

Inverter Operation

Safety Instructions

To ensure reliable service your power inverter must be installed and used properly. Read and understand the installation and operating thoroughly prior to installation and use. Pay particular attention to the **WARNING** and **CAUTION** statements in this manual. **CAUTION** statements advise against certain conditions and practices that may result in damage to your inverter. **WARNING** statements identify the conditions or practices that may result in injury or death.

PLEASE READ ALL THE INSTRUCTION BEFORE USING THIS POWER INVERTER.

WARNING:

To reduce the risk of fire, electric shock, explosion or injury:

- Do not connect to AC distribution wiring.
- Always disconnect appliances from the inverter and turn the inverter off before working the appliance. Multiple outlet power strips with switches and power switches and circuit breakers only interrupt power to the "live" socket terminals. The neutral terminals remain powered with respect to the earth terminals.
- Do not make any electrical connections or disconnections in areas designated as IGNITION PROTECTED including DC cigarette lighter type plug connections and ring terminal connections. Always disconnect appliances from the inverter before removing the inverter's power source.
- Do not obstruct or block the air vents on the inverter.
- The inverter is not a toy, keep away from children.

CAUTION:

- Do not use with positive earth electrical systems (the majority of modern vehicles are negative earth). A reverse polarity connection will result in a blown fuse and may cause permanent damage to the inverter.
- The inverter will not operate high wattage appliances or equipment that produces heat, such as dryers, microwave ovens and toasters.
- Earthing the neutral will cause the inverter to shut down.
- Do not operate the inverter if it is wet. Water and electric do not mix.
- Do not install the inverter in the engine compartment, the inverter must be used in a well ventilated position.
- This inverter is not tested for use with medical equipment.

Introduction

The inverter supplies continuous power in the form of one household type socket. The inverter has enough power to run almost any household or electronic appliance. Safety features include automatic shut down and a low battery alarm to prevent damage to your battery.

HOW INVERTERS WORK

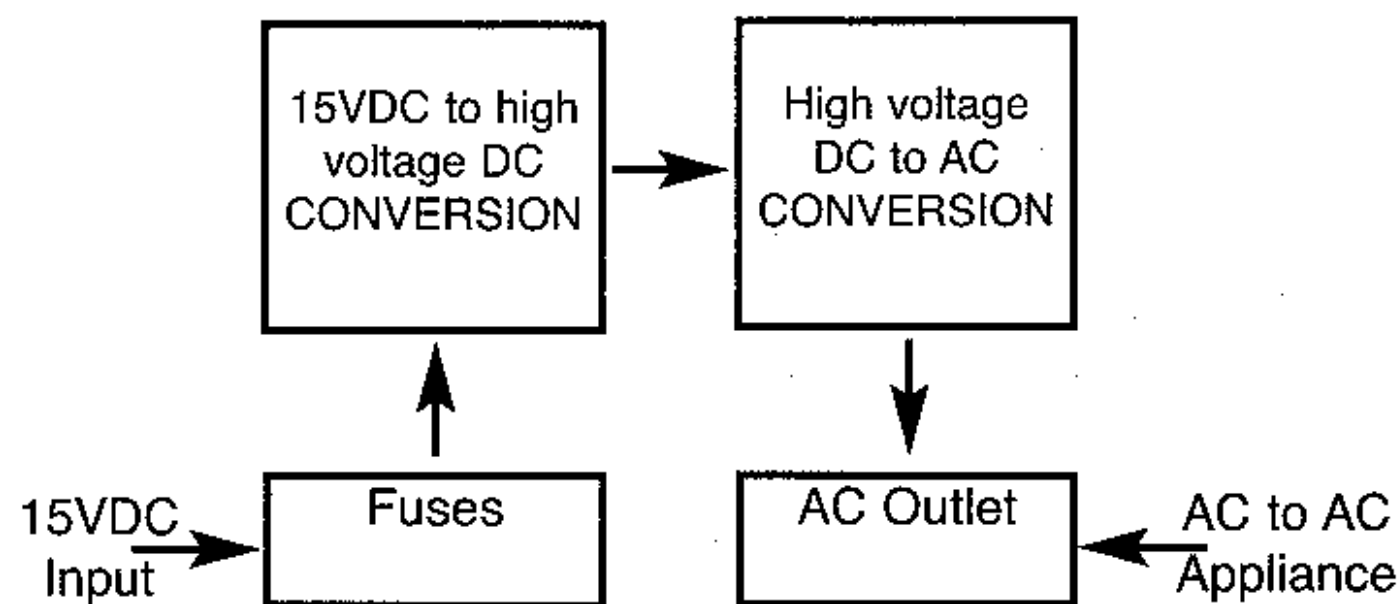
Principle of operation.

