

Installing the Cyron HT-1506 LED footwell light kit in a Toyota Prius

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Disclaimer:

This guide was written by a Prius owner who is neither a photographer nor a graphic artist. This will become obvious as you read this document. It is assumed that if you are going to attempt this installation that you are familiar with auto mechanical systems, auto electrical systems, and basic tools. This guide is meant to be informative but cannot be guaranteed to be complete nor to represent what is found in your vehicle. The author disclaims any liability or responsibility for anything that happens to your vehicle as a result of following these instructions, including damage to your vehicle, personal injury, emotional distress, paper cuts, and anything else I may have forgotten. Bottom line: Please use good common sense and don't sue me if anything goes wrong!

Introduction:

The purpose of this guide is to assist in the installation of the Cyron HT-1506 background LED lighting kit in a Toyota Prius. The Cyron light kit is available at Costco for around \$50 or online from Ebay or Cyron. The pictures are from a 2005 and 2008 Toyota Prius.

The Cyron HT-1506 uses 3 primary color LED's (Red, Green, and Blue) to generate solid and mixed colors and can be set to scan through the pre-programmed color ranges or stopped at one particular color. Some have tied the kit to the 12v accessory outlet so that it comes on whenever the car is powered up. I chose to tie my kit into the car's dome light circuit so that it comes on when the dome lights illuminate and turns off about 10 seconds or less after the dome lights extinguish. Both methods are described in this guide. I have also installed a manual override switch that allows me to turn the light on whenever I want, even if the car is not powered on. I based my design on what I have read about the Toyota OEM footwell lighting kit. I have never used or disassembled the Toyota kit, and my circuit design is based on the description of how it works and what I know about the operation of the dome light control circuit as published in the Toyota wiring manual for the Prius. I would guess Toyota's design is similar if not the same.

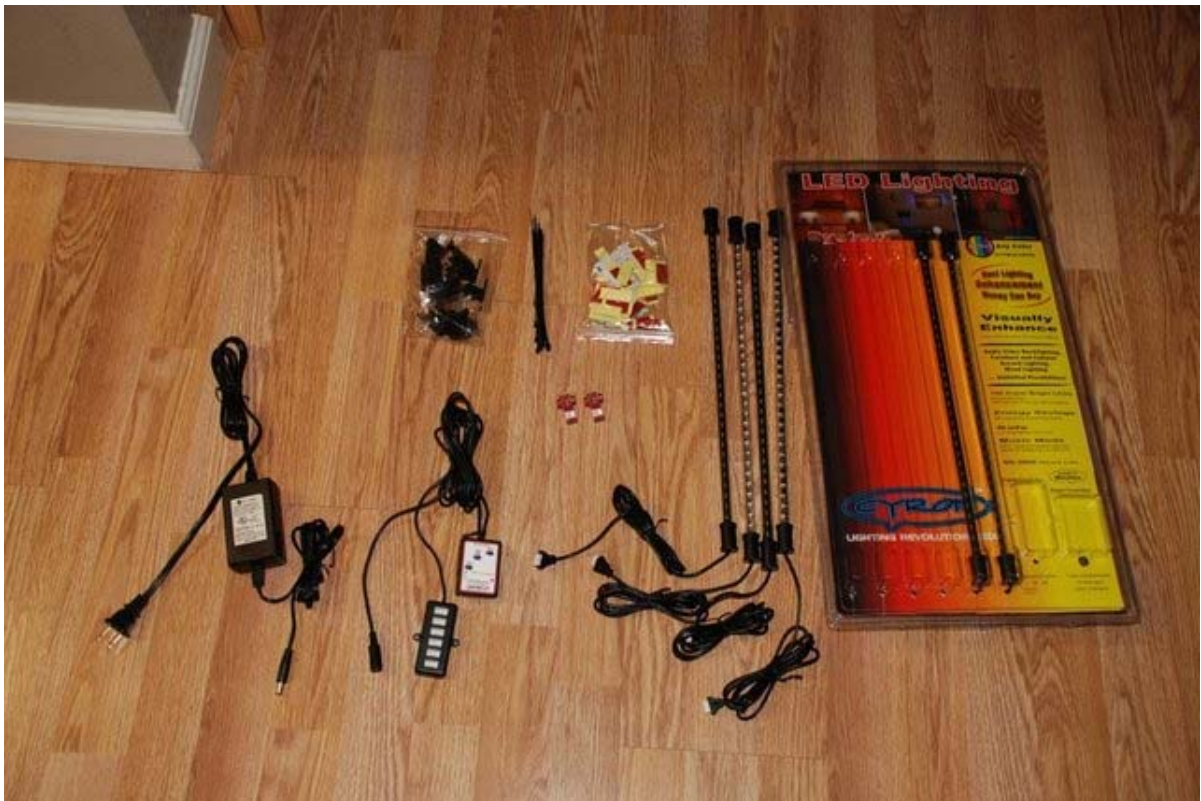
I would recommend that you disconnect your 12v battery before attempting this installation. I did not disconnect mine as I needed power for testing during various phases of the installation, so I used extra caution during the procedures. Be aware that having the doors open for any length of time tends to drain the battery. I almost ran mine flat until I hooked up a battery charger to compensate.

For an excellent guide on disassembling the Prius dash components, see Chris Dragon's Stereo Accessory Installation Guide which can be found on Hobbit's web site:
<http://techno-fandom.org/~hobbit/cars/chris-dragon-dash.pdf>

Let's begin:

Tools you will need:

- 10mm and 12mm socket wrench with extension
- Diagonal wire cutter
- flexible “grabber” tool
- Assortment of screwdrivers, flat and Phillips, including jeweler’s sizes
- 35w soldering iron and solder
- zip tie assortment
- 4pcs metal angle bracket, ½” wide x 1 ½” legs
- 8pcs 4-40 x ½” pan head Phillips machine screw
- 4-40 hand tap
- 4pcs 4-40 hex nut with serrated washer
- heat shrink tubing assortment, 1/16”, 3/32”, 1/8” dia
- heat gun
- Power drill, step drill bit, or tapered reamer
- Dremel tool with cutoff wheel or hacksaw
- A piece of stranded wire, 12 to 14 gauge, approximately 3 feet in length
- Electrical tape
- Flashlight
- mirror
- Cyron HT-1506 LED lighting kit
- Cold beverage of choice to celebrate the completion of this project



Here are the package contents for the Cyron HT-1506 LED lighting kit. The parts you will need are the controller, the four light tubes with 5 foot cable, zip ties, and plastic mounting brackets.

