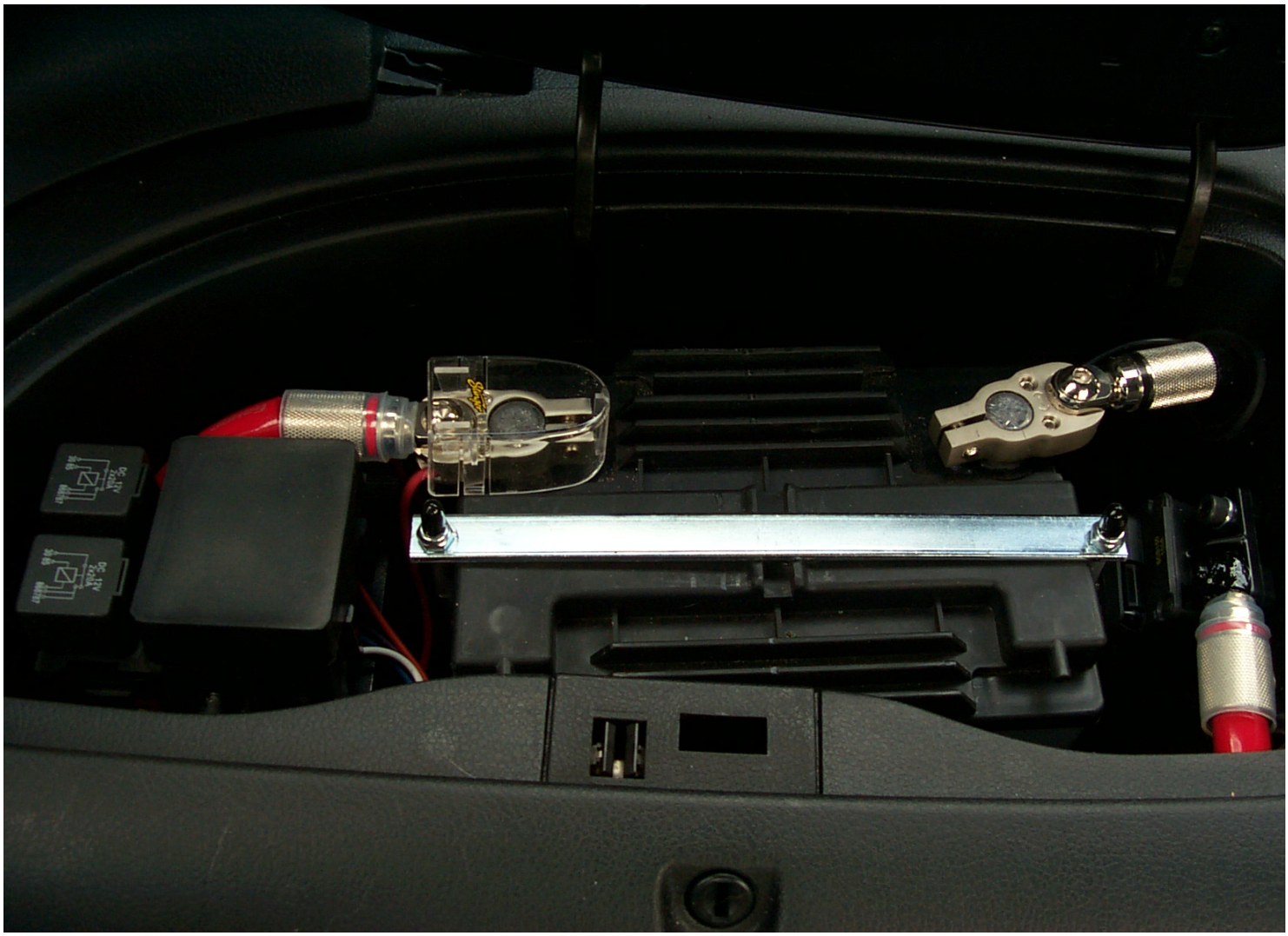
3rd Generation RX-7 Battery Relocation

Relocating the battery to one of the rear storage bins is a common modification on a 3rd generation RX-7, primarily driven by the need to free up space in the engine bay so that a large intercooler can be used. Either of the two rear bins found on an FD can be used, though the passenger bin is most commonly used on LHD vehicles because it is lockable and this location results in a slightly better weight distribution.



Pretty much all battery relation projects involve replacing the stock battery and running a line from the new relocated battery's positive terminal to the positive line that attached to the original battery; a ground line from the relocated battery is attached to the chassis within a short distance of it. A fuse or circuit breaker is usually used on the positive line of the relocated battery, and should be as close as possible to the battery. High current capacity cables should be used for the power and ground lines. Typically gauge 0 or 1 cable is used, though gauge 4 cabled is probably sufficient for most applications.

On an FD, a battery relocation project typically involves attaching a positive line to the stock battery attachment point or adjacent fuse box, running the line through the firewall to the cabin, and routing it to the rear bins either under the carpet or under the center console.

Because the storage bins on an FD are inside the cabin, a sealed battery is usually used for relocation projects. If a non sealed battery is used, it should be vented to the exterior of the car via an air line - assuming the battery has vent tubes; if not, it should not be used. The stock FD actually has a plugged 1 cm hole in the chassis just under the passenger side bin that could be used for venting purposes. A sealed battery is preferable, however.

While FD storage bins are relatively large, only a small selection of suitably powerful batteries will fit in them. The stock battery is way too large, for example. The top opening of each storage bin is approximately 28 cm in length and is 15 cm at its widest point. However, the width tapers gradually to 5 cm or about two thirds of the way along each bin, so the effective top dimensions to fit a rectangular battery are roughly 20 cm by 15 cm; the sides of the bins also gradually taper inwards towards the bottom of the bins to give a usable rectangular base width of a few centimeters smaller than this. Very few automobile batteries are as small as that, however. In practice, a battery with a slightly larger footprint can be used with a platform to raise it above the base. In any case, a platform should be used to hold the battery and securely attach it to the chassis.

Some minature batteries (e.g., the Hawker Odyssey PC680) will fit nicely but none of these batteries has been shown to perform well on a street-driven FD - they tend to not be able to start the car if it remains idle for more than a few days.

A slightly larger solution is the Westco sealed battery, which is an aftermarket replacement for the stock Miata battery. It will fit in the stock bins without cutting and is sufficently powerful for an FD. It is rated at 475 CCA and weight 25 lbs (10 lbs lighter than the stock battery), and measures 19cm long by 12.7cm wide by 18.4cm tall. The Westco battery is not a completely perfect fit, however. Because its base is larger than the base of the bin, it does not slide down to the bottom of it. It sits about 1cm up from the base, though it is held very snugly in place by the sides of the bin. Some people have reported happily running with the battery held in this way. In general, however, attaching a battery securely to the chassis is preferable.

A number of larger 51R-sized sealed batteries (e.g., the Optima Red Top) are common in FD relocation projects. These batteries require a serious amount of hacking to 'fit' in the bins - the entire base of the bin will have to be cut off approximately half way down the sides.

My Battery Relocation Project

So, with all of the above verbiage in mind, here is the write up of my relocation project. My goals were as follows:

- Reversibility. I wanted the installation to be reversible if necessary, so, beyond drilling a few (pluggable) access holes, I did not want to cut any stock part.
- Streetability. While my car is not really daily driven, I wanted it to behave as though it were, so no weird-ass batterries that only hold their charge for three minutes.
- Em, Stockability. I wanted the car to retain its stock look, so batteries hanging out in the hatch area (a fairly common solution) were out of the question.
- Safety. I wanted the solution to be as safe as the stock system, so no suspicious wire routing or dodgy electrics. Exposed live wires or connections seem to be common in battery relocation projects.

I also wanted to install a fuse block while installing the battery. I had plans for a number of aftermarket electrical items such as gauges, wideband oxygen sensors, and computer equipment so I wanted easy access to fused ignition-activated 12 volt connections.

