**POWERING YOU OFFROAD**

# AllSpark® PS Series - Pure Sine Wave Inverters

# OPERATION & USER MANUAL


**Models:**

**12V 1000w**
**12V 2000w**
**24v 4000w**

**Revision 5 - Next review date 01.06.2023**

# Table of Contents

# 1. WELCOME

Thank you for purchasing your new AllSpark Pure Sine Wave Inverter. Please read this manual thoroughly before installing and operating your AllSpark® Inverter. This manual contains important information and safety instructions required to obtain the performance, reliability, and safe operation for your application. Please keep this manual for future reference (or download an electronic version available at www.offroadliving.com.au). AllSpark® Inverters have been designed in a compact size, containing an innovative advanced microprocessor controller, with high electrical efficiency & high flow cooling fans resulting in a unit you can rely on for years to come.

AllSpark® is a registered Trademark in Australia which has been proudly designed & developed by the team at Offroad Living. Use of this Brand name or Trademark without the express permission of Offroad Living is expressly prohibited. Offroad Living is Owned and Operated by a True-Blue Aussie family based in Perth Western Australia with suppliers and installers throughout Australia.

# 2. WARNINGS, CAUTIONS AND NOTES

It is critical that any operator or installer of this AllSpark® Inverter, reads and follows all WARNINGS, CAUTIONS AND NOTES and all installation and operation instructions.

### ⚠ WARNINGS: INVERTER OUTPUT

- This heavy-duty device produces voltages more than 230V like commercial AC power
- There is a Danger of shock or electrocution. Treat the Inverter output the same as commercial AC power
- Do not use the Inverter near flammable materials or in any locations that may accumulate flammable gases
- This electrical device will briefly spark when electrical connections are made or broken. This is normal to charge the internal capacitors
- Do not allow water or other liquids to contact the Inverter or operate in extreme humidity. Do not allow water, snow, chemicals or dust to enter the Inverter
- Do not use appliances with damaged or wet cords

### ⚠ CAUTIONS: INVERTER OPERATING ENVIRONMENT

- Surrounding air temperature should be between 0°C and 45°C. The cooler the ambient air, the more efficient the inverter will run. Keep the Inverter away from direct sunlight, if possible, to reduce operating temperatures
- Keep the area surrounding the Inverter clear to ensure free air circulation in and out of the unit. Do not place items on or over the Inverter vents and fans during operation
- The unit will automatically shut down if the internal temperature gets too high. Restart the Inverter after it cools
- This Inverter series is designed to be powered from for DC voltages: Please very carefully check the DC voltage of your Inverter and only connect it to the correct DC voltage power source. Failure to do so will destroy the unit beyond repair. Verify the DC voltage with your retail seller if it is not clearly marked on the product or its package.
- These units do not have AC mains transfer compatibility built in. To achieve this, you must install a combination AC circuit breaker/Residual current device (RCD) along with an AC transfer device (manual or auto changeover switch can be used). Any AC cabling, connections or terminations shall be undertaken by a licensed Electrician in accordance with local wiring standards and regulations
- Do not reverse the DC input polarity or connect to the incorrect DC voltage. This will damage the Inverter and it will void the warranty

### ⚠ WARNING: DANGER OF BATTERY DAMAGE OR EXPLOSION/FIRE

- Loose connections or undersized cables can result in a severe decrease in voltage and increase in current draw. It can cause damage to cables and insulation and can result in fire events.
- Failure to make the correct polarity (Positive & Negative) connections between the Inverter and the battery bank can result in blowing fuses internally in the Inverter and can permanently damage the Inverter. Damage caused by reversed polarity is not covered under the warranty
- Making the initial connection to the DC Positive (Red +) terminal may cause a spark because of current flowing to charge the capacitors within the Inverter. This is a normal occurrence. The preferred and recommended practice to avoid terminal damage is to install a manual reset circuit breaker with the breaker open circuit, prior to making the final battery connections. Connect the cables to the inverter first, followed by the circuit breaker, then battery positive and finally the battery negative (or load side of shunt if using a battery monitor)
- Because of the possibility of sparking however, it is extremely important that both the Inverter and the battery/s be positioned

far away from any possible source of flammable gases. Failure to heed this warning could result in fire, explosion, serious personal injury, or death. As a result, there inverters are not ignition protected and not safe in encloses spaces where fuel, gases/vapours are present, or any other flammable product is in use or storage.