Save your battery:



If you choose to work on a 'live' car, you will discharge your battery from the current draw of the dome and door lights remaining on for the many hours it takes to complete this installation. Hook up a battery charger now so you don't damage the battery by discharging it too much.

Prius Disassembly:

Begin by removing the lower glove compartment. Release the glove compartment latch, the squeeze both sides to release the catches and drop the box out of the dash.

Disconnect the damper shock on the right hand side of the box by popping the shock arm from the plastic peg. Then press together on each side of the glove compartment and pull towards you. Remove the box and set it aside.



Now, remove the silver passenger air vent to the left of the glove compartment. You can do this by grabbing it from the top and bottom and pulling straight back. Alternatively, you can curl your hand around inside the glove box opening and push the assembly out from the inside. It is helpful to push it from the inside to get it started and makes it easier to remove from the outside. Now is a good time to clean out the cabin air filter. It is located in the top part of the white box shown in the center of the above picture. If it's really dirty it's best to replace it. They are less than \$20 at the dealer, or you can make your own from a household air conditioner filter. I like to vacuum mine every 4-6 months to keep it clean, and it will probably won't need to be replaced for a long time.

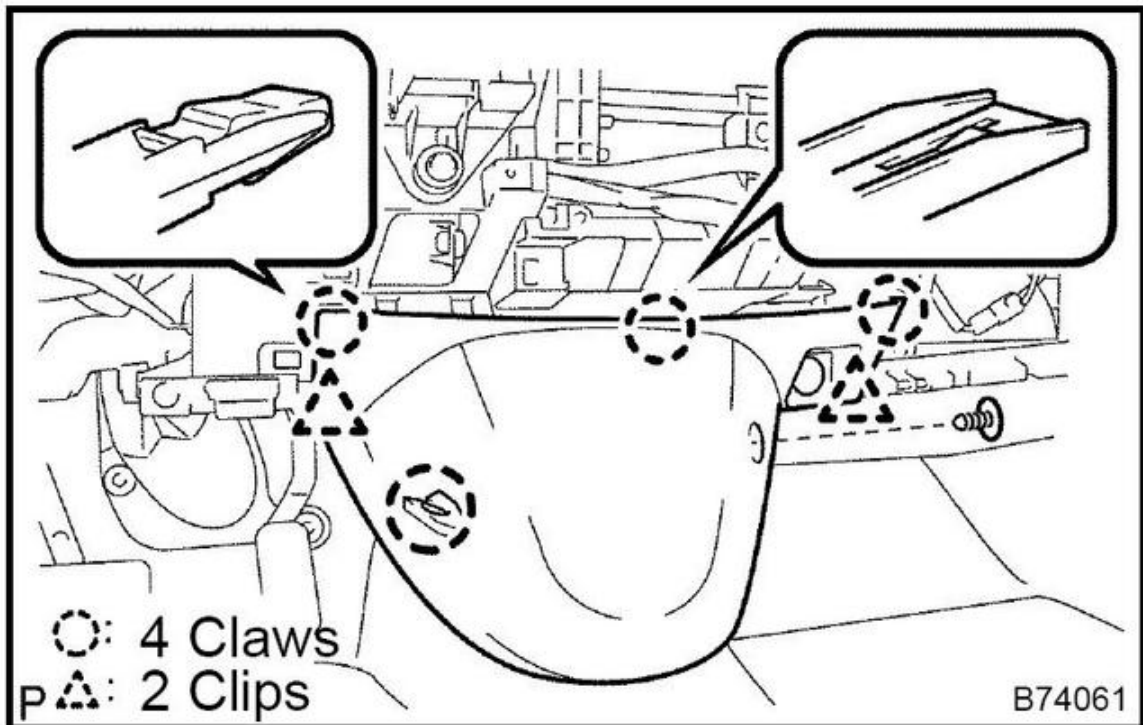
Continue disassembly of the dash to allow for routing the power and signal wires. Plan your installation as far as the routing for Cyron controller and hub wiring. At this point, you must decide where to store the controller during normal use / driving. I chose to install my controller in the “secret drawer” on the lower front part of the center console, which means running wiring underneath the carpeting between the center console and the curved panel. The simpler option that requires less wire routing is to store it in the glove box.



To remove the curved panel, begin by removing the plastic Christmas tree push pin from the passenger side of the curved panel. You can remove it with a flat screwdriver or gently pull the panel straight back and the pin will come loose. The driver's side of the curved panel is held by a metal post with a plastic catch. Once the push pin is removed, pull the panel straight back and it will pop loose. The panel is fairly easy to remove and it will pop back in place on re-assembly. Once the curved panel is loose, remove the connector from the 12v accessory socket and set the panel aside. The connector is polarized so it will only fit the accessory socket in one orientation, so there is no need to mark it.



Remove the curved panel by gently pulling straight back. It will pop lose from the dash.



Here is a diagram showing the location of the clip points on the curved panel.



