

**PROJECTA**

**CONVERTS 12 VOLT DC – 230/240 VOLT AC**

# **POWER INVERTER**

**POWERS HOUSEHOLD APPLIANCES  
FROM A 12 VOLT BATTERY**



P/No.s IM150, IM300, IM600, IM1000, IM2000

## **WARNING**

- **For use with negatively earthed vehicles & systems only.**
- **For indoor use out of weather only.**
- **Internally bonded for safety, battery DC negative to case & AC socket earth .**
- **Hazardous voltage inside - do not attempt to open or repair.**
- **Do not use if damaged.**
- **Read operating manual before using or making any connections.**
- **Only connect 230/240V AC appliances that are in safe condition.**
- **It is recommended that a type 'A' portable residual current device (RCD) be used for added output protection.**
- **For independent use, do not connect to buildings.**

## **FEATURES**

- Peak Power Technology runs appliances with high start up loads.
- Noise-free filtering reduces TV buzz & interference.
- Built in safety protection against AC power overload and low battery.
- Heavy Duty power lead with accessory plug (IM150 only).
- Heavy Duty power leads for direct battery connection (except IM150).
- Approved AS/NZS power outlet sockets.
- Twin power outlet sockets (except IM150 & IM300).
- Turbo cooling fan (IM300 only).
- Temperature controlled automatic cooling fan (except IM150 & IM300).

## SPECIFICATIONS:

P/No.	IM150	IM300	IM600	IM1000	IM2000
Input	12V Battery/Vehicle (10–15 Volt DC)				
Input Current: (Max DC Amps)	12A	30A	75A	120A	240A
Input Standby Current (+/-5%)	260mA	570mA	680mA	800mA	800mA
Output	230/240 Volt AC, 50Hz (Modified Sine Wave)				
Continuous Output Power (Watt)	150W	300W	600W	1000W	2000W
Peak Output Power (Watts)	300W	600W	1200W	2000W	4000W
Efficiency	85–90%				
Low Battery Alarm/Shutdown	Alarm 10.5 Volt/Shutdown 10.0 Volt (+/-0.2 Volt)				
Cooling Fan	N/A	Manual	Automatic temperature controlled		
Thermal Shutdown	65° (±5° C)				
Replacement Fuse	Standard Auto Blade Fuse				
Fuse Quantity & Size	1x20A	1x40A	3x25A	6x20A	12x20A
Fuse Location	External	External	External	Internal*	Internal*
Connection Cable	Cig Plug 800m	3mm <sup>2</sup> /900mm	6mm <sup>2</sup> /900mm	16mm <sup>2</sup> /1100mm	25mm <sup>2</sup> /1100mm
Dimensions (cm)	16.5 x 12.5 x 5.2	18 x 12.5 x 5.2	19 x 21 x 7	30 x 24 x 8	47 x 24 x 8
Weight	0.6kg	0.8kg	1.5kg	2.9kg	5.2kg

# WHAT IS AN INVERTER?

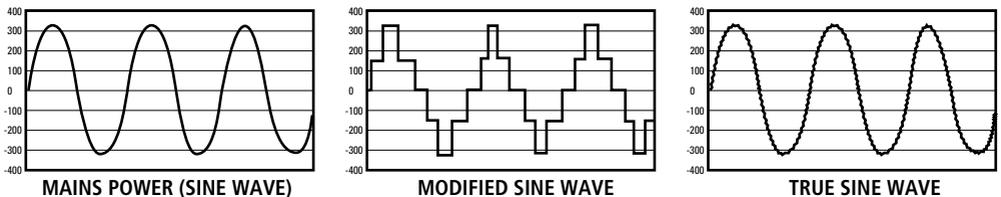
Inverters are designed for powering household appliances from a battery or vehicle. They are electronic devices that convert (12V DC) battery power to (230/240V AC) mains power.

Inverters are compact and often lightweight making them an ideal source of portable mains power. Thanks to their portability they are commonly used in cars, caravans, motor homes, boats, 4WD's and utility vehicles.

