

Installing a Gíandel 1200 Watt Inverter in a 2019 to 2022 Kia Niro EV

This document describes one way a DC-to-AC inverter may be installed in a Kia Niro battery electric vehicle. The inverter used in this installation is a Gíandel model PS-1200JCR which is a sine wave inverter rated at 1200 watts continuous output and 2400 watts peak output. The inverter is mounted in place of the decorative cover over the vehicle motor and electronics. The inverter output is 110 to 120 volts AC power at a frequency of 60 Hz.



The intent of this installation is to provide 120VAC power in an emergency, for camping, or for tailgate parties. The inverter can be used while the car is being driven, however, the inverter is not designed for outdoor applications and is likely to be damaged by rain or extended exposure to high humidity. Installation or removal of the inverter will normally take less than 10 minutes.

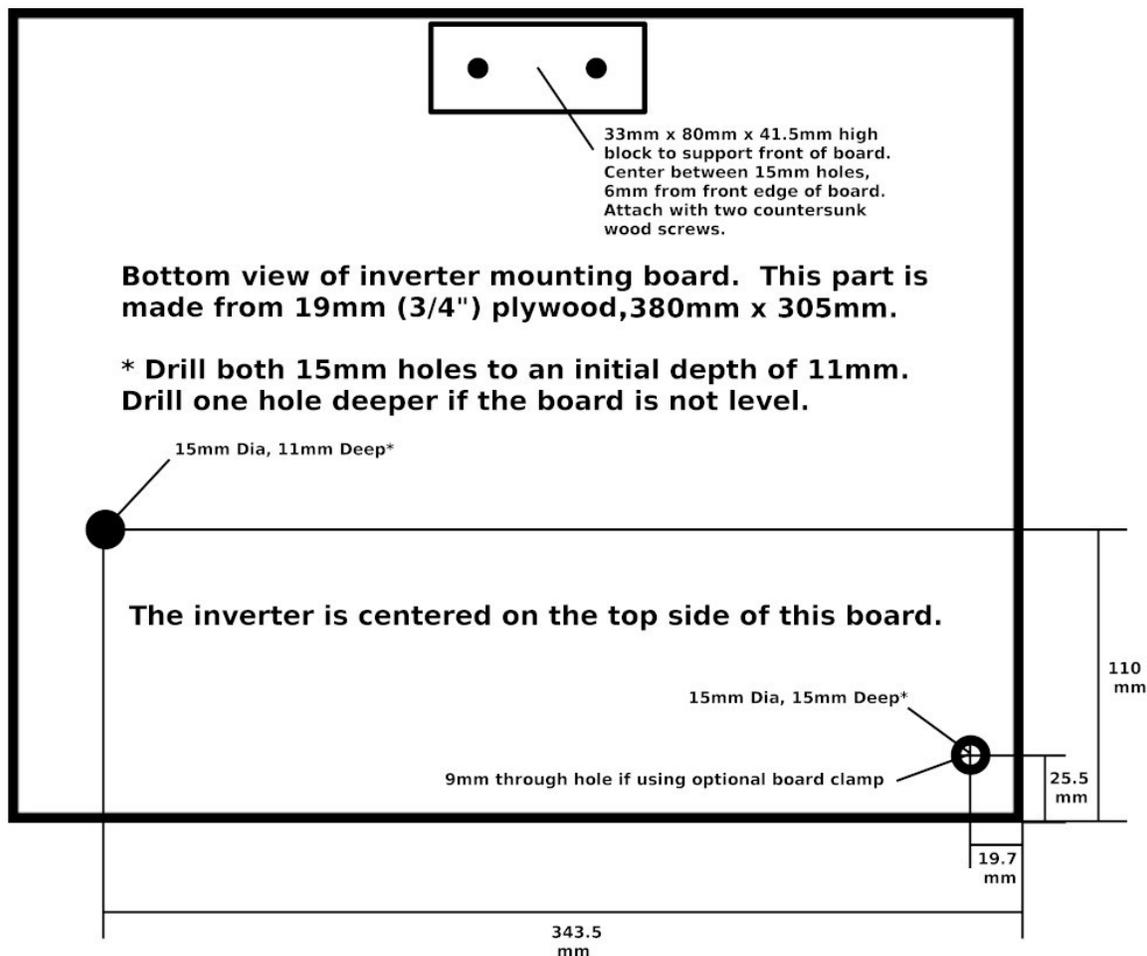
Radiated radio frequency noise warning: This inverter does not have FCC certification in the U.S. It appears to make no attempt at suppressing radio frequency noise. It will power motors, lights, heating appliances, and most computers without a problem. It will probably be unsatisfactory for powering amateur radio or other equipment that is intolerant of radio frequency noise.

