

# Tesla Model S Front/Rear Camera Switch

## Installation Instructions

With a Tesla Model S rear camera mounted in the front of the car, the camera switch makes possible switching from a rear to front view on the touchscreen when parking the car or in other situations when the driver wants to be able to see obstacles in front of the car that are not in the line of sight. The switch fully integrates with the touchscreen camera electronics. Supplied with two remotes, the switch can be operated using the Model S Homelink system.

## Parts Needed

- Camera switch kit (if you weren't one of the original 75 buyers and don't have the kit they are available on Open EVSE.)
- Tesla rear camera: Part # 1006773-00-E (available from a Tesla Service Center)
- OBD2 connector (provided with the camera switch kit)
- Tesla Camera Cable kit. Available from [RFsupplier.com](http://RFsupplier.com)
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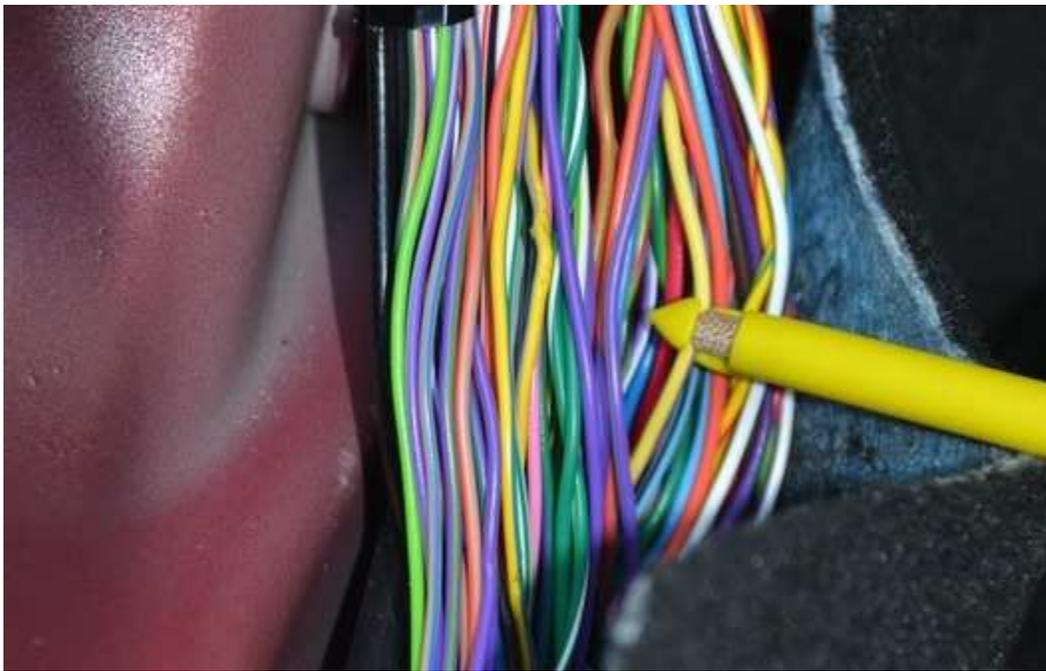




- Optional front license plate mounting bracket (available from OpenEVSE)
- Replacement Camera back (available from OpenEVSE)
- 5 feet red 20 gauge wire
- 10 feet black 20 gauge wire 3M double sided auto tape
- Clear silicone adhesive (Goop recommended)
- Posi-Taps for 18-22 gauge wire (available on amazon.com). Posi-Taps are strongly recommended over other brands of taps.
- Power Probe Piercing Probe Set (available on [amazon.com](http://amazon.com))
- 12v test light (available on [amazon.com](http://amazon.com))

**Tools needed:**

- Wire cutters
- Wire stripper
- Hack saw or Dremel tool with cut-off disc
- Plastic pry tool
- 1/8" four foot dowel or rod
- Soldering pencil or gun and solder (if using OBDII connector so supply power and ground to the PCB)
- #20 Torx driver/bit



