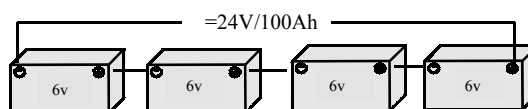
This is the maximum amount of current that the battery can supply for a short period of time.

NOTE: Batteries joined in series (+ to -) will increase the voltage but not the Ah. Batteries joined in parallel (+ to +, - to -) will increase the Ah but not the voltage.

For example: 4 x 12V / 600Ah batteries joined in series = 48V / 600Ah

2 x 12V / 600Ah batteries joined in parallel = 12V / 1200Ah

There should be no more than 2 batteries in parallel.

12V, 100AH BATTERIES IN PARRALLEL**12V, 100AH BATTERIES IN SERIES****6V, 100AH BATTERIES IN SERIES****MECHANICAL REQUIREMENTS**

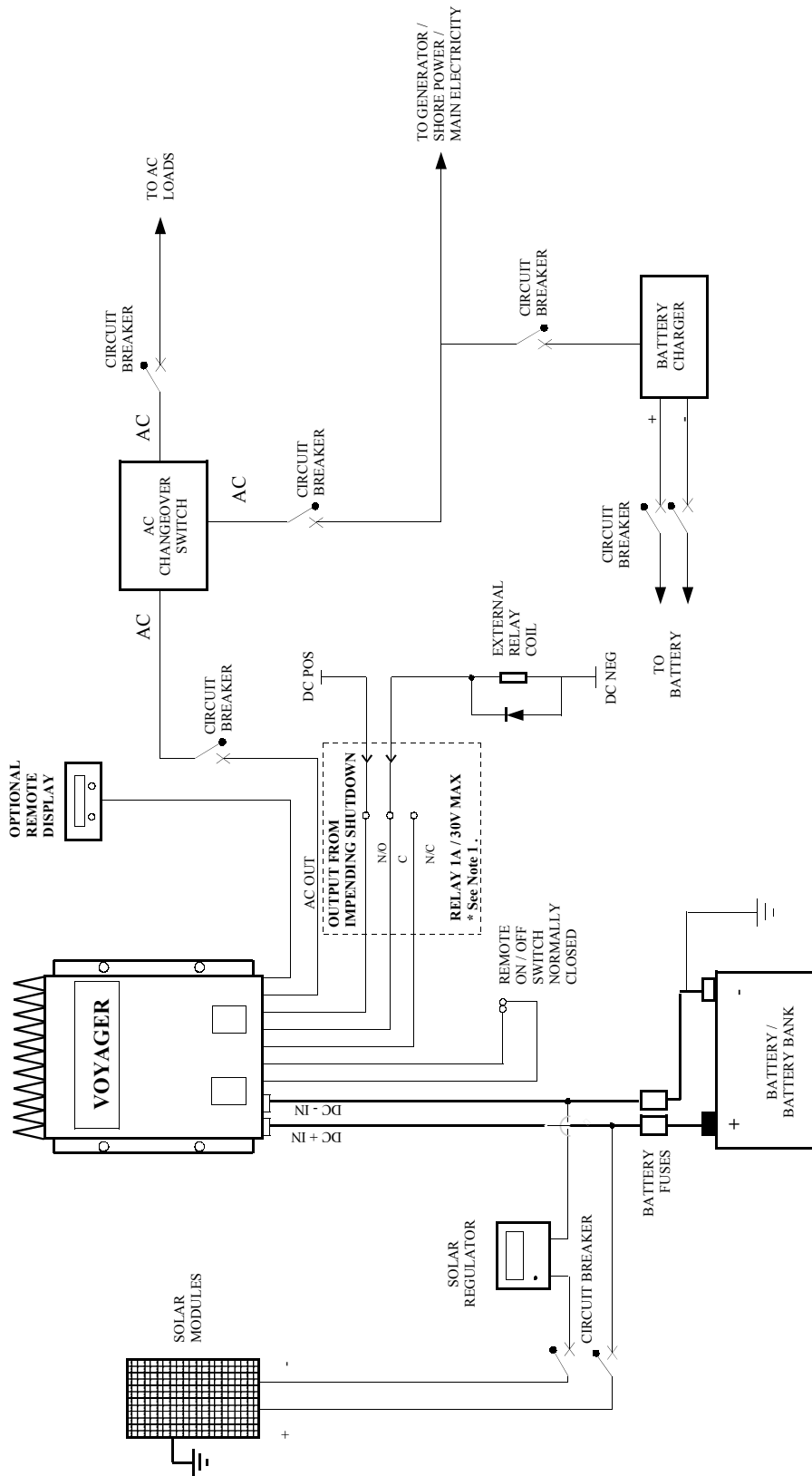
- ◆ After choosing the correct batteries you must choose a suitable spot to mount the Inverter. **Select a site which is dry, free of salt or moisture laden air, dust, exhaust or battery gases and access to rodents.** The unit can be mounted vertically or horizontally.
- ◆ **NEVER** mount the inverter directly above the batteries.
- ◆ There are many advantages in wall mounting the unit. Inspection and operation is more convenient.
- ◆ Mount the inverter between 1 and 3 metres from the batteries, on a suitably solid vertical wall. Allow a cooling space of at least 200mm all around the inverter. Placing the inverter in a cupboard or small enclosure may reduce the available output power. The installation site should not be susceptible to temperatures in excess of 50°C.

