

# ***INVERTER MANUAL***

## **Table of Contents**

	<b>Page</b>
<b>INTRODUCTION .....</b>	<b>2</b>
<b>INSTALLATION.....</b>	<b>2</b>
<b>SAFETY.....</b>	<b>3</b>
<b>INVERTER OPERATION.....</b>	<b>4</b>
<b>INVERTER EFFICIENCY &amp; OUTPUT WAVEFORMS.....</b>	<b>5</b>
<b>STANDARD INTERNAL JUMPER OPTIONS (BKZ SINEWAVE ONLY) .....</b>	<b>6</b>
<b>OTHER OPTIONS .....</b>	<b>6</b>
<b>FAULT FINDING .....</b>	<b>8</b>
<b>FAULT FINDING CHART .....</b>	<b>9</b>
<b>STATEMENT OF QUALITY ASSURANCE .....</b>	<b>10</b>
<b>ELECTRICAL &amp; MECHANICAL SPECIFICATIONS.....</b>	<b>11</b>
<b>WARRANTY CONDITIONS.....</b>	<b>12</b>
<b>DECLARATION OF CONFORMITY .....</b>	<b>13</b>

## INTRODUCTION

Congratulations on your choice to purchase a new Latronics Inverter.

- We at Latronics have developed this product based on our concern about the state of the environment. Your Inverter was produced in a factory using Solar Energy for light, power and water.
- We recycle all paper and metal materials.
- Your decision impacts on the environment in several positive ways. By using renewable resources such as solar, wind or hydro you reduce Greenhouse Gas Emissions. (refer to our website [www.latronics.com](http://www.latronics.com) for more information)
- The meantime between failure (MTBF) of Latronics Inverters is 21.5 Years for Sinewave Models and 42 years for Modified Squarewave Inverters.
- The recycleability has been a important design criteria and at least 95% of your Latronics Inverter is reusable. We will be happy to receive your inverter at the end of its lifecycle, and to encourage you we have provided a free postal service: *Latronics Reply Paid MB1 Moffat Beach Qld 4551 Australia*

**We strongly suggest that you read through the next few pages of this manual that explains all the modes of operation and relevant safety precautions for your new Power Inverter. Please remember to complete and return your warranty card to validate your 3 Year warranty.**

## INSTALLATION

### **DC WIRING:**

- Ensure the Inverter has not been damaged in transit.
- The unit must be placed in a well ventilated and protected area, not exposed to the open environment, and free from contaminants (ie exhaust gases, sea air, battery gasses, dust).
- For best performance, the unit should be placed as close as possible to the battery supply.
- The Inverter DC input voltage is stated on the back of the Inverter. Check that it is the same voltage as the battery supply.
- Connect the Inverter **DIRECTLY** to the battery terminals for best performance for recreational applications, or in accordance with the relevant standards for RAPS installations. (The DC Circuit Breaker is in line with the positive Battery Lead)  
Input leads marked **RED** (positive), **BLACK** (negative).
- The Inverter is designed to operate on a battery supply only.


---

### **O B S E R V E P O L A R I T Y**

---

**NOTE:** The cables connecting the Inverter to the battery are designed to achieve maximum efficiency and output power, they should not be extended.

## AC WIRING:

- Make sure the Inverter is switched off before working on the mains wiring. Turning the circuit breaker switch into the position  isolates the Inverter from the positive battery terminal.
- The active and neutral of the 240V AC output are electrically isolated from the battery negative, battery positive, and earth connections.
- The earth is connected internally to the Inverter case.
- The AC output can be connected via the twin Power Point on the front panel or the junction box on the rear.
- Ensure that power will never be fed into the Inverter from the Mains or a Generator. ***This would result in the destruction of the unit and will not be covered under warranty!*** We suggest using a “break-before-make” double pole changeover switch, switching both the active and neutral between Inverter and other 240V AC supplies.
- In systems where there are multiple power sources of AC power eg. Inverter, Generator or Mains ensure there is only ONE Earth/Neutral connection for MEN wiring at the switchboard.

