Installing an Electronic Brake Controller and a 7-pole Trailer Wiring Adapter on a 2009 Subaru Forester

Disclaimer: As the old saying goes, "There's more than one way to skin a cat." The following steps, techniques, and practices are what worked for me in my situation using the parts specified, and should not be considered as professional advice or industry best practices. Always work safely, especially when working with power tools, your car's electricity, and underneath a vehicle. Wear eye protection at all times! Be comfortable with the limits of your own technical and mechanical abilities and don't exceed them if you feel the outcome might be expensive to repair, or would constitute a current or future danger to you or others. Seek professional help as needed. As another old saying goes "Discretion is the better part of valor!"

The following describes the steps I took to install a proportional electronic trailer brake controller on my 2009 Subaru Forester X Premium (non-turbo). This project didn't take a lot of technical skill, but it was time-consuming. I hadn't done a lot of car wiring of this nature before, and I had to do some custom fabrication and modifications, so I took my time thinking things through and doing the old "Measure twice, cut once" thing, especially when cutting the notch in the rear bumper cover. I don't have a full-car lift, and all of the underbody work was done without raising the vehicle at all, so that work was a bit slow and cramped, especially drilling work. I use jack stands plenty for other work, but for this project I felt more comfortable (safety-wise) not using them; not being a large guy, I can fit reasonably well under the Forester without raising it. If I were to do this project again, I would rethink that strategy….

I've included photos where available to help illustrate what's described. No video, sorry. Many of the descriptions of what's going on make more sense when you have parts in-hand and are actually doing the project.

Background

When I bought my Forester back in 2011 I had the dealership install a Subaru 1-1/4" frame-mounted receiver hitch and Subaru flat-four trailer light connector. The Subaru hitch is a weight-carrying hitch with a 2400-lb. maximum tow weight and 200-lb. maximum tongue weight, which matches my 2009 Forester's towing capacity limits (the Forester's 2400-lb. limit ceiling applies only if the trailer has trailer brakes). After recently buying a small, molded-fiberglass travel trailer (a Scamp 13' Deluxe), I had to convert the flat-four connector to a 7-pole connector and add a suitable electronic trailer brake controller to enable the single-axle Scamp's electric trailer brakes. The brake controller is mounted in the driver's cab and wired into the tow vehicle's brake and power wiring. The controller sends braking signal (voltage) back to the trailer brakes via the trailer's 7-pole connector.

I decided on the Tekonsha Primus IQ controller, designed for trailers with 1-3 axles. Tekonsha seems to be a major manufacturer of proportional brake controllers, and I've seen lots of references from other Scamp owners for the Primus IQ. I've also seen lots of references of folks using the Tekonsha Prodigy P2. Either should work fine. I went with the Primus IQ since that's the controller recommended by Scamp.

For the 7-pole connector, I used a Hopkins 47185 which converts a pre-existing 4-pole flat connector to a single unit that has both a 7-pole connector and a flat-four connector. However, because wiring in the 7-pole connector and the brake controller requires more parts than just what's included with the controller or adapter (e.g., circuit breakers, bulk wiring, extra connectors), I found this handy ETBC7 7-pole adapter kit that included almost all parts needed for a turnkey controller/adapter installation. You

could search out all the kit parts separately for less money, but since this was my first foray into this kind of project, I went with the kit for convenience (your time is worth something) and peace-of-mind.

Besides the 4 wires that connect into the pre-existing flat-four connector, the 7-pole connector has 3 additional wires/connectors as follows:

- Blue (typically) = signal from brake controller to trailer brakes;
- Red or black (typically) = connects to the tow vehicle's battery and passes current back to the trailer's power converter;
- Yellow or purple (typically) = auxiliary, typically for backup lights on the trailer, if so equipped.

The blue and black wires will be fed from the front of the tow vehicle; the auxiliary wire, if used for backup lights on the trailer, can be spliced into the tow vehicle's backup lamp wire contained in the wiring loom supplying one of the tow vehicle's tail light clusters.