We refer you to Australian Standard AS4509, AS4086, AS3010.1 for further information regarding home power installations.

ELECTRICAL REQUIREMENTS

- ◆ DC input voltage of the inverter must be the same as the battery bank voltage:
See specifications for your model. Extra high DC voltage failure can be detected and will void your warranty. High ripple voltage from a battery charger, poor condition batteries or loose connections can cause this problem.
- ◆ DC cabling must be connected to the correct polarity terminal of the battery bank (red = positive, black = negative).
- ◆ It is **Not** recommended that the DC cables to the Inverter be extended. If it is necessary, then you **MUST** increase the DC wire size, consult your Supplier/Installer for this calculation.
- ◆ **Do not connect** 240V AC or any other power source to the 240V output of the inverter as this will result in damage to the inverter and can be detected by the repairer. Your warranty will be void in this case.
- ◆ If you need to switch from Inverter to Generator or Shore Power it is absolutely critical that there can be no AC back feed into the inverter. We suggest a manual switch with a clear OFF position. Contact Solar Energy Australia for further details.

SYSTEM CONNECTION DIAGRAM



- All circuit breakers used on DC circuits must be DC rated
 - All AC wiring must be carried out by a Licensed Electrician
 - All wiring must comply with relevant local standards
 - All fusing / circuit breakers must be sized to protect the conductor
 - A conductor not earthed, must be fused.
- Relevant Standards:
 AS4509—Stand Alone Power Systems
 AS4086—Secondary batteries for use with stand alone power systems
 AS3010.1—Generators
 AS1768.1991—Lightning Protection

* NOTE 1
 If using the impending shut outputs to drive another Relay, a 1A—100V diode must be connected across The relay coil as shown