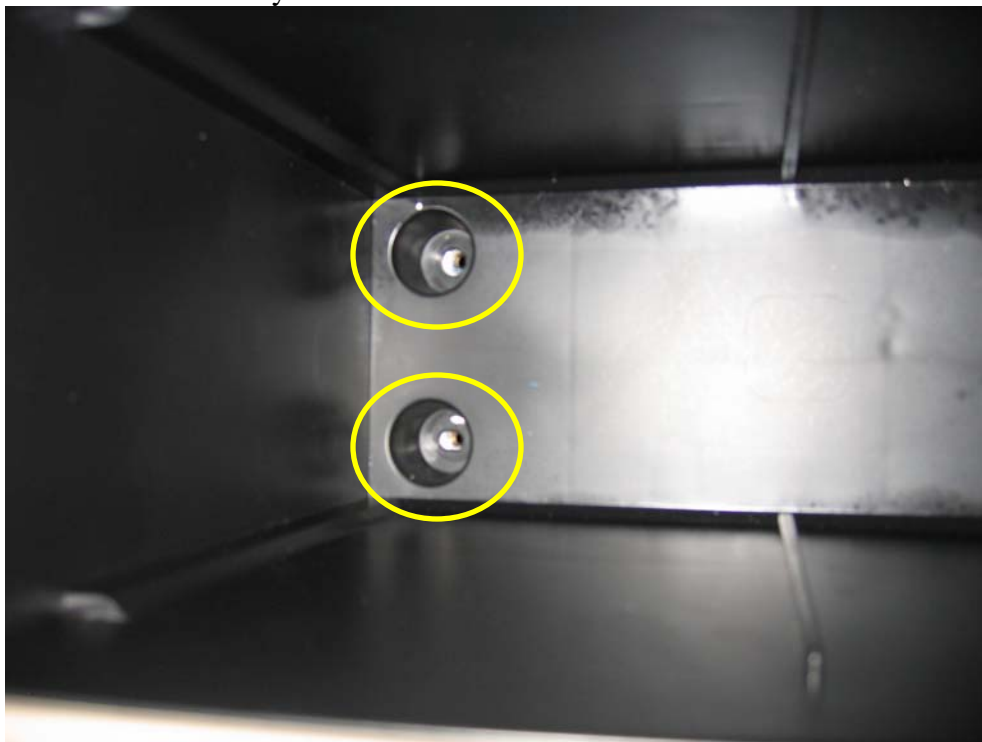
Continue by removing the assembly containing the cupholders from the top of the center console. The bottom front of this panel needs to be pulled forward to release it from the lower plastic lip below the secret drawer, then lift straight up and it will pop out.



Here is the cupholder assembly after removal.



This will expose two Phillips head screws on either side of the console near the floor. Remove both screws (the ones near the floor on each side) and place them in the upper glove compartment. Now, open up the center console and clean out all the miscellaneous stuff that may be in there.



Remove the black mat from the bottom of the console and use the 10mm socket to remove the two hex head machine screws from the back side of the console.

Removing the center console:

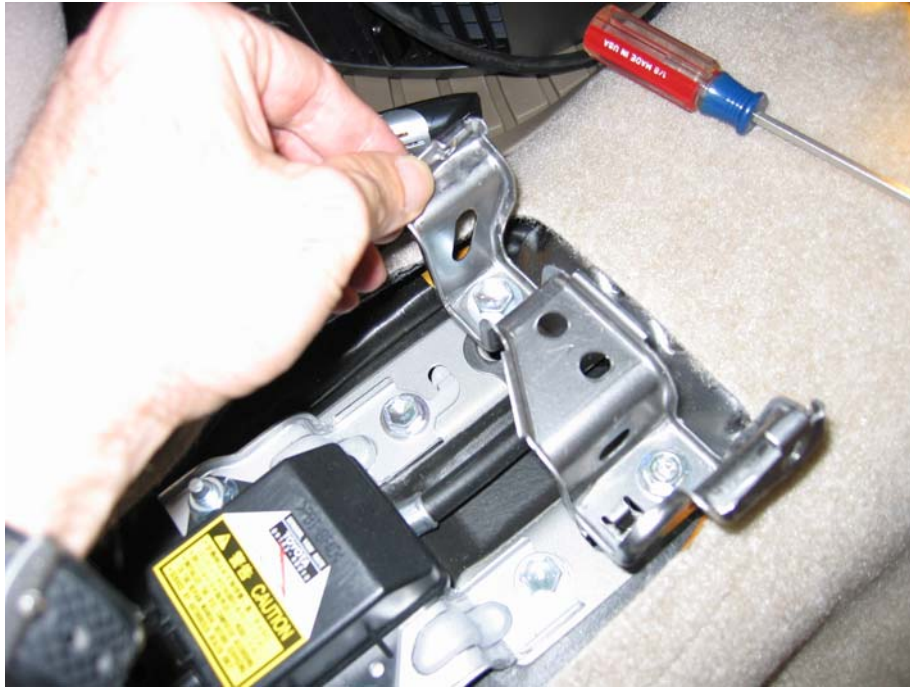
If you are going to install the Cyron control unit in the glove compartment it is not necessary to remove the center console from the car, so this step can be skipped.



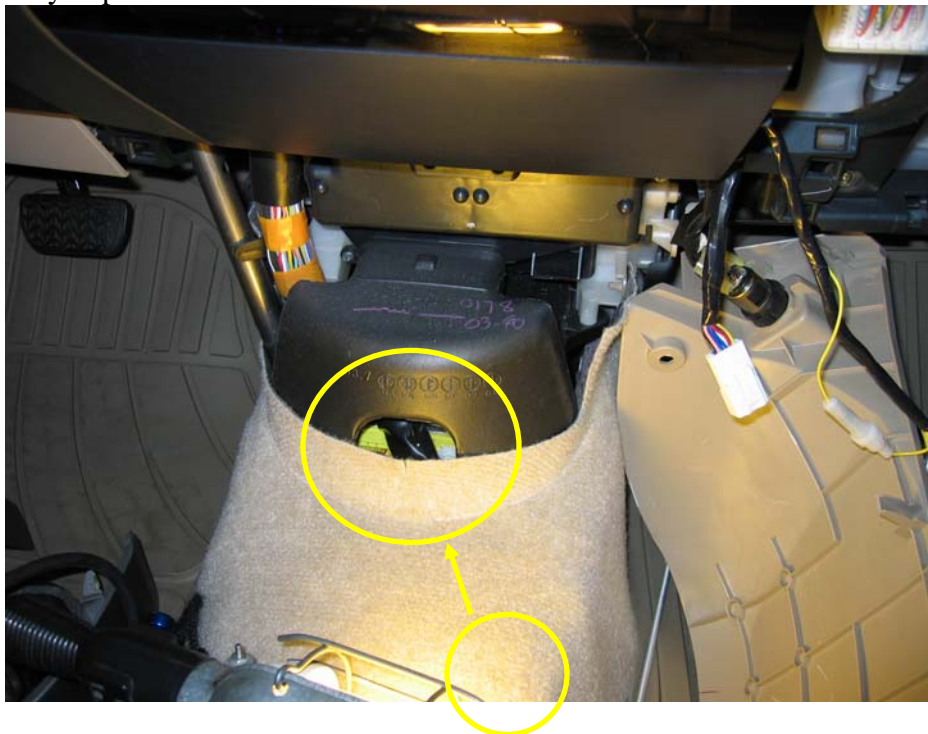
Remove these two connectors from the back of the center console. Lift the console from the front, pivoting toward the back. Be careful as there are two wires on the back side of the console that do not have much slack! Once you have pivoted the console, remove the accessory socket wire by squeezing the release tab and gently pulling. Now for the hard part. There is another other wire that runs up into the back side of the console which connects to a White Mystery Box. This connector is an absolute PITA to remove. I recommend using a mirror to make it easier to see what you are doing. Using a flat blade screwdriver, slip the screwdriver into the connector and twist to release the catch. Then gently pull the connector out. Be careful to not pull too hard as these are thin gauge wires!