Most applications I've seen on the internet for mounting the 7-pole adapter are on hitch frames that are visible (and therefore accessible) below the bottom edge of the rear bumper cover. In those applications you can easily use just the mounting bracket supplied with the Hopkins 47185, or in conjunction with a short or long auxiliary bracket, to attach the 7-pole adapter to the hitch frame. However, because the OEM Subaru hitch frame is completely hidden behind the bumper cover except for the receiver tube, and there were no other convenient, solid mounting points to use, I fabricated a custom bracket.

Plan and Notes

1. **Mounting the ETBC7 7-pole adapter.**
    a. I removed the Forester's rear bumper cover and crafted a custom mounting bracket to use with the 7-pole adapter's OEM bracket to attach the adapter at a convenient height above the ground. I wanted to make sure the bottom of the 7-pole adapter was mounted higher than the Subaru hitch receiver to minimize damage to the adapter in case of low exit-clearance from a road dip, etc. In that case, the bottom of the hitch receiver tube (safety-chain attachment ears) would take the brunt of the ground contact. I crafted the bracket out of 16-gauge aluminum (for rust prevention). I was afraid that there might be too much "give" in the aluminum while connecting and disconnecting the trailer plug, so I used JB Weld to attach lengths of ½" x ½" aluminum angle stock as "ribs" to the back surface of the bracket to try to add rigidity. However, I cut the ribs too short so after attaching the ribs, there was a gap of about 3/8" between the top of the ribs and the bottom of the hitch frame crossbar, and since filling that gap would also add rigidity, I added a short piece of steel bar stock I had on hand. If I was to do it over, I would cut the ribs longer and attach the ribs so they butted up against the bottom of the hitch frame crossbar.


b. I attached the OEM adapter bracket to my custom bracket, then secured my custom bracket to the hitch crossbar using a stainless steel hose clamp routed around the crossbar and through a slot cut in the custom bracket. I then mounted the 7-pole adapter onto the OEM bracket. I used removable (blue) thread-locker on all the bolts.



c. I positioned the 7-pole adapter about 6-7 inches to the left of the hitch receiver, then, through a series of careful measurements, incremental cuts, and test fits, I used a utility knife to cut a notch in the lower edge of the rear bumper cover to accommodate the

adapter.

2. **Wiring in the 7-pole adapter.**
    a. Prior to re-installation of the rear bumper cover, I removed the zip-ties securing the Subaru flat-4 plug from around the hitch receiver. I liberally applied dielectric grease to the contacts of both 4-pole plugs, then connected the 4-pole plug from the adapter to the Forester's flat-4 plug, and bound the excess length up along the height of the drop post connecting the hitch receiver to the hitch crossbar. I wrapped the 4-pole plug junction with electrical tape, then secured it with a zip-tie. I then installed 3/8" plastic wire loom around the flat-4 leads from the 7-pole adapter, and zip-tied the assembly up out of the way.

    b. From the 7-pole adapter, I ran the ground (white) wire up and forward along the driver's side inside frame rail, and secured it to the frame above the rear axle with a self-tapping screw through the OEM-attached ring terminal. Tip: Due to clearance/accessibility limits, a 12"-long one-piece drill extension like this was extremely helpful (required?) in getting the self-tapping screw drilled in. Remember, it's not a project unless you can buy more tools!

c. To make the connection to the 7-pole adapter's auxiliary (purple) wire to my vehicle's backup lights, I traced the wire colors from the backup bulb in the tail light cluster back across to the vehicle side of the cluster plug, and determined that the brown wire with yellow tracer was the wire supplying the backup bulb. I confirmed this with a test lamp probe.

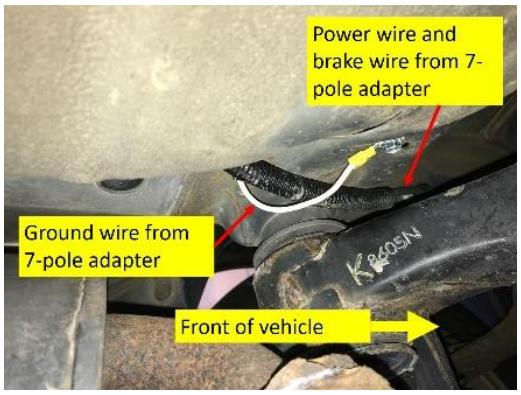
d. I removed the rear cargo area cover, the Styrofoam rear cargo storage pieces, and the spare tire. I located the OEM wire loom supplying the driver's side rear taillight cluster up underneath the interior side trim. I worked the loom out where I could work on it, then carefully cut/stripped off the OEM loom sheathing to expose the wire bundle and worked out the brown/yellow wire. I used a test lamp probe to re-confirm that was the backup light wire.

