DB Grid Charged Inverter PR301

Renewable energy series - *Light and power from batteries*

By Microsolve C.C.

User Manual

Thank you for purchasing this state of the art product. This product has been designed to provide years of trouble free service.

Introduction

This unit serves as an alternative electrical supply DB to any existing grid supplied home, to provide limited power via an inverter running off batteries. The main features is the simplicity of operation to the user. Depending on the control switch position, the system can supply power upon a power failure, or load shedding situation automatically or can be under the control of the user via a panel mounted control switch.

The user simply ensures that any equipment powered by the wall mounted DB inverter is what is required, and any nonessential appliance is switched off to preserve energy in the battery for the limited powered appliances. The only understanding the user must have, is that there is a limited amount of energy stored in the battery, and it will power whatever is connected to the battery for a fixed period of time. The amount of time that the inverter runs will be directly linked to battery size and load consumption, that is the number of appliances powered by the inverter. The higher the load consumption, the less time the battery will be able to maintain power to the load via the inverter.

The unit has its own DIN rail mounted circuit breakers, not only to offer overload protection to the equipment, but to also enable safety to any maintenance being done on the circuits connected to the DB.

This DB unit is to only be installed by qualified electricians, who understand the operation of alternative power supplies, and must be installed under the respective local electrical regulations, who must also provide the necessary certificates of conformity.

Sine Wave Output

Depending on the model you have purchased, it can either be a modified Sine Wave or a Pure Sine Wave. The unit converts the 12V DC from the battery to 230V AC using power electronics. The AC can be used to power up a number of mains equipment. It is important that you do not overload the inverter. In the case that the inverter is overloaded, it will shut down, and will require you to switch the unit off, remove the loads, and switch on again. Reconnect the loads one a time to see which load is over loading the inverter. If the inverter you have is too small for your application, then you may have to purchase an inverter which can handle a higher load. Speak to your supplier to see what other solutions that they may have for your application.

Modified Sine Wave – Suitable for most loads such as TVs, P.C.s, decoders, LED and CFL lamps, cell phone chargers.

Pure Sine Wave – Suitable for devices with electric motors, fans, micro waves, gate controllers, audio equipment, TVs, P.C.s, decoders, LED and CFL lamps, cell phone chargers.

Operation

The inverter output is controlled by the On/Off switch at the base of the DB unit. When the mains is available, there is power through the switch over control, through the DIN rail mounted circuit breakers and directly to the loads connected to the DB unit, irrespective if the switch is in the On or Off position. When the mains fails, and the switch is in the 'Off' position, the inverter is disconnected and there is no power to the load. When the mains returns, the internal switch will immediately pass the mains to the loads again.

In the case that the switch is in the 'On' position, while mains is available, there is power through the switch over control, through the DIN rail mounted circuit breakers and directly to the loads connected to the DB unit. When there is a mains failure, the internal relay switches over, and the inverter starts, and approximately 2 seconds later, there will be power through the changeover switch, through the panel mounted circuit breakers and the load is powered by the inverter. When the mains returns, the internal relay immediately transfers the mains to the loads, and switches the inverter off.

This ensures that the inverter only works when the user wishes to have battery backup, and preserves the battery should there be a mains failure during a time the user is not making use of the battery backup, thereby preserving the battery for when it is required by the user.

When the switch is in the Off position, the inverter does not run, placing the unit in a low power drain mode preserving the energy in the battery for when you need it.

Whenever there is power from the grid, the battery is always maintained at full power via the internal battery charger.

Mains Input

The Mains Input is used to charge the battery, but it also supplies power to the load, irrespective of the state of charge of the battery through the changeover switch..

Ensure that the On/Off switch is in the 'Off' position before connecting

A grid supply circuit monitors the mains, and while the grid is supplying power, the grid power is passed onto the load through the changeover switch. As soon as the grid supply falls away due to load

shedding or whatever reason, the inverter is switched on, provided the 'On/Off' switch is in the on position, and the load is connected to the inverter. As soon as the mains returns, the load is immediately switched over to the mains, and the battery starts charging to replenish the used energy.

Depending on the model purchased, which may have 1 or 2 circuit breakers.
All monitoring and local electronics supply is coming of the number '2' input line. When connecting single circuit breaker DB Grid inverters, use the number '2' terminal connections on the input side.

Installation of the DB Inverter

Locate the position of the main supply DB box, now plan where the DB inverter unit will be installed, taking into consideration, the wires from the main DB to the inverter DB, and the battery connections. It is better to have longer mains wires, than to extend the battery wires. The reason for this is the high currents on the battery side will require the use of very thick copper cables to prevent volt drops across the cables and reduce the efficiency of the inverters.