- Operating the Inverter without correctly grounding the unit may result in an electrical shock

### ⚠ WARNING: MEDICAL OR LIFE PRESERVING DEVICES

- DO NOT use any AllSpark Inverter to power life preserving or other critical medical equipment

### ⚠ WARNING - INSTALLATION PERSONNEL

- Offroad Living highly recommends that the installation of your new AllSpark Inverter is carried out by trained and certified electrical technicians. AC wiring must be carried out by a licenced electrical contractor in accordance with local wiring regulations and Australian Standards. Failure to install and connect correctly and in the appropriate order can result in damage to the inverter, circuit protection and/or battery and personal injury or death.

## 3. GETTING STARTED WITH YOUR ALLSPARK® INVERTER

When a motorized appliance or a tool turns on, there is almost always an initial surge of power to start up. This surge of power is referred to as the "starting load" or "peak load". Once started, the tool or appliance requires less power to operate. This is referred to as the "Continuous Load". This electrical information is usually stamped or printed on most appliances and equipment or can calculated as per below:

**AC AMPS X 230 VOLTS (AC voltage) = "OUTPUT WATTS"**

To determine the current draw from your batteries "INPUT WATTS", you take the OUTPUT WATTS that your device draws (this is will be the output power from the inverter) and multiply this by 1.1 (the power conversion loss from DC to AC power), then divide by 11 volts (minimum DC volts from your battery) to give you the maximum DC amps the inverter will draw from your battery (for that device).

**Example using a 1400W Coffee Machine**

**1400W X 1.1 = 1540W ("INPUT WATTS"). 1540W / 11V = 140A DC. This is the current draw from the battery.**

Motorized appliances such as pumps, freezers and air conditioners can have peak start-up loads of up to 8 times the rated continuous load. If this sort of appliance draws more than the peak power of the unit, damage can occur to the unit. This should be carefully assessed before using these appliances.

### FRONT PANEL AND REAR PANEL REPRESENTATION

**(Subject to change over time with model improvements)**

**1000w** **2000w** **4000w**


2000w rear panel shown for explanation (1000w and 4000w models both have similar rear plate arrangements)

24V/4000w model includes AC line terminals in addition to 2 x 3 pin AC output sockets

All AllSpark Pure Sine Wave Models include a 5m remote on/off switch panel with power status indicator

## COMPONANT DESCRIPTIONS

The follow items describe the components shown on the images above on each size of Inverter. These images are provided for information purposes only. Models may change slightly because of product developments and improvements over time.

1. AC outlets – All models have 2 x 230v 3 pin AC output sockets). The 24v/4000W model also has AC terminals for hardwired terminations. Use of these terminals must be in accordance with local wiring standards/regulations.
2. ON/OFF Switch. Turns the Inverter circuit ON and OFF. All models are supplied with a 5m remote switching control panel with power status indicator. You can only switch the unit on/off from one source at a time, not both at the same time.
3. Fault indicator - if this LED is lit in red, the unit encountered a fault (contact customer service for technical support)
4. Power indicator – when lit blue the device has entered Inverter mode
5. Battery DC voltage digital display (this is for general indication only and should not be relied on as an accurate reading). A shunt-based battery monitor should be used to provide accurate voltage information. The 1000w model only has a single LCD display. It indicates DC voltage on start-up and when the battery voltage drops too low, then reverts to displaying AC output voltage for the rest of the normal operation. It also shows error/fault codes where applicable.
6. AC Output voltage digital display
7. DC positive ( red + ) input terminal, connect it to the battery Positive ( red + ) terminal
8. DC negative ( black - ) input terminal, connect it to the battery Negative ( black - ) terminal
9. High speed brushless motor cooling fans. The cooling fan automatically turns on to cool the Inverter when the temperature inside the Inverter exceeds the pre-set limit. It turns off when the temperature reduces below this set point.

## SIZING THE BATTERY

The following is a basic guide to help determine the Ampere-hour (Ah) capacity rating that you will need to include in your battery bank sizing calculations for each appliance you wish to run from the Inverter. The sustained current producing ability of the battery should be checked with the battery manufacturers specifications to ensure it can produce the current required for your calculated demand. We recommend allowing two days usage in your battery capacity for each appliance you wish to use daily.