e. From the purple auxiliary wire coming out of the 7-pole adapter, I butt-spliced a piece of 14-gauge wire long enough to route up into the spare tire well and up to the exposed backup light wire. I made a slit in the rubber plug at the bottom of the spare tire well through which Subaru ran the 4-pole plug wiring loom from the inside to the outside of the vehicle, then fed the auxiliary wire up from 7-pole adapter through the slit into the spare tire well, and up to the previously-exposed brown/yellow backup light wire, where I spliced it in. I taped all connection points, then installed 3/8" plastic wire loom along the length of the auxiliary wire both inside and outside the vehicle, and inside the car I tucked the wiring back up underneath the plastic side trim. I sealed the slit in the rubber plug with silicone caulk.

f. Now that I had the 4-pole wires, the ground wire, and the auxiliary wires connected up from the 7-pole adapter, all I had left was the 12-volt power lead (black wire) and the trailer brake voltage lead (blue wire) left to connect. Those two remaining leads will be carried forward to the engine bay using the gray duplex cable supplied in the ETBC7 kit.

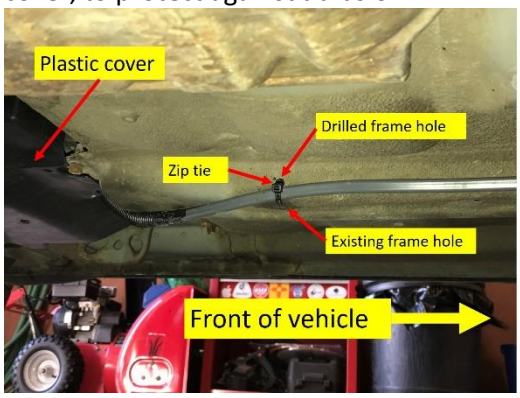
g. I loosely fed the duplex cable from the front of the vehicle rearward along the inside of the frame on the driver's side, up above the rear axle near the ground wire attachment location (see 2.b. above), then down toward the 7-pole adapter, following the route of the ground wire.

h. I "dry-fit" the duplex cable down along the ground-wire route, then stripped the duplex sheathing back to a point just forward (toward front of vehicle) of the ground wire attachment point. I then connected (butt-spliced) the black wire from the 7-pole adapter to the black duplex wire, and the blue wire from the 7-pole adapter to the white duplex. I taped the connections, then installed ½" plastic wire loom around those two wires and the adapter ground wire; the loom extended about 4" forward of the ground wire attachment point. I tucked the loom up between the driver's side muffler heat shield and the vehicle body, and zip-tied the loom to the rear muffler hanger bracket.

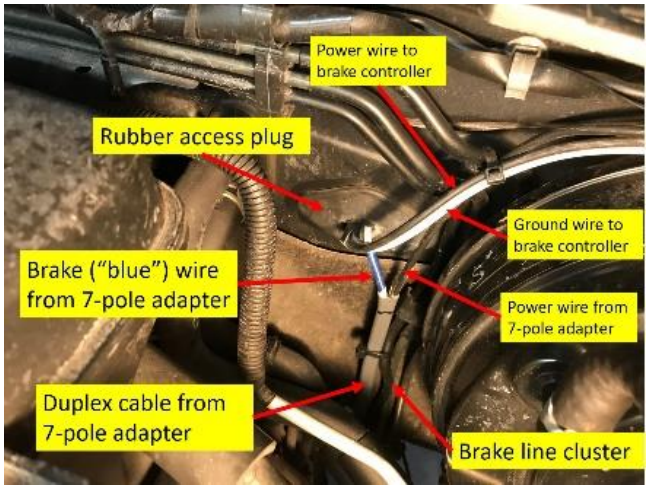


i. I removed a bolt-on plastic underside cover on the driver's side underbody that is just forward of the rear axle, and routed the duplex cable through that cover between the cover and the underbody; I had to cut an "exit hole" in the front edge of the cover

where the duplex cable exited from under the cover out to the exposed underbody area, then I installed ½" plastic wire loom around the duplex cable where it exited the cover, to protect against abrasion.