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Mounting board for the inverter

The board for mounting the inverter is 19mm or 3/4" plywood with outer dimensions of 380mm x 305mm or about 15" x 12". Two 15mm or 5/8" holes are drilled part way through the board on the bottom side to fit over the two rear mounting points of the decorative electronics cover. The cover mounting points may not be at the same height so some adjustment may be needed in the depth of the 15mm holes to make the board level with the top of the electronic module below it. If the inverter is to remain in place with the car in motion, a clamping stud should be added to the right rear mounting point to secure the inverter mounting board.

This drawing shows the locations of the mounting point holes:



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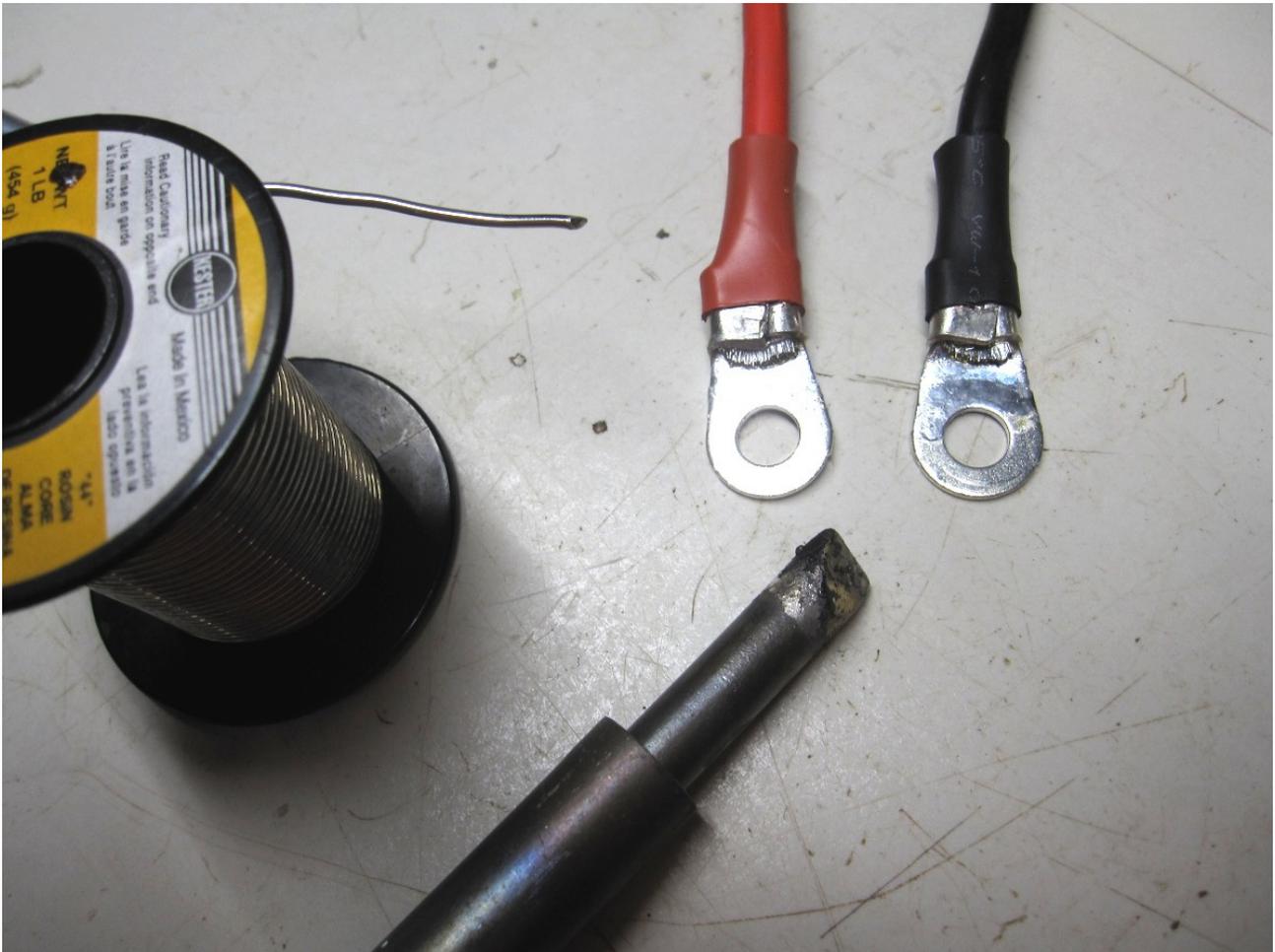
If the decorative cover is to be used with the hold down stud, it is necessary to make a hole in the top of the cover mounting grommet for the stud.