Remove the lid of the inverter DB box, by loosening the 4 large plastic screws in each corner. Mounting of the box to the wall, will make use of the 4 corner holes, in which to use a maximum of M5 screws or bolts to mount to the wall.

Once the box is bolted on the wall, open the main DB box, and trace out the 1 or 2 circuits which will be supplied by the inverter. Switch off the main switch on the DB and always observe safety when working around the DB boxes.

Remove the 1 or 2 wires from the original circuit breakers. Using Norsk 6Amp cable, will make the installation easier and safer. Find the earth bar on the main DB box, connect the Norsk cable earth wire to the this earth terminal, and route the Norsk cable to the DB inverter box.

Place the first cable 'Red' wire cable from the existing circuit breaker, and connect to the DB Invertor box, and locate 'L2' terminal on the changeover PCB. Next connect the 'Black' Norsk cable to the Neutral us bar from the main DB box, and route it to the DB inverter box, and wire it into the terminal marker 'N' on the changeover PCB. Using another Norsk cable, join the earth in the DB inverter box, and on the other end, join to the main DB box earth bar. Next connect the 'Red' wire of the Norsk cable to the Circuit breaker bottom output terminal. Join the other 'Red' wire side to the cable removed from the main DB circuit breaker at an earlier step. Use a glass end cap to make the connection safe.

2 Circuit breaker DB Inverter Unit

Do the same to the next circuit breaker circuit, and connecting to the number 'L1' terminal of the changeover PCB. Take the wire from the 2nd circuit breaker bottom output terminal and join to the second circuit in the main DB box.

Connect the battery as per the next step.

Connecting the Battery

The battery is the energy source which the inverter uses to drive your load. Any problems with your battery will have a direct influence on the capability of the inverter to supply your load.

When using the battery for the first time, charge the battery at least for 24 hours, to get the full output capacity of the battery.

BEFORE CONNECTING OR REMOVING THE BATTERY, ENSURE THAT THE PANEL ON/OFF SWITCH IS IN THE 'Off' POSITION. THE MAINS SUPPLY FROM THE

ORIGINAL DB BOARD IS IN THE OFF POSITION. Failure to do this, may cause damage to the DB Grid Charged Inverter or to your load. This action will also void all warranties.

REVERSE CONNECTION OF THE BATTERY WILL ALSO VOID ALL WARRANTIES.

BEFORE MAKING ANY CONNECTIONS MAKE SURE THAT YOU ARE CONNECTING THE CORRECT COLOUR WIRE TO THE BATTERY.

The following convention is used in this manual and with the DB Grid Charge Inverter :-
RED – Positive
BLACK - Negative

Depending on which model you have, there are two ways that the unit connects to the battery, either directly from the cables from the unit to the battery, or via an inline battery connector.

If the battery was supplied by the unit representative, chances are that the battery will have already been connected to the inline connector correctly, and you simply have to mate the connectors and push them in until a solid click is felt and heard. The polarity of the battery would have been confirmed by your supplier.

In the case that you have not purchased the battery directly from your supplier, then you will have to connect the battery to the DB Grid Charge Inverter. Before commencing ensure you have the correct tools to tighten the cables to the battery terminals.

To avoid damage, fire or dangerous usage must you under no circumstances use a different capacity of battery for what the unit has been manufactured for.

Battery Charge table

Maximum Charge Current	Battery Capacity Amp Hour	Minimum Recommended solar panel size
1.5A	20Amp	35W
3A	30Amp	75W
4A	45Amp	100W
6A	65Amp	150W
7.5A	80Amp	180W
10A	100Amp	250W
12.5A	125Amp	300W
15A	150Amp	350W

Cables with ring connectors

Check the battery and locate the 'Negative' terminal on the battery. This is usually marked with a '**-**' symbol, or with a BLACK washer or other marking such as "Neg'. Now take the BLACK wire, and locate the end ring, and attach it to the battery terminal. Tighten the screw or bolt well. Tug on the cable and ensure that the ring does not move. If it does move, then retighten the screw/bolt. DO NOT OVETIGHTEN, or you may strip the thread either in the battery or strip the bolt.

Next locate the 'Positive' terminal on the battery. This is usually marked with a '**+**' symbol, or with a RED washer or other marking such as 'Pos'. Now take the RED wire, and locate the end ring, and attach it to the battery terminal. Tighten the screw or bolt well. Tug on the cable and ensure that the

ring does not move. If it does move, then retighten the screw/bolt. DO NOT OVETIGHTEN, or you may strip the thread either in the battery or strip the bolt.