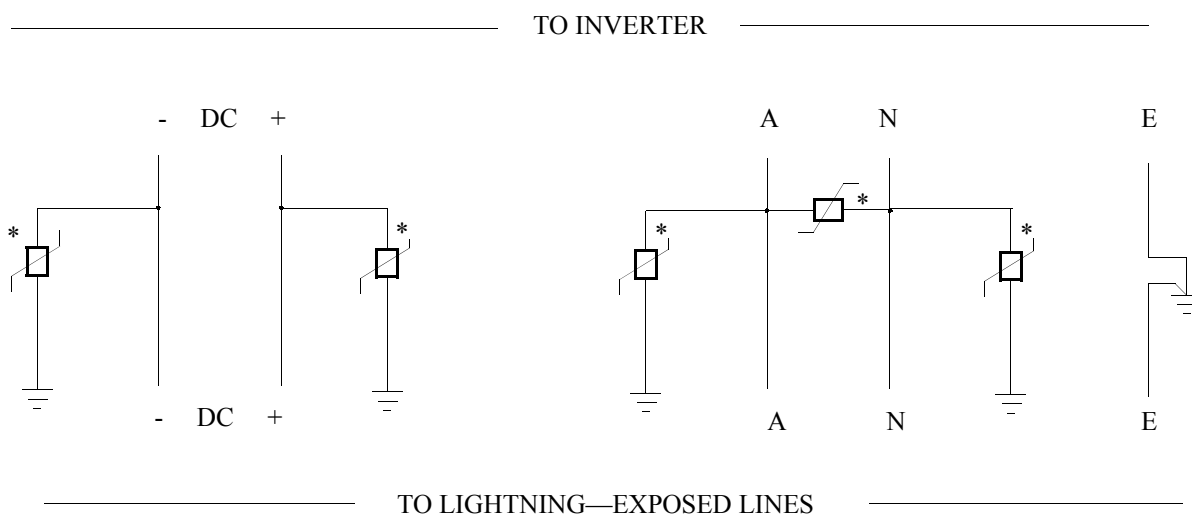
* NOTE 2
 See Page 7 for additional lightning protection.

LIGHTNING PROTECTION

All installations where exposure to lightning is possible must be designed in accordance with AS 1798. In particular any exposed structures must be connected to a low resistance earth stake.

To further protect the Inverter against lightning spikes and surges which occur on outside wiring such as DC feeds from solar arrays or overhead/underground wiring to pumps or outbuildings. In this case the following protection circuits must be connected between these lines and the inverter at or near the inverter. Protection may be placed in a sub board no further than 2 metres away from the inverter, the leads of the Varistors must be no more than 150mm between ground and the protected circuit.

- Protection is given by means of MOV's (Metal Oxide Varistors) P/No Iskra V275E40 or equivalent.



INSTALLATION

WARNING: Please read these instructions thoroughly before commencing installation. Installation should be performed by a competent professional electrical / renewable energy installer, as dangerous voltages can be present.

The following steps should be completed in the order presented in this section.

1. MOUNTING

- Unpack your Inverter from its shipping container and inspect the unit for any transit damage. Report any concerns immediately to your supplier.
- Mount the Inverter to a suitable surface, paying close attention to the mounting requirements as set earlier.
- Remove the front plate of the Inverter by removing the pozidrive screws and gently prying the lid off. This gains you access to the internal wiring rail. Your Voyager comes standard with a 10 amp GPO. It is recommended that this be used for temporary use only.

Important: All AC wiring must comply with relevant Australian and local standards, and be performed by a licensed electrician to satisfy warranty requirements and conditions.

2. AC WIRING

- The panel which holds the glands can be easily removed for greater wiring access. Loosen the cable glands and remove the 4 screws. This allows you slide the plate back down the cables. Pass approximately 15cm of minimum 2.5mm² AC power cable through the appropriate outlet gland. These glands can be replaced with conduit glands if required. Alternatively, AC cabling can enter the chassis from the rear via the 20mm hole. It is recommended a gland or grommet be used in this case.
- Connect active, neutral and earth to the appropriate terminals on the DIN rail. It is possible to mount a RCD / Safety Switch or AC breaker on the internal DIN rail of the inverter, by replacing the existing terminals. After installing these items cut around the border named “AC Circuit Breaker” on the red front label. This cutout allows the breaker to penetrate the lid. The space provided is wide enough for an RCD or double pole circuit breaker up to 54mm (9mm x 6).
- Pull excess cable back through the cable gland (allowing a small slack loop), and tighten the gland.
- Replace the lid.