Here's a close up of the connectors removed from the center console.



Now the center console is free you can set it aside. Remove the metal bracket which holds the front of the center console as shown above. There are two 12mm hex head bolts that hold it in place. This bracket has sharp non-deburred edges, so be careful! Notice the yaw rate sensor with the Caution label. Don't spill your beverage on this since it is probably expensive.



Using the springy grabber tool, insert it just above the big bundled wire harness on the passenger side of the yaw rate sensor (the black box in the center of the hump). Guide grabber tool toward the center of the front console that is normally covered by the curved panel. Even though the grabber tool only has to go underneath about 12" of carpeting, it is a PITA to get it through. Be careful not to jam the grabber into the computer under the black air duct, and do not try to remove the air duct during this installation!



Now use the grabber to pull a length of stranded wire (I used 14awg stranded) from the front to the back.

Drilling the cable access hole in the hidden drawer:



This step is only necessary if mounting the Cyron controller in the center console. If not, skip to the next step. Flip the center console over and drill a 1/2" hole into the lower corner of the hidden drawer. I like to use a step drill bit for plastics since it does not grab when it breaks through. Use a rubber grommet to protect the wire from chafing on the plastic. Cut one side of the grommet, slip it around the cable, and secure it with some clear RTV silicone.



Now it's time to fabricate the metal brackets used to hold the light tubes underneath the rear seats. Use the plastic clips provided in the Cyron kit and attach them to metal angle brackets. The metal angle brackets are $\frac{1}{2}$ " wide x $1\frac{1}{2}$ " long on each leg. Use a transfer punch to locate the center of the mounting bracket holes and drill and tap for a 4-40 machine screw. I used longer screws than necessary ($\frac{3}{8}$ ") and cut them flush with a Dremel tool or hacksaw. Do not use threadlocker such as Loctite as it will soften the plastic clip to the point where it cracks out. I learned this the hard way.



Remove the plastic seat rail covers from the back side of the slide rails for the front seats. There are 4 pieces total. These are a bit tricky to remove the first time. You need to get your fingers underneath the long edge and pull it sideways to pull the release catch out from the metal rail, then it will slide off towards the back. Once you have one out you will see the location of the catch and how to remove it. Now you will need to drill two holes to secure the metal angle bracket to the plastic cover. There is a plastic rib in the back, so be careful to position the bracket so the nut used on the screw will clear the plastic rib. I placed the hex nut from the back and marked the hole from the back side, so the flat of the hex nut was resting against the rib. This helps lock the nut as well to keep it from spinning loose. You can also use a serrated washer to keep things in place. I eyeballed the location of the bracket so the top of the bracket is just above the top of the plastic seat rail cover



Back side view of the seat rail cover. Plastic catch is circled in green.



Here is a view of the rear assembly before it goes back into the car.



Re-install the plastic slide-rail covers on the slide rails and install the light tubes to the clips. There should be a *light* pressure from the seat cushion on the light bar that will keep it in place. If the light bar is bowed from the seat cushion, the metal mounting brackets should be re-positioned downward, otherwise the LED circuit board may crack. Keep the cable for the passenger's side to the left side and the cable for the driver's side to the right. Route the cables alongside the seat sensor cable bundle in the black corrugated tubing back to the floorboard. The corrugated tubing bundle passes through a cut in the carpet to the wire channel in the body. The Cyron light tube wires can follow this cable bundle and be fished into the center console area. Secure the Cyron light tube cable to the black corrugated cable with zip ties at several points along the cable. This cable flexes as the seat is moved, so be careful to attach the light tube cable so it does not get damaged when the seat is moved. Have an assistant help test the installation by moving the seat the full range back to front to make sure the cable does not get snagged anywhere.



A close-up of the passenger side rear installation.



Now, route the light tube cables underneath the carpet to the center console area. Use the springy grabber tool to fish the light tube wires from the cut in the carpet up to the console area. The cables will then be routed through the wire channel in the floor to the front area covered by the curved panel. There is a wire channel on each side of the hump that the respective cable can be passed through.



Attach the cabling from the passenger side rear light tube to the wire. Strip about 2" of insulation from the fish wire (Green wire in the photo), then wrap this wire behind the Cyron light tube connector as a pull anchor and strain relief, then wrap the assembly with electrical tape. Add a piece of 20 gauge wire to the bundle to use as a fish wire to pull the hub and power cabling from the front to the point underneath the center console. In order to route the hub and power cables for the controller, you first need to open up the Cyron controller and unsolder them from the PC board. There are two power wires (red and black) and 4 control wires for the hub (red, black, green, white). Make a note of the wire locations before unsoldering. Once the cables are free, connect the wire ends to the 20 gauge fish wire and pull back underneath the carpeting. Route the wiring into the secret drawer and re-solder the wires to the Cyron controller board. Re-assemble the plastic case for the controller. Be sure to leave some extra wire inside the center console drawer so you can pull the Cyron controller out.



Next, install the light tubes in the front seat area. Here is a close-up of the passenger side front installation. The tube is positioned with the cable exit on the left side. The ends of the light tube tuck into the carpet flaps and a clear zip tie is used to secure the tube to the plastic panel. This keeps it flush to the panel and out of the way.



A close up of the driver's side light tube installation. The cable is routed to the right side, behind the accelerator pedal. The plastic mounting bracket was modified with a hole drilled through the vertical supports, then a zip tie secured the bracket to the metal bracket in the car which already has holes drilled for the zip tie to pass through. On the left side, the light tube is secured to the emergency brake cable with a zip tie.