## POSSIBLE CONFIGURATIONS:

- Domestic wiring - neutral and earth connected (MEN wiring)
- Telecom wiring - battery positive connected to earth.
- Industrial and vehicle wiring - floating system.

**Warning: The Inverter produces lethal mains electricity. Latronics recommend that installation and connection of all AC wiring be carried out by a licensed electrical contractor in accordance with the relevant standards AS3000 or equivalent.**

# SAFETY

## Battery Terminals and Batteries

Your Battery Terminals require frequent care and maintenance. Very high currents (up to several hundred amps) are drawn by the Inverter when starting electric motors and other high power appliances. We recommend the inspection of the battery terminals every 3 months for tightness and / or corrosion. Special attention should be paid to soft Lead Terminals which are prone to loose connections over time. Please refer to relevant Australian Standards for sizing and safety procedures.

## ***Inverter Isolation and safety***

All Latronics inverters have an isolation rating of 3500V between AC and DC via the toroidal transformer, which ensures extremely safe and risk free operation. All the switching electronics and control circuitry are on the DC input. The inverter AC output is connected directly to the transformer output winding.

Latronics inverters have the AC output (active and neutral) floating with respect to the DC and earth. The earth connection is connected to the case only. This configuration provides the highest safety and the most flexibility for installation wiring.

## ***RCD or Earth leakage protection***

Latronics Inverters can be fitted with an RCD, however there are several points to be taken into consideration. When using an RCD, the input wiring of the RCD requires the neutral and earth wires to be connected (MEN) otherwise the RCD will not operate. In this case the Inverter chassis will be connected to the neutral. When operating in a vehicle the chassis of the vehicle is connected to battery negative, this now presents the problem of isolation between the vehicle chassis (DC) and the inverter case (AC). In order to maintain the isolation between AC and DC when operating in vehicles it would be safer to leave the inverter output floating, ie no MEN connection and hence no RCD.

# **INVERTER OPERATION**

## ***Indicator Lamps***

**BKZ Sinewave Inverter only:** When the Inverter is switched on all 4 LED'S light up for 1 second while the microprocessor performs a startup and system check procedure.



### **1. Standby/240 volts (Green LED)**

This LED flashes when in Standby mode (ie. no loads connected). When a load is applied the LED lights up to indicate that 240V AC is being supplied.



### **2. Overload/Overtemp (Red LED)**

This LED lights when the APPLIED load demands more current than the Inverter can safely supply. If this condition remains constant for more than 5 seconds the Inverter will shut down. The LED will light until reset by the circuit breaker. Similarly if the internal temperature exceeds safe operating limits of the components for more than five seconds the Inverter will shut down with the LED illuminated. Allow 5 minutes for the Inverter to cool and reset the unit.



### **3. Overvolts (Red LED)**

If the battery voltage rises above its limit, as specified in the Electrical Specifications table, the Inverter shuts down without delay and lights this LED.



### **4. Undervolts (Red LED)**

In order to protect the battery bank the Inverter shuts down after 5 seconds and lights this LED if the battery voltage falls below its limit as specified in the Electrical Specifications table.

## Circuit Breaker Switch

ON

The circuit breaker is designed for ease of operation and safety. By pushing the switch “UP” the battery supply is connected to the Inverter. The circuit breaker will turn OFF automatically if too large a load is left on the Inverter continuously. Reset the switch after allowing approximately 5 minutes to cool.

OFF

If the Inverter shuts down due to overload, undervolts or overvolts it can be reset by turning the circuit breaker OFF, waiting 10 seconds (or until LED goes out), then turning it ON again.

