

## Honda Generators in Parallel

**Question:** I was puzzled by the last sentence in your response to the inquiry about running an electric blanket from a Honda generator. (*Blue Beret*, August, 2014, p. 24) You had suggested using a three-prong plug with neutral connected to ground. In the last sentence, you advised that when using two generators, be sure to remove the plug.

The neutral terminals on both generators working in tandem are held exactly in phase by the connecting wires (Likewise for the hot {positive} terminals.) Also, the grounds are all connected together between the two generators (using the green wire supplied for this purpose). Then, is there really any difference using a three-prong plug to connect neutral to ground for a single generator or for the pair working in tandem?

**Answer:** Our RV's can use different sources for supplying 110 VAC. This could be shore power, generator or inverter. All RV's are wired with the ground and neutral separate. Neutral is always connected to ground in the 110 VAC source. For shore power this is in the electric breaker box, usually at the Campground main input circuit panel. Motorhome generators usually provide this circuit by having it internally wired so that when they are hooked up to the RV (thru the transfer switch), it is grounded. Inverters usually have a relay that operates when they are switched on to make this ground connection.

This is a safety consideration since if a short occurred in the RV appliances (for example a toaster shorting internally to its case) there could be high voltages on the body to ground. The safest thing is to trip the breaker or blow the fuse thus removing the 110 VAC source.

With a built in generator there is no problem since the ground is directly connected to the RV. With a remote generator, that has a separate ground and neutral connection there is no ground to the trailer chassis, which means it could have a significant voltage between the body and earth ground. You can run a separate ground wire from a ground connection on the A-frame to the generator ground connection. You can also drive two ground rods into the earth with one near each unit. Ground rods are not too effective unless they are at least 10 or more feet deep.

With generators that are designed to be hooked in parallel they are purposely not grounded so that they can be hooked together to provide double the current and operate properly synchronized.

Many owners of Honda generators do not ever anticipate running two units in parallel. In this case, they can remove the 110 VAC connector panel and permanently put in a jumper from ground to neutral thus insuring that any shorts will cause the breaker to trip. For those owners who might desire, on occasion, to hook two generators together a simple solution is a three prong plug which could be wired internally with the ground and simply removed when not needed.

The purpose of the three-pronged plug is to provide a neutral to ground connection when using **just one generator**. Otherwise, you have a floating trailer body, which could be dangerous when an individual touches the body and becomes the ground path. I have measured as much as 85 volts between a trailer and a short rod stuck in wet ground. This was after a camper complained that his wife was getting a shock by touching their trailer after a short rain.

Why not just wire the RV body ground to the neutral, permanently? Besides being against the electrical code, we would not be able to hook up to any shore power system that uses GFCI outlets. These outlets compare the current from both the hot and neutral lines to the RV ground. These currents must have a very small difference (a few milliamperes) or the shore power GFCI will trip and turn off. This is also true of the GFCI outlets and/or breakers that have been wired internal to the RV.

To sum up:

1. For electrical safety reasons all RV's have floating ground and neutral 110VAC wiring
2. When hooked up to 110 VAC the source should provide the ground-neutral connection
3. When using a remote generator that has been designed to run with parallel units there is no built in ground and therefore you must provide the ground circuit
4. The grounding is a safety requirement and not really a voltage measurable item
5. To work with either built in or shore power GFCI outlets your RV ground and neutral must not be connected before you apply power.

Now to the original question, from a wire hook-up standpoint there is no difference between the single and dual generators. The parallel generators are hooked together with the floating neutral, hot and ground wires each connected individually. However, the synchronization of the 60 Hz sine waves of both generators is done when they are turned on. This is accomplished with circuitry in the internal generator inverters which adjusts the phase. This circuitry will not work properly if either generator has its neutral hooked directly to ground. The generators are connected to each other thru the banana plugs with a three-wire cable. In fact, the positive and neutral connection wires can be reversed between the two generators and they will still synchronize. Check out this video, which shows a home built parallel cable kit with a 30-amp outlet and circuit breaker:

<http://www.youtube.com/watch?v=LXqts2Lfgzk>

You can clearly see the sine waves synchronizing to provide the proper output power and cancelling each other when they are out of phase.

A single generator should have the 3-prong plug or some ground to neutral connection for safety.

The question then comes up **“What do I do to provide a true ground for the parallel generator system?”** You can run a separate ground wire from the generators to the trailer A-frame or drive two ground rods into the earth near the RV and generators.