Battery connection cables

The battery connection cables that come with the inverter have large ring terminals with 12mm holes on one end. These could be used with washers on the 7mm Niro 12 volt battery connections but it is better to replace the large ring terminal with terminals that have a 7mm or 5/16" hole. One terminal that should be satisfactory is the Molex 19067-0084 4 AWG Ring Terminal. Terminals can also be made from copper tubing by smashing part of it flat in a vise and drilling a hole in the flattened area. The correct battery cables for the 1200 watt inverter will be marked as 21mm² (equivalent to 4 AWG) and about 10mm in diameter including the insulation.

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Another recommendation is to cut back the tubing covering the terminal crimp area and solder the connections on the terminals. The crimps as received may not have long term reliability.

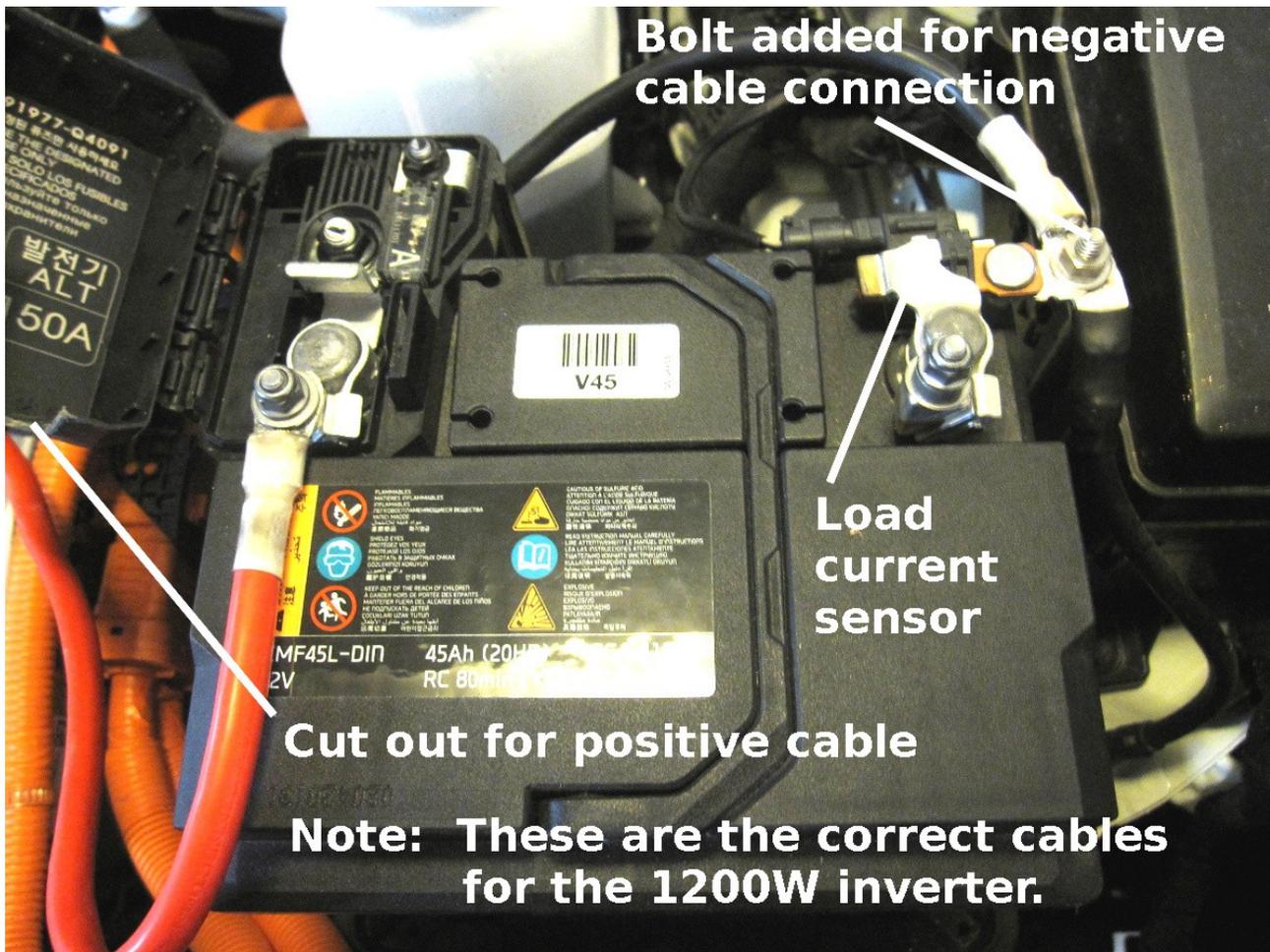


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Connecting to the Niro 12 volt battery

There are some modifications needed in the Niro 12 volt battery area to facilitate connection of the inverter cables. The easier of these is to cut a notch in the positive side battery post cover for the red cable to connect to the battery post clamp.

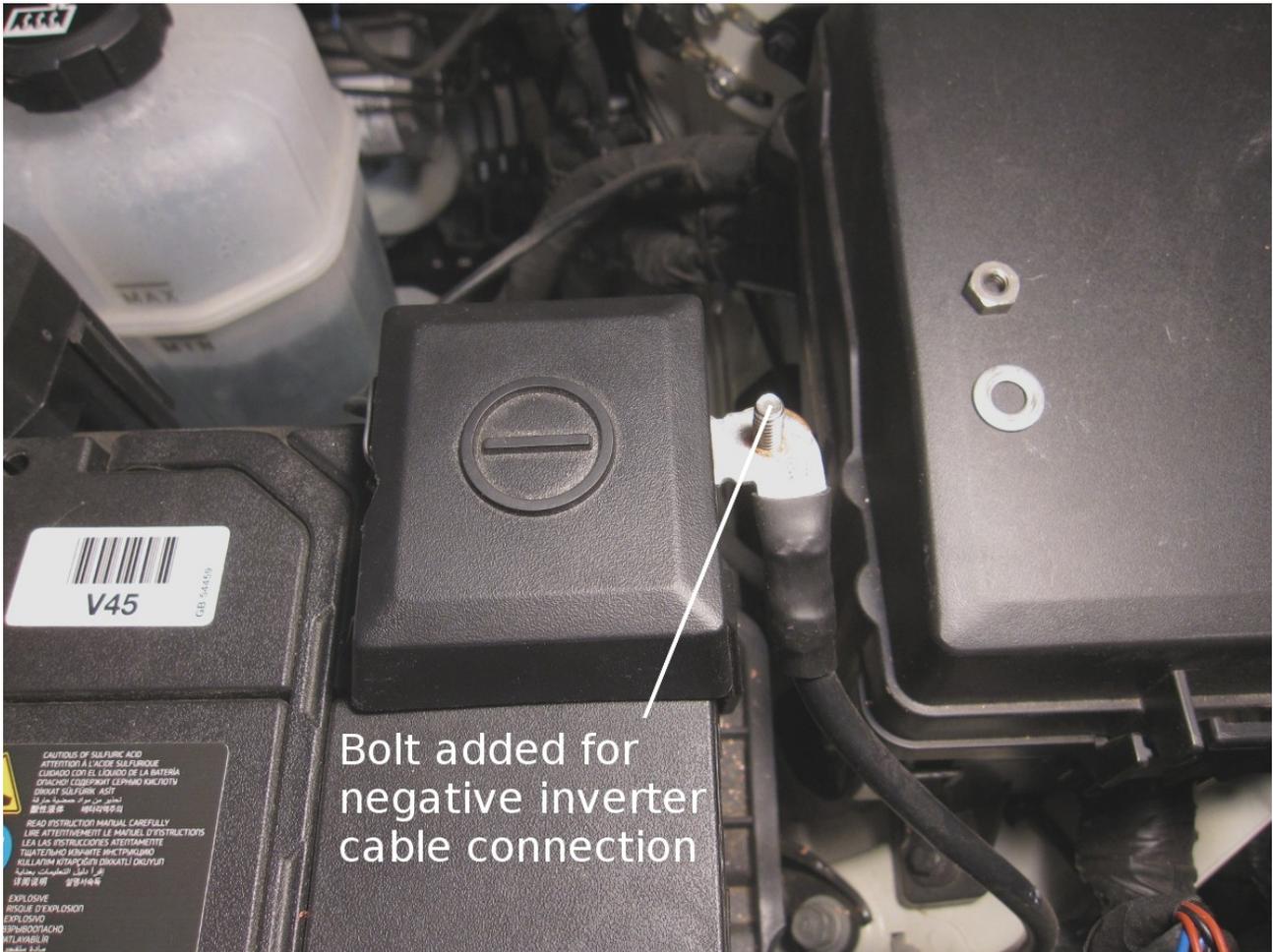
The second modification requires drilling a hole in the negative side battery cable terminal for a 7mm or ¼" bolt. The negative (black) inverter cable must be connected to the car body side of the battery load current sensor or the 12 volt battery charging electronics will not work correctly.