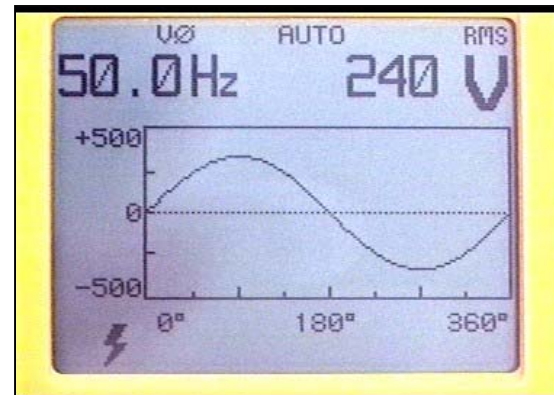
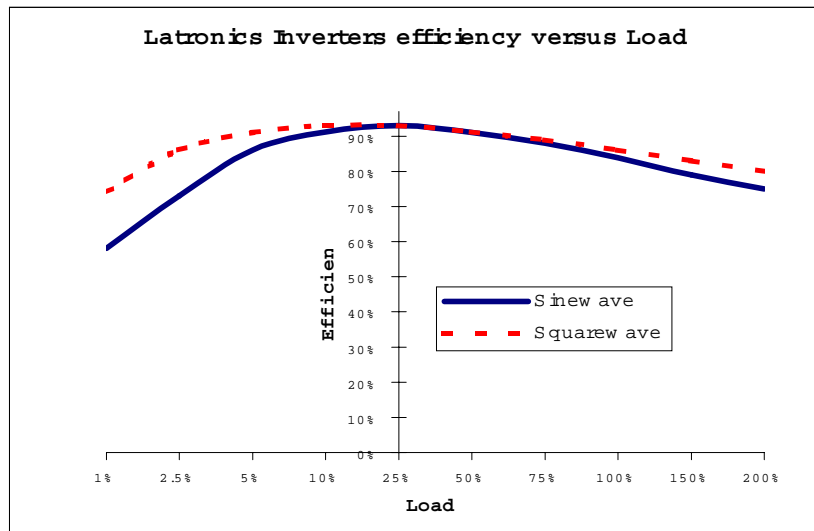
## Auto Start Sensitivity Adjustment

The screwdriver adjustment slot is situated just below the indicator LED'S on the front panel, thus permitting the operator to adjust sensitivity between 0-20VA. Due to lengthy 240V AC cables the Inverter may sense fake loads. To combat this turn the control clockwise. Alternatively turning the control in the opposite direction increases sensitivity. Turning the control fully anticlockwise will disable the Auto Start feature and the Inverter will remain constantly ON.

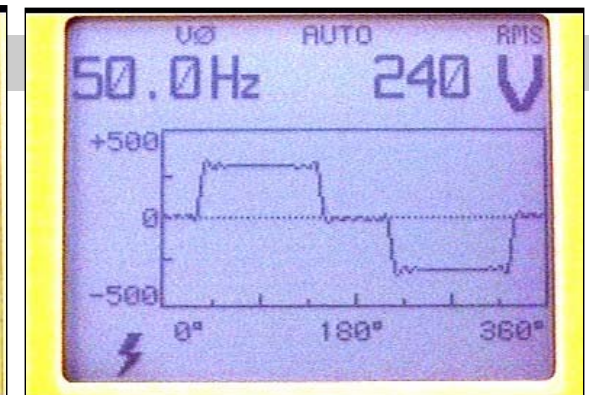
## Fan Operation

Larger Inverters are fitted with a cooling fan. If the temperature inside the Inverter reaches approximately 45 °C the fan will switch on. **Obstruction of the air intake on the left and the air output on the right will reduce the power rating of the Inverter.**

## INVERTER EFFICIENCY & OUTPUT WAVEFORMS



Output BKZ series  
Sinewave Inverter



Output s/SUN series Modified  
Squarewave Inverter (MSQ)

## STANDARD INTERNAL JUMPER OPTIONS (BKZ SINEWAVE ONLY)

In order to access these options you have to open the Inverter and locate the control card (circuit board with LED status indicators). When altering the jumper settings switch inverter off, adjust the jumpers and switch inverter back on again.

**WARNING: Due to dangerous voltages existing inside the unit make sure the circuit breaker switch is turned off before opening the unit. Should you have any doubt about performing these modifications, we strongly recommend the use of a qualified trades person.**

### Automatic Reset

In unattended situations where total shutdown is not desirable, an automatic reset option can be requested. Should the Inverter shut down due to under voltage, over temperature or any fault condition, the Inverter is reset every eight minutes (other settings available) until the fault condition clears (for example Inverter cools or batteries recharge) and operation resumes.