Here is a photo of the hub and controller wiring, with everything connected. Use some clear RTV silicone sealant to secure the hub to the plastic air distribution box.



Alternatively, the controller can be installed and routed to the glove box. This is a bit easier and does not require unsoldering the wires from the Cyron controller.

Powering the unit: connecting to the 12v accessory outlet

Now it's time to decide how to power the controller. The easy way is to cut the coaxial connector from the power supply and connect it to the 12v accessory outlet that is part of the curved panel. This will cause the lighting to turn on and stay on anytime the car is powered on, unless you turn it off manually at the controller.



You can harvest the connector by cutting the power cable from the Cyron power supply, or go to Radio Shack and buy a coaxial DC power connector (P/N: 274-1569) with a 5.5mm outside diameter and 2.1mm inside diameter. Use 18 or 20 gauge speaker wire for the connection to the coaxial power connector.



Connect the power supply cable to the 12v accessory outlet using wire taps. The Cyron unit requires 12v dc positive on the inside (center) of the connector and ground on the outside ring. The solid white wire on the accessory outlet connector is positive, and the white wire with the black stripe is ground.



Verify the connections using a digital voltmeter. Outer = ground, inner = positive voltage. The DC voltage should read between +12 and +14V.



Connect the power connectors and secure with electrical tape to prevent them from separating.

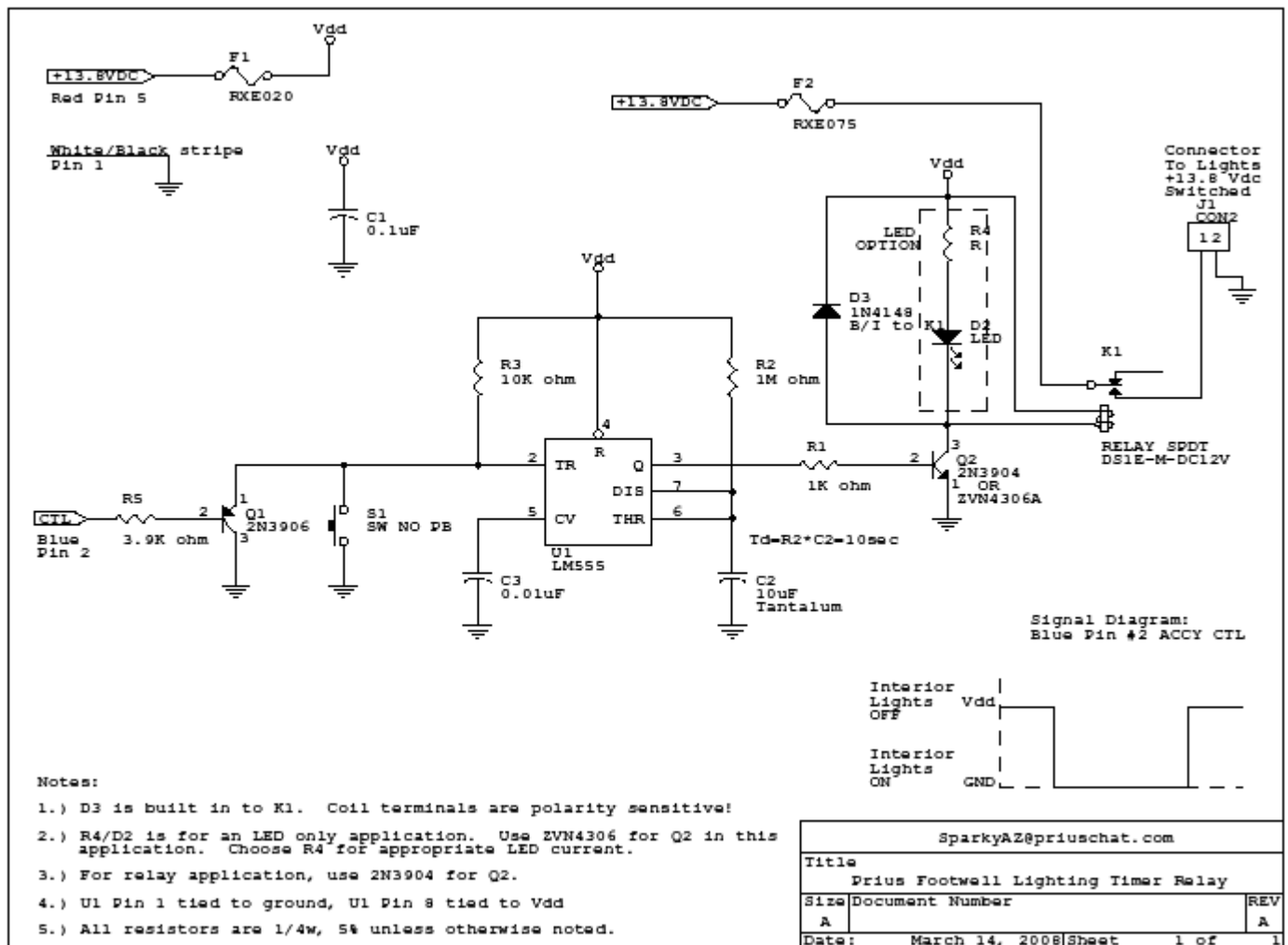


Plug everything in and test the connections.

