



Inverters 101 By Analytic Systems

A power inverter changes DC power from a battery into conventional AC power that you can use to operate all kinds of devices ... electric lights, computer servers, microwaves, marine radios, power tools, TVs, to name just a few. You just connect the inverter to a battery, and plug your AC devices into the inverter ... and you've got portable power ... whenever and wherever you need it.

The inverter draws its power from a battery (preferably deep-cycle), or several batteries wired in parallel. The battery will need to be recharged as the power is drawn out of it by the inverter. The battery can be recharged by running a vehicle or a gas generator, solar panels, or wind. You can use a battery charger designed for the battery voltage, plugged into an AC outlet to recharge the battery.

What size inverter should I buy?

Analytic Systems manufactures and distributes many different sizes of power inverters. *Short Answer:* The size you choose depends on the watts (or amps) of what you want to run (find the power consumption by referring to the specification plate on the appliance or tool). We recommend you buy a larger model than you think you'll need (at least up to 20% more than your largest load). In case you ever need to power anything else at the same time.

Example: You want to power a server with a 17" computer monitor, some lights, and a radio.

Server and Computer:	1300 Watts
2 - 60 Watt lights:	120 Watts
Radio:	30 Watts
Total Needed:	1450 Watts

For this application, you would minimally need a 1500 W inverter, a larger one, say 2000 W would give you the opportunity to run a fan, etc.



Longer Answer: Determine Continuous Load and Starting (Peak) Load: You need to determine how much power your electronics (or combination of them that you would use at the same time) requires to start up (starting load), and also the continued running requirements (continuous load).

What is meant by the terms "continuous-2000 watts" and "peak surge-4000 watts" is that some appliances or tools, such as ones with a motor, require an initial surge of power to start up ("starting load" or "peak load"). Once started, the tool or appliance requires less power to continue to operate ("continuous load")

Helpful formulas:

TO CONVERT AMPS TO WATTS:

Multiply: AMPS X 120 (AC voltage) = WATTS

This formula yields a close approximation of the continuous load of the appliance

TO CALCULATE APPROXIMATE STARTUP LOAD:

Multiply: WATTS X 2 = Starting Load

This formula yields a close approximation of the starting load of the appliance, though some may require an even greater starting load. **NOTE:** Induction motors such as air conditioners, refrigerators, freezers and pumps may have a start-up surge of 3 to 7 times the continuous rating.

Most often the start-up load of the motor determines whether an inverter has the capability to power it.

For example, you have a compressor with a continuous load of 4 amps, and a start up load of 12 amps:

4 amps x 120 volts = 480 watts continuous

12 amps x 120 volts = 1440 watts starting load

You would need an inverter with peak-surge rating greater than 1440 watts.

FORMULA TO CONVERT AC WATTS TO DC AMPS:

AC Watts divided by 12 x 1.1 = DC Amps

(this is the size vehicle alternator you would need to keep up with a specific load; for



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example, to keep up with a continuous draw of 1000 watts, you would need a 91 amp alternator)

Do I need Quasi-Sine Wave, or PureSine Wave?

Analytic Systems was one of the first companies to develop a PureSine inverter in the early 1990's, so we have a great deal of experience building high performance inverters. Advantages of PureSine inverters over modified sine wave inverters:

- a) Output voltage wave form is pure sine wave with very low harmonic distortion and clean power like utility-supplied electricity.
- b) Inductive loads like motors run faster, quieter and cooler.
- c) Reduces audible and electrical noise in a variety of electronics.
- d) Prevents crashes in computers, weird print outs, and glitches and noise in monitors.
- e) Reliably powers the following devices that will normally not work with Quasi-Sine wave inverters:
 - Laser printers, photocopiers, magneto-optical hard drives
 - Certain laptop computers (you should check with your manufacturer)
 - Some fluorescent lights with electronic ballasts
 - Power tools employing "solid state" power or variable speed control
 - Some battery chargers for cordless tools
 - Some new furnaces and pellet stoves with microprocessor control
 - Digital clocks with radios
 - Sewing machines with speed/microprocessor control
 - X-10 home automation system
 - Medical equipment such as oxygen concentrators

Analytic Systems provides a full line of PureSine Inverters. Quasi-Sine Wave works well for some uses, but with the prices getting much closer to Quasi-sine inverters, PureSine inverters seem to be the common choice these days. PureSine inverters are more suited for sensitive electrical or electronic items such as laptop computers, stereos, laser printers, certain specialized applications such as medical equipment, and variable speed or rechargeable tools. If you wish to use those items with an inverter, then choose a



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Pure Sine Wave inverter. If you mostly want to run household applications, microwave oven, tools, etc, a Quasi-Sine Wave inverter is fine for your needs.

We often are asked if computers will work with Quasi-Sine Wave. It's been our experience that most (with the exception of some laptops) will work (though some monitors will have interference such as lines or a hum). However, if you have any doubt about any electronics, tool or device, particularly laptop computers, we recommend that you check with its manufacturer to be sure it is compatible with a Quasi-Sine Wave inverter. If it is not, choose one of our PureSine Inverters instead.

Be aware of the environment in which the inverter will be used. If as with many of our customers they are used in extremely rugged applications they may need to be built with options that protect them from moisture, heat, cold, vibration. Analytic Systems high performance power inverters can be modified for use in many rugged applications such as commercial marine, mining, utility vehicles, military vehicles, arctic applications and desert applications. These inverters can also be modified to specialized specifications such as extra low EMI specifications, and mil-spec connectors for military uses.