j. I continued to route the duplex cable forward along the inboard face of the driver's side frame rail, attaching the duplex cable at various points using zip ties or rubber-insulated cable clamps purchased from the hardware store. I finished the routing into the engine bay up along the firewall by zip-tying the duplex cable to the brake line group that descends from the brake booster/master cylinder assembly down against the firewall.



k. I did a final dry-fitting of the duplex cable up and over the brake vacuum booster, then forward alongside the driver's side of the engine bay/inside fender, then to the positive battery terminal, then cut the cable, making sure I had several inches of extra length. I saved the excess length of duplex cable (about 4-5 feet long) for wiring power and ground to the brake controller (see Step 4 below).

3. Mounting the brake controller inside the passenger cabin.

a. I determined that the best location for the brake controller would be attached to the removable, interior fuse-panel access cover. I thought other locations (e.g., in the center console "cubby-hole" next to the cigar lighter) would be unnecessarily complex, plus a test-fit in that location showed that visibility of the controller lights and/or access to the controller buttons would be restricted.

b. I marked holes on the back of the access cover using the holes in the controller's clip bracket as a template. I located the holes immediately below the molded grip in the access cover, allowing clearance below the grip on the back for backing washers. Because the orientation of the access cover when installed in the dash panel was angled from horizontal, I had to compensate (by eye-balling) by angling the mounting hole alignment so the mounted controller would be more horizontal to the ground (important for proper operation of the brake controller).

c. I drilled holes for the controller mounting bracket. The hole size matched #8 machine screws I used instead of the sheet-metal screws supplied by the controller manufacturer.

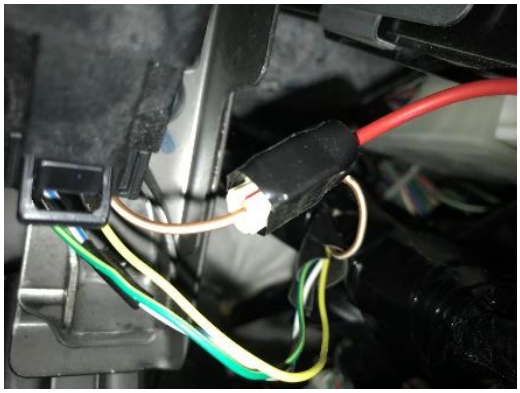
d. When mounting the controller bracket to the fuse panel access cover, I added 3/16” thick rubber pad plus a washer between the bracket and the cover on the inboard hole to compensate for the angle of the dash panel at this location in the car. The length of the machine screws had to account for that spacer and not extend too deeply into the fuse bank. I used removable (blue) thread-locker on the machine screws, along with lock washers and hex nuts.

e. Once the controller mounting bracket was attached to the fuse panel cover, I clipped in the controller for wiring.

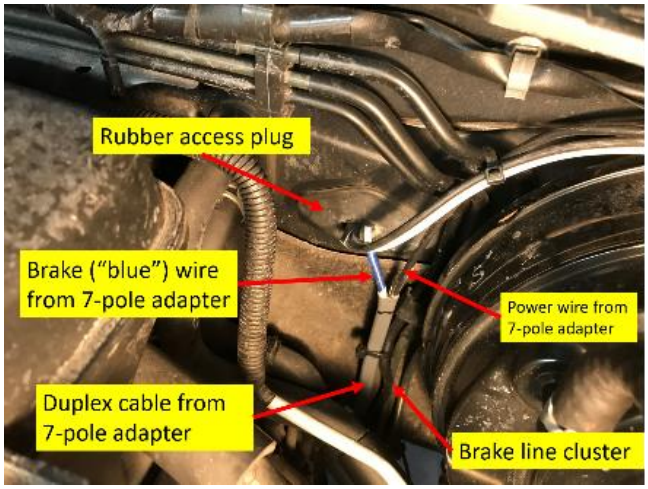
4. Wire in the brake controller.

a. I located the brake switch at the top of the brake pedal, then carefully cut off the tape/sheathing several inches back from the wire cluster exiting the back of the switch.

b. The red wire from the brake controller must be connected into the wire from the brake switch that is cold until the brake pedal is pressed. Using a test lamp probe, I determined the correct wire to connect into the brake controller's red wire was the brown wire with a white tracer. All the other wires from the switch were hot all the time (with the key on); the brown wire with white tracer was the only wire hot only when the brake pedal was pressed. I spliced in the controller's red wire to the brown/white wire of the brake switch.



