

I receive a lot of questions and concerns about the RV electrical system. Most people ask me if I can explain the RV electrical system in simple to understand terms. The electrical system in your RV can seem complex and confusing until you have a basic understanding of how it works. Your RV actually has three separate electrical systems. It has a 12-volt DC automotive system, a 12-volt DC coach system, and a 120-volt AC coach system. We are primarily concerned with the 12-volt DC and 120-volt AC coach systems. The RV electrical system is also covered in our RV Education 101 training videos and DVDs. <http://www.rveducation101.com/trainingvideos.htm?siteID=0>

12-volt DC or direct current is electricity supplied by the RV batteries. DC electricity flows in one direction, from negative to positive. 12-volt DC electricity is stored in the RV batteries and supplies power for components, devices and appliances that operate off of 12-volts. 120-volt AC or alternating current is the same electricity used in your household. AC electricity reverses or alternates direction 60 times per second, or 60 hertz. 120-volt AC electricity supplies power to all of the 120-volt appliances and electronic equipment in your RV.

The majority of campgrounds you go to will provide you with an external 120-volt electrical source to plug into. Your RV has a heavy-duty power cord that is normally about 20 to 25 feet long. Depending on the type of RV you have, or purchase, it will either be a 30 Amp or 50 Amp electrical system. When you plug into the proper campground electrical source it will supply power throughout your RV. You must have a 120-volt AC power source if you are going to use the microwave, roof air conditioner, the refrigerator in the electric mode and the 120-volt electrical outlets.

For the most part everything else in the RV works off of 12-volt DC power. When you're plugged in at the campground the 120-volt AC current is converted to 12-volt DC current, by the RV's converter, for the items in the RV that work off of 12-volts. Some of these items are the overhead lights, the furnace fan, the fan over the range, the vent fan in the bathroom, the water pump, LP gas leak detector, stereo, and the refrigerator when it's in the LP gas mode. If you look at the RV's power distribution panel you will see circuit breakers like you have in your house for the 120-volt AC side, and automotive style blade fuses for the 12-volt DC side.

If you're not plugged into an external power source you can still use the 12-volt DC system if you have a 12-volt deep cycle battery or batteries on your unit. As long as the battery or batteries are charged you can use everything in the RV except the microwave, roof air conditioner, the refrigerator in the electric mode and the electrical outlets.

If you have a motor home, or if you're going to purchase a motor home, it will have a battery for the 12-volt automotive system and an auxiliary battery or batteries for the 12-volt coach system. The coach battery is charged whenever the motor home is running; the generator is running, or when it's plugged into an external electrical source.

For a thorough understanding of how your batteries work, how to maintain your batteries and how to test and store your batteries check out my [RV Batteries 101](#) article.

Motor homes also provide an additional source of 120-volt AC power with an onboard power generator. This unique feature offers you the convenience of 120-volt AC power whenever you need it, making the unit fully self-contained. AC power generators are rated in kilowatts (KW). One kilowatt equals 1000 watts so a 4KW generator would be capable of producing 4000 watts. The fuel supply for the generator comes directly from the motor home fuel tank. The system is designed so that when the fuel tank gets to a 1/4 tank the generator will stop running so it doesn't use all of the fuel in the motor home. Some motor homes have an automatic switch over from an external power supply to the generator. Other motor homes require you to plug the motor home power cord into a generator receptacle on the motor home to use the generator.

I have always been an advocate of monitoring the AC line voltage coming into your RV. Campground electricity can fluctuate a great deal. If you don't know what the voltage is coming into your RV, you risk damaging thousands of dollars worth of electrical appliances and electronic equipment.

Every RVer should invest in some type of digital voltmeter that plugs directly into a 120 volt outlet in your RV. There are several types available and they are inexpensive compared to the repair costs for damaged electrical equipment and appliances. I recommend one that can test campground polarity, measure AC line voltage and if you have a generator measure AC frequency. Click for [More info](#) on the Good Governor 3 in 1 digital meter.

You should always test the campground wiring for improperly wired circuits before you plug your RV in. Once this is done plug the voltmeter into any 120-volt outlet in the RV where it will be easy to monitor the AC voltage during your camping trip. By monitoring the AC voltage throughout your trip you can protect thousands of dollars worth of electrical equipment and appliances in your RV. If AC voltage drops below 105-volts or goes above 130-volts you should turn electronic equipment and appliances off until the power is restored.

When you use your generator set the digital meter so it will measure or count the AC frequency output of the generator. Frequency is the number of times that electricity alternates per second. U.S. appliances are designed to operate at 60 cycles per second, or 60 hertz. When you use your generator the governor in the generator must hold the speed constant at, or close to 60 hertz from no load on the generator to a full load. Depending on the load placed on the generator, AC voltage can range from 105 to 130 volts and the frequency can range from 58 to 63 hertz. The meter will let you know when the generator is not operating within the proper ranges and you can have it checked out and repaired before any damage occurs.

If it's possible you should try to avoid using an extension cord when making electrical connections at the campground. The gauges of the wire used in standard household

extension cords are not suitable for RV electrical hook-ups. Eventually you will be put in a situation where you will need to use an extension cord. It's a good idea to purchase an RV extension cord that is compatible to the electrical system of your RV. If you do purchase an extension cord somewhere else it should be 10-gauge wire and always use as short of an extension cord as possible.

There are RV electrical adapters that will go from your RV type plug and size down to household type outlets, and adapters that go from household type outlets to all types of campground RV connections. **It's nice to have these adapters on hand when you need them, but you must exercise caution and use common sense when you use them.** If you have a 30-amp system and you have to use a 50-amp service use your RV electrical system exactly the same way you do when you're plugged into a 30-amp service. In other words don't try to run anymore than you normally would.

On the other hand if your RV is a 30-amp or 50-amp system and you use an adapter to plug the RV into a 15 or 20-amp outlet you severely limit what you can operate in the RV. In this situation you should only use the appliances or electronic equipment that are absolutely necessary. The air conditioner alone can draw 15 to 16 Amps when the compressor engages. If you try to use the air conditioner and have other appliances or electronic equipment on you risk damaging those items. If you place too much of a demand on these electrical adapters, or use them for extended periods of time they can overheat and melt resulting in damage to the RV power cord or the electrical system.

Even when you're plugged in to the proper service for your RV you still need to be selective about what you are using. If you try to use too much the RV will let you know by tripping a breaker in the distribution box and hopefully no harm will be done. The RV also has what is called a Ground Fault Circuit Interrupter or GFCI. This is designed to protect you in the event that you plug something into a receptacle and there is moisture or water present. The GFCI will trip automatically. Several outlets can be wired on the GFCI circuit, so if you ever plug something into an outlet and it doesn't work check the GFCI to see if it needs to be reset.

There are a couple of simple formulas that may be helpful in calculating how much electricity you can safely use in your RV. Check the data plate on the appliance or electronic equipment you are using and apply the formula that works.

Watts divided by Volts = Amps
Amps times Volts = Watts

*Happy Camping,
Mark*

Mark Polk is the owner of RV Education 101. RV Education 101 is a North Carolina based company that produces professional training videos, DVDs and e-books on how to use and maintain your RV. Our goal is to make all of your RV experiences safe, fun and stress free.
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