Battery

For my relocation project, I decided on the Westco battery. While larger 51R-sized batteries are more common, they require extensive bin cutting to fit. This type of savagery seems unnecessary given that the Westco battery is sufficiently powerful, is cheaper and lighter, and requires no cutting beyond drilling a few access holes for wiring and mounting hardware. These holes can be replugged for a stock look if the battery is returned to the engine bay. It has a sufficiently high CCA rating for an FD with a stock sound system - YMMV, if you have an elaborate sound system.

Circuit Breaker

There are a variety of suitable automotive circuit breakers out there. I decided on the Stinger SCB150 150 amp breaker, though any equivalent circuit breaker should suffice. A rating of 150 amps or more is recommended for an FD to ensure that the starter can get sufficient current. The Stinger has the nice bonus of a cutoff switch, so the battery can be isolated in seconds when performing work on the car.

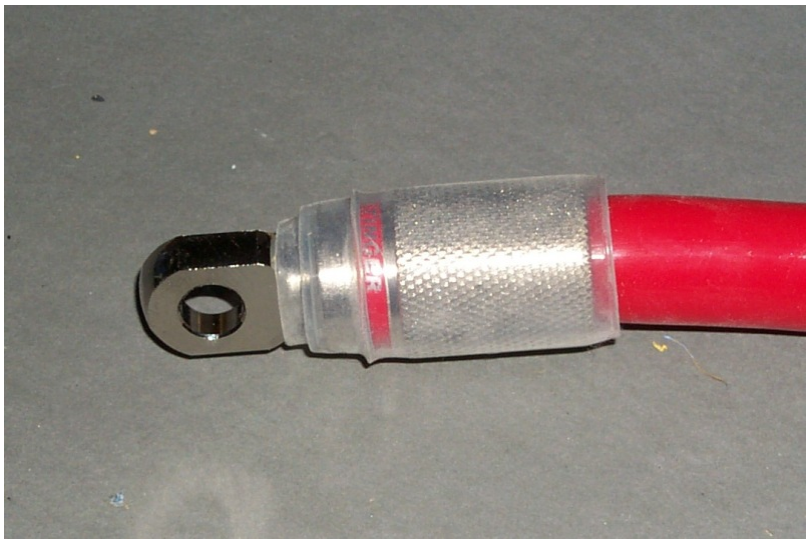
Cable Hardware

Power and ground cables and associated hardware can be found in any auto store. I decided to go with Stinger hardware because it looks cool and does not require any soldering or crimping.

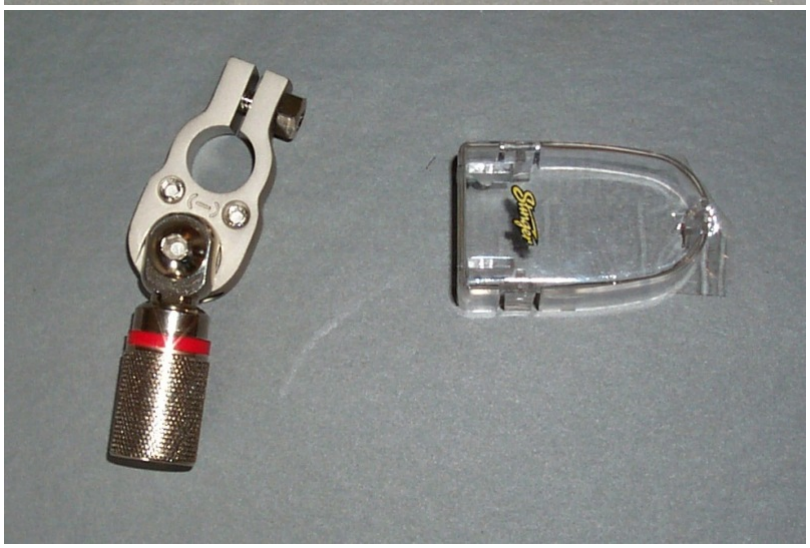
The power cable will carry quite a bit of current so at least 4 gauge wire will be needed. Many people use 0 or 1 gauge in relocation projects. I decided to with 0-gauge because the associated connectors are widely available in this size. This gauge is probably overkill. Stinger has 0-gauge positive (#SPRO0R) and negative (#SPRO0B) cables that are sold by the foot. I bought 3" of negative cable and 12" of positive cable.

Here is the Stinger 0-gauge postive connector (#PROBATTZPT). I used five of these in the install - four for positive connections and one for a negative connection. This connector comes with black and red adhesive strips to colour-code it for positive or negative use.

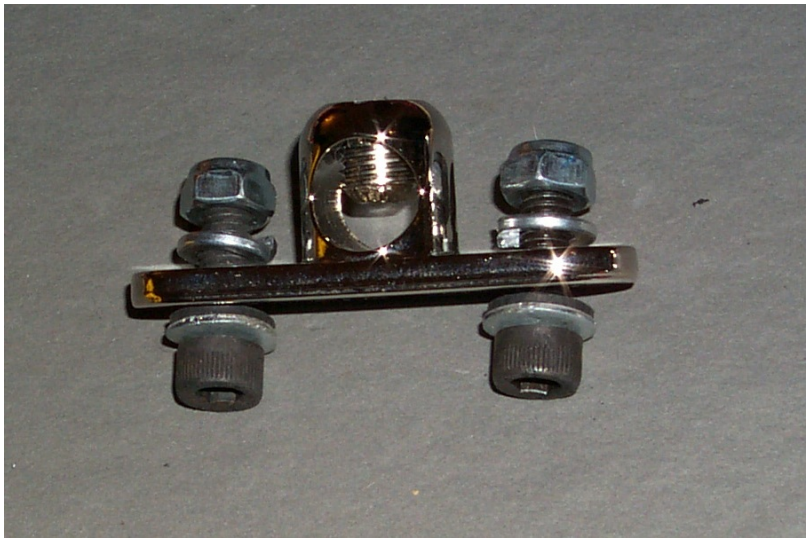
This connector has an associated clear cover (#SPBCOVZ). Here is a picture of the connector and cover with a 0-gauge wire wire attached. The wire can be attached to the connector without crimping. I used four of these covers in the install.



Here is a picture of the Stinger positive terminal (#BTPS) with attached 0-gauge connector and postive terminal cover (#SBTCOV3). I used one of each in the install.



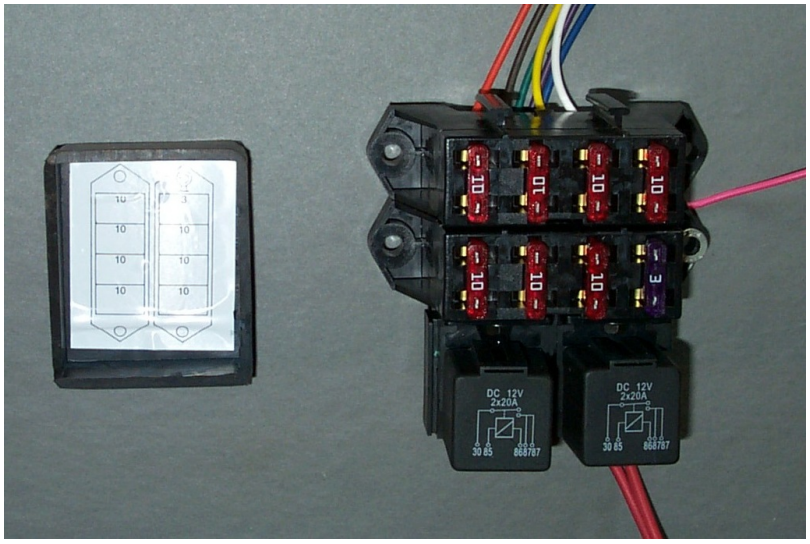
And here is Stinger negative terminal (#BTNS) with attached 0-gauge connector (#PROBATTZPT, which is the same part number the positive connector). I used one of each in the install.



Stinger also make a 0-gauge ground attachment terminal (#SGT0NPT). Here is a picture of one with the M6 hardware that I used to mount it to the chassis. Because the bolts will go through the chassis, I used bonded sealing washers on the outside. These washers have a rubber seal that act as moisture barriers. I could not find any metric washers, so I used #10 x 1/2" bonded sealing washers that I tapped to M6. I used one of these terminals in the install.