3. DC WIRING

The primary consideration is to ensure that the battery bank voltage matches the DC input voltage rating of the inverter. The batteries should be located only a short distance from the inverter in order to obtain best results, but not closer than 500mm. A battery fuse **MUST** be installed no closer than 500mm from the battery to protect all wiring connected to the battery. We suggest the use of a motor start fuse. See table on page 5 for sizing. Your installer should determine the exact size of fuse.

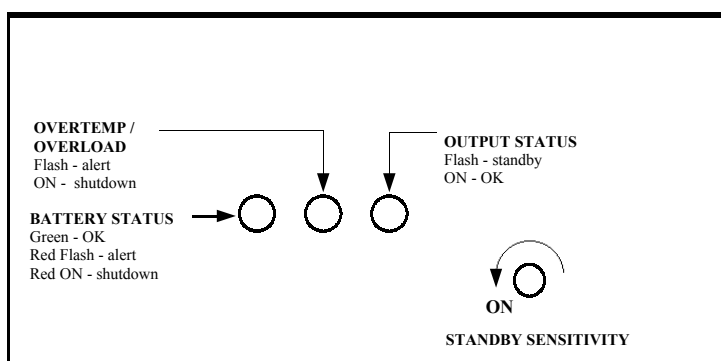
Before making any connections, ensure the circuit breaker is in the **OFF (down)** position. Connect the inverter DC input cable to the battery terminals via the battery fuse, ensuring the correct polarity (the **RED** cables connecting to the positive battery terminal).

INSTALLATION (CONT.)

4. START-UP PROCEDURE

- a) Check battery condition and voltage are within specifications.
- b) Ensure the DC circuit breaker is set to the OFF (down) position.
- c) Ensure no AC load is connected.
- d) Switch DC circuit breaker to the ON (up) position.
- e) If all is well you will hear the fans turn ON for 5 seconds and the Output Status LED will be flashing green and the battery status LED will be steady green. This indicates all parameters are normal and the unit is in Standby waiting for an AC load to be switched ON.
- f) Apply AC load.

CONTROLS AND DISPLAY



Indicator	Condition	Symptom
BATTERY STATUS	Steady Green (Normal)	Battery Voltage is within Specification
	Flashing RED	Battery Voltage is not within specification, unit will shut down if this condition persists.
	Steady RED	Inverter has shutdown due to battery voltage too high or too low.
OVERTEMP/OVERLOAD	No light (Normal)	No overloads are present
	Flashing RED	Inverter is preparing to shutdown due to a power overload or the Inverter has become too hot.
	Steady RED	Inverter has shutdown due to a power overload or the Inverter has become too hot.
OUTPUT STATUS	Flashing GREEN (slow)	Inverter is in Standby waiting for a load be turned ON
	Flashing GREEN (fast)	Inverter will soon switch into Standby mode
	Steady GREEN	A load has been turned ON and Inverter is supplying power to the load normally, or the Standby Sensitivity adjustment has been turned fully anti-clockwise.
	No Light	There is no output from the Inverter

LOAD SENSE FEATURE & ADJUSTMENT

Your Solar Energy Australia Inverter features an Automatic Load Sensing circuit which allows the Inverter to remain in Stand-by when no AC load is switched ON. Once an AC load is switched ON, the Inverter will immediately start. This feature conserves valuable battery energy. The amount of AC power required to start the Inverter can be adjusted. The procedure for this (adjusting the sensitivity) is outlined below. When no AC load is present, the inverter should remain in standby (Output Status indicator flashing GREEN)

Adjust the sensitivity as follows:

- a) Turn all AC loads OFF, keeping wiring connected. Some loads such as TV's must be turned OFF at the power point as they can still represent a small load to the inverter.
- b) Adjust Sensitivity using the small dial below the indicators until the Output Status indicator is flashing GREEN at the rate of once per second. Waiting ten seconds between adjustments for stabilisation. If the indicator is flashing at a much faster rate the inverter is unsure of whether to be on or off. In this case, adjust sensitivity slightly or wait 10 seconds for stabilisation.

Clockwise = less sensitive, anti clockwise = increased sensitivity.