The inverter converts low voltage DC (direct current) from a battery or other power source to standard AC (alternating current) household power. The inverter converts power in two stages. The first stage is a DC to DC conversion process that raises low voltage DC from the inverter input to high volts DC. The second stage is the actual inverter stage that converts the high DC into AC power.

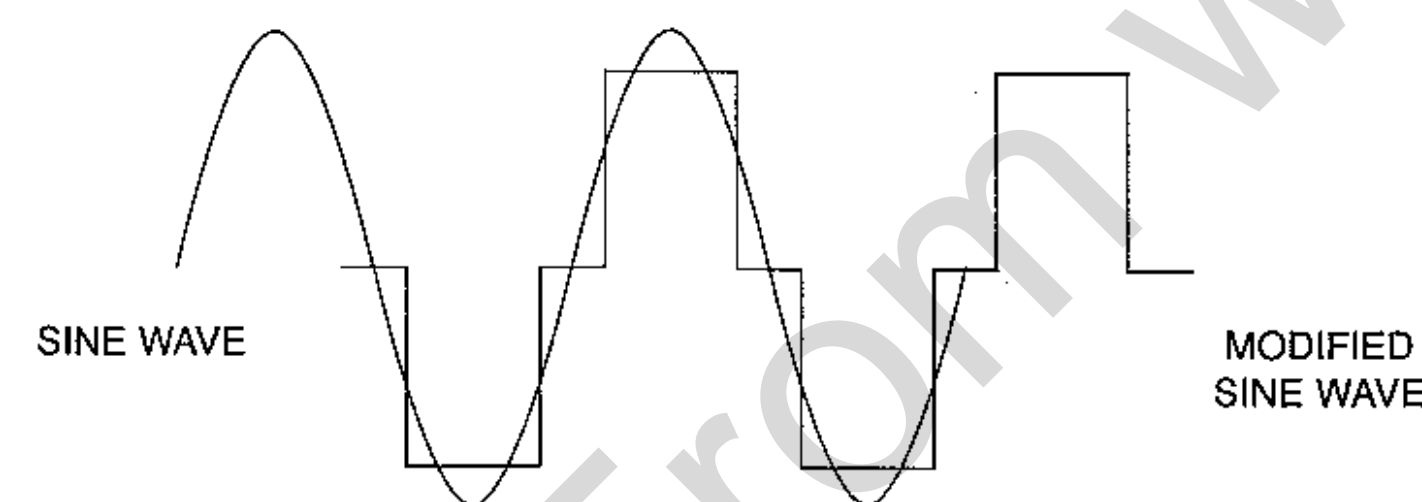
The DC to DC converter stage uses modern high frequency power conversion techniques that have replaced bulky transformers found in less technologically advanced models. The inverter uses advanced MOSFET transistors in a full bridge configuration, which ensures excellent overload capabilities and allows the inverter to operate reactive loads such as small induction motors.

The output waveform.

The AC output waveform is known as a "modified sine wave". It is a waveform that has characteristics similar to the sine wave shape of standard household power. This type of waveform is suitable for most AC loads, including linear and switching power supplies used in electronic equipment, transformers and motors.



The modified sine wave produced by the inverter has an RMS (root mean square) voltage, which is the same as standard household power. Most AC voltmeters (analog and digital) are sensitive to the average value of the waveform rather than the RMS value. They are calibrated for RMS voltage under the assumption that waveform measured will be a pure sine wave. Voltmeters will not read the RMS voltage of a modified sine wave correctly. The reading will be around 20-30 volts too low when measuring the inverter's output.



INSTALLING THE INVERTER

Power source requirements

The power source for the inverter must provide between 11 and 15 volts DC and must be able to supply the necessary current to operate the load. The power source may be a battery or a well regulated DC power supply. To obtain a rough estimate of the current in Amps the power source must deliver simply divide the power consumption of the load by 10.

EXAMPLE: If a load is rated at 300 watts AC, the power source must be able to deliver 300 divided by 10 = 30 Amps.

CAUTION:

The inverter must be connected only to batteries with a nominal output voltage of 12 volts. The inverter will not work if connected to a 6 volt battery and will sustain permanent damage if connected to a 24 volt battery.

Connection to load

The inverter is equipped with a standard AC household type socket. Plug the cord from the appliance you wish to use into the socket. The green LED indicator light shows the inverter is functioning normally. Make sure that the combined load requirement of your equipment does not exceed the rated watts.

