

Inverters

Many renewable energy technologies, such as solar and wind electric systems, generate direct current (DC) power. All systems that use batteries as an electricity storage device operate on DC.

However, grid electricity (supplied via power lines) operates on alternating current (AC). Most electrical appliances like TVs, radios, computers and power tools operate on AC. Alternating current is the standard household electricity used in the urban areas.

An inverter is a device that converts DC electricity into AC electricity.

The inverter size is stated in VoltAmpere (VA) and determines the size of the AC appliances that can be used.



600 VA Inverter

For any appliance up to 600 W.

Shaver	-	50 W
HIFI	-	100 W
Food mixer	-	200 W
TV	-	400 W
Power Drill	-	550 W



3000 VA Inverter

For any appliance up to 3000 W.

Shaver	-	50 W
HIFI	-	100 W
Food mixer	-	200 W
TV	-	400 W
Power Drill	-	550 W
Grinder	-	650 W
Vacuum cleaner	-	700 W
Washing machine	-	800 W
Toaster	-	1100 W
Microwave	-	1500 W
5 xTV (same time)	-	2000 W
Welding machine	-	2500 W



1200 VA Inverter

For any appliance up to 1200 W.

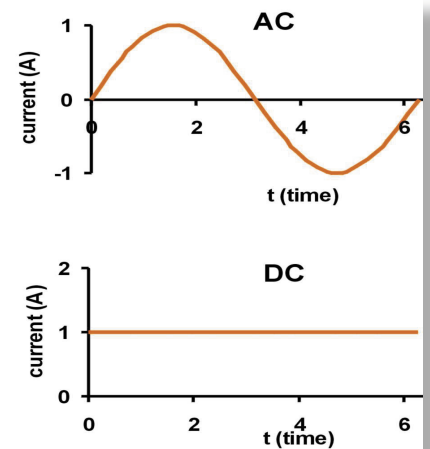
Shaver	-	50 W
HIFI	-	100 W
Food mixer	-	200 W
TV	-	400 W
Power Drill	-	550 W
Grinder	-	650 W
Vacuum cleaner	-	700 W
Washing machine	-	800 W
Toaster	-	1100 W

Watt (W) indicates the power rating of an appliance and is calculated by multiplying the Volts with the Ampere.

Direct current (DC) flows in one direction, thus from Plus to Minus polarity. Both voltage **V** (measured in Volt) and the current **I** (measured in Ampere) in a direct current (DC) circuit are **constant** over time.

However, many appliances operate on alternating current which **changes** its direction 50 times per second (50 Hz).

An inverter draws direct current (DC) from a 12/24 Volt battery and converts it into alternating current (AC). The conversion is done by transistors. These transistors hack the direct current by switching on/off at very high speeds and change the polarity 100 times per second (50 Hz).



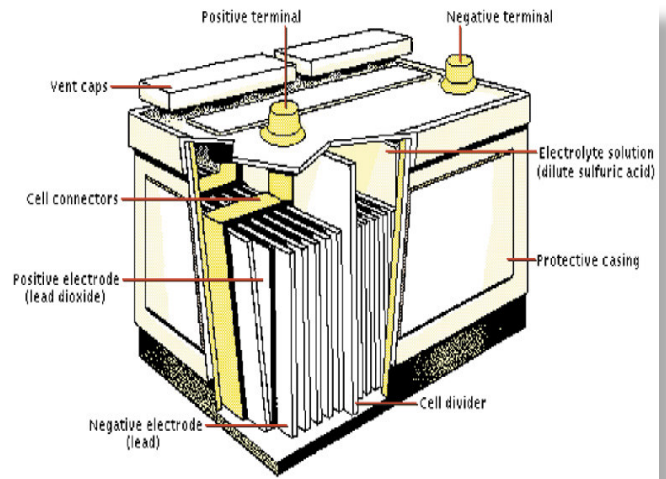
There is a great variation in the quality of the inverters available on the market. Standard grid provides an output waveform that is known as a sine wave. Other inverters (usually cheaper than pure sine wave inverters) provide a square wave form or a modified square waveform (also known as modified sine wave). Some sensitive equipment can be damaged by or will not operate on very distorted waveforms, therefore it is recommended to only use pure sine wave inverters.

Batteries

The electricity produced by a solar system is stored in batteries which makes it possible to use lights at nights or charge your cell phone on cloudy days.