Note: the Sensitivity dial is very sensitive..

When the indicator flashes **GREEN**, the unit is in standby mode.

- c) Turn on a small AC load in the home as specified in the installation procedure. The inverter now delivers AC power, and the indicator should be steady GREEN. However, if the indicator turns OFF after 10 seconds and then back on again, you must increase the sensitivity. Now turn OFF the AC load. The indicator should return to flashing GREEN, if this does not occur, reduce sensitivity.

If you wish to override the Standby feature, the inverter can be placed in continuous ON by turning fully anti-clockwise the dial towards the ON position. Turning the dial fully clockwise will shutdown the Inverter.

IMPENDING SHUTDOWN ALARM CONTACTS

Located on the smaller Printed Circuit Board is the output of the Impending shutdown relay. This relay provides a voltage free set of contacts with a maximum rating of 1 Amp/30v. To use this connector you will require Part No 95-1154-03 available from Solar Energy Australia.

The relay is closed when you see the Battery Status indicator or Overtemp/Overload indicator either flashing Red or steady Red.

These contacts will close with the following conditions:

Low Battery Volts

As battery volts decrease, the contacts will close before shut down occurs. The contacts will reopen when normal battery volts are restored

Over Temperature

Contacts will close just before the inverter is about to shutdown due to the inverter getting too hot. The contacts will reopen once normal temperature has been restored.

IMPENDING SHUTDOWN ALARM CONTACTS (CONT)

Applications

- Provide an early warning of shutdown via an alarm or visual indicator (useful for computers).
- Auto start a generator
- Switch over to mains electricity

The 1 Amp switching capability of these contacts could be used to energise an external relay (must have diode fitted across coil) or activate an external timer. By activating an external timer you will remove the possibility of an auto start generator being turned on or off at short intervals due to large loads and small or old batteries.

**** Please note: If using this output to energise another relay, a diode must be wired across the coil. See diagram.**

REMOTE ON / OFF (ALL MODELS) **(UNITS PURCHASED AFTER DEC. 1ST 2003)**

A 2 pin connector is located on the main PCB. This connector allows ON / OFF control of the inverter via a remote two position switch, when the switch is opened, the inverter will shutdown.

The remote On / Off feature can be very useful where it is necessary to shut down the inverter completely but easy access to the inverter is not possible, for example, the remote switch may be placed in the cabin of a vehicle while the inverter is mounted elsewhere.

Order connector SEA part No .SPM-1302A if you wish to make use of this facility

TROUBLESHOOTING

Inverter shuts down due to Over Temperature/Overload

Your inverter will safely provide the output power as described in the technical data section in the conditions specified. The Voyager has been designed for optimum reliability, therefore shutting down before damage can occur. Each time your Inverter is overloaded due to excessive power draw, the Overtemp/Overload indicator will flash briefly. If the indicator remains steady RED, the unit will have shutdown. **CAUTION: In an overload shutdown, the inverter will automatically restart in 30 seconds.**

Check the following:

- a) Ensure the inverter has adequate ventilation; insufficient ventilation can severely restrict the power output of your inverter. This will be recognised by the black heatsink on top of the Inverter being hot.
- b) Ensure the true power rating of your appliance (including power factor) does not exceed the rating of your inverter.

An Inverter which is continually overloaded will have reduced life.

Inverter shuts down when trying to start a load

When starting a load such as a motor it may cause the inverter to shut down. If this is the case:

- a) Ensure the battery voltage is within spec when the appliance is trying to start. You may need to increase the size of your batteries.
- b) If battery voltage is OK then the inverter may be too small. Consult your Solar Energy Australia representative.

TROUBLESHOOTING

Screeching noise on radio when inverter is operating

Your Solar Energy Australia inverter is manufactured to the highest standards for the reduction of EMI (Electro Magnetic Interference). It is still possible however that in extreme cases, interference may be noticeable in radio's or television sets. Below are some suggestions to try to reduce this noise.