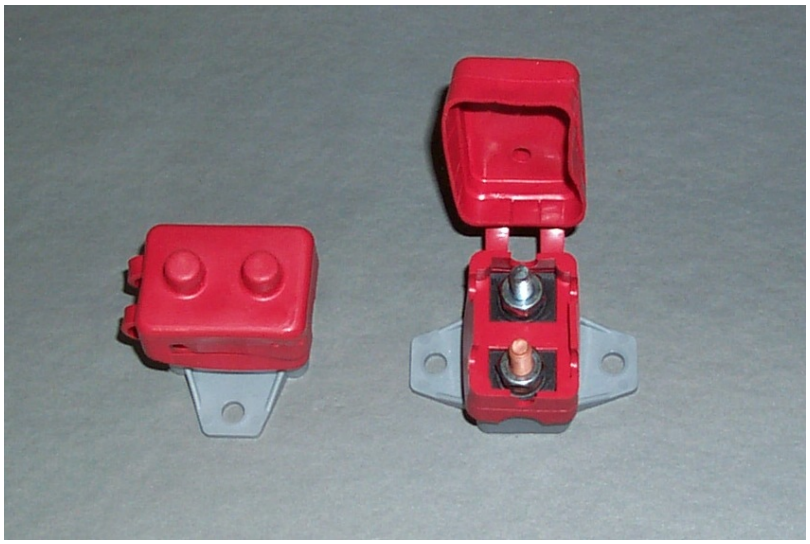
Fuse Block

There are a variety of automotive fuse blocks available. I decided on the Cirkit #70217 fuse block, which has seven fused remote-on connections. This block comes as a kit with two breakers, mounting hardware and terminal crimps.



Here is the block and cover. The two red cables at the bottom right of the picture above carry power from the battery; they are attached to the positive battery terminal (through individual breakers - see below). The seven multi-coloured wires at the top of the picture carry current for the seven circuits. The pink cable on the right of the image is the remote-on wire. Both relays are activated when 12 volts are applied to this line, activating all seven circuits. This line is normally attached to the car's ignition-on line. The purple 3 amp fuse in the picture is for the two relays; the other seven fuses are for the individual lines. These are standard automotive fuses so individual fuses can easily be replaced with fuses of a lower rating if required.

There is also an equivalently sized Cirkit fuse block (#70107) that has four remote-on and three constant-on connections that can be used if you have items that need to be powered when the ignition is off.

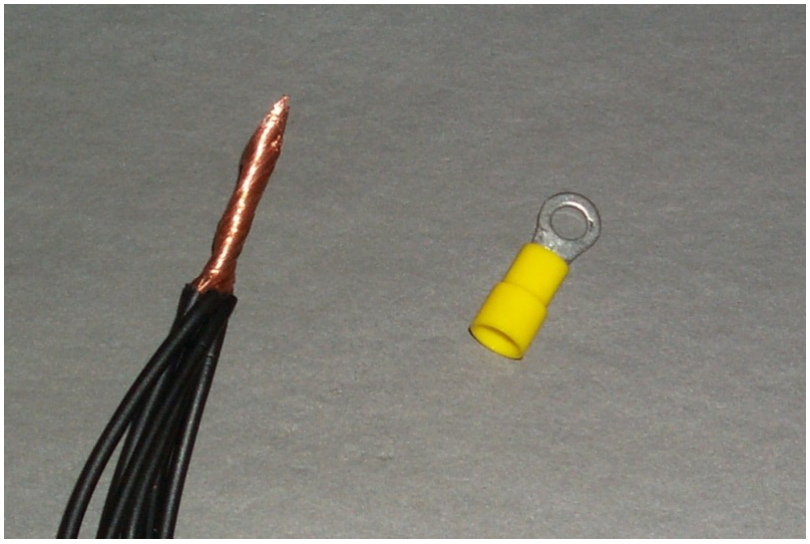


The Cirkit kit comes with two breakers, one for each of the relays. These breakers go between the positive battery terminal and the power cables to the relays. For fitment reasons, I used two breakers that I had in my parts bin, thought the breakers that come with the Cirkit kit are equivalent. Here is a picture of the breakers with protective covers attached.

Grounding Circuits from the Fuse Block

The seven circuits from the fuse block could be grounded through the car's common ground system. However, since the FD is known to have a noisy common ground system, I decided to run a ground wire from the block for each line. This solution also ensures cleaner accessory wiring.

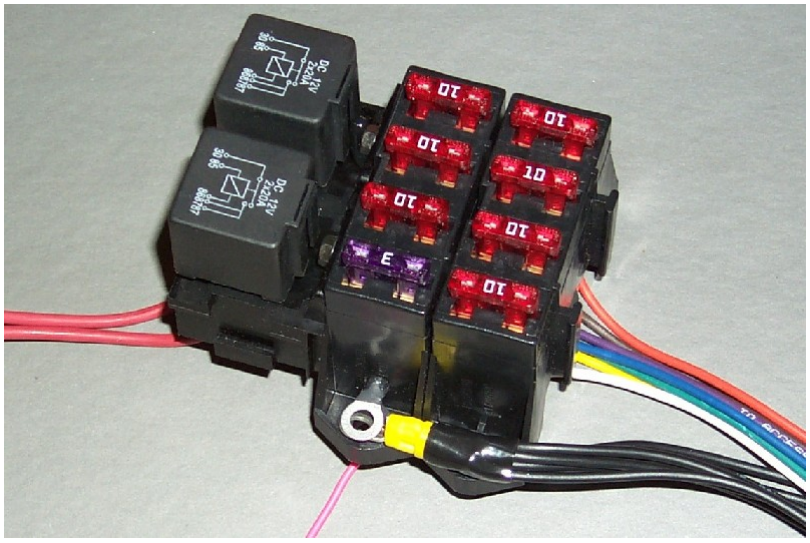
I took seven wires of the same size as the seven Cirkit fuse block wires, cut each of them to the same length as the wires, and then stripped about 2 cm of wire covering from the end of each of the seven wires and twisted the wires into a single end point.



I then crimped one end of the wires with a 10 AWG circular terminal crimp (which came with the Cirkit kit) and wrapped the end in electrical tape.

And attached it to the block ground ground point. Here is a picture of a test fitting to the block.

The ground point on the terminal block can then be attached to the negative terminal of the battery cable thus ensuring that the seven circuits have a clean ground.



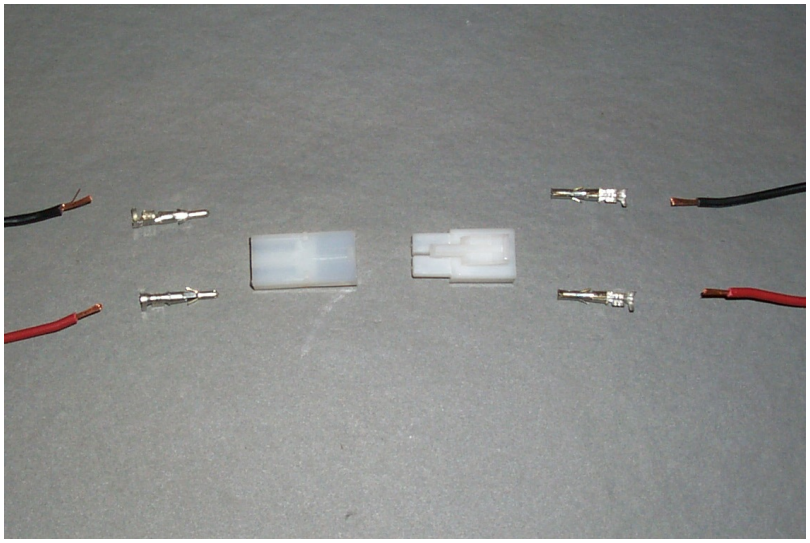
Terminating the Fuse Block Circuits

I terminated the ends of each of the seven lines with RC connectors. These connectors have male and female plastic connector with associated metal crimps that can be used to produce very secure removable connections.