Follow this example to calculate an approximate battery capacity you need. Perform this calculation for each AC powered device:

*Current draw = (Appliance Watts x 1.1) / 11 Volts*

*Battery Ah required = (Current draw / 60 minutes) x No. minutes of run time*

***Example using a kettle of 1850W which takes 5 mins to boil***

***Current draw** = (1850 x 1.1) / 11 = 185 Amps*

***Battery Ah required** = (185 / 60) x 5 minutes = **15.4 amp hours***

**Note:**

The type of batteries you use with your high-power Inverter is important. Batteries used to start engines are not designed to be repeatedly deeply charged and discharged. We recommend using “deep-cycle” batteries with enough continuous output current that exceed the maximum output current of the inverter. Small amp hour batteries will struggle to provide enough continuous current or overcome the voltage sag when connected to larger inverters (over 1000w) and may encounter regular drops into low voltage protection modes as a result. If you experience this, try using a larger battery or two batteries connected in parallel.

All AllSpark LiFePO4 battery models can support a 2000w inverter. For higher wattage inverters we also have models available that are suitable to power 12v/2500w, 24v/3000w and 24v/4000w. Contact us for more information.

## 4. INSTALLATION

### MOUNTING THE UNIT

Before installing your inverter, give adequate thought to the location of the installation to ensure sufficient airflow to both ends of the inverter and connection and bend radius of the AC and DC cables. You should have a minimum of 75mm at each end on the inverter.
All AllSpark Inverter models have mounting tabs at the front and rear, each with 2 mounting holes. The inverter can be mounted on a horizontal or vertical surface, but not upside down. If mounting on a vertical surface, avoid installing the unit with vents and fans top and bottom (side to side is ok). Your Inverter should not be mounted under the bonnet or external to the vehicle. It is not water or dust proof.

### SIZING THE CIRCUIT PROTECTION

When connecting the Inverter to a battery/bank, it is critical to install correct sized circuit protection that is appropriate for the installation and the maximum current draw of the inverter. Circuit protection is installed to protect the supply cables from over current damage. Circuit protection for DC circuits is calculated by taking the maximum current draw of the circuit x 1.25 (then rounded up to nearest standard size). The following table provides the maximum current that each model can draw and as such provides the required circuit protection ratings for each model.

| Model | Minimum Circuit Protection Rating |
|---|---|
| 12V 1000W | 120A |
| 12V 2000W | 200A |
| 24V 4000W | 200A |

We recommend using AllSpark manual reset circuit breakers for inverter circuit protection. Ensure that the circuit breaker is in the open circuit position when connecting cables during installation. If using a circuit breaker is not suitable for your installation, then midi or mega fuse holders/fuses and should be used instead. In the event of using fuses, a manual isolation switch of a similar or higher rating than the circuit protect must also be used. This switch should be in the off position during installation. This is for isolating the inverter circuit when not in use or during maintenance, service or repairs.

### SIZING THE DC SUPPLY CABLES

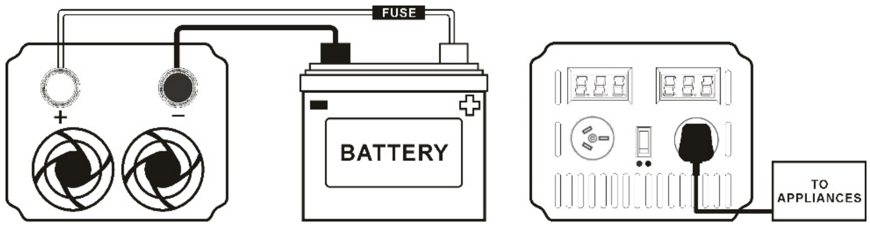
When connecting the Inverter to a battery/bank use the thickest multistranded insulated copper wire available in the shortest length practical. The cable rating should be calculated by taking the correctly calculated maximum current draw x 1.25 x 1.25. This ensures that the cable has a current rating higher than the circuit protection rating. You want the circuit protection to blow/trip in an overcurrent event and not melt/damage the cable.

The following table provides the recommended cable sizes for each model inverter based on using the recommended circuit protection ratings in the table above.

| Model | Minimum cable size 0-3m | Minimum cable size 3-5m |
|---|---|---|
| 12V 1000W | 4B&S | 1B&S |
| 12V 2000W | 0B&S | 00B&S |
| 24V 4000W | 0B&S | 00B&S |

## CONNECTING THE INVERTER

This Inverter needs two DC cable connections, one to Positive and one to Negative. The order of steps in the following procedure minimizes the danger of sparking near the battery bank.