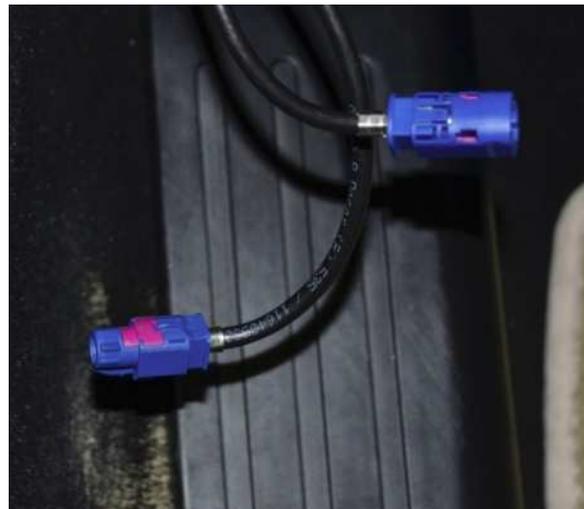
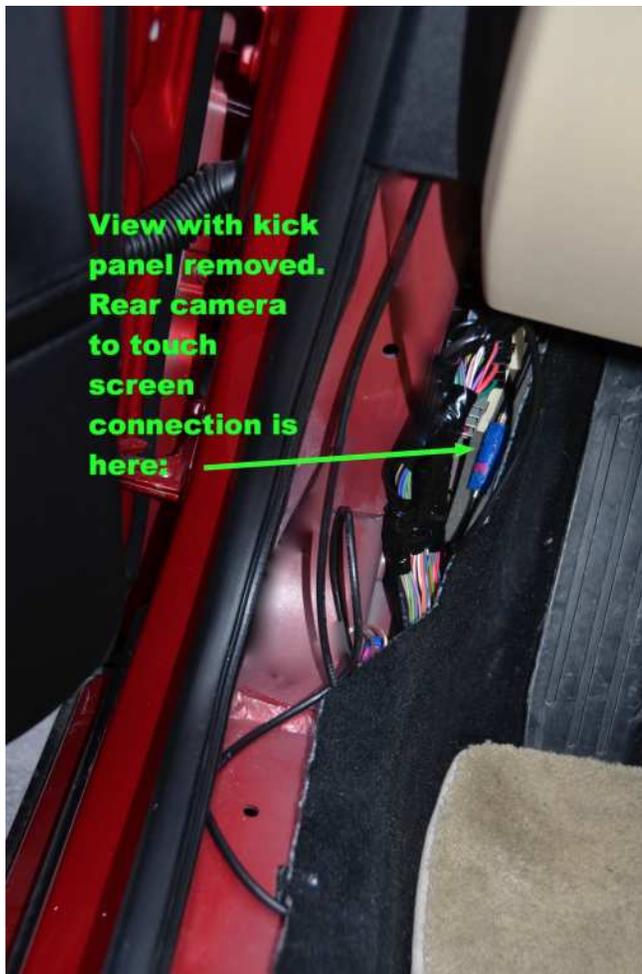
## Connections to the Camera Switch PCB and Operational Test

### *Power and reverse signal connections*

Remove the driver and passenger side kick panels. Then, using the pry tool lever out the triangular panels on both ends of the dashboard, and remove the small plastic pieces on both door jambs.

On the driver's side you'll see three large wire bundles. Search the bundles and locate the yellow wire with purple stripe and attach the PowerProbe. This job will be easier if you remove some of the black electrical tape holding the bundles together. Be careful you have the right wire. If you don't odd messages may appear on the touch screen. Sitting in the driver's seat to power the car on, connect the the PowerProbe to the 12v Test light and the test light to ground. The test light should light up. If it doesn't you've tapped the wrong wire. Once you have the correct wire, strip about 1/8" insulation off the wire and attached a PosiTap over the stripped section (stripping the insulation insures a good connection). Then attach a 16" length of 20 gauge red wire to the other end of the PosiTap.