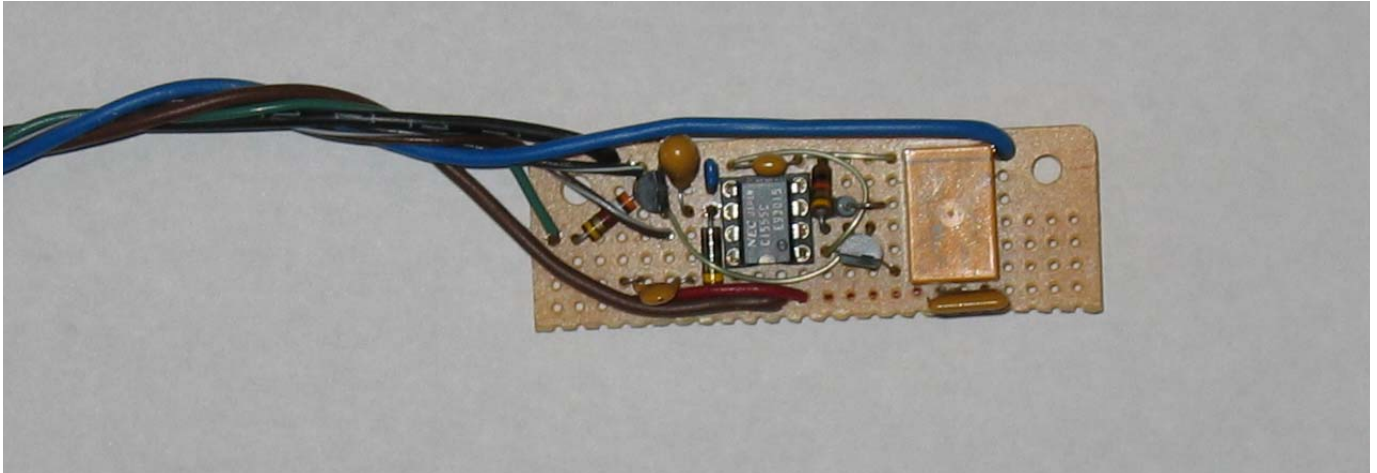
If everything works, it's time to button things up and replace all the panels!

Option 2: Connecting the Cyron unit to the Prius Dome light circuit.

If you are really ambitious, you can connect the Cyron unit into the Prius dome light circuit in the same way as the JDM footwell lighting unit. This involves further dash disassembly as well as building an electronic timer circuit for the interface. The circuit is a 10 second timer and activates whenever the dome lights turn on. 10 seconds after the dome lights extinguish, the relay will turn off, which turns off the Cyron unit. A manual control switch is also used to override the timer circuit and turn on the lights as needed, such as when you wish to locate something on the floor at night.



This is the schematic for the timer circuit I constructed to interface the Prius dome light circuit to the Cyron controller. If you build the relay option (as I did for the Cyron), you can eliminate D2, D3, and R4 from the schematic. The SPDT relay specified has a built in freewheeling diode (hence is polarity sensitive during hook-up). If you use a different relay (Radio Shack P/N: 275-241, etc), leave D3 in the circuit to protect Q2. The timer U1 should be a CMOS 1555 timer for operation from the Prius 12v electrical system.



Here is the completed circuit ready for installation into a plastic case.

Parts list:

- C1: 0.1uF ceramic capacitor, 50vdc
- C2: 10uF tantalum capacitor, 25vdc
- C3: 0.01uF ceramic capacitor, 50vdc
- F1: Raychem RXE020 auto resetting fuse, 200mA
- F2: Raychem RXE075 auto resetting fuse, 750mA
- J1: Molex 6 pin connector P/N: 39-01-2060 and P/N: 39-01-3063
- K1: Relay, 12vdc SPDT Panasonic P/N: DS1E-M-DC12V or Radio Shack P/N: 275-241
- Q1: 2N3906, PNP transistor, TO-92
- Q2: 2N3904, NPN transistor, TO-92
- R1: 1K ohm, 1/4w, 5% resistor
- R2: 1M ohm, 1/4w, 5% resistor
- R3: 10K ohm, 1/4w, 5% resistor
- R4: Not used
- R5: 3.9K ohm, 1/4w, 5% resistor
- S1: SPST push-on push-off maintained action black pushbutton switch
R13-511B-05-BB or Radio Shack 275-1565
- U1: TLC555 CMOS timer Radio Shack P/N: 276-1718

Other parts:

- 8 pin DIP IC socket
- Perfboard
- Plastic case
- Hook-up wire
- Molex 2 pin connector P/N: 39-01-3022 and P/N: 39-01-3023
- Molex pins, male, P/N: 39-01-0041
- Molex pins, female, P/N: 39-01-0039

If you do not have access to the Raychem fuses, use a single 1A fast acting 5x20mm fuse inline with the main +13.8vdc supply from the red wire on the dome light connector.



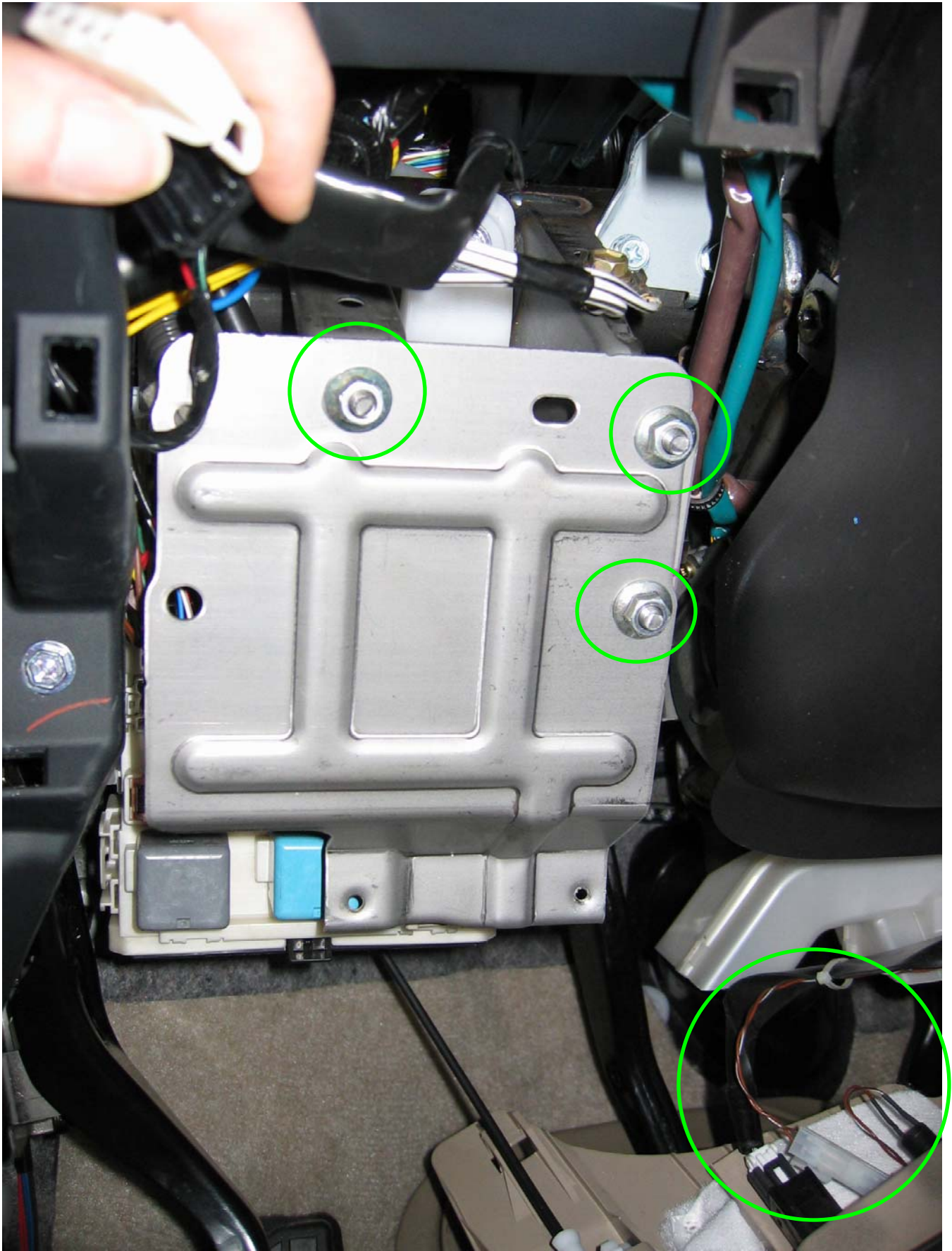
Here is a photo of the timer circuit installed in the plastic case. A 6 pin Molex connector was used to interface the circuit to the Prius dome light circuit.