Using an inverter with standard household appliances is a much cheaper option than purchasing specialised 12V appliances for times when power is not available.

There are two different types of inverters, modified sine wave and true sine wave. The difference between the two is how close the output replicates mains power.

These graphs show the difference in output between mains power, modified sine wave and true sine wave inverters.



Logically it follows that the process used in a true sine wave inverter is more complex than a modified sine wave inverter and subsequently they are lot more expensive.

In reality most electric appliances operate unaffected on a modified sine wave and hence they are more common.

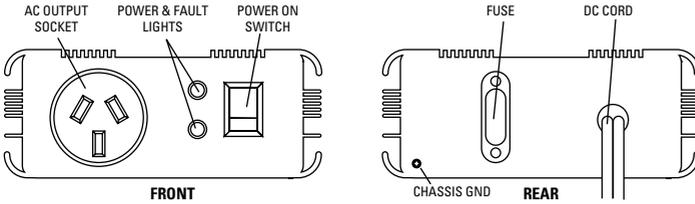
True sine wave inverters are reserved for use on medical equipment and sensitive electrical appliances.

Inverters are available with different power output levels to suit the type of appliances to be powered. Small inverters are designed for powering one small low power electrical or electronic appliance. Larger inverters can be used to power multiple small appliances or one larger appliance. Typically inverters are not an efficient method for running appliances with very high power requirements such as electric heaters, stoves, kettles and air conditioners. This is due to their high current draw and battery consumption.

# CONNECTIONS / CONTROLS & ACCESSORIES

After unpacking your inverter take a moment to check that you have all the correct accessories for your model and familiarise yourself with the connections and controls.

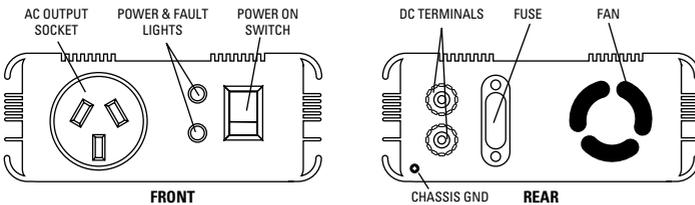
## P/No. IM150



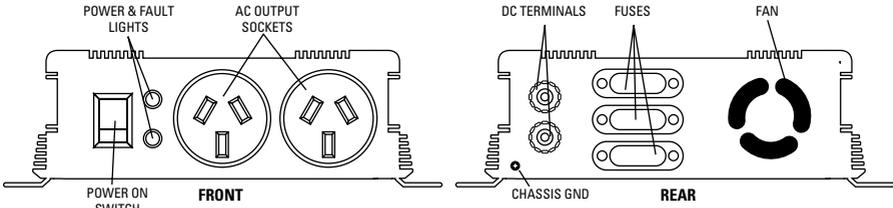
Supplied:

- Operating instructions
- Fitted DC cord with accessory (Cigarette) plug (800mm)
- Spare blade fuse

## P/No. IM300



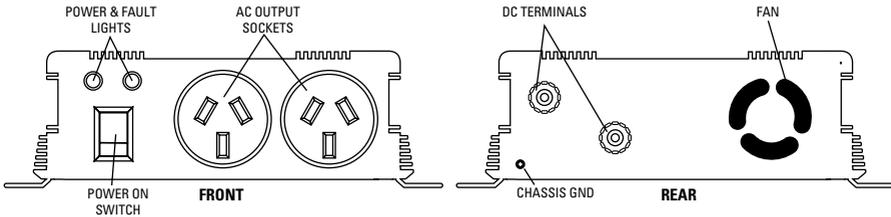
## P/No. IM600



Supplied:

- Operating instructions
- Negative (Black) DC connection lead fitted with battery clips (900mm)
- Positive (Red) DC connection lead fitted with battery clips (900mm)
- Spare blade fuse (IM300) or fuses (IM600)

## P/No. IM1000 & IM2000



Supplied:

- Operating instructions
- Negative (Black) DC connection lead fitted with ring terminal (1100mm)
- Positive (Red) DC connection lead fitted with ring terminal (1100mm)

## PLACEMENT / LOCATION / MOUNTING OF INVERTER

### Caution:

- The inverter must be mounted away from any flammable goods, gas bottles or gas appliances.
- Batteries should be mounted in a separate well-vented enclosure.
- For vehicle or camping use the inverter must be protected from rain, water or moisture.