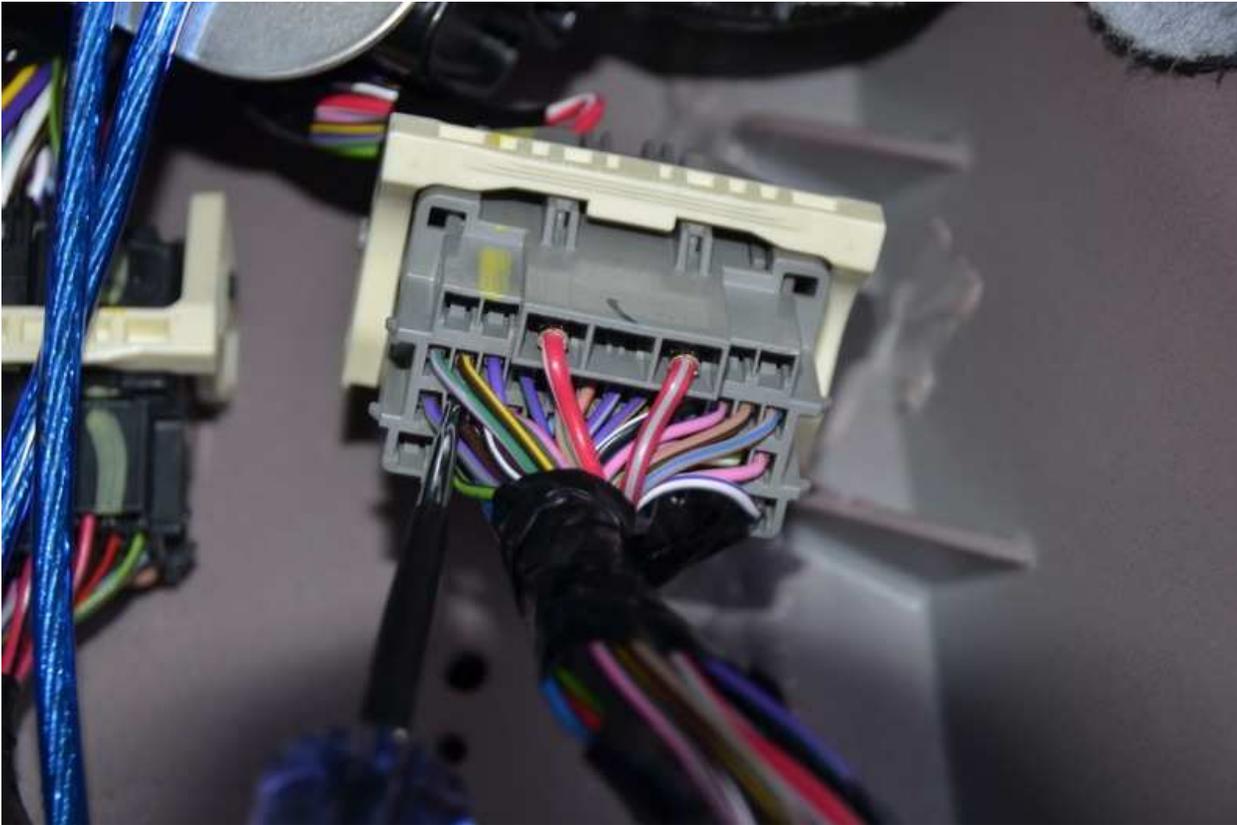
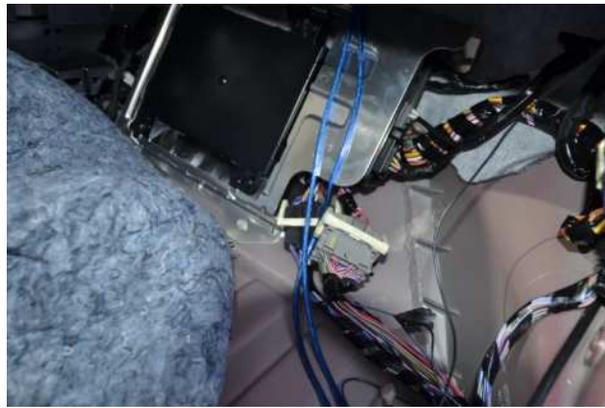
*Note: We highly recommend using PosiTap connectors to tap the wires for 12v power and the reverse signal to the PCB. However, sometimes it's*



