

Cigarette Lighter Socket or A Dedicated Fused 12 Volt Power Source

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Some time ago I was asked by a new ham about how to install a mobile radio in his vehicle. The conversation went all over the place including a “short” discussion about powering the radio through the cigarette lighter socket. Concerning that, my response to him was something like, do not use the cigarette lighter because the wiring and fuse to the cigarette lighter are, most likely, not designed to carry the load his transceiver will put on the circuit. I then suggested he run a separate circuit directly off the battery to avoid the problems that might arise by using the cigarette lighter socket.

I suggested using a separate circuit for two good reasons. The first reason for powering his radio directly from the battery is that he can install and fuse a circuit designed to handle the current he will need for his radio. The other reason for running a separate circuit is that he can operate the radio without having to have the engine running. The drawback is that when operating that way, the battery is not being charged by the running engine and if he leaves the radio on and unattended, it will draw down the battery possibly causing problems.

After the call, I looked on the internet and found and sent to him three good articles all written by the same person, Jeremy Laukkonen. Links to each are provided here. These are not short articles but I believe they offer a good explanation as to why we **should not** power our radios through the cigarette lighter.

<https://www.lifewire.com/fix-car-cigarette-lighter-fuse-4125196>

<https://www.lifewire.com/car-cigarette-lighter-12v-socket-534754>.

<https://www.lifewire.com/car-fuses-and-links-explained-4018163>

What I suggest a ham do to get power for his mobile radio, and why.

Basically the problem Mr. Laukkonen addresses in his articles is that, in many, maybe most, vehicles the wire size and fusing inline to the cigarette lighter are likely not correctly sized to provide the higher amperage required by a mobile radio or many of the other pieces of ham equipment.

What follows are the steps I suggest be taken to create a separate battery powered and fused circuit to power a typical 2m/440 mobile radio.

Important Note: For safety reasons, do not connect this new circuit to the battery until the last step of the installation. There is no need to run the risk of a “hot” positive cable hitting anything, including the negative cable you will be working with during the assembly and positioning of the new power cable.

Note: The circuit you are installing might be used in the future to power something besides an amateur radio. Keep that in mind when you select the wire size, and the fuze, you want to run from the battery to the cab of your vehicle.

I used #10 “red/black” zip cable to carry power from my truck battery through the firewall and direct to my radio, and will refer to that size wire in this paper. I also prefer using crimp-on connectors rather than solder-on connectors. (*)

If you expect to run additional electrical items, such as a fan, portable light, etc, all powered by this circuit, and used possibly while you are on the radio, **be sure you install the correct size wire, and in-line fuse, that will safely carry the current/amps needed to power everything you have connected to this circuit, all being used at the same time.**

Before getting started, a word about continuity checks. Be sure to do a continuity check at the end of each stage of your installation. If you are

attempting a continuity check between a point under the hood and another point in the cab of your vehicle, you might need to use a separate piece of wire to bridge the distance as well as a friend to help with the test. Don't just skip over doing the continuity checks. The cost of an error might make you very unhappy!

Another comment, if you are doing a continuity check across the new installation of the fuse holder, and find an open, first check to see if there is a fuse in the holder, and if there is one, remove the fuse to do a check of the fuse itself. It won't be the first time a new fuse holder has had a bad fuse in it! If you need to replace the fuse, be sure to install a new fuse of correct value for the amount of current you can safely use on the circuit you are installing.

The following steps are how "I" would proceed. If you have a better way, go for it. Just stay safe! A "jolt" from your 12 volt battery can stop your heart, **AMONG OTHER THINGS!**

Step 1: Install the cable you plan to use from the cab, through the fire wall, and to the battery.

Decide the route you want the #10 cable to take going from under the dash to the battery under the hood. Following that, pull the #10 wire through the firewall from the cab to the battery. Add extra length because what you plan at this point might be different from what actually becomes the path for the cable; it is easier to shorten the cable than lengthen it! Pulling the cable should be rather simple since normally there are several holes in the firewall filled/closed with rubber plugs that you can pull the wire through. When you have what you think will be enough wire pulled through the firewall, leave the wire connected to the spool and in the cab of the vehicle.

Step 2: Connect an in-line fuse socket, and fuse, somewhere along the red (+) wire.

Before you Install an inline fuse holder under the hood: [Read the "Fuse Holder Important Note"](#) at the end of this paper. Also, check that the fuse holder you plan to install contains the correct sized fuse for the circuit you are installing; if it doesn't, replace the fuse with the correct fuse

for the circuit. Do not insert a fuse that will exceed a safe current the cable can carry! This fuse **protects the new “circuit”** you are installing; in other words the value of the fuse should relate to the wire size and the maximum current the new **circuit** is designed/expected to carry. The radio itself will be fused separately under the dash inside the vehicle.

To position this fuse holder, start at the firewall and pre-position the paired #10 cable going towards the battery. As you are doing this, decide where you can comfortably install the fuse holder and, equally as important, access the fuse holder to replace the fuse if that is ever needed to be done. Also, before cutting anything, be sure there is enough cable beyond where you will put the fuse so the cable can easily, and with some slack, reach both battery terminals!