- a) If possible run a heavy gauge earth wire from battery negative to a moist ground stake.
- b) Separate AC and DC wiring
- c) Improve signal strength of receiver by improving antenna.
- d) Reposition inverter as far away from receiver as possible.

Inverter stays shut down for a long time after overload

The inverter is responding to either a severe overload or repeated overloads. The inverter will see a very large overload as a short circuit, in this case the inverter will stay shut down for 10 minutes. If this occurs, reduce the size of the load or check for possible cable faults. If the cause of the original shutdown is still present, the inverter will shut down again. Reduce load or allow inverter to cool down. **Disconnect all AC wiring when checking for short circuits.**

How long will my battery last?

The state of charge of your battery is critical to the performance of your inverter. Follow this guide to calculate how long your battery will last.

Step 1 Take the power rating of your appliance and divide this by 10. This is the approximate current the inverter will draw from your battery. (Divide by 20 for 24V; 40 for 48V).

Step 2 Take the Ah (Ampere Hour) rating of your battery and divide it by two. This is the conservative amount of useable power in your battery.

Step 3 Now divide the current draw into the useable battery capacity. This is the maximum number of hours you should use this appliance. This equation presumes that no other charging has taken place.

Example: A 67 watt TV running on a 100 Ah 12V battery

Current draw = $67 / 10 = 6.7$ Amps DC

Useable battery capacity = $100 / 2 = 50$ Ah

Time = $50 / 6.7 = 7.4$ hours

How can I tell if my Inverter is In Standby is I am in the house?

It is important to keep your inverter in standby whenever no power is being used. A power point with a neon indicator or a child's night light will mimic the output of the inverter. Eg, these will flash when the inverter is in standby. This feature will save unnecessary battery drain.

TECHNICAL SPECIFICATIONS

Voyager	SEAP-12-1K3A	SEAP-24-1K7	SEAP-48-1K7
All Specifications at 25°C and unity power factor unless other wise stated			
DC Input Voltage (Battery Voltage)	12 Volt	24 Volt	48 Volt
Continuous Output Power @ 30°C	1300watts	1700 watts	1700 watts
Output Power for 20 minutes	1800 watts	2400 watts	3000 watts
Output Power for 5 minutes	2200 watts	3000 watts	4400 watts
Short Term Output Power	4000 watts	5000 watts	5000 watts
Temperature Derating above 30°C	1.50%p/°C	1.25%p/°C	1.0%p/°C
Continuous AC Output Current	5.65 AC	7.40A AC	7.40A AC
DC Battery Draw Standby	40mA	40mA	40mA
DC Battery Draw AC ON–No load	.60A DC	0.35A DC	0.25A DC
DC Current @ Max Continuous	134A DC	84A DC	41A DC
Auto Start Adjustment	1 – 40w		
Output Voltage	230v AC		
High DC Volts Cutout	17V DC	34V DC	68V DC
Low DC Volts Cutout	10.5V DC	21V DC	42V DC
Output Frequency	50Hz +/- 0.02%		
Total Harmonic Distortion @ No load	4%		
Output Waveshape	True Sinewave		
Power Factor Range	.2-1.0		
Peak Efficiency	91%	94%	95%
AC Output Method	Terminal block on Din Rail or 10Amp GPO		
Impending Shutdown Alarm Contacts – Voltage Free	1A / 30V DC . Closed with any impending shutdown or shutdown.		
Remote On / Off	With Optional External Switch		
Input / Output Isolation	3500V AC		
Battery Lead Length	1.4metres with 10mm lug		
Conforms to Standards	AS3000 wiring, AS/NZS2064 Class B Conducted Emissions		
C Tick Certified	Yes		
Dimensions (H x W x D) mm	460x300x165		
Weight Packed	21 kg	19.5 kg	19.5kg
Chassis Material	3mm Aluminium Base, 4mm high impact plastic		
Enclosure Protection	IP20		
Warranty	2 Years		

MOUNTING DIMENSIONS