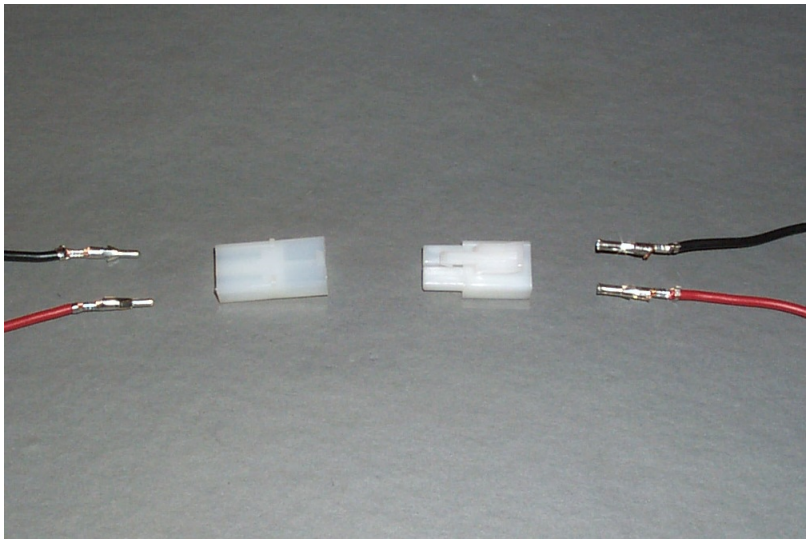
RC connector hardware is available from Digikey. The Digikey part numbers are: #WM2309-ND for the female plastic connector, #WM2308-ND for the plastic male connector, #WM2310-ND for the male metal pin (which go into the female plastic connector), and #WM2311-ND for the female metal scoket (which go into the male plastic connector).

Any equivalent automotove connectors coud be used here. I decided on the RC connectors because of their compact size.

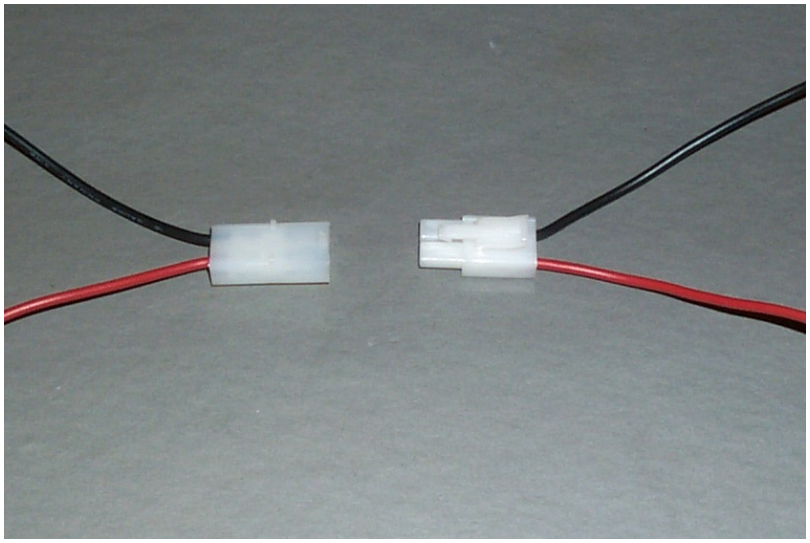
First, strip 5mm or so of wire covering from the ends of each wire.

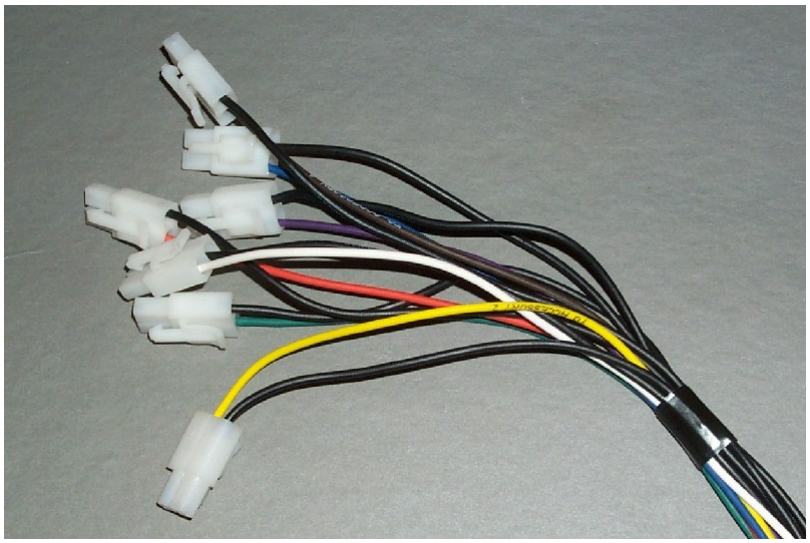


Then crimp them in the male and female metal connectors.



Then insert the male metal connectors into the male plastic clips, and the female metal connectors into the male plastic clips.





Here are the seven power distribution circuits with male RC terminals attached.

New electrical items can now easily be added by terminating their power and ground lines with a female RC connector that clip into one of these seven connectors. The fuses on the fuse block can also be changed to a lower rating for individual circuits if required.

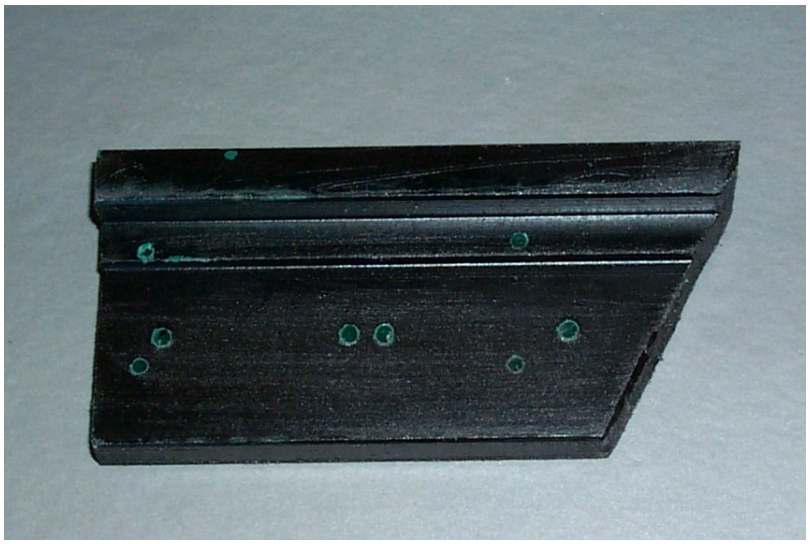
Fuse Block Platform

The Cirkit fuse block is weather-proofed so could be installed in the engine bay. However, I wanted to put it as close as possible to the battery - with the two breakers between it and the battery - which basically meant putting block and breakers in the bin with the battery.

The block and breakers come with mounting hardware so could, for example, be attached to the bin walls. For a slightly cleaner solution - and to avoid drilling a dozen or two holes in the bin walls - I decided to fabricate a platform for the block and breakers. This platform will sit in the bin next to the battery.

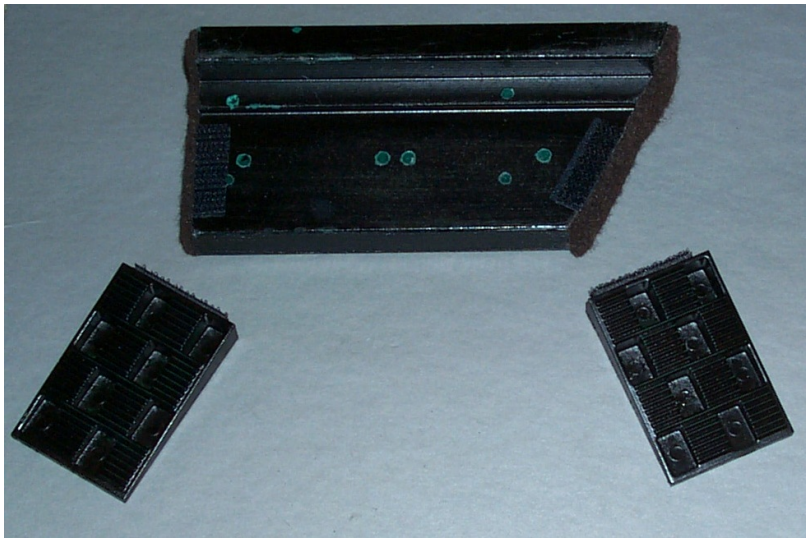
I fabricated this platform from some plastic blocks I had lying around. I painted each component of the block matte black for a stock look.