Projecta inverters are designed for indoor, out of weather use only. For best performance the inverter must be used or mounted in a cool, dry, clean and well-ventilated area.

For best TV / Radio reception keep inverter as far away from TV's, radios, antenna cables and antennas as possible.

Some models are supplied with mounting brackets (except IM150 & IM300). If used in mobile applications such as 4WD, Caravan, Motor home or boat the inverter should be mounted to a suitable horizontal or vertical panel, with at least 20cm clearance from the rear panel of the inverter to provide good ventilation for the cooling fan.

## SUITABLE POWER SOURCE:

In order to operate the inverter and supply power to an appliance a suitable 12V DC power supply is required. This can be a vehicle or caravan battery, portable power pack or an independent 12V lead acid battery. For most applications, a deep cycle battery is recommended for best performance.

The size of the battery used will determine how long the inverter will supply power to an appliance and how well the inverter will perform. Most batteries are marked with their size in Amp hours (Ah) or Cold Cranking Amps (CCA).

Because 12 Volt inverters are capable of drawing high currents the inverter should only be connected to a suitable size battery. Connection to an undersized battery could damage the battery and will result in the inverter shutting down within a short period due to low battery voltage.

The amount of power drawn from the battery is proportional to the inverter load.

P/No.	IM150	IM300	IM600	IM1000	IM2000
Minimum Recommended Battery Size	17Ah (100CCA)	24Ah (200CCA)	50Ah (400CCA)	75Ah (550CCA)	85Ah (600CCA)
Run time with maximum load & minimum battery size	40min	40min	30min	15min	5min
Run time for a 100 Watt globe with minimum battery size	80 min	2 hours	4 hours	6 hours	7 hours
Ideal battery size	50-70Ah	50-70Ah	50-130Ah	75-250Ah	85-400Ah

## CONNECTION TO POWER SOURCE & EARTHING

### Caution:

- *Even though the inverter is powered from a battery, it still produces Dangerous High Voltage AC power and has the potential to fatally injure if incorrectly installed or used.*
- *Before making any connections ensure inverter is switched off and has no AC appliances plugged into the AC output sockets.*
- *Ensure vehicle / system is a negative earthed or negative ground system only.*
- *Double check battery negative and positive posts before making any connection, a wrong connection (Reverse polarity) will cause the fuse/s to blow and may damage the inverter.*
- *A small spark (Arc) can occur when making the final battery connection, this is most common when the inverter has not been used for some time. This spark is caused by the inverter's large capacitors charging quickly. To minimise this, make the last connection quickly and completely.*
- *Do not make any connections if there are any flammable fumes present or near any volatile fuels.*
- *Batteries can be dangerous, follow all battery manufacturer's instructions and warnings.*
- *Projecta inverters are designed FOR INDEPENDENT USE ONLY. That is, they cannot be connected to household wiring whether the building is connected to the electricity grid or not.*
- *Never operate the inverter without the DC negative input connected direct to the battery and never install a fuse, circuit breaker or battery switch in the negative supply line (IM150 excepted).*

### **P/No. IM150**

Making the DC connection on the IM150 is easy with the supplied lead and accessory (cigarette) plug:

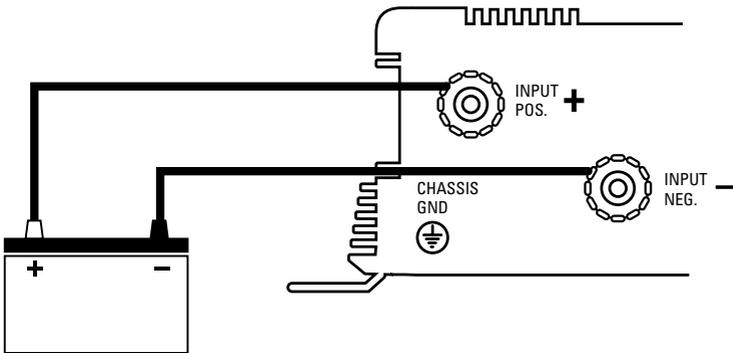
- Insert the accessory plug into your vehicle's 12 Volt accessory (cigarette) socket. You may need to turn the ignition key to the "Accessory" position to energise the socket and provide power to the inverter.
- The IM150 does not need any external earthing, however an external earth connection (Chassis GND) has been provided on the rear panel, this connection can be used to help reduce radio / TV interference, see the section on external earthing.

### **P/No. IM300, IM600, IM1000 & IM2000**

These inverters can be connected to a power source on a temporary basis with the supplied DC leads (see the section Temporary Connection) or hard wired for a permanent installation with suitably sized cable and hardware for your application (see the section Hard Wired Connection). Regardless of which connection method is used it may be advantageous to earth the inverter case, see the section on External Earthing for more details.

### TEMPORARY CONNECTION:

- Connect the ring terminal on the negative lead (Black) to the negative (Black) DC terminal on the back of the inverter.
- Connect the battery clip (Black) or ring terminal (IM1000, IM2000) on the other end of the lead to the negative DC supply or (-) battery terminal.
- Connect the ring terminal on the positive lead (Red) to the positive (Red) DC terminal on the back of the inverter.
- Connect the battery clip (Red) or ring terminal (IM1000, IM2000) on the other end of the lead to the positive DC supply or (+) battery terminal.



## “HARD WIRED” CONNECTION

When mounting the inverter in a vehicle, caravan, boat or cabin it may be preferable to use longer DC battery cables than those supplied, so that the inverter can be placed in a more convenient, cooler or more protected location.

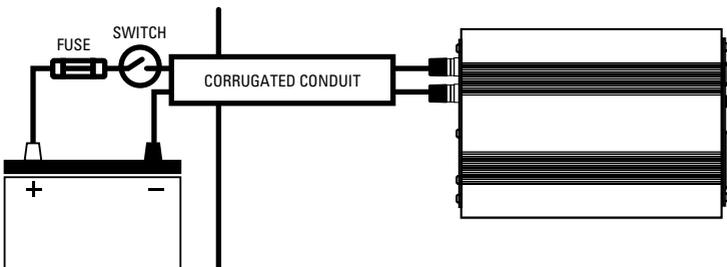
If longer cables are required only use suitably insulated automotive battery cable according to the following table (Note: B&S = AWG)

P/No.	IM300	IM600	IM1000	IM2000
Up to 2m	8 B&S (8mm <sup>2</sup> )	6 B&S (14mm <sup>2</sup> )	3 B&S (26mm <sup>2</sup> )	2 B&S (32mm <sup>2</sup> )
3m	8 B&S (8mm <sup>2</sup> )	3 B&S (26mm <sup>2</sup> )	2 B&S (32mm <sup>2</sup> )	0 B&S (49mm <sup>2</sup> )
4m	6 B&S (14mm <sup>2</sup> )	2 B&S (32mm <sup>2</sup> )	0 B&S (49mm <sup>2</sup> )	00 B&S (64mm <sup>2</sup> )
6m	3 B&S (26mm <sup>2</sup> )	0 B&S (49mm <sup>2</sup> )	00 B&S (64mm <sup>2</sup> )	Not Recommended

- It is recommended that a circuit breaker or high current fuse be placed in the DC positive (+) line close to the battery.