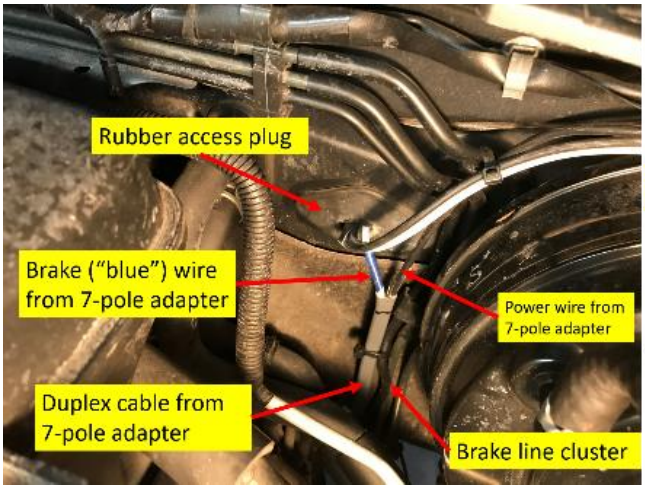
c. On the firewall, engine-bay side, I made a 1" long horizontal slit in the rubber plug covering an access hole below and inboard of the brake booster. That plug cover is right adjacent to where the gray duplex cable was zip-tied to the brake line cluster. From the passenger compartment side, I removed a felt cover from that access hole, and made a corresponding 1" horizontal slit in the felt.



d. On the duplex cable previously run up into the engine compartment from the 7-pole adapter, I stripped the sheathing off all the way back to just below the rubber firewall hole cover. I re-routed the "freed" black wire (power wire from 7-pole adapter) back up above the brake booster and around the inside fender toward the car battery. To the end of the white wire, I wrapped a piece of blue electrical tape as a marker that this white wire connects back to the blue (brake) wire at the 7-pole adapter; this made it easier to later distinguish this white wire from the similar white wire that will be used to provide ground to the controller via the negative post of the vehicle's battery.

e. Using the excess gray duplex cable referenced in Step 2.k. above, I stripped the gray cable sheathing from the entire length, then taped the two wires together at one end, then taped that pair to the end of the white "brake" wire from the 7-pole adapter. I then pushed these 3 wires as a group through the rubber plug slit from the engine-bay side into the passenger compartment.

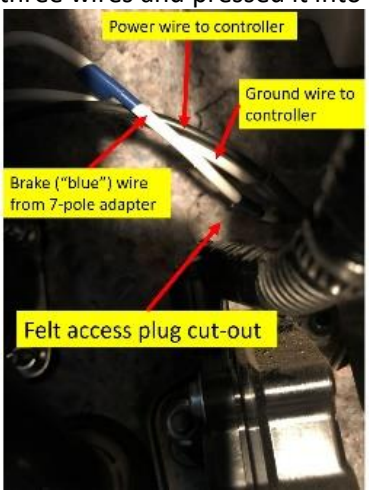
f. From the passenger compartment side, I un-taped the white "brake" wire from the black and white wires from the duplex cable. I pulled the brake wire slack all the way into the passenger compartment, and on the engine-bay side I wrapped a piece of blue electrical tape as a marker right where it enters the firewall to indicate this wire connects to the blue wire on the 7-pole adapter; I did the same on the passenger-compartment side of the firewall. This makes it easier to distinguish the white wire going to the 7-pole adapter from the white wire from the duplex cable that will serve as the brake controller ground.



g. So, inside the passenger compartment, the white wire with the blue tape marker ("white/blue") will connect to the blue wire (brake voltage-out) on the brake controller; the black wire will connect to the black wire (12-volt power supply) on the brake controller, and the white wire without the blue marker will connect to the white ground wire on the brake controller.

