

Wiring for 50 amp RV outlets

The RV Forum (rvforum.net)

Terms and conventions:

- For this article, we are referring to 240 volts and 120 volts, but these are also commonly described as 220 volts and 110 volts

- Older 240 volt wiring (typically stoves and dryers) was three wire consisting of hot-neutral-hot (not current code but grandfathered in for existing installations.) Newer 240 volt wiring consists of four wires - ground, hot, neutral, hot which is current code

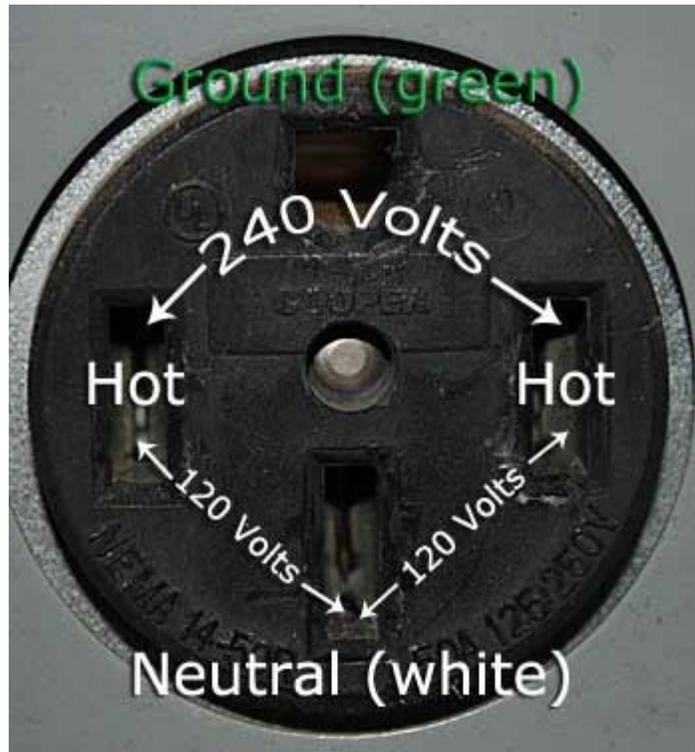
Safety note:

The addition of the ground wire with the updated electrical code was an important safety enhancement and we recommend you strictly adhere to the National Electrical Code

It is beyond the scope of this article to provide step-by-step instructions for installation of a 50 amp RV outlet, rather it is intended to provide the amateur electrician with enough information to identify parts required and how to wire the 50 amp RV outlet. If this article is confusing, then it is probably best for you to engage an experienced electrician. Work safely and be safe.

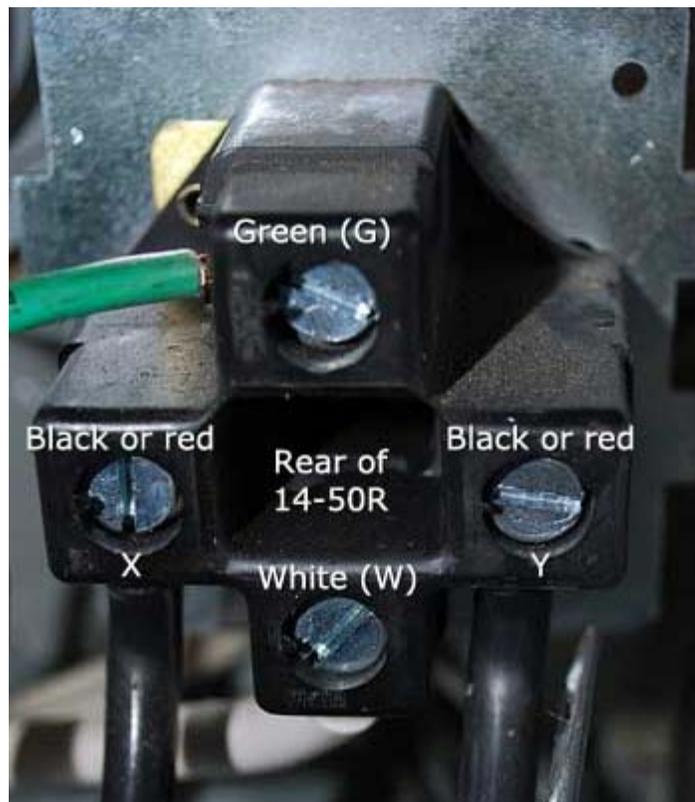
50 amp RV wiring is different than say a 50 amp clothes dryer outlet or an older stove outlet. 50 amp RV wiring is four-wire (ground, neutral, hot, hot) and uses a 14-50R receptacle. The older 50 amp clothes dryer outlet is three wire (neutral, hot, hot) and uses a 10-50R receptacle. Older stoves use a three-wire 10-50R receptacle while newer stoves will use the very same four-wire 14-50R receptacle the RV uses. The difference (and improvement) of the 14-50R receptacle over the 10-50R is the addition of the ground wire and note that it is not special or unique for RVs.