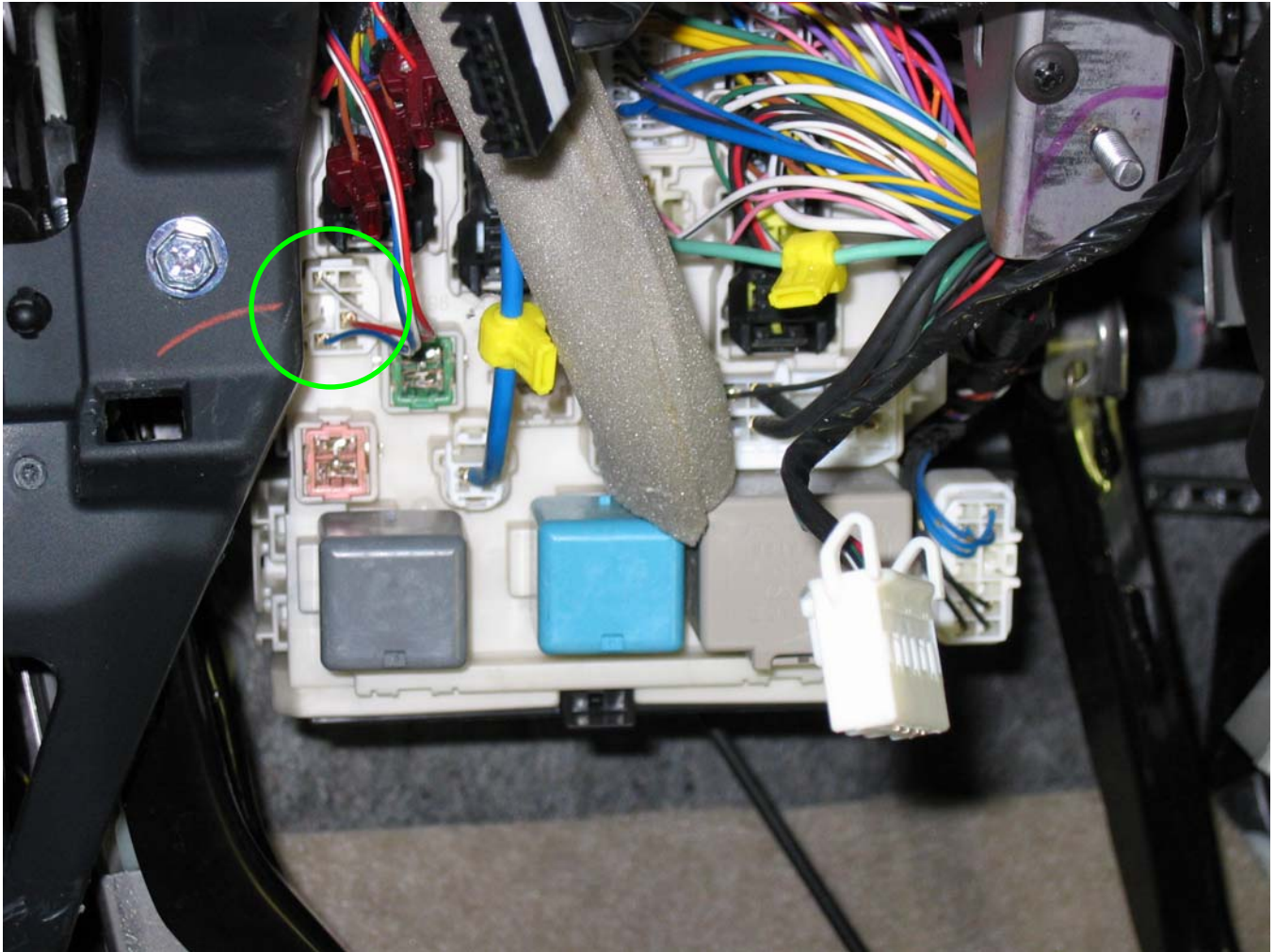
I also added a manual latching pushbutton switch to turn the lighting on and off at any time in case I want to find something on the floor at night (switch S1 in the schematic). Drill the hole for the switch now before the panel is removed. Be careful when drilling the plastic panel since it is only held in place by a couple of small tabs. I reinforced the open area around the plastic panel with epoxy and will paint it to match the tan plastic. A step-drill bit or tapered reamer works best for drilling the hole since it won't catch and twist the tab off. The switch is connected by a short (12") length of wire to a Molex 2 pin male/female locking connector so it can be separated from the wire harness should the panel need to be removed for service.