P/No.	IM300	IM600	IM1000	IM2000
Fuse or Circuit Breakers size (+) Only	40AMP	100AMP	150AMP	250AMP (or 2 x 150AMP in parallel)

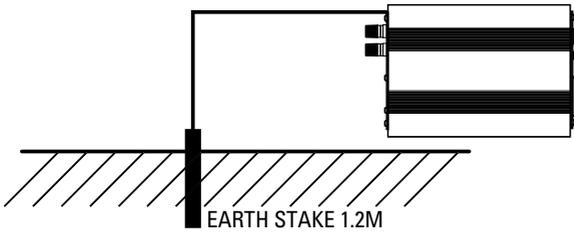
- It is recommended that a heavy duty battery switch with a current rating higher than the fuse (or combined fuses) be fitted in the DC positive (+) line close to the battery to allow the supply to the inverter to be switched off, this can also be achieved by using a circuit breaker which has a trip facility.
- Positive and Negative cables should be run close together to reduce cable inductance, and be protected from damage by corrugated conduit.



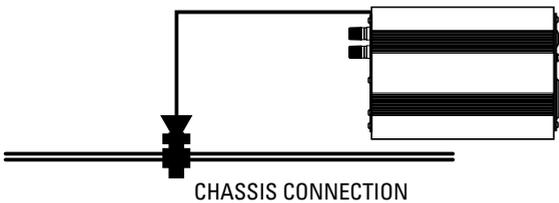
### EXTERNAL EARTHING: (OPTIONAL)

Projecta inverters have been internally bonded for safety, by connecting the AC socket/s earth pin to the inverter case and to the DC negative supply input. Because of this most installations do not require the inverter to be earthed. However if the inverter is used in a stationary land based application or if the inverter is causing interference with TV sets or radios it is recommended that an external earth connection is made by one of the following methods:

- External Earthing Stationary Applications --Connect an earth wire (Preferably solid Green or Green with Yellow stripe) from the external earth connection (Chassis GND) on the rear of the inverter to a metal stake or pipe that is driven into the ground at least 1.2m.



- External Earthing Mobile Applications --Connect an earth wire (Preferably solid Green or Green with Yellow stripe) from the external earth connection (Chassis GND) on the rear of the inverter to the chassis of the vehicle or ground wires in a boat.



# OPERATION

## *Caution:*

- *Always switch off the appliance and inverter before recharging the battery or starting the vehicle engine.*
- *Never connect the AC output of the inverter to normal fixed building wiring or any wiring connected to the mains grid. Normally AC wiring contains a M.E.N. link, this neutral to earth link will damage the inverter.*
- *This inverter is designed for direct connection to appliances however extension leads and power boards can be used.*

# PROTECTION FEATURES

Projecta inverters include sophisticated circuitry that monitors the operation of the inverter and turns the inverter off if a problem is detected. The "Fault" light will illuminate and an audible alarm will be heard if this occurs. This prevents damage to the inverter, battery or appliance being powered.

- **Low Battery** - This feature will sound a continuous alarm when the battery powering the inverter is low (10.5 Volts). It is recommended that the appliance is turned off, then the inverter is also turned off and the battery is recharged.

If the appliance is allowed to continue to run, the inverter will turn off when the battery is very low (10.0 Volts) to prevent damage to the battery or inverter. This will cause a sudden disruption of power to the appliance that may cause problems for some appliances, for example most computers that need to be shut down properly.

- **Overload** - This feature will sound an alarm and turn the inverter off when the total load connected to the inverter exceeds the inverter's rating (see "Determining suitable load/appliance") This may also occur due to highly inductive loads such as any appliance with a motor causing a sudden peak load on the inverter.

If this occurs, switch "OFF" the appliance and the inverter. After 2 seconds turn the inverter "ON" and the inverter will provide power again. Turn the appliance "ON", if the inverter shuts down more than 3 times, it is likely that the appliance is drawing more load than the inverter can supply, and a larger inverter would be recommended.

- **High temperature** -This feature will turn the inverter off if the inverter has reached a high temperature. This may occur from continuously running a high load for long periods, due to high ambient temperatures or due to poor ventilation around the inverter. If this occurs, turn the inverter off and allow to cool for at least 15 minutes before resuming operation. Where possible reduce the load on the inverter and improve ventilation.