*difficult to screw the PosiTap down on the wire strong enough to penetrate the insulation. To make these connections a bit easier we recommend first stripping the wires where the taps will be made then screwing on the PosiTaps, This can be done with a wire stripper or knife. Only the insulation on the top edge of the wire needs to be removed. The photo on page 3 shows the 12v yellow wire with purple stripe stripped for placement of the PosiTap*

On the driver's side search under the left side of the dash for the blue rear camera and touchscreen cables. They're connected and are found near or under the wires/ cable in that area but can be hidden behind other cables as far back as the firewall. The connectors are blue with small pinkish red tops. One you find the cables pull them out as far as you can without severely stressing them. Then press on the tab on the top of the plug to disconnect them. The location of the cable connections for the touchscreen and rear camera (blue connectors with pink tops) varies in every car. In some cars the connectors will be in plain sight when the kick panel is removed. In others they may be hidden by other cables or back near the firewall. Rest assured they are there – it just might take some work to find them.

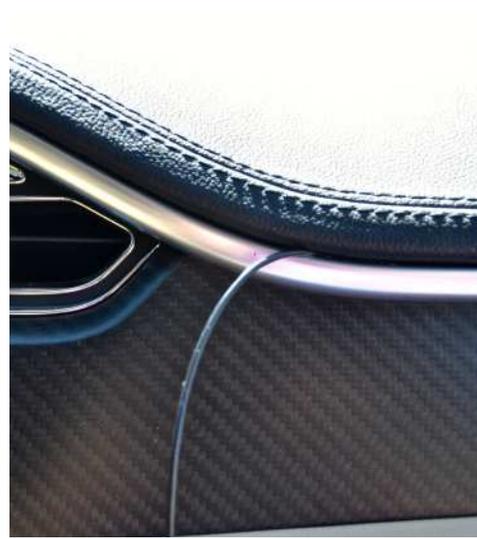
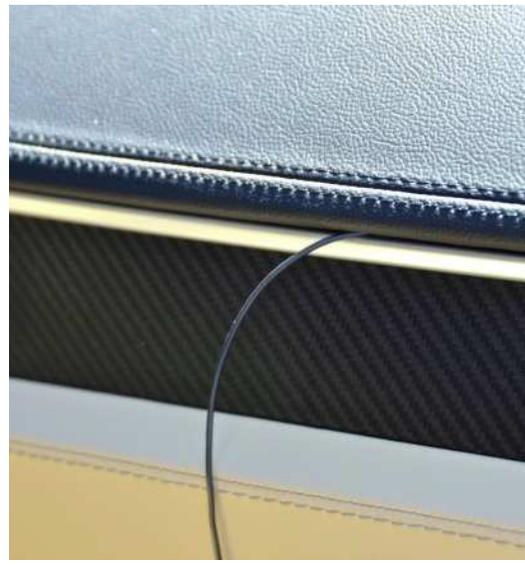
Now make the back-up light 12v connection. Roll back the carpet on the passenger side as far as you can. This will expose a number of wire bundles with large connectors. You want



the gray connector with a white surround. In newer cars, that connector may be partially hidden behind a metal footplate that is bolted to the floor. To access the wires in this bundle you may have to pull the connector out from under the kick panel.

Find the purple wire with green stripe in this bundle. There are several wires with green stripes, making it more difficult to find. Also, Tesla has several different harnesses and the wire colors can change. So the best way to identify the correct wire is to find the gray connector on your car and find cavity number 3, which is marked on the rear side of the connector. The photo shows a probe inserted into that cavity/connection. The wire shows as purple with a green stripe but, as noted, on some cars it could be different.

Once you find the wire, clip the thePowerProbe to it, connect the 12v test light to the PowerProbe, and the test light to ground. Then put the car in reverse. If you've found the correct wire, the test light will light. Then put the car in park. The light should go out. Trace the wire from this location/cavity to a good place to add the tap. To loosen up the bundle to attach the tap, you may have to remove some the electrical tape around the bundle. Then connect a PosiTap and add a 8 foot length of 20 gauge black wire to the tap. Using the PowerProbe and 12v test light, test