The inverter is engineered to be connected directly to standard electrical and electronic equipment in the manner described above. Do not connect the power inverter to household or recreational vehicle AC distribution wiring. Do not connect the inverter to any AC load circuit in which the neutral conductor is connected to earth or to the negative of the DC (battery) source.

WARNING:

Never connect to AC distribution wiring.

CAUTION: RECHARGEABLE APPLIANCES

Certain rechargeable devices are designed to be recharged by plugging them directly in to a household socket. This type of device must never be used in the inverter. The device will damage the inverter. Do not use the inverter to recharge items that can be plugged directly into a household socket. This problem does not occur with the vast majority of battery-operated equipment. Most of these devices use a separate charger or transformer that is plugged into an AC household socket. The inverter is easily capable of running most chargers and transformers.

The inverter should only be used in locations that meet the following criteria.

- Dry: do not allow water or liquids to come into contact with the inverter
- Cool: ambient air temperature should be between 30°F (-1°C) non-condensing, and 105°F (40°C). Do not place the inverter on or near a heating vent or any equipment, which is generating heat above room temperature. Keep the inverter out of direct sunlight.
- Ventilated: keep the area surrounding the inverter clear to ensure free air circulation around the unit. Do not place items on or near the unit whilst it is operating. A fan is helpful if the unit is operating at maximum power outputs for extended periods of time. If the internal temperature of the inverter exceeds 90°C the inverter will shut down and restart when it has cooled.
- Safe: do not position the inverter near any flammable material or in a position that may accumulate flammable fumes or gases.

OPERATING TIPS

Rated versus actual current draw.

Most electrical equipment has labels that indicate the power consumption in amps or watts. Ensure the power consumption of the item you wish to operate is specified at the rated watts or less. The inverter has overload protection so it is safe to try and operate equipment rated at the specified watts or less. The inverter will shut down if it is overloaded. The overload must be removed before the inverter will restart; resistive loads are the easiest for the inverter to run. However larger resistive loads, such as, stoves and heaters usually require more wattage than the inverter can deliver on a continuous basis. Inductive loads such as, TV's and stereos require more current to operate

than resistive loads of the same wattage rating. Induction motors as well as some televisions may require 2-6 times their wattage rating to start up. The most demanding in this category are those that start under load such as, compressors and pumps. Testing is the only definitive way of determining if a specific load can be started and how long it will run. The inverter is fitted with overload protection so will simply shut down if overloaded. To restart the unit after overloading remove the overload.

Battery operating time.

With a typical vehicle battery, a minimum operating time of 2 to 3 hours can be expected. In most instances, 5 to 10 hours of operating time is achievable however it is recommended that the operator starts the vehicle every 2 to 3 hours to recharge the battery system thus guarding against unexpected equipment shut down and ensuring that there is still sufficient power to start the engine. The inverter's built in alarm will sound if the DC voltage drops below 10.5V. The inverter can be used whether or not the vehicle's engine is running however the inverter will not operate whilst the engine is being turned over as battery voltage drops substantially whilst the engine is being started. In most cases the inverter can be left connected to the battery when not in use as it draws very little current, however if the vehicle is to remain unused for several days disconnect the inverter from the battery.

In built protection.

Your inverter monitors the following potentially hazardous conditions:

- **Low battery voltage:** This condition is not harmful to the inverter but could damage the power source. An audible signal will sound when input voltage drops to 10.5V. The inverter automatically shuts down when input voltage drops to 10.0V. When the power source input voltage is above 10.5V the inverter may be restarted.
- **Over voltage protection:** The inverter will automatically shut down when the input voltage exceeds 15V DC
- **Short circuit protection:** The inverter will shut down. Remove the short circuit and the inverter will reset.
- **Overload protection:** The inverter will automatically shut down when the continuous draw exceeds 15V DC.
- **Overheating protection:** When the temperature sensor inside the inverter reaches 65 degrees C, the unit will automatically shut down. In this instance, allow at least 15 minutes before attempting to restart the inverter and always disconnect appliances.
- **Low battery alarm:** The alarm will sound if the input voltage drops below 10.5 V, this is an indication that the battery needs to be recharged. Users should discontinue operation of the appliance(s) at this point, as the inverter will shut down shortly after the alarm sounds. The vehicle engine should be started to recharge the battery. If the low battery alarm sounds when the battery is fully charged follow the steps for solving lack of output power in the troubleshooting guide.

The alarm will sound if the inverter is overloaded, overheated or if there is an excessive voltage drop between the battery and inverter.

NOTE:

It is normal for the alarm to sound while the unit is being connected to, or disconnected from the power source, this is not indicative of a problem.