NOTE: If there is more than one place to install the fuse holder, select the location that is closest to the battery.

To install the fuse holder where you’ve decided it should be installed, begin by separating the red and black #10 wires from each other. Do this carefully without cutting the insulation on either wire. Separate enough of the wires so you can install the fuse holder by its pigtails (**) inline with the positive “+” wire of the cable. And, if you need to remove a small amount of the red #10 wire, do it. Just remember the old adage “measure twice and cut once” as it applies here. The best way to connect the pigtails to the #10 wire is with appropriately sized crimp-on connectors covered by heat shrink, or Liquid Electrical Tape.

Regardless of how you connect the fuse holder to the red #10 wire, once connected, and before you cover the connectors with heat shrink, or Liquid Electrical Tape, do a continuity check to assure yourself the connections are good.

At this point start to use wire ties to support your new circuit wire along existing wiring in the vehicle. If you split too much or the red/black pair when you inserted the fuse holder in the line, use a wire tie or two to “tie” the two wires together again.

Keep the rest of the the #10 red/black wire joined together until the pared wire gets to the battery and you need to separate them to connect each to its respective battery terminal. **Don't connect to the battery at this time!** I use wire ties to secure the newly installed cable between the firewall and the battery to existing cable bundles, or whatever is convenient. The idea is to keep things as neat as you can under the hood. Also, while you are now basically done under the hood, **don't connect either cable to the battery yet;** you still need to work in the cab of the vehicle to prepare the cable ends for the radio.

Inside the vehicle and under the dash

The first thing to decide is where you wish to mount the radio(***) followed by how you will run the cables from the radio to the cable you just installed under the dash. Concerning a location for the radio, keep in mind that your first priority is to drive the vehicle while you are on the radio. You also need to fuse the radio between it and the cable coming from the battery. Wherever you decide the radio should be located, the best way I believe to fuse it is to use the fused cable that came with the radio. That cable will definitely be longer than needed for this installation. I, like many hams, prefer to leave the power cable in tact. I also suggest the use of powerpole connectors to make the power connections.

After installing the powerpoles, and checking that the cables connect as planned, **disconnect the cables for now. After the battery is connected, check everything, including a voltage check on the newly installed cable from the battery.** And, if all is as you expect it to be, connect the radio to the power cable, coil up the extra length, string tie it together and store it under the dash out of sight.

Connecting to the Battery

Before proceeding, check under the dash that nothing is connected to the powerpole connectors from the battery. If there is something connected, disconnect it for now. With nothing connected under the dash, proceed with connecting the new circuit to the battery.

While there are many ways hams have connected wires to a battery, the fact is, it can be done almost anyway you wish. The one thing I believe is universal is that how you connect to the battery needs to take into consideration the battery posts and battery connectors used in your vehicle. The only thing I would **NOT** recommend is to remove the battery terminal from the battery post and then replace it with the new wire jammed between the post and the battery terminal.

When I installed the circuit in my truck, it was suggested to me to use crimp on ring terminals that also fit the bolts holding the battery terminals on the battery. And if those bolts are long enough, it was suggested to install each ring terminal outside the nut holding the terminal on the battery post and to secure the ring terminal in place with a second nut effectively sandwiching the ring terminal between the nuts. If the bolt is not long enough to do that, remove the existing nut, put the ring terminal on the bolt and reinstall the nut. So I pass on to you that suggestion.

If you connect to the battery as it was suggested to me, use a ring terminal that can be crimped onto the #10 cable used in the installation. Also, before connecting your radio to the cable installed under the dash, do a voltage check to assure yourself that the new circuit is providing the nominal 12 volts needed for you radio.

I hope this paper can be of some use to you. **Please use caution** working around the battery. When and if in doubt, ask for assistance from someone who is familiar with what you want to accomplish and, possibly, has installed a circuit from the battery before. Good Luke!

—> **Fuse Holder Important Note!** <—

PREWIRED IN-LINE FUSE HOLDER CAUTION: Not all fuse holder are wired the same! If you plan to use an inline “prewired” fuse holder, be sure the gauge of the pigtail wires connected to the fuse holder match or exceed the wire size needed for your installation. The pigtail wire size and, of course, the fuse used should be appropriate for the **total load** you expect to have on this circuit.

(*). Crimping vs Soldering <https://monroeengineering.com/blog/crimping-vs-soldering-cable-connectors-which-is-best/>

(**) A suggestion, install the fuse holder by making a loop of its leads such that they cross at the bottom and can easily be connected to the positive “+” cable. The end result is the fuse holder is easy to access if and when you need to replace the fuse, and you don’t need to remove much if any of the positive “+” cable.

(***) Where you install the radio itself is, of course, your decision but many hams, myself included, mount the radio on the dash near the middle of the width of the dash. I mounted mine there so I don’t have to take my eyes off the road if and when I need to access the radio.