- Access the jumper marked "AR" on the control card
- Jumper in place (over both pins)= Automatic reset enabled
- No jumper (off or over one pin)= Automatic reset disabled

### 50/60Hz

If you need to operate American equipment this option will allow your Inverter to operate at 60HZ.

- Access the jumper marked " 50/60HZ" on the control card
- Jumper in place (over both pins)= 50Hz
- No jumper (off or over one pin)= 60Hz

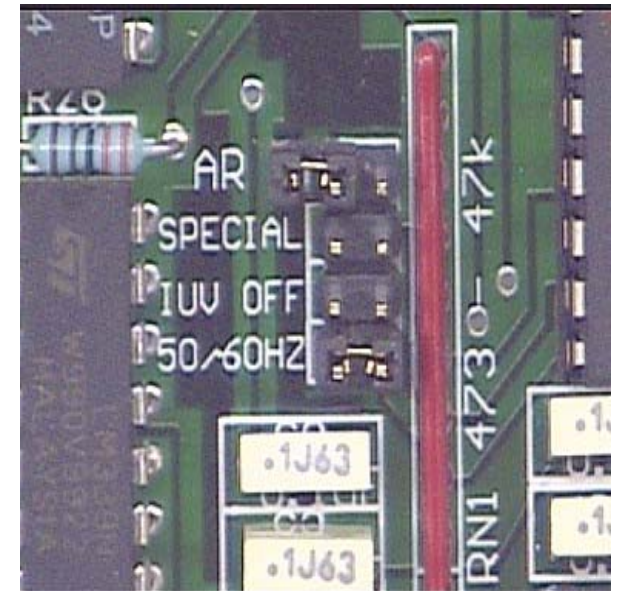
### Instantaneous Undervolts

If you operate the Inverter on a Transformer Powersupply with only a small battery attached, the Inverter might shut down in instantaneous undervolts when trying to start bigger loads!

- Access the jumper marked "IUV OFF" on the control card
- Jumper in place (over both pins)= Instantaneous undervoltage shutdown disabled
- No jumper (off or over one pin)= Instantaneous undervoltage shutdown enabled

### Special

The jumper marked "special" is for customer specific options and has no function in standard Inverters.



## ***Mounting Brackets***

Latronics Inverters can be provided with mounting brackets. These Brackets can be fitted at any time to all Inverters. They are suitable for 19" rack mount, top mount, or base mount.

## ***Earth Leakage Circuit Breaker***

For installations where Earth Leakage Protection is required the Inverter can be fitted with a special Power Outlet which includes a Residual Current Device (RCD).

## ***Other AC Output and DC Input Voltages***

As an alternative to 240 V AC 50 Hz, the output can be 110 V AC 60 Hz, 110V AC 50 HZ or 220V AC 50HZ. DC Input voltages are available in a range from 12V DC to 125V DC

## ***Changing DC Input Window***

For systems with high battery voltage fluctuations, the DC Input Window can be adjusted or increased to suit requirements

## ***2kV Isolation***

2kv RMS for 1 minute – special industrial requirement.

## ***Single GPO (European, American, Japanese)***

## ***Extended Battery Leads***

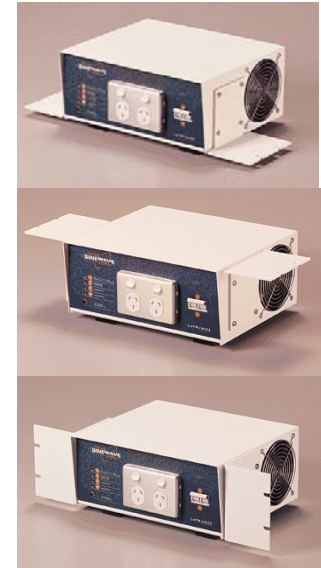
Although this option is available it is not recommended. Due to the very high currents flowing any increase in length will affect the efficiency of the Inverter. In applications, like boats, where it might be not practical to have the Inverter next to the batteries the length should not exceed 3 meters.