First, I cut a mounting platform to fit into the bin to the right of the battery. I pre-tapped it with mounting holes for the breakers and the block itself.

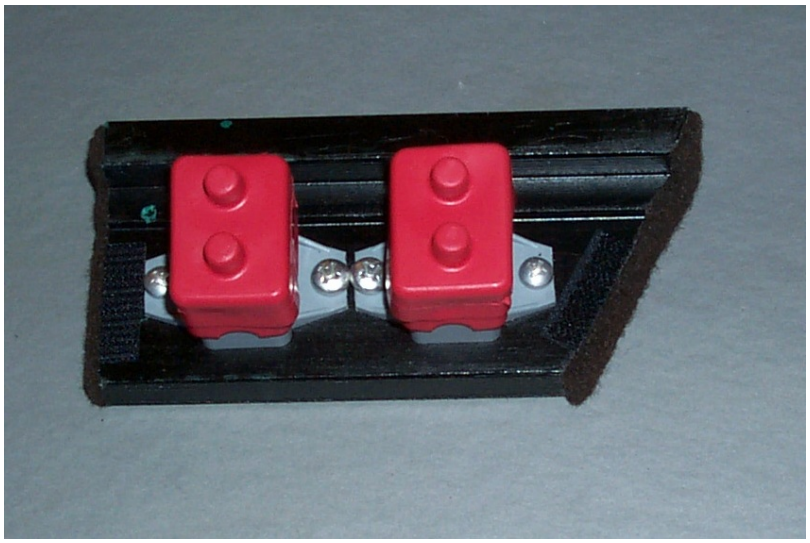


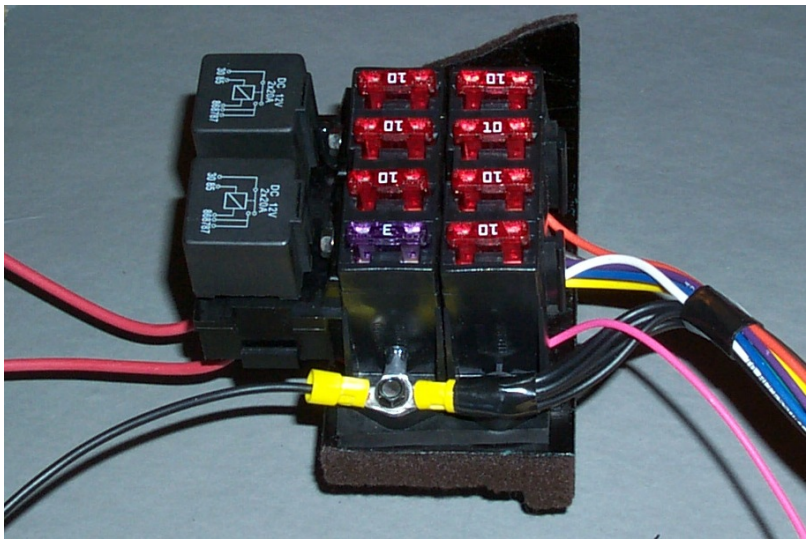
I then made two supports for the platform. These supports will be attached to the sides of the bin. The platform sits on these supports and is attached via Velcro strips. I used Velcro instead of permanently attaching the platform so that I can easily access the breakers under the fuse block is one of them fails.

I also attached adhesive-backed furniture protectant strips to the sides of the platform to reduce the chance of noise due to rubbing.

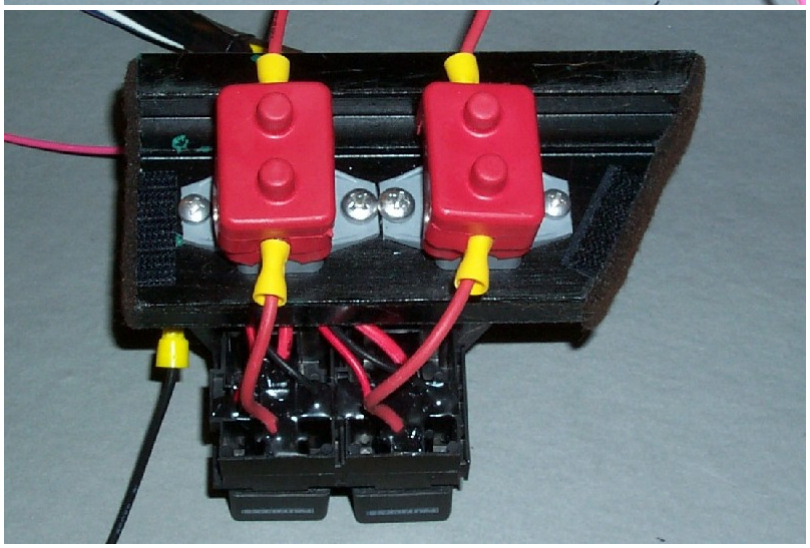


Here are the two relays mounted to the underside of the platform.





And here is the fuse block attached to the top of the platform. The ground for seven circuits are attached together to the fuse block grounding point. The single black wire on the bottom left will go the the battery ground, which will serve as the common ground for the block.

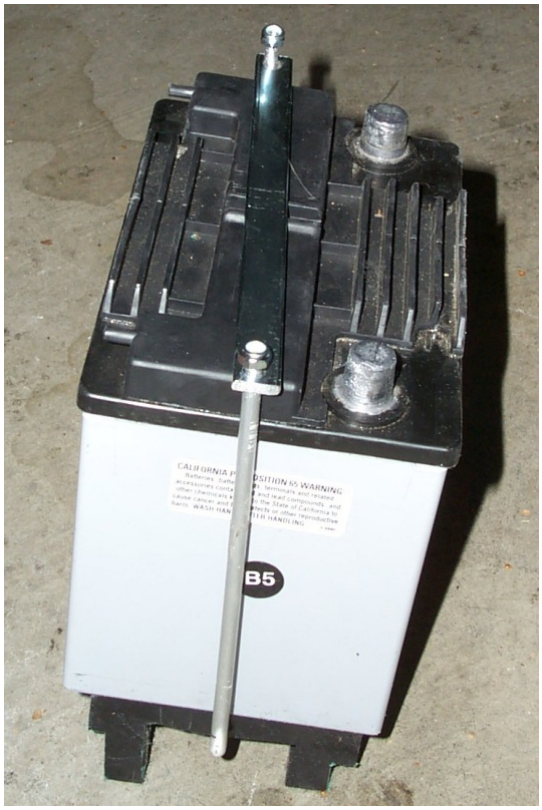


Here are the relays wired to the block. The two red power wires at the top of the picture will go directly to the battery positive terminal.

Battery Platform

I also fabricated a platform for the battery. This platform has four legs to attach it securely to the chassis and a tie-down component to hold the battery in place. I made this platform from two plastic sections and 1/4" aluminum tubing. I used a die to create M6 threads on the tie down arms and then used M6 lock nuts to hold a metal cross member that I made from some scrap metal.

Here is a picture of the platform. I used adhesive-backed furniture protectant on the top of the platform to reduce the chance of noise due to rubbing.



Here is the platform with the Westco battery mounted.