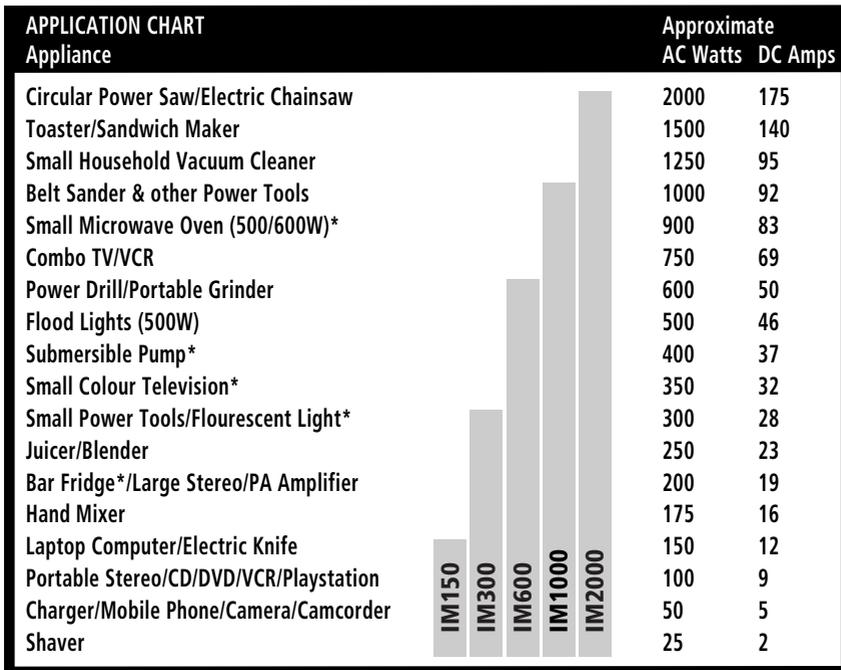
**DETERMINING SUITABLE LOAD / APPLIANCES:**

The inverter is fitted with 1 or 2 approved AS/NZS Australian socket outlets (depending on model) either or both sockets can be used, as long as the combined load (Watts required to run appliance) does not exceed the inverters’ continuous rating. All appliances have a rating plate that shows the amount of power (Watts) used or the current (Amps) drawn under normal use.

The following table shows the maximum combined AC Watts or AC Amps which can be run by the inverter.

P/No.	IM150	IM300	IM600	IM1000	IM2000
AC Combined max load (Watts)	150W	300W	600W	1000W	2000W
AC Combined max load (Amps)	0.6 A	1.2 A	2.4 A	4.0 A	8.0 A
Number of sockets	1	1	2	2	2

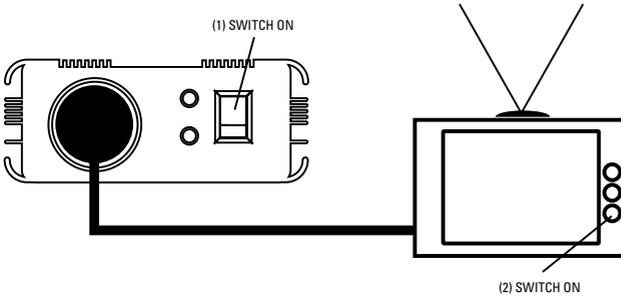
Some appliances that use an electric motor or transformer may draw 2 to 6 times their rating when first turned on, these are called inductive loads and are the most difficult for the inverter to run. For these appliances it is often a matter of trial and error to see what size inverter they will run on, if in doubt always use a larger inverter. The following table is a guide to the appropriate AC Watt drawn by various appliances. The DC Amps column shows the approximate power drawn from the 12 Volt supply.



\*Appliance may require a larger inverter.