Now, remove the left driver's side vent panel. Grab it from the top and bottom and pull straight back. It is held in by the same yellow plastic spring clips used on the rest of the dash. After it is out, remove the two screws holding the plastic panel to the dash (circled in green). Once the two screws have been removed, gently pull the large dash panel free from the dash.



Remove the 10mm nuts holding the metal cover panel in place. The manual pushbutton switch is circled green. The wiring attaches to a connector to allow the panel to be removed for service.

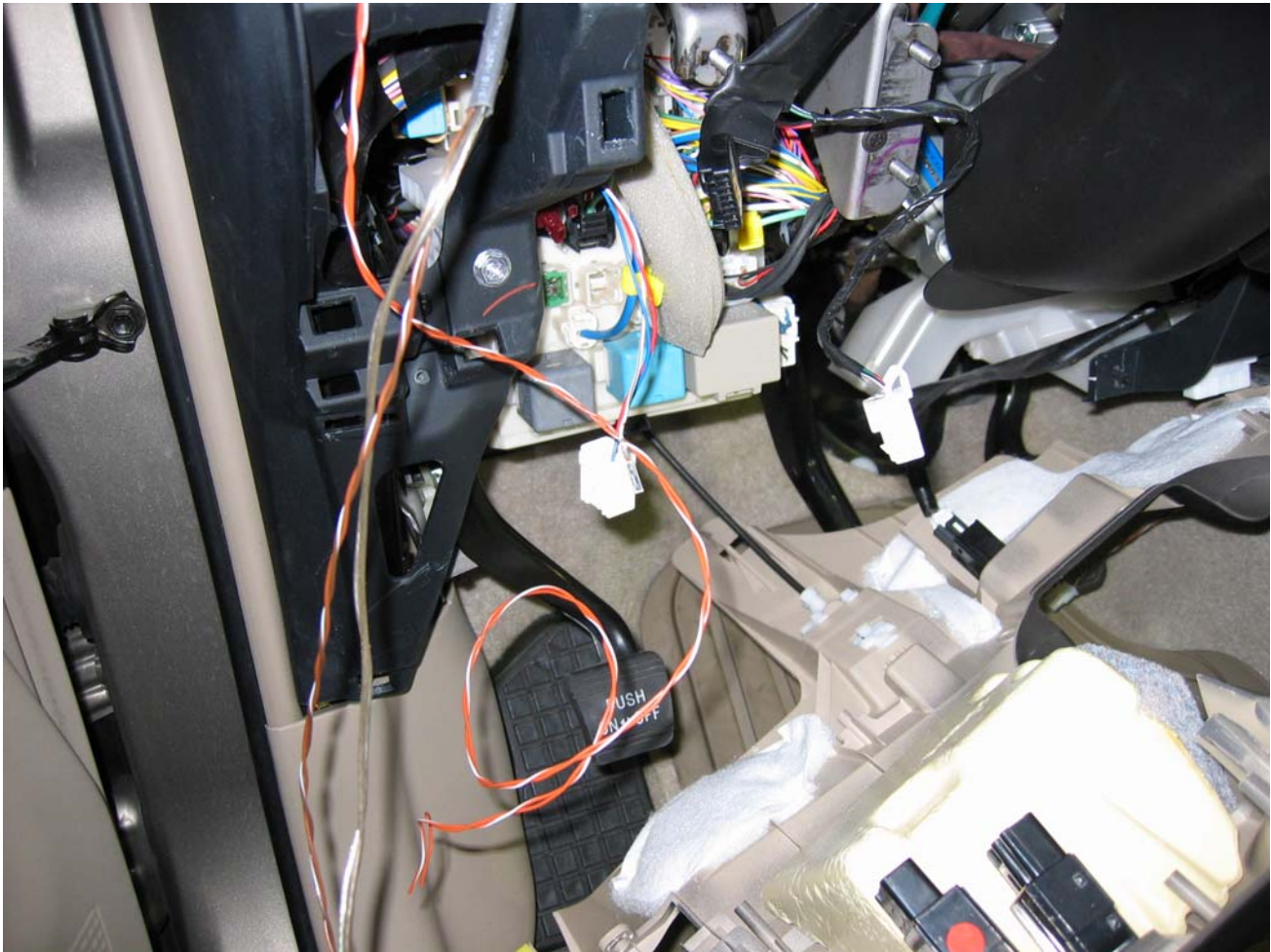


The dome light control connector is circled above. The white wire with black stripe is ground, the red wire is +12 volts, and the blue wire is the control signal.

You can use 3M Scotchlock connectors from Radio Shack (P/N: 64-3081) to tap into the wires, or solder directly to the pins. I chose to solder to the pins for a more reliable connection. To remove the pins from the housing, use a jeweler's screwdriver to lift the release tab on the top of the connector. The release tab lifts only about 1/16". Do not attempt to pry it beyond this or lift it out of the connector housing. Once the pin release tab is popped up, insert the jeweler's screwdriver into the front of the connector and lift the plastic catch above the metal pin. Then slide the pin out the back of the connector. Once the metal pin is free, lift one tab of the strain relief wrap on the rear of the pin and solder the wire to the inside of the tab. Apply heat shrink tubing to hold the wires together and re-insert the pin into the connector housing.



< Scotchlock connector from Radio Shack



Wiring Mess

A 12" connecting wire is soldered or connected with Scotchlock connectors to each of the three pins in the dome light connector (+12v, control signal, and ground). I used 18 gauge wires for the power and ground connections. The clear wire on the left is the 20 gauge speaker wire pair that goes to the coaxial DC connector to power the Cyron controller. The brown and brown with white stripe are 22 gauge twisted wires that loop around the top of the dash and down to the kick panel to the manual on/off switch that is located next to the smart KEY switch. The orange wire was installed for turn signal mirrors which were done at a later date.



Now that the wiring is done, it's time to put everything back together. Tuck the control box in the open space behind the vent panel and tuck the wiring away. The box wedges nicely between the thick wire harness and the white batting material. Secure the wiring with zip ties as necessary and re-assemble the rest of the dash panels.

IT WORKS!



What's that I see? Oh, look - it's my MoJo. YEAH BABY!!!

Have fun playing around with the different lighting modes in the Cyron controller and enjoy your new footwell lighting!