Ground Attachment

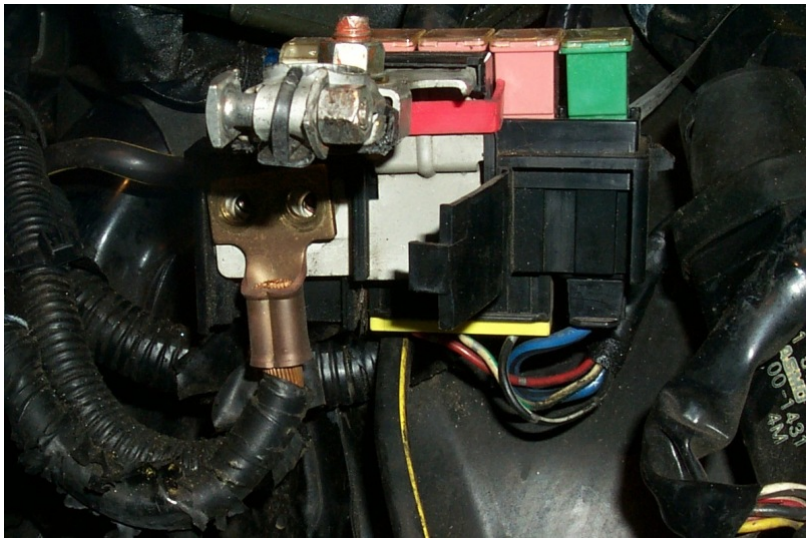
The battery ground needs to be attached to the chassis as close as possible to the negative terminal.

Conveniently, there is already a hole is the sound deadening material underneath the passenger bin which will serve to locate the attachment point. I sanded the grounding point, drilled two M6 holes in the chassis, and mounted the terminal using two M6 bolts and two locknuts and lock washers. The 0-gauge negative cable can then be attached to this terminal and routed to the battery in the bin.

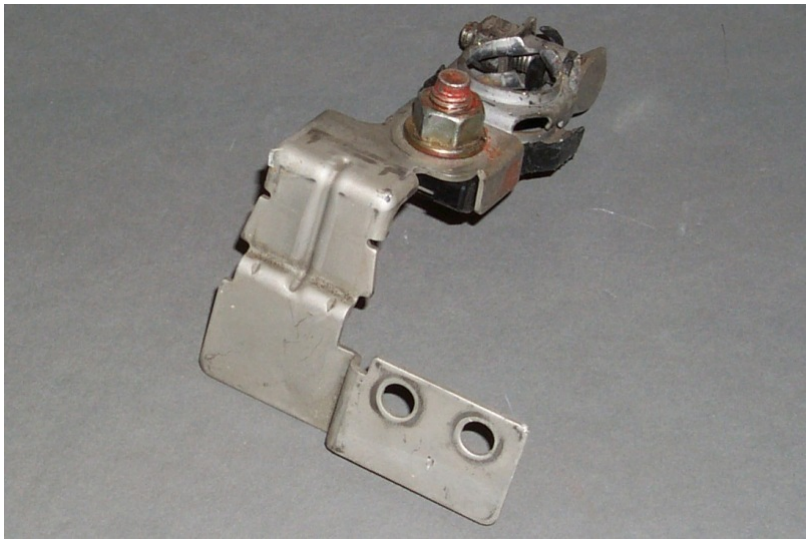
Here is a picture of the underside of the car showing the bolt heads and sealing washers.

Positive Cable Routing

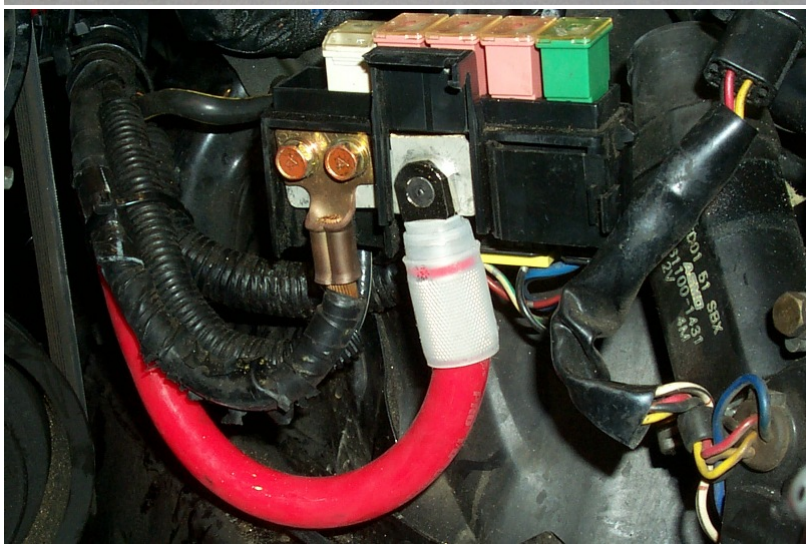
I ran the positive cable from the fuse box next to the stock battery, then through an existing hole in the wheelwell to the driver footwell, and along the center console back the the passenger bin.



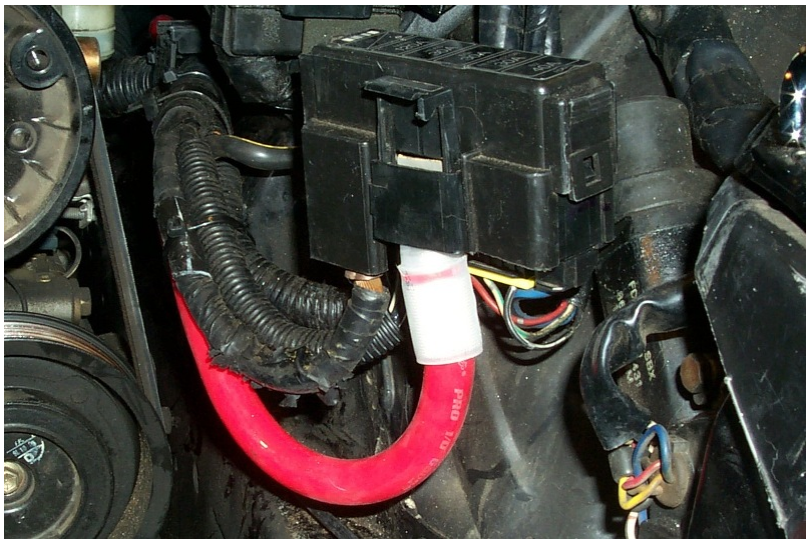
Here is the stock fusebox that sits next to the battery. It has a grey metal bracket that attaches to the positive terminal of the battery. This bracket can be removed by unbolting the large copper coloured connector and sliding the bracket out.



Here is a picture of the bracket after removal. I drilled an M4 hole in the bottom left of this bracket to mount a positive connector and cut the top arm off the bracket because it will no longer be needed.



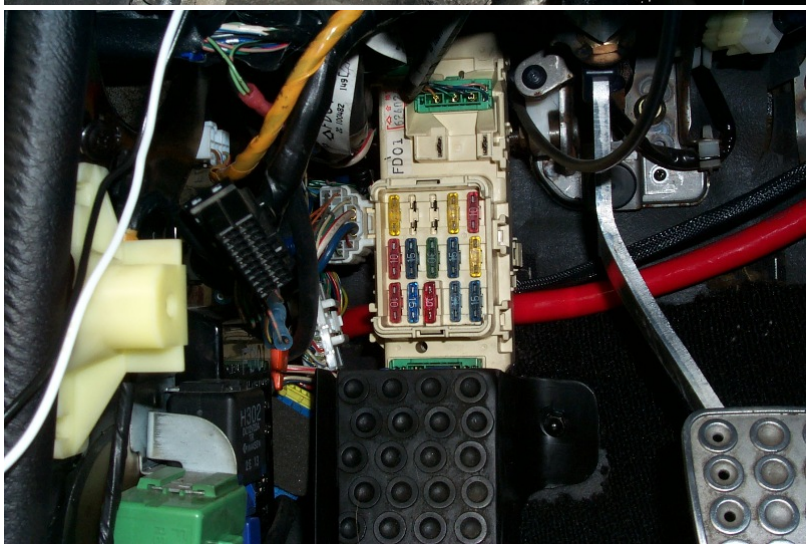
I then slid the bracket back into place, reattached the old cable, and used a flat head M4 bolt and an M4 locknut to mount a positive connector to the bracket. I used a flat head bolt because a normal bolt would not provide enough clearance to reinstall the fusebox cover.