## ***Changeover Relay (extra j-box included)***

When fitted with this option the AC output is switched between mains AC and Inverter AC. An auxiliary AC source can be connected to the mains input junction box on the rear on the inverter. While this AC source is present it will be connected to the AC output junction box on the rear and the power outlet on the front. Should the auxiliary AC source fail the changeover switch automatically diverts the Inverter's AC source to the AC output junction box on the rear and power outlet on the front.

## ***Alarm Contact Output (extra j-box included)***

The alarm output is provided by a relay contact. Wiring is via fixed terminals located in the junction box marked "Alarm Output" on the rear of the inverter. The relay contact changes state when the inverter's AC output is not present.



## FAULT FINDING

Should the Inverter appear to be malfunctioning we suggest the following to eliminate any external problems.

1. Turn the Inverter "OFF" via the circuit breaker switch on the front panel.
2. Disconnect all AC wiring from the Inverter.
3. Disconnect DC Battery leads from Battery.
4. Clean Terminals (remove all grease and or corrosion on both DC leads and battery terminals)
5. Ensure you have sufficient battery capacity at the nominal voltage (specified on the compliance label at the rear of your Inverter).  
Please note: Use minimum 60AH battery or the size of a substantial car battery.
6. Make connection direct to battery terminals and insure all connections are tight.
7. Ensure battery voltage is within the correct limits as outlined in the section ELECTRICAL & MECHANICAL SPECIFICATIONS of this manual. If you do not have a DC voltmeter or multimeter check the front panel for overvolts and undervolts LED'S.
8. Turn the Inverter "ON" via the circuit breaker switch on the front panel. Observe the lights on the front left of your Inverter. Refer to sections INVERTER OPERATION for explanation of lights and / or section FAULT FINDING CHART.
9. Plug in various appliances and monitor the Inverters operation.

**PLEASE NOTE:** .A service charge will apply for all instances where no Fault is identified on the Inverter

### Helpful Hints

- Remember that it has automatic start with load.
- Make sure leads and terminals are not corroded or faulty in any way.
- Make sure the Inverter goes into Standby with no load switched on.
- Make sure the circuit breaker is reset properly. If unsure switch "OFF" and "ON" again.
- When measuring the AC output of Modified Squarewave Inverters use a TRUE RMS VOLT METER. Average reading meters will not give an accurate measurement. (240V RMS = 210V average) depending on Battery voltage and load



## FAULT FINDING CHART

<b>Symptom</b>	<b>Cause</b>	<b>Action</b>
No LED on. No output power.	Is Circuit Breaker switched on?	Switch OFF and ON.
	Is input voltage present?	Check battery connections.
	Was too high DC Voltage left on Inverter ie. from PV Modules or battery charger	If voltage exceeds more than triple the Inverter input voltage, damage may have occurred.
Inverter does not go back to Standby mode Green LED does not flash.	Inverter senses load present.	Disconnect all loads. Disconnect leads on junction box on back of Inverter.
	Auto Start set too low.	Turn Auto Start clockwise.
Inverter overloads constantly.	Inverter overheated due to a large load being run.	Check if case is hot, allow 5 minutes to cool down, reset Inverter via circuit breaker.
	Current draw from battery is excessive due to a short circuit on 240V AC side or load to be started is too large.	Disconnect all AC 240V wiring from Inverter, check if Green LED flashes .
	Fluorescent Lights are used with power factor correction capacitors	Remove capacitors (MSW only)
	If any lightning has occurred unit might be damaged.	Return to supplier.
Inverter constantly shuts down in undervolts.	Battery voltage below specified limit.	Check battery connections and state of charge (should be above SG level of 1220)
	Battery voltage drops below limit only when load is being connected.	Check size of load, might be too large for battery to handle. Check connections! Check DC wiring between Inverter and battery for any defects!
Inverter constantly shuts down in overvolts.	Battery voltage above specified limit.	Battery might be overcharged.
	Battery charger imposes high ripple peak voltages across battery terminal which may exceed limit for short periods.	Check battery charger.
	Solar panels are connected to Inverter without batteries.	Open circuit voltage of solar panels exceeds limit. Check system.
	Solar regulator causes voltage peaks across battery terminals.	Check solar regulator for this symptom. This only occurs during peak sun periods and when load demand on system is very low, ie. during holiday periods.
	Battery Charger without regulation circuit and or choke is connected to the battery which imposes very high peak currents.	Battery bank might be too small to soak up these currents. The detection circuit of the Inverter works within a time frame of 0.1 second to detect this fault condition. Check float voltage.