In Line Battery Connector

In the case the inline connector has not been connected to a battery, then follow these instructions. Check the battery and locate the 'Negative' terminal on the battery. This is usually marked with a '**-**' symbol, or with a BLACK washer or other marking such as 'Neg'. Now take the BLACK wire, and locate the end ring, and attach it to the battery terminal. Tighten the screw or bolt well. Tug on the cable and ensure that the ring does not move. If it does move, then retighten the screw/bolt. DO NOT OVETIGHTEN, or you may strip the thread either in the battery or strip the bolt.

Next locate the 'Positive' terminal on the battery. This is usually marked with a '**+**' symbol, or with a RED washer or other marking such as 'Pos'. Now take the RED wire, and locate the end ring, and attach it to the battery terminal. Tighten the screw or bolt well. Tug on the cable and ensure that the ring does not move. If it does move, then retighten the screw/bolt. DO NOT OVETIGHTEN, or you may strip the thread either in the battery or strip the bolt.

Connect to the unit inline connector by mating with the battery side connector, and push in until you feel and hear a click. To disconnect the in line connector, simply pull hard on each connector, and they will separate.

The advantage of the inline connector, is that you can change batteries very quickly without tools or without having to worry about the polarity being correct. ALWAYS remember to switch the DB Inverter unit off, and to disconnect the main DB circuit breakers off when disconnecting or connecting the battery.

The amount of time that the inverter runs will be directly linked to battery size and load consumption. The higher the load consumption, the less time the battery will be able to maintain power to the load via the inverter.

Electronics Charger and Controller

A PWM based 3 stage charger ensures the battery is fully charged. For best results, match the battery to the internal charger. Adding more batteries will take the charger longer to charge all the batteries, in some cases, if the internal charger is too small, then it may never charge the batteries properly, thereby affecting the amount of inverter running time. Always order and match the battery to the DB Inverter charger.

There is an internal circuit, which monitors the battery voltage, and when it drops below 10.5V, will disconnect until the power is restored, and the battery is recharged.

On new installations, in which there is no mains available at the time of installation, and the user wishes to use the inverter, locate the red reset button, on the bottom side of the DB inverter unit, press for a second or two to enable the electronics to power up and run the inverter. This is not s 'Reset' switch for when the battery has been disconnected due to use and is now below the 10.5V threshold. Continually over riding this mode will damage the battery permanently.

When the battery is discharged and is in this situation, ensure that the battery is charged as soon as it is possible, to ensure the battery recovers from this deep discharge. Periods longer than 12 to 24 hours will begin the damage to the battery chemistry.

Switch On the system

Recheck the wiring to ensure that there are no shorts, open circuits or errors.

Switch on the main DB circuit breaker. Next switch on the 2 isolated circuits via the circuit breakers in both DB boxes.

Test to see that mains is getting to the 2 circuits that were modified. If not, recheck your wiring.

- Place the 'On/Off' switch on the DB inverter box to the 'On' position.
- Switch off the breaker in the main DB to the circuits that will be supplied by the inverter.
- After 2 seconds, you should hear the inverter working. Verify that the circuits have power on them. If not verify all your wiring.
- Replace the covers to both DB boards.
- Place a label on the main DB board circuit breakers with a label stating that the respective breakers are going to the Inverter DB.
- Place a label on the Inverter DB facia indicating the respective circuits that are being supplied by the inverter.
- Place a label indicating the method to isolate the circuits so that any future electrician will be aware of the modifications made on the DB boards.
- The system is now ready for full operation.

To isolate the loads from the DB boards, you must switch the respective circuit breakers off on both DB's and place the 'On/Off' switch of the Inverter DB into the off position, so that the inverter is not powered by the battery.

Specifications:

Inverter power	500Watt or 1000Watt - model dependant
Inverter output voltage	200V to 250V dependant on battery voltage
Inverter wave output	Modified sine or Pure sine wave - model dependant
Inverter load	100% overload for 1 second
Unit physical size	W = 223mm, D = 286mm, H = 124mm
Weight	500W model – 4Kg, 1000W model 5Kg
Packed size	235mm X 300mm X 130mm
Packed weight	500W model – 4.5Kg, 1000W model – 5.5Kg

Battery sold separately. When ordering, battery size must be advised so that the unit is set up at the factory for your requirements.

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