1. Before mounting and connecting the Inverter, the ON/OFF switch and remote control switch must be in the OFF position
2. The Inverter should be securely mounted horizontally or vertically but not upside down, using corrosion-resistant fasteners sized 10g or larger
3. Prepare all cable with correctly sized cable lugs – the all PS-series inverters have M10 DC lugs.
4. The circuit protection must be installed in the positive cable as close as possible to the battery bank (ideally within 30cm) to protect the cable from excess current draw or short circuit in the event of a damaged cable.
5. Ensure all appliance cords or extension cords are disconnected from the Inverter

**NOTE: Before making any cable connections to the battery or inverter, it is important to ensure that the circuit breaker or isolation switch is in the open circuit/off position.**

6. Connect the positive ( red + ) cable to the Inverter positive ( red + ) terminal and the other end to the load side of the circuit breaker or fuse (CB should be in open/isolated position)
7. Connect the other positive cable to the battery side of the circuit breaker/fuse and the other end to the battery positive (or positive busbar if applicable)
8. Connect the negative ( black - ) cable to the Inverter's negative ( black - ) terminal and the other end to the isolation switch (if in use) or load side of battery monitor shunt. If no shunt in use, then direct to battery negative or negative busbar (if in use)
9. If using a shunt, the cable from battery to shunt and shunt to isolation switch and switch to inverter must all be of the correct size as per the cable sizing table in the previous section above.

**NOTE: Sparking and minor terminal damage is to be expected if you do not install a circuit breaker or isolation switch in the off position on the initial cable connections. This is normal as it is charging the capacitors internally. This can be avoided by following the steps 1-9 above.**

## 5. OPERATION

1. Check the battery voltage to make sure it matches the DC input voltage of the Inverter. Only connect a 12V DC input Inverter to a 12V DC battery or 24V DC input inverter to 24V DC battery. Connection to the incorrect voltage can result in damage that is not covered by warranty
2. Turn On (“I”) the Inverter. Make certain the overload audible alarm doesn’t sound
3. Turn OFF (“0”) the Inverter. The audible alarm may also sound a short "chirp". This is normal
4. On the first use, please use a small wattage appliance (under 100w) to test the installation is safe, correctly installed and free of any defects.
5. Before connecting an AC appliance, make sure the appliance is turned off. Once you have confirmed that the appliance to be operated is turned off, plug the appliance cord into one of the 230V AC outlets on the front panel of the Inverter or into general purpose outlets (GPO’s) connected via the hard wired line terminals (on 24v models only)
6. When you first turn ON the Inverter, the Inverter starts a self-detection procedure. The audible alarm will sound a beep at the same time and the power indicator will be lit. If the fault indicator is lit in red, then turn the Inverter off. This Inverter has a soft starting function. Always wait to turn ON your appliances for a minimum of 3 seconds after powering up the inverter
7. Turn the appliance ON

**Notes:**

The audible alarm may make a momentary "chirp" when the Inverter is turned OFF. This same alarm may also sound when the Inverter is being connected to or disconnected from the 12V DC battery bank. When using an extension cord from the Inverter to an appliance the extension cord should not be longer than 15m and ideally should be of good quality and cable thickness to ensure no voltage drop along the cord.

## 6. SPECIFICATIONS

| Model | PS-100012 | PS-200012 | PS-400024 |
|---|---|---|---|
| Continuous power | 1000W | 2000W | 4000W |
| Maximum power | 1200W | 2500W | 5000W |
| Surge power | 2000W | 4000W | 8000W |
| Output Sine Wave | Pure | Pure | Pure |
| DC input (V) | 12 Volt | | 24 Volt |
| DC cut out (V) | 10.5 Volts (Low) & 15 Volts (High) | | 21.0 Volts (Low) & 30 Volts (High) |
| No Load Draw | 0.4 Amps | 0.8 Amps | 0.6 Amps |
| AC Output | 230 Volts (+/- 8% in accordance with Australian Voltage standards | | |
| AC Sockets | Dual 10 Amp Australian standard 3 pin sockets | | |
| AC hard wire terminals | No | | Yes, up to 4mm2 cable input |
| Remote switch panel | Yes – 5m cable | | |
| Display | Single digital voltage meter and LED indicators | Dual digital voltage meters and LED indicators | |
| Efficiency | ≥90% | | |
| THD | THD≤3% | | |
| Output frequency | 50 Hz±1 Hz | | |
| Isolation strength | ≧1500Vac/1min, Between input and output and the casing | | |
| Insulation method | Optical Coupling DC-DC-AC | | |
| Protection | Short circuit protection, Overload protection, Over temperature protection, Battery low voltage protection, Battery over voltage protection, Battery low voltage warning | | |
| Minimum Cable size for DC connection | 4B&S | 0B&S | 0B&S |
| Circuit Protection | 120A | 200A | 200A |
| Dimensions (L x W x H) (inc. mounts and terminals | 335 x 150 x 90 | 440 x 180 x 110 | 510 x 180 x 142 |
| Weight kg (inc. remote) | 2.4 | 4.6 | 6.7 |

*Specifications are subject to change without prior notice.