<b>Symptom</b>	<b>Cause</b>	<b>Action</b>
Inverter does not sense load (MSW only)	Load too small for inverter to sense. I/e. compact fluros without electronic ballast!	Adjust Auto Start anti clockwise or run other load at the same time or fit PTC Sense resistor. Use PL lamps.
Inverter switches on with load but drops out occasionally.	Current draw of load changes. ie. small battery chargers.	Auto Start also depends on battery voltage to some extent. Run other small load at the same time.
Inverter starts up correctly ie. green light on then flashing; but shuts down when load applied	Current flow causes voltage drop on Battery connections.	Check battery connections and fuse connections. Connect inverter straight to battery terminal.
AC Output voltage too low	Average reading meters will not give an accurate measurement of Modified Squarewaves. (240V RMS = 210V average) depending on Battery voltage and load	<b>Use TRUE RMS volt meter..(MSW only)</b>

Should you require further assistance for fault finding or service please call the Latronics Service Department on 07 5491 5503

## **STATEMENT OF QUALITY ASSURANCE**

The whole of the supplies have been subjected to the Quality System Requirements in accordance with the conditions of AS/NZS ISO 9002 : 1994. All items are manufactured with full traceability.

Signed,



Gary Graham – Quality Manager and Chief Inspector.  
For and on behalf of Latronic Sunpower Pty Ltd.

# ELECTRICAL & MECHANICAL SPECIFICATIONS

Output power @ 25 °C Ambient and unity Power Factor

<b>s/SUN MODIFIED SQUAREWAVE INVERTER</b>					<b>BKZ TRUE SINEWAVE INVERTER</b>							
<i>Inverter Model</i>	<b>46-si-12</b>	<b>46-si-24</b>	<b>412-si-12</b>	<b>415-si-24</b>	<b>47-BKZ-12</b>	<b>48-BKZ-24</b>	<b>412-BKZ-12</b>	<b>415-BKZ-24</b>	<b>518-BKZ-12</b>	<b>525-BKZ-24</b>	<b>530-BKZ-24</b>	<b>535-BKZ-48</b>
Nominal DC Voltage	12V	24V	12V	24V	12V	24V	12V	24V	12V	24V	24V	48V
Continuos Power	600W	650W	1300W	1600W	700W	800W	1300W	1600W	1800W	2500W	3000W	3500W
1½ Hour Rating	800W	1050W	1600W	2100W	950W	1050W	1600W	2100W	2000W	3100W	3700W	4100W
Surge Rating	3000W	3500W	4800W	5500W	2800W	3200W	4000W	5000W	5500W	7500W	9000W	10500W
Input Voltage Range	10-17V	21-34V	10-17V	21-34V	10.5-17V	21-34V	10.5-17V	21-34V	10.5-17V	21-34V	21-34V	42-68V
Instantaneous Shutdown	-				9V	18V	9V	18V	9V	18V	18V	36V
Standby Current	25mA	25mA	25mA	30mA	40mA	25mA	50mA	30mA	60mA	35mA	40mA	35mA
Output Voltage	240V AC +/- 3%				240V AC +/- 4%							
Output Waveshape	Modified Squarewave				True Sinewave							
Total Harmonic Distortion	-				<4%							
Peak Efficiency	93%	94%	93%	94%	90%	92%	91%	94%	90%	94%	93%	95%
Demand Start Sensitivity	User Adjustable											
Output Frequency	50HZ +/- 0.1%											
Power Factor	All conditions											
Input / Output Isolation	3500V											
Operating Temperatures	-10 °C to + 50 °C											