A battery is an **device that stores electrical energy**. Batteries do not make electricity; they store it, just as a water tank stores water for future use.

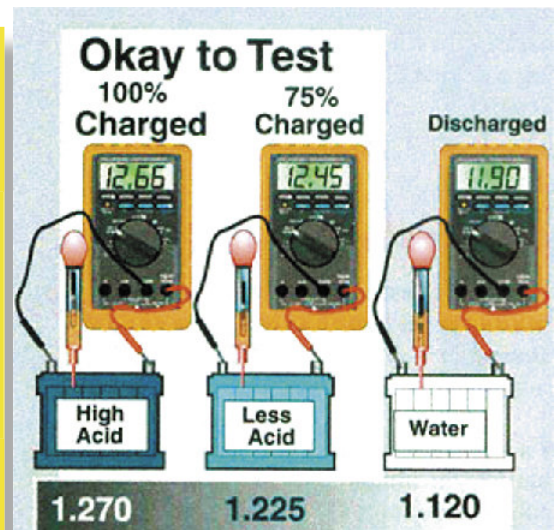
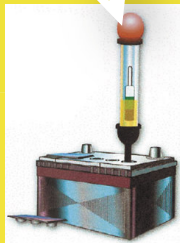
- The metal plates in a battery are called the **electrodes**, and the chemical liquid (acid) is called the **electrolyte**.
- The electrolyte reacts with the two different electrodes.
- It causes one electrode to lose electrons and develop a **positive charge**; and it causes the other electrode to gain electrons and develop a **negative charge**.
- The difference between the two electrode charges is related to the cell **voltage**.
- As the composition of the electrolyte changes the charges accumulate on the electrode and electrical energy is stored or released. In rechargeable batteries this process can be repeated many times.
- Batteries are not 100% efficient - some energy is lost through heat and chemical reactions when charging and discharging. If you use 1000 watts from a battery, it might take 1200 watts or more to fully recharge it, but **slower charging and discharging rates are more efficient**.
- The life span of a battery will vary considerably with how it is managed, maintained, discharged and charged and various other factors.



Battery Care

- Check the **water level regularly**
- Re-fill the batteries with **distilled water only**
- Have solar technicians regularly check the battery terminals and tighten loose connections
- Check the state of charge by using a **hydrometer**

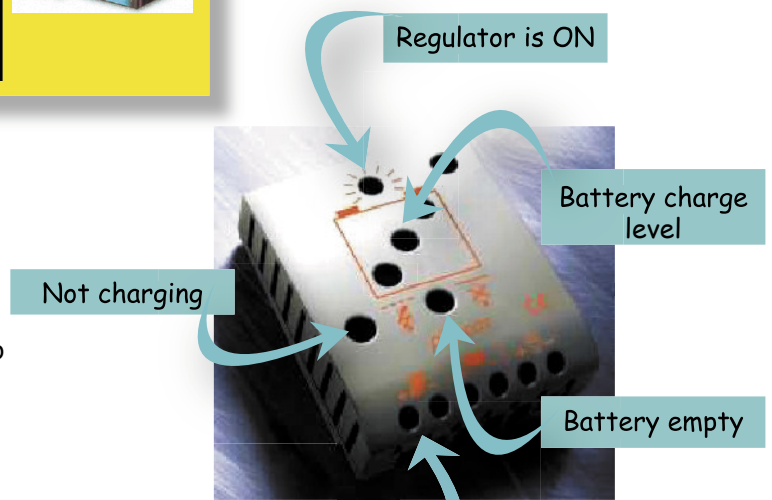
State of Charge	Relative Density at 25 °C - use Hydrometer	Open Circuit Voltage - use Multimeter
0% (flat)	1.120	11.8 V
25%	1.155	12.0 V
50%	1.190	12.2 V
75%	1.225	12.4 V
100% (full)	1.270	12.6 V



Regulator

A regulator is a charge controller that is placed between the solar panels and the batteries. The regulator is the **supervisor and manager of the batteries'** charging and discharging. It prevents that the battery is overcharged or drawn down too much.

Lights or acoustic signals inform the user, so that the user is constantly aware of the batteries' charge.



Additional Information

<http://www.dixonbatteries.co.za>

<http://www.activegridtech.com/batteries.html>

Cable connections

www.drfn.org.na
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