## CONNECTING APPLIANCE AND RUNNING INVERTER

- Connect the appliance AC plug to the inverter AC outlet socket.
- Switch the inverter “ON”, the “Green” power light will illuminate to indicate operation.
- Turn the appliance “ON”, if the appliance is fitted with an “On/Off” switch always switch the inverter on before switching the appliance on and always turn the appliance off before switching the inverter off.
- When not in use turn the inverter off.

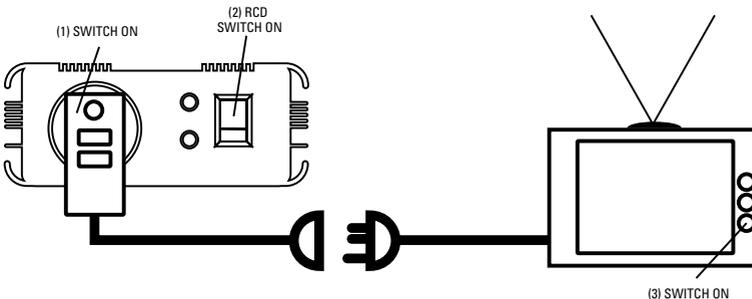


## RESIDUAL CURRENT DEVICE (RCD)

For added safety it is recommended that a Type “A” Residual Current Device (RCD) be used for any appliance that is being operated by the inverter. These are sometimes called “Safety Switches” and are designed to be connected between an appliance and power source.

1. Connect the RCD to the inverter AC outlet socket
2. Connect the appliance to the other end of the RCD
3. Turn the inverter “ON”
4. Follow the manufacturer’s instructions to turn the RCD “ON” and “TEST” that it is functioning correctly.
5. Turn the appliance on.

Some RCD do not work properly with the inverter’s “Modified Wave” output. Check with the RCD manufacturer and always follow the manufacturer’s “TEST” procedure to check that the RCD is functioning correctly.



## **TROUBLESHOOTING / FAQ:**

### **Q. Why does the inverter turn itself off?**

A. If the inverter makes a beep sound and the "RED" fault light illuminates this indicates that there is a problem, and the inverter will usually turn off. Most commonly this would be caused by an appliance that is drawing too much power (overloading), low battery voltage or voltage drop due to insufficient size cables or poor connections (see section on protection features, page 12).

### **Q. The inverter will not run my appliance even though the appliance draws less power (Watts) than the size of the inverter?**

A. Electrical appliances can be divided into three groups by the way they draw energy (current) from their power supply. These groups are "Resistive", "Inductive" and "Capacitive" appliances or also called "loads". Some appliances may draw all three types of power.

- Resistive Loads such as normal incandescent lights (wire filament) always draw a constant power (watts) from the power supply, that is a 100 Watt light will draw approximately 100 Watts from the power supply at all times. Resistive loads are the easiest appliances for an inverter to run.
- Inductive Loads such as a refrigerator (Electric Motor) require a large rush of power (surge current) to start and then usually draw a more constant power once running. Inductive loads contain coils of wire (motors, transformers, ballasts, solenoids) When the power is first turned on these coils of wire draw a large surge current which forms the magnetic flux (magnetic field) which allows these appliances to work. This magnetic flux is a kind of stored energy.
  - The most common inductive appliances are: fridges, air compressors, transformerschargers, pumps, power tools and fluorescent lights. These appliances can draw 2 - 6 times their normal running power to start up, that is to run a 190 Watt fridge you may need a 600 or 1000 Watt inverter.
- Capacitive Loads such as many TV's or many electronic appliances require a large surge current to start only when they have not been used for a while. This is often due to large capacitors in the power supply that must be quickly charged when the appliance is turned on. If the appliance is not used for a few days these capacitors slowly go flat. Resetting the inverter a couple of times may allow these appliances to work.
- There are some appliances such as large refrigerators, air conditioners and other pump driven appliances that have extremely high start up currents, because they have an inductive motor that must start under load. These appliances are not recommended for use with an inverter. They should be powered by an engine driven generator.

### **Q. The inverter is powering my portable television, but I cannot get a clear picture?**

A. In poor reception areas it is quite common to have some interference on a portable TV (such as faint lines on the screen) when operating on all modified sine wave inverters.