	s/SUN 600VA	s/SUN 1300VA	s/SUN 1600VA	BKZ 700VA	BKZ 800VA	BKZ 1200VA	BKZ 1500VA	BKZ 1800VA	BKZ 2500VA	BKZ 3000VA
Dimensions	L x W x H	L x W x H	L x W x H	L x W x H	L x W x H	L x W x H	L x W x H	L x W x H	L x W x H	L x W x H
mm	310x287x145	310x287x145	310x287x145	310x287x145	310x287x145	310x287x145	310x287x145	390x400x180	390x400x180	390x400x180
Weight	9kg	12kg	14kg	10kg	10kg	13kg	14kg	22kg	22kg	24kg

## WARRANTY CONDITIONS

All conditions and warranties expressed or implied by statute, common law, equity, trade, custom, usage or otherwise howsoever are hereby expressly excluded to the maximum extent permitted by law. Where so permitted the liability of Latronic Sunpower Pty. Ltd. for a breach of condition or warranty that cannot be excluded is limited (at Latronic Sunpower Pty. Ltd. 's option) to the replacement or repair of the goods or the supply of equivalent goods or the cost of replacing or repairing the goods or of acquiring equivalent goods. Latronic Sunpower Pty. Ltd. shall not be liable in any way whatsoever for indirect or consequential loss or damage whatsoever (whether based on tort or contract or otherwise).

- Damage caused by unauthorised repair, alteration or substitution of non-standard parts, incorrect installation, misuse, negligence, accident or similar cause, or usage other than in accordance with the operating instructions, is not covered under Warranty.
- Unauthorised opening of the goods will render the Warranty invalid.
- The Company may, at its discretion, agree to act as agent for the owner where delivery is requested and all costs for cartage and insurance will be for the owners account.
- The replacement of any part or labour involved will not have the effect of extending the period of the warranty of the goods.
- Any faulty part replaced under Warranty becomes the property of the Company for purposes of examination and claim under proprietary Warranty.
- Registration Card must be returned within 3 Months from date of purchase to validate your 3 year warranty.
- Keep your receipt as proof of purchase, should any difficulties arise concerning the return of the registration card.
- Inverters are supplied by the manufacturer or the manufacturers agents under the express condition that no responsibility is implied or accepted by the above parties for any damage to any appliance, equipment or property associated with the correct or otherwise operation of the Inverter.

**PLEASE NOTE: Many Inverters are returned with no fault. Please read trough the Fault finding section before returning the Inverter for repair.**

## DECLARATION OF CONFORMITY

Manufacturer : Latronic Sunpower Pty Ltd  
ABN : 97 010 707 169  
Address : PO Box 73 , Moffat Beach , QLD 4551, Australia

Product : BKZ Series DC to AC Sinewave Inverter

Models : All Model No's. Starting with  
47-BKZ-  
48-BKZ-  
412-BKZ-  
415-BKZ-  
518-BKZ-  
525-BKZ-  
530-BKZ-  
- 535-BKZ  
630-BKZ-



The products listed above conform with the C-Tick mark for the EMC emission standard EN55014.

The products listed above conform with the CE mark for the EMC emission standard EN55014 and meet the applicable standards on immunity EN50082-1.

IEC1000-4-2 Electrostatic Discharge 8kV air discharge /4kV contact discharge.  
IEC1000-4-4 Fast Transients/ Burst Immunity 1kV 5kHz rep. Frequency.  
IEC1000-4-5 Surge Tests 4kV phase/neutral and earth, 2kV phase to neutral.  
IEC1000-4-6 Conducted Immunity test Injected Currents 0.15MHz to 230MHz, 3Vrms.

Bradley Cowin  
Development Engineer

A handwritten signature in black ink that reads 'Bradley Cowin'.

20.02.2001