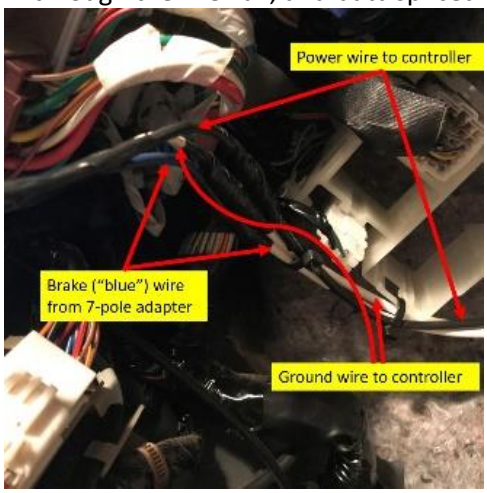
h. Back on the engine-bay side, I dry-fit the length of black (controller power) wire and white (controller ground) wire alongside the route of the black 7-pole adapter power wire, estimating the length needed to connect the black wire to the positive battery post and the white wire to the negative battery post. Knowing that length, I then pulled the excess length of these two wires into the passenger compartment through the firewall plug.

i. In the passenger compartment, I fed the felt access hole cover down the length of all three wires and pressed it into its mating hole in the firewall insulating felt cover.



j. Still inside the passenger compartment, I routed all three wires above a bracket holding the steering wheel shaft and around to the left side above the driver's side footwell, making sure I avoided pinch/abrasion points. I then routed up the OEM pigtail connecting into the brake controller, and, estimating where the pigtail would meet the

wires, I trimmed the excess length of the white/blue wire and butt-spliced it into the blue wire from the controller pigtail. I then trimmed the excess length of the black power wire coming in from the firewall, and butt-spliced it into the black wire from the controller pigtail. Finally, I trimmed the excess length of the white ground wire coming in through the firewall, and butt-spliced it into the white wire from the controller pigtail.

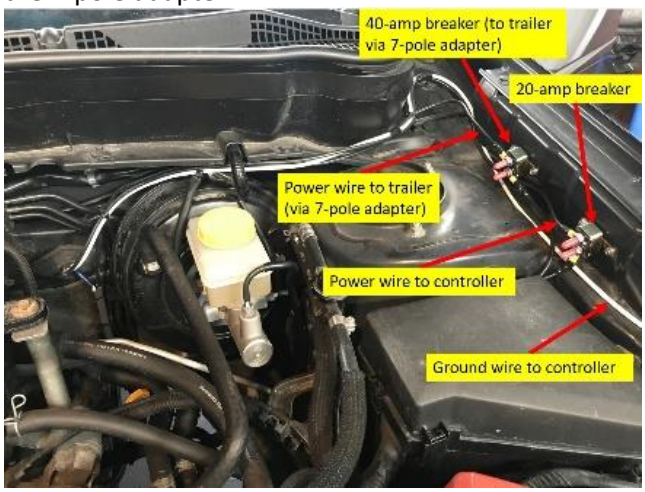


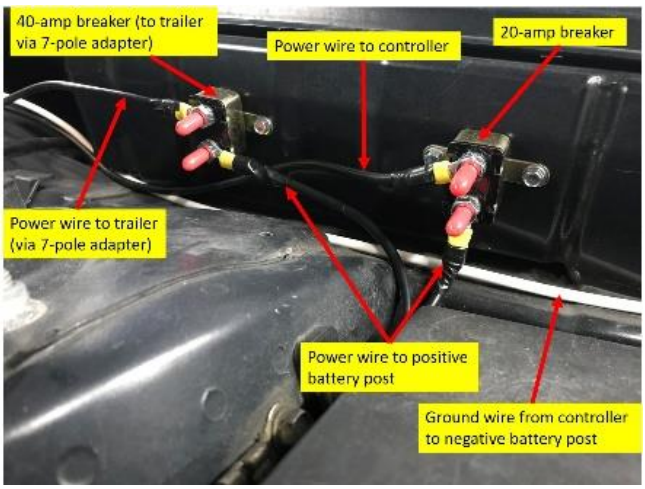
k. I taped up the connections, and zip-tied the wiring up out of the way.