Do not drill the hole in the negative battery terminal while it is mounted on the battery or the load current sensor may be damaged. It is best to unplug the current sensor, remove the negative cable from the car, and hold the cable area in a vise when drilling the hole. The copper on the terminal is thick enough that the hole can be threaded to hold the bolt in place.

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This is a closer view of the new bolt for the negative side inverter cable connection:



Grounding the inverter housing

Gíandel says the ground post on the inverter housing should be connected to the vehicle chassis. I disagree with that. The body of the Niro is not grounded. It is an large, electrically isolated, metal structure sitting on four insulators called tires. If the inverter housing can be at a hazardous voltage because of an insulation fault, it is not desirable to have that hazardous voltage on the whole car body.

Connecting the inverter ground to the car body also increases the radio frequency noise radiated by the inverter. Amateur radio operators will know that grounding improves the operation of a transmitter. In this case, it is an undesirable transmitter and we don't want any improvement.

I do not see how connecting the inverter housing to the car body can be an advantage but I do see some significant disadvantages of making that connection. My recommendation is to leave the ground post on the inverter housing unconnected.

Connecting the inverter to the car battery

Caution. Sparks near a lead-acid battery can cause it to explode. Wear eye protection such as a face shield when making electrical connections on or near a battery.

1. Be sure the car is off and the charging connection to the car is unplugged so the 12 volt battery is not being charged. If you have a voltmeter, the 12 volt battery voltage should be in the 12 volt to 13 volt range. If the voltage is above 14 volts, the battery is being charged. Wait at least 5 minutes with the hood open to let any fumes escape if the battery has been charging.
2. If the negative (black) cable is connected to the inverter, make sure it will not come into contact with any metal on the car.
3. Connect the positive (red) cable first to the terminal marked + on the inverter and then to the positive terminal of the 12 volt battery.
4. Connect the negative (black) cable to the terminal marked – on the inverter if not already connected.
5. Touch the negative battery connection ring terminal to metal connected to the car frame but not near the battery. There should be a noticeable spark when the terminal first makes contact. This initial contact will charge the input capacitors in the inverter. Disconnecting the terminal and then again touching the metal within a few seconds should not result in a significant spark. If there is no significant spark when reconnecting the terminal, it can then be attached to the bolted connection on the battery negative cable.

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Operating the inverter

1. The car needs to be on and ready to drive or set to the Utility mode when the inverter is in use to prevent the 12 volt battery from being discharged.
2. If the inverter load is in the 500 to 1,200 watt range, the car should be set to the Utility mode. All of the other major 12 volt loads such as the air conditioning, heating, blower, defrosters, heated seats, heated steering wheel, and headlights should be turned off.
3. If the inverter is being used while driving the car or when other major 12 volt loads are in use, the inverter load should be limited to 500 watts.
4. Use the 0-1 button on the converter or the remote control to turn the inverter on and off.

Removing the inverter

1. Turn off the inverter and then the car. Do not have the charging cable connected to the car. Wait 5 minutes with the car hood open after everything is turned off.
2. Disconnect the positive (red) cable from the positive battery terminal. Don't let the cable end touch any metal on the car body to avoid creating a spark. Turn on the inverter to discharge the inverter input capacitors.
3. Disconnect the negative (black) cable from the negative battery lead.
4. Remove the mounting board and inverter.

Quick version of install and remove

Connecting

1. Connect red
2. Charge capacitors
3. Connect black

Disconnecting

1. Disconnect red
2. Discharge capacitors
3. Disconnect black