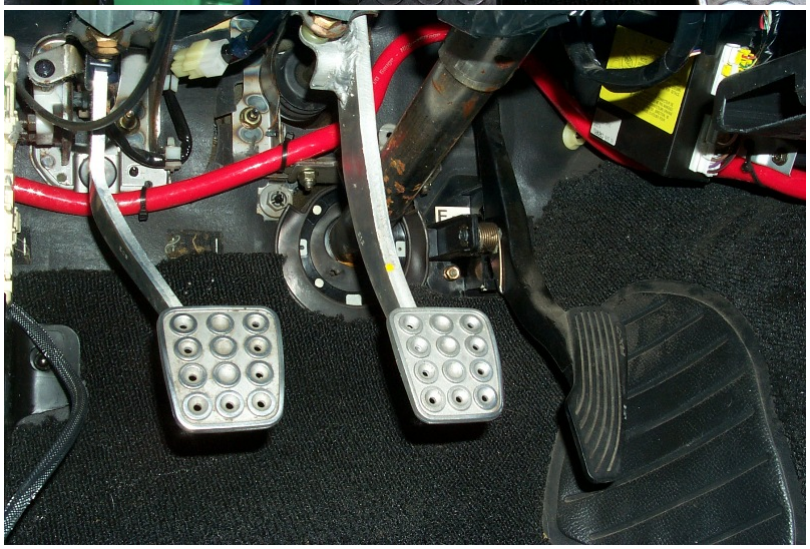
Here is a picture with the fusebox cover installed.

I then ran this wire along the fusebox harness to the hole in the driver's side of the engine bay next to the ignitors.

This hole leads to the driver-side wheelwell and is used to route some stock wiring from the engine bay. The wheelwell contains an unused hole leading to the driver footwell that is sealed with a large plug. The center section can be cut out of this hole and it can then serve as a grommet to run wiring to the interior of the car. Here it is used to route the 0-gauge positive cable. In this picture, it also routes some rubber vacuum tubing and and a cable from a wideband oxygen sensor.



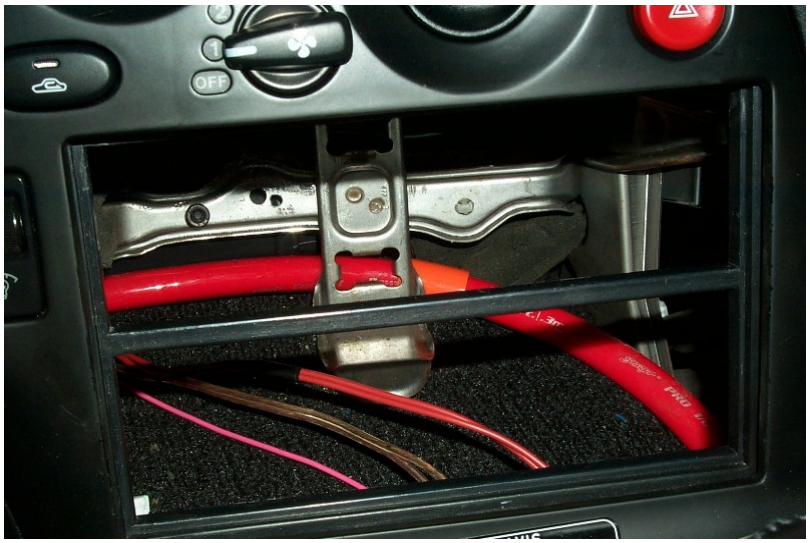
This hole enters the driver footwell behind the fusebox.



The positive cable can be routed from here over the steering wheel column and behind the airbag sensor to the area behing the radio on its way to the center console. Zip Ties can be used to attach it securely.

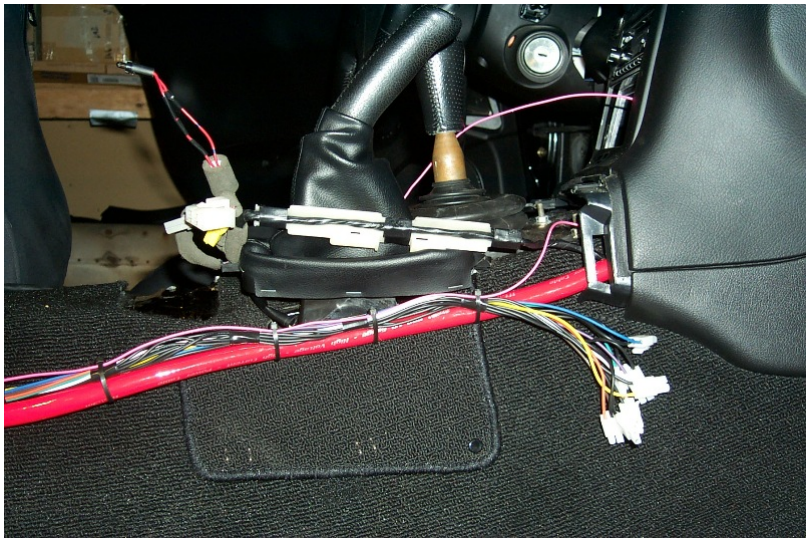
Running the cable along the driver door sill insead through the driver footwell and along the center console would have been my preferred option but 0 or 1 gauge cable does not fit in the sill wire guide. Apparently, 2 gauge cable will fit. It may be worth considering using this gauge. In any case, I made sure to keep the cable away from any moving parts. In places where the cable passed through an area where it looked like it would rub, I used protective sheath around it at those points. These sheats can be seen in orange in the picures.

I ran the cable behind the radio using a protective sheath to prevent it rubbing on the metal bracket.



And along the center console. This picture also shows the seven circuits from the fuse box and the pink remote-on wire. The remote-on wire runs to the ignition wiring harness (see below).

The seven circuits can be easily accessed by removing the item in the lower DIN area. I have a stock DIN drawer is this area so it can be removed in seconds to access the wiring and to attach any electrical items.



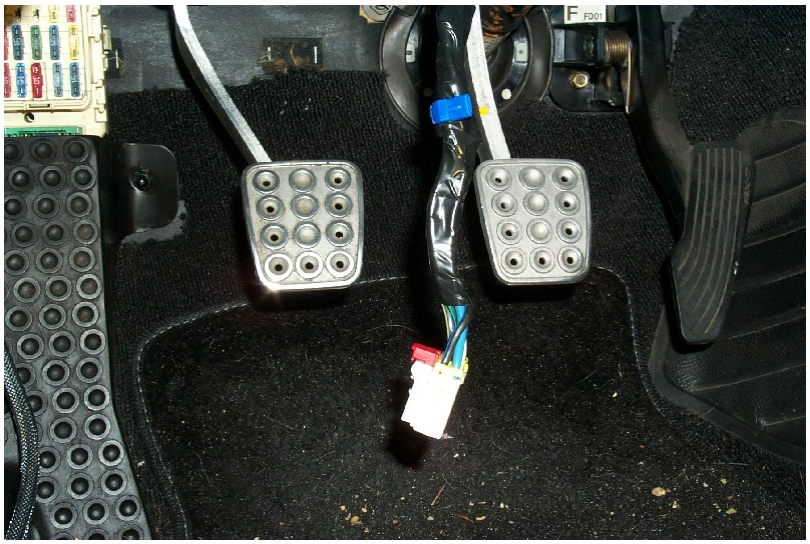
Here is a picture of the routing with the center console installed. The seven circuits can also be seen inside the DIN area.

The cable is then routed to the passenger bin area. I used a sharp knife to remove a small amount of plastic from the inside of the bin panel to allow the cable to pass through. I also drilled two holes in the metal bracket to attach a Zip Tie.

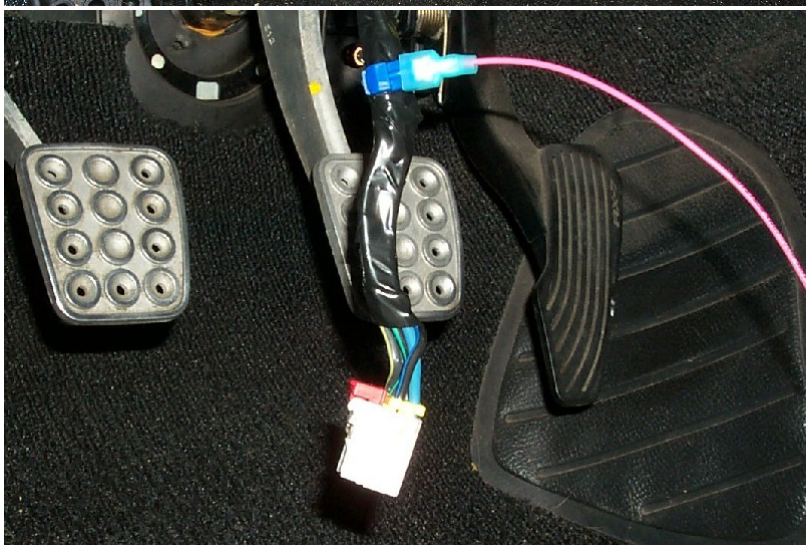
Remote-on Wire

The remote-on wire activates the two relays and the associated seven circuits in the fuse box when 12 volts are applied to it.