Let's point out another difference - the clothes dryer uses 240 volts to operate while the 50 amp RV (in 99% of all cases) does **not** use 240 volts to power anything in the RV. Here's where it gets a little tricky but follow along with us. The RV is being provided with two legs of 120V, if you measure across the two hot wires, you will measure 240 volts (or thereabouts.) Now if you measure from one hot (red or black color) wire to the neutral (white wire), you will measure 120 volts. The below picture of a 14-50R receptacle should make it a little easier to understand.



When you wire up a 14-50R 240V 50 amp outlet, you will measure 240 volts from hot to hot, 120 volts from each hot to neutral, 120 volts from each hot to ground, and finally **zero (0) volts from neutral to ground**. If your measurements don't correspond, then you have a **PROBLEM!**

Now, let's look at the back-side of the receptacle:



For terminal X or Y, it doesn't make any difference if the red or black is on X or Y - they are completely interchangeable. Note in the above picture the wires for both hot legs are black, but this wiring example is from a commercially produced RV power box. Typically one hot leg of 240V service will be colored red, and the other hot leg will be black.

On the circuit breaker end, you will of course need a 50 amp 240V breaker like shown below:



When planning wire runs to determine the wire size or gauge you need, you can search the Internet for "wire size calculator" and input your variables (length and desired voltage drop) and the script will output the wire gauge you will need. Recommend you plan for no more than a 3% voltage drop.

Some wire gauge calculations to provide less than or equal to a 3% voltage drop will be:

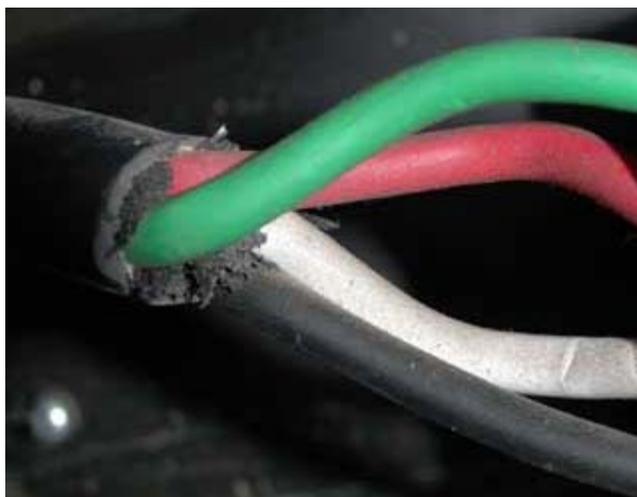
25 feet - 8 gauge (0.67 % voltage drop)
at 50 amps

note: 8 gauge is the minimum wire size for 240 volts

50 feet - 6 gauge (0.85 % voltage drop)

75 feet - 6 gauge (1.27 % voltage drop)

100 feet - 4 gauge (1.06 % voltage drop)



Green = ground

Red = hot

White = neutral

Black = hot

Here's the colors of a four-wire 50 amp RV shore power cable and what they represent