- To improve your picture quality:
  - Keep the inverter as far away from the TV as possible.
  - Use an external long range or fringe area TV antenna with good quality coaxial cable.
  - Earth (Chassis GND) the inverter (see section on earthing, page 11)

**Q. Can I run fluorescent lighting from my inverter?**

- A. Most portable fluorescent work lamps should operate fine on an inverter even though they may be slow to start.
- Fluorescent lights are an inductive & capacitive load and often draw at least twice as much power from the inverter than their normal rating to start.
  - Normal household fluorescent lights should be avoided, because they contain power factor correction capacitors. Power factor correction is used in normal buildings to help smooth out the inductive effects of fluorescent light ballasts. If used with portable power inverters the power factor correction is effected by the harmonic distortion in the modified waveform, this causes a high load on the inverter that can overload the unit. If normal household fluorescent lights must be used, you will need to have a qualified electrician remove the power factor correction capacitor. The light should then be marked "For Inverter Use only".

**Q. Why does it damage the inverter if the battery leads are connected back to front?**

- A. Your inverter uses sophisticated electronics to convert DC battery power to AC mains power. If you accidentally connect the inverter to the battery incorrectly (reverse polarity) a large current will be drawn by the inverter which will blow the protection fuses, as this occurs some of the high current could damage sensitive electronic components. Because of this risk it is important to always double-check the battery polarity before making any connections.

**Q. How do I check or change the fuses?**

- A. The IM150, IM300 & IM600 inverters are fitted with one or more external fuse holders. If the unit does not function, disconnect the inverter from the DC power source and disconnect any AC appliances. Remove the black fuse caps, then remove the fuses and check if they are blown. Replace blown fuses with the spares provided or standard automotive blade fuse of the correct rating. The IM1000 & IM2000 contain internal fuses, these should only be checked or replaced by a qualified electrical appliance repairer.

THE DC SUPPLY MUST BE DISCONNECTED BEFORE ANY REPAIR, THEN TURN THE ON/OFF SWITCH OF THE INVERTER "ON" TO DISCHARGE THE CAPACITORS.

**Q. Why do lights operating from the inverter start dim and then get brighter.**

- A. Projecta inverters feature "Peak Power Technology". This feature allows the inverter to ramp up its voltage output. This gradual increase in power allows appliances to operate with a "Soft-Start" ensuring superior operation and helps the inverter to power inductive loads.

**Q. Why does the fan only operate sometimes on IM600, IM1000 & IM2000 inverters?**

- A. These inverters feature a temperature controlled automatic cooling fan that only operates when needed. This allows the inverter to run very quite for most of the time.

**Q. Why does my Residual Current Device (RCD) trip each time I turn an appliance on?**

A. Some RCD's disconnect (trip) when they do not receive any power. These types of RCD's can be tripped by the inverter's Peak Power Technology which allows a gradual ramp up of power. Use a continuous RCD which does not trip out when the power is turned off, these only trip when there is a fault.

**Q. Why do some power tools not work properly?**

A. Some newer power tools use PWM variable speed controllers to vary the tool's speed as the trigger is squeezed. These power tools switch the power on and off very quickly in a similar way to how the inverter works. Because of this, some may not function properly with the inverter's modified sine wave output.

**Q. Can I run laptop computers?**

A. Most laptop/notebook computer AC power adapters work perfectly fine with the inverter's modified sine wave. Some however are more sensitive and may not function properly. If your power adaptor does not function or causes a humming noise it is probably not compatible. The best way to operate a laptop/notebook from your vehicle is to use the Projecta 12 Volt Laptop Power Adaptor P/No. DC3500. This is a much more convenient and efficient way to charge and operate the laptop direct from a 12V source.

**Q. Can I connect lights with dimmers to the inverter?**

A. Older light dimmers may function fine but most newer light dimming circuits are designed for household sine wave AC power, these may not work properly with modified sine wave inverters.

## NOTES:



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