I attached a t-tap to the ON wire on the ignition harness. This wire is black with a white stripe and is live when the ignition is in the ON position.



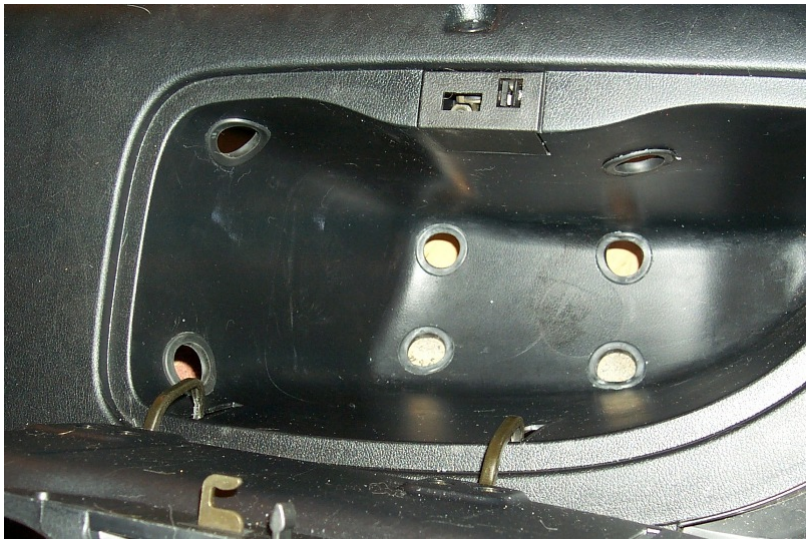
I then attached the remote-on wire. An inline fuse on this circuit shortly after the connection point.



Bin Access Holes

A total of seven access holes are required to mount all of the hardware in the passenger bin: four for the battery platform legs, one for the ground cable, one for the positive cable, and one for the seven circuits and the remote-one wire.

Here is a picture of the four battery platform holes from under the bin. I used 1 1/2" rubber grommets (available from Home Depot) to provide a finished appearance.

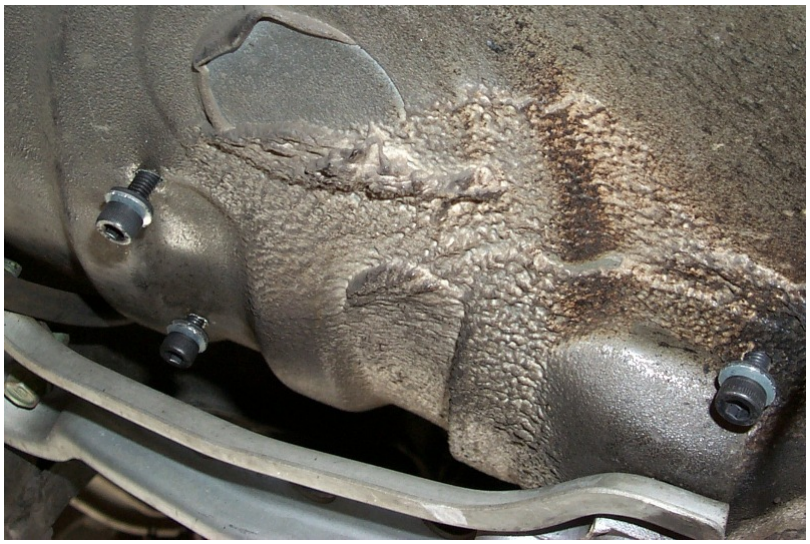


Here is a picture showing all seven holes from the top. The hole on the left rear side of the bin is for the ground cable, which runs under the bin to the ground attachment point. The left front side hole is for the positive cable, which runs to the engine bay. Finally, the right front hole on the side of the bin is for the fuse box circuits and remote-one wire, which run to the front of the car.

Final Install

Here is a picture of a test-fitting of all the components. The battery platform sits at the bottom of the bin. The gound cable entering on the top right will be attached to the negative terminal of the battery. The fuse box sits on its platform and its seven circuits and remote-on wire are passed through the hole next to it. The two red wires shown com from the two breakers underneath the block will be attached to the battery positive terminal. The ground wire for the block will be attached to the battery negative terminal.

The circuit breaker is mounted to the bin walls on the opposite side and a positive cable routed through the adjacent hole. When the battery is installed, a positive cable will run from the battery positive terminal to the other breaker connector. It should be noted that this breaker is mounted upside down here for space and cable routing reasons. The cutoff and reset switches are also easily accessible in this position.

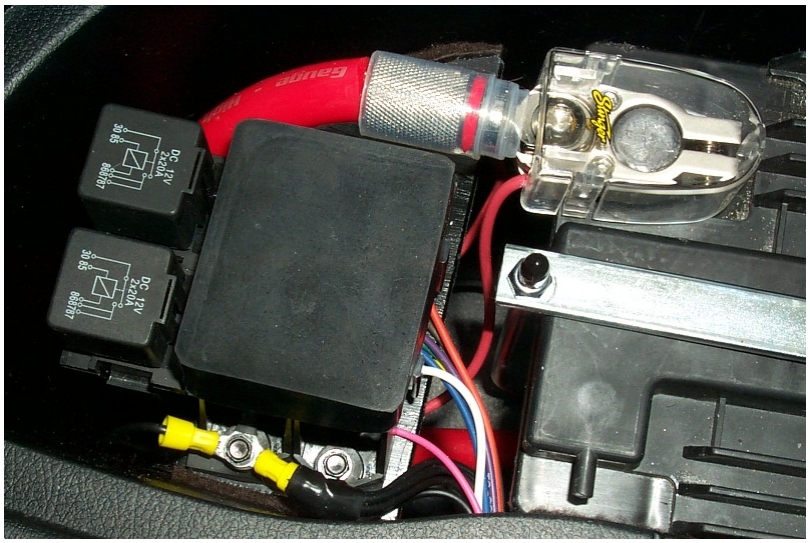


I tapped four 3 cm M6 holes in the battery platform legs and drilled M6 holes in the chassis to attach M6 bolts to the legs. Only three areas are suitable for drilling given the positioning of the legs so one of the platform legs in not attached to the chassis. As with the ground terminal, I used bonded sealing washers on the bolts as a moisture seal.

As is clear in this picture, space is pretty tight in the bins. The only satisfactory positioning of components I could arrive at involved installing the battery with the terminals at the rear. In this position, the positive terminal is not next to the breaker so a positive cable must be routed under the battery to the breaker on the opposite side of the bin.

The two red power wires to the fuse block breakers are attached to the positive battery terminal. The black ground wire from the fuse block must be also routed under the battery to the the negative terminal on opposite side of the bin. Both Stinger terminals have dedicated attachement points for these wires and use screws to attach them so they can be removed easily if required.

Here is a picture with the postive cable installed. A Stinger cover is placed on the terminal. I also use a screw protector on the threaded battery mounting arms for a finished appearance.



Here is the other side of the bin showing the ground cable entering the bin next to the battery negative terminal. The thin black wire attached to this terminal is from the fuse block. The positive cable from the battery positive terminal is attached to the lower connector in the breaker (not visible here).

Here is a picture with the negative terminal installed. The top positive conector on the breaker has an exposed metal area so I used black paint-on electrical tape to cover it. This breaker does have an associated protective cover but there is no room for it in this configuration.

Here is a top view of the final installation. I attached a large adhesive-backed furniture protectant pad to the front bin wall to stop the battery rubbing off the walls.