



# How power inverter works

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Everyone uses some kind of electronic gadget while in their car, SUV, or motor-home. You might stream music on your smartphone, check for directions on your global positioning system (GPS) or play a portable video game. Since most of these electronic devices can be plugged into the cigarette lighter (or power port) in your vehicle, you may be wondering, "what is an inverter and why would I ever need one?"

Well, perhaps you want to use something a little more elaborate while you're on the open road. Maybe you want to make toast, watch an LCD TV, or even write an article on your laptop computer. These devices plug into regular wall outlets, not cigarette lighters. Making sure your electronic gear gets the juice it needs while on the road isn't a simple matter of finding the right adapter. You need a power inverter.

What kind of power inverter is the right one for the job? How do you install one? And how exactly does an inverter change the current from one form to another? Don't worry, as inverter technology isn't super complicated. In this article, we'll explore all the positives and negatives of DC to AC power inverters.

-Power inverters convert direct current (DC), the power that comes from a car battery, into alternating current (AC), the kind of power supplied to your home and the power larger electronics need to function.

Most cars and motor homes derive their power from a 12-volt battery. In some cases, a heavy-duty 24-volt battery might be used. It's important to know your vehicle's voltage because the voltage rating of the inverter you select should match the voltage of the battery. In either case, the battery provides direct current.

This means that the current flows continuously from the negative terminal of the battery, through the completed circuit and back to the positive terminal of the battery. The flow is in one direction only, hence the name direct current. The ability to provide direct current power is inherent to the nature of batteries.

An inverter increases the DC voltage, and then changes it to alternating current before sending it out to power a device. These devices were initially designed to do the opposite -- to convert alternating current into direct current. Since these converters could basically be run in reverse to accomplish the opposite effect, they were called inverters.

The earliest AC power inverters were electro-mechanical devices. Direct current would flow down one end of a circuit with an electromagnet. As soon as the current hit the magnet, the magnet would activate. This would pull a wire attached to a spring arm, forcing the wire to contact the circuit. This would change the flow of the current to the other side of the circuit, cutting power from the electromagnet.

Modern inverters use oscillator circuits to accomplish the same process. They're made with transistors or semiconductors, so there's no longer the need for a spring arm flipping back and forth to alternate the current.

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It's not quite as simple as that, however. Alternating current forms a sine wave. The output of an inverter is a very square wave, not like the smooth, round wave of a perfect sine.

Cleaning up the sine wave requires a series of filters, inductors and capacitors. Inexpensive inverters have little or no filtering. The alternating current they produce has a very square wave, which is fine if you just want to make coffee or run something with a simple electric motor. If you need a smoother sine wave, you'll need an inverter with better filtering. Of course, better filtering also costs a little more.

Inverters can get extremely expensive, even costing thousands of dollars, that is, if you're looking for an inverter with a smooth sine. The good news: Given a large enough budget, you can purchase an AC power inverter that produces virtually perfect AC sines. In fact, some high-end DC to AC inverters (such as modified sine wave inverters) can make sine waves that are even smoother than the AC power supplied to your house.

So, with all of these choices, how do you pick the right inverter for the job? Do you spring for a solar inverter or a mechanical inverter? The first step is to match the inverter to the voltage of the battery you'll be using for power. In the majority of cases, you'll be using a 12-volt battery, so you would want to select a 12-volt inverter.

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