## 7. TROUBLESHOOTING

| **PROBLEM: The Inverter will not power ON, power indicator (blue) is not lit** | |
|---|---|
| **Reason** | **Solution** |
| Poor contact with battery terminals | Shut down Inverter and disconnect. Clean terminals thoroughly and reconnect |
| Blown DC battery fuse(s) or tripped circuit breaker | Turn off Inverter. Replace fuse(s) with same type and rating or reset circuit breaker |
| **PROBLEM: The appliances do not work, the fault indicator (red) is lit, Audible alarm ON** | |
| **Reason** | **Solution** |
| Battery voltage below 10 Volts* (*20v for 24v models) | Charge or replace battery |
| Inverter is too hot (unit is in thermal shut down mode) | Allow Inverter to cool. Check for adequate ventilation. Reduce the load on the Inverter to rated continuous power |
| The Inverter is overloaded | Reduce the load |
| Unit may be defective. | See Warranty and contact AllSpark® customer service |

### FAULT CODES

| FAULT CODES | |
|---|---|
| **ERROR CODE** | **PROTECTION MEANING** |
| OH | Over Temperature Protection. Reduce load or stop the inverter and restart it after cooling down |
| OL | Current Overload. Reduce the load current and reset |
| L | Battery under voltage protection. Recharge battery or use larger capacity batteries |
| H | Battery over voltage protection. Battery voltage is too high (over 15v) or in Equalization charge cycle from battery or solar charger. Wait for charging to end or reduce voltage below 15v for 12v applications. Solar controllers at primarily the cause of this when at high states of charge or final 1-3% of charging stages and with incorrect charge voltage settings. Reduce charger output voltage to below 14.5V (29V for 24v batteries) |
| EO | Abnormal output voltage – internal fault. Contact customer service for support |
| HH | Protection against heavy load starting, switch on the inverter before switching on any load |
| HE | Protection against high percentage overload or short circuit. Contact customer service for support |

## 8. WARRANTY

Due to changes in product design and improvements over time, effective from the 1st of November 2021 the updated model AllSpark PS-Series Pure Sine Wave Inverters come with a 24-month warranty. All models sold prior to this date have a 12-month warranty.

The warranty only applies to the original purchaser. It is warranted to be free of material or workmanship defects for the warranty period outlined above.

This warranty is the only warranty applicable to your AllSpark PS-Series Inverter. No other warranty is specified or implied regarding its fitness for purpose for your application other than that specified in this document.

The warranty is limited to the dollar value of the original purchase price of the original product itself only and expressly excludes incidental or consequential damage that may result in relation to use of this inverter. The warranty does not cover incorrect installation or incorrect use and does not extend to any other components such as cables, circuit protection, batteries etc and does not cover damage of defects from normal wear and tear, including scratches, chips, dents nor accidents, shipping damage, modification by users, misuse, or abuse.

The warranty does not cover commercial use or applications. Contact us for details on commercial or heavy-duty applications.

If you have any queries about service in or out of the Warranty period, please contact us by email at warranty@offroadliving.com.au or by phone on 08 6205 6868

Warranty requests can be made on our website using the following URL.
https://offroadliving.com.au/pages/warranty-technical-support

## 9. THE LEGAL STUFF

The following information is applicable for any purchase directly from Offroad Living and not from retail re-sellers.

A copy of our Warranty Policy, Terms & Conditions of Sale and Privacy Policy can be found on our website at https://offroadliving.com.au/pages/legal

These documents outline your rights and obligations under this Warranty and Australian Consumer Law with regards to Consumer Guarantees.

For any technical queries about this product, you can email us at contact@offroadliving.com.au

If purchased through an authorized third party or reseller, please refer any initial enquires to the original place of purchase for technical support or warranty enquiries.

## TO THE NEW TRIBE MEMBER

From the Tribe at Offroad Living, we sincerely thank you for your purchase. We hope this Inverter helps to increase your enjoyment of the great outdoors and gets you “Offroad” more often. If at any time you need further advice on 4wd, camping or caravan products please do not be a stranger and feel free to hit us up on Facebook

https://www.facebook.com/groups/offroadliving/