5. Making final power and ground connections.

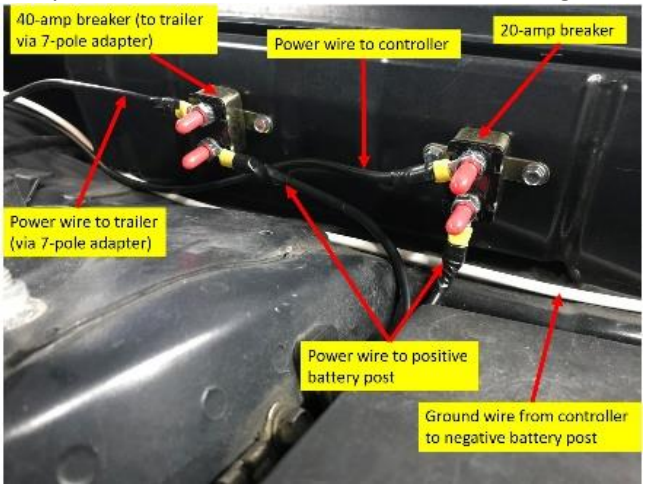
a. In the engine bay, I mounted the 40-amp auto-resetting circuit breaker supplied with the ETBC7 kit onto the inside driver's side fender using the kit-supplied self-tapping screws (I had to pre-drill pilot holes due to limited clearance and angle for the drill).

b. I finalized the routing of the black power lead wire to the 7-pole adapter and cut excess length at the 40-amp breaker. I spliced on a ring terminal and attached the end to the silver post on the circuit breaker. I dry-fit the leftover length to go from the copper terminal of the 40-amp breaker to the positive battery post, then crimped on ring terminals and made the final connections to complete the 12-volt power wire circuit to the 7-pole adapter.

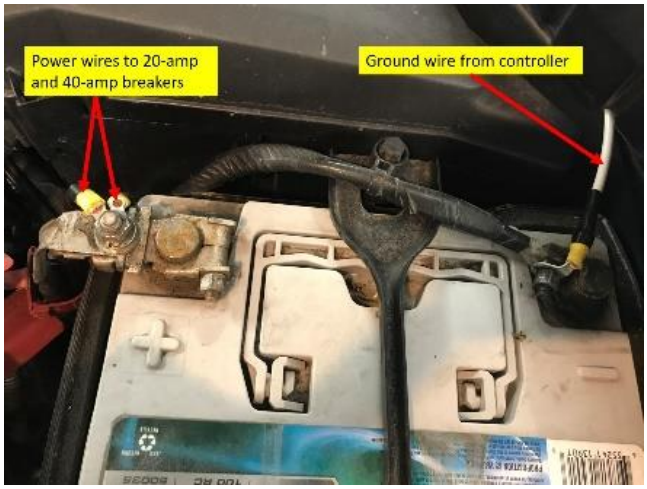




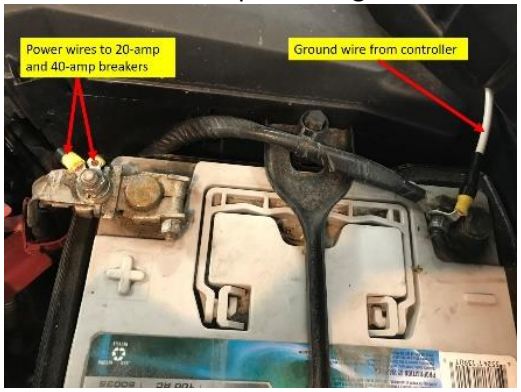
c. I mounted the 20-amp auto-resetting circuit breaker supplied with the ETBC7 kit onto the inside driver's side fender using the kit-supplied self-tapping screws (I had to pre-drill pilot holes due to limited clearance and angle for the drill).



d. I finalized the routing of the black power lead wire from the brake controller to the 20-amp breaker, and cut the excess length at the 20-amp breaker. I spliced on a ring terminal and attached the end to the silver post on the circuit breaker. I dry-fit the leftover length to go from the copper terminal of the 20-amp breaker to the positive battery post, then crimped on ring terminals and made the final connections to complete the 12-volt power wire circuit to the brake controller.



e. I finalized routing the white ground wire from the brake controller to the negative battery post, cut off the excess length, crimped on a ring terminal, then made the final connections to complete the ground side from the brake controller.



6. Testing connections – I used a tester from Northern Tool to test circuit continuity back to the 7-pole adapter.