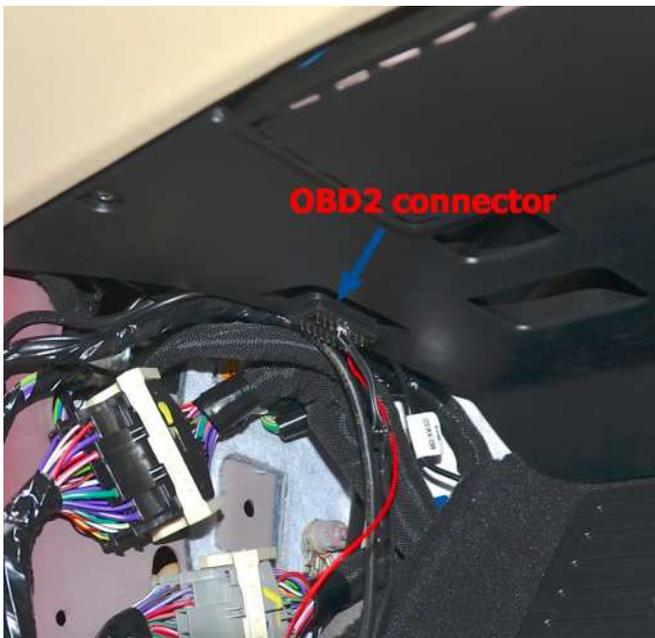
this connection again to be sure it's working.

Next run this black wire into the space behind the right side dash panel. You have two options. First you can insert this wire into the space between the front of the dash and the top panel, as shown in the photos. Thread this wire into this gap all the way to the open space on the driver's side. The other option is to run this wire through the metal tube that runs behind the dash from the passenger to driver's side. You can find the opening to this tube at the top front edge of the triangular space on the passenger side. Use a fish tape to channel the wire through the tube to the driver's side. The tube is completely hollow with no obstructions.

### **Ground Connection**

You have two choices, a ground behind the dash or using the OBD2 connector in your kit.

***Under-dash ground.*** To do this snap, snap out the lower dash panel as shown in the photo. It's held into place with several spring clips. Pull hard from the upper left side and it should snap loose. The space behind the panel provides more than ample room for the PCB case with the cables attached. Then lever the panel from the top so you have access to the space behind. Leave this panel open until the front camera has been mounted, its cable run, and the final tests have been completed. The



ground connection is made to a #20 Torx screw near the bottom of the metal frame behind the panel as shown in the photo. Strip about 3/4" off the end of a 2' strip of the bleach 20 gauge wire, loop it under the loosened Torx screw then tighten down the screw.

*OBD2 ground:* If you're using the OBD2 connector to provide ground to the camera switch, at your work bench solder a 16 inch piece of black 20 gauge wire to pins 4 and/or 5 on the connector. This lead will be connected to the ground connection on the PCB green connector.



You will now have the 12v power connections (red) the reverse signal wire run from the passenger side (black), and the ground connection (also black). Cut these wires to the appropriate length to fit the PCB behind the lower dash panel and strip 1/8" off the ends. Then find the green connector on the side of the PCB case (labels for the connections are on its side), loosen the screws for 12v, rear, and ground, connect the wires, and tighten the screws down. To make the connections easier, the green connector can be pulled out of its plug on the PCB case.



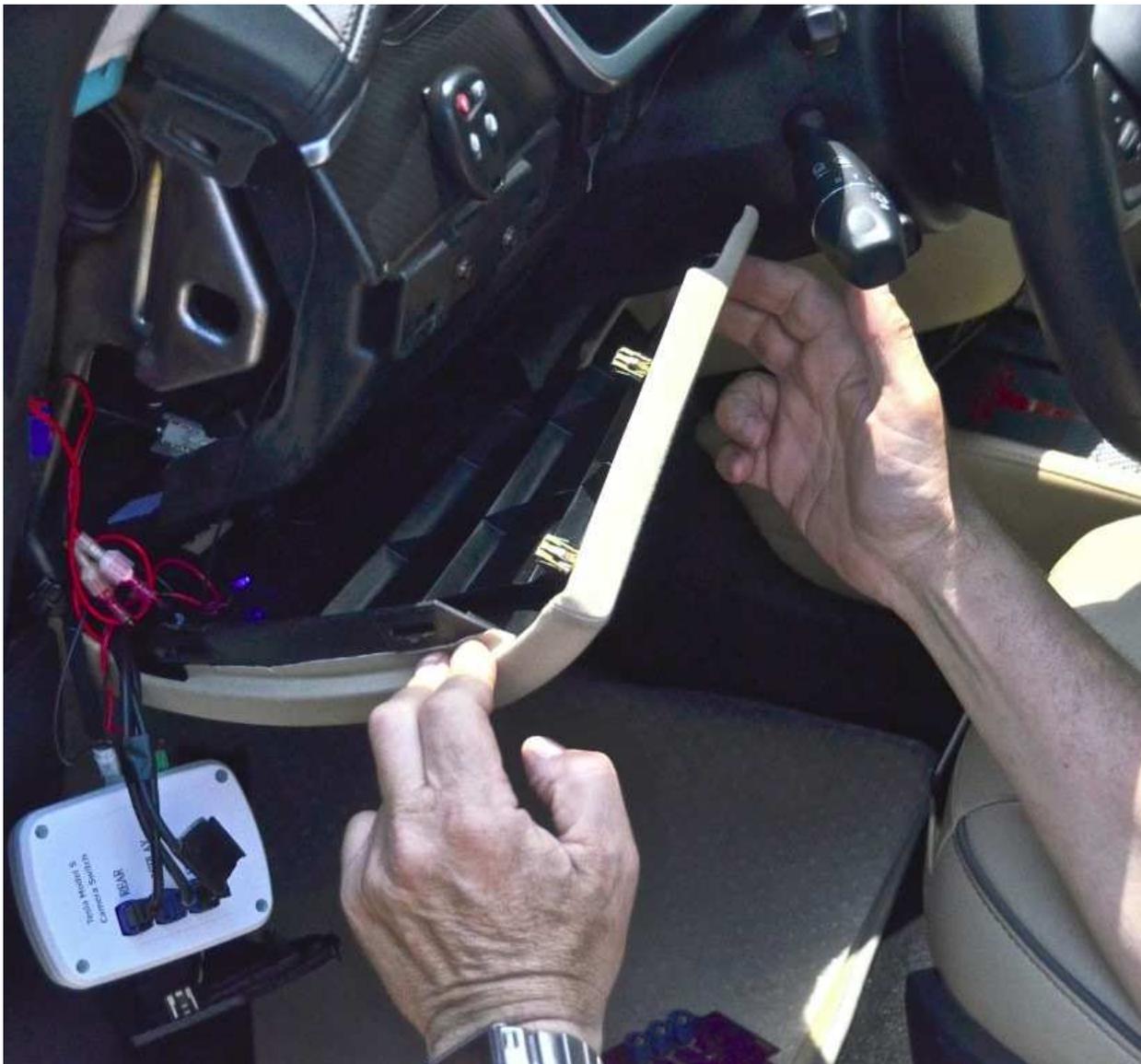
## Test connections of camera and touchscreen cable

With these wires connected to the PCB, the next step is to connect the touchscreen and front and rear camera cables to the PCB and test the functioning of the system before the front camera is mounted on the the car and its cable threaded through the bumper area into the frunk and driver's side dash area. This test will be done with the PCB loose near the side of the dash and the front camera in your hand or held outside the car by an assistant. Here is how the two cameras and touchscreen are connected:

The long Chinese cable, which has two males ends, attaches to the blue female receptacle on the front camera and the other end plugs in to the female **Front** camera receptacle on the PCB.

The rear camera cable has a blue female end. One end of the short Chinese cable plugs into this blue female receptacle and the other end plugs into the **Rear** camera female receptacle on the PCB.

The touchscreen cable has a blue male end. This male end plugs into the female **Touchscreen** receptacle on the PCB.



With the two camera and touchscreen cable connections made to the PCB, with its case hanging beside the dash, sit in the driver's seat and test the operation of the camera switch. Push the camera button on the touchscreen. The front or rear image should show on the touchscreen. Use button D on the remote to toggle the view to the front camera. Then put your foot on the brake and place the car in reverse. The touchscreen image should automatically show the rear camera. Now place the car in park. The front camera view should appear. Assuming all is well, you're now ready to install the camera on the front of the car and the PCB case behind the dash. If the front camera image does not show and you instead see "Camera Unavailable" on the touchscreen, the long Chinese cable is probably faulty and will have to be replaced.

To further test for a fault on the long cable disconnect it from the PCB and camera. Take the 2nd short Chinese cable and use it to connect the camera to the PCB. Repeat the test above. The view from the front camera will show on the touchscreen. If it does, the long cable is faulty. If it doesn't recheck the connections and notify Rick Hesel at [hesel@artsci.com](mailto:hesel@artsci.com).



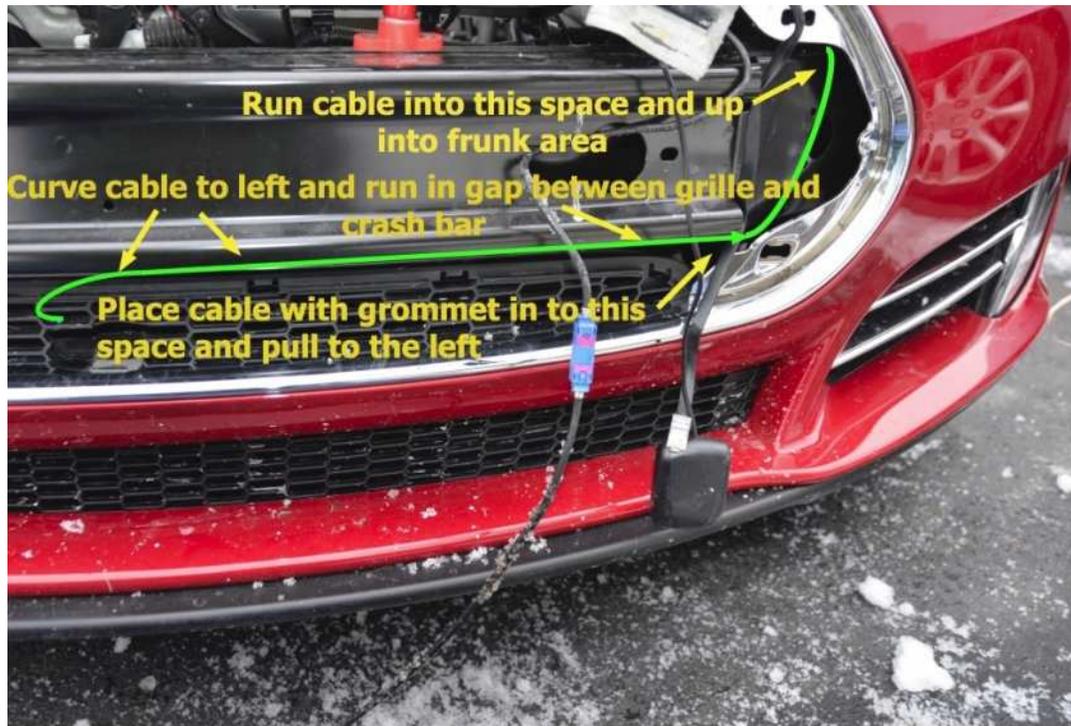
## Mounting the Front Camera and Threading its Cable through the Frunk and Driver's side Door Jamb to Make the PCB Connection

The camera is now ready to mount and the cable routed. Follow these steps:!

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1. Remove the nose cone. ! "
2. Remove the driver's side frunk trim. "
3. Locate the center point of chrome strip in front of the upper grille under the nose cone and mark it with painters tape.

Next open the driver's door. At the top of the fender where it meets the passenger door near the windshield, you'll see a 1/8 inch gap about six inches long, as shown in the photo. Using a plastic pry tool and working from the drivers' end, pry the fender section a bit wider and push the long Chinese cable into the gap until it falls into the channel below. Work along the gap toward the frunk side until the cable is completely in the opening below the gap.



Once the cable is threaded through this space, leave about two feet of slack on the driver's side. Then pull the rubber seal up from the door frame and run the cable under it, leaving enough slack to connect it to the PCB and mount the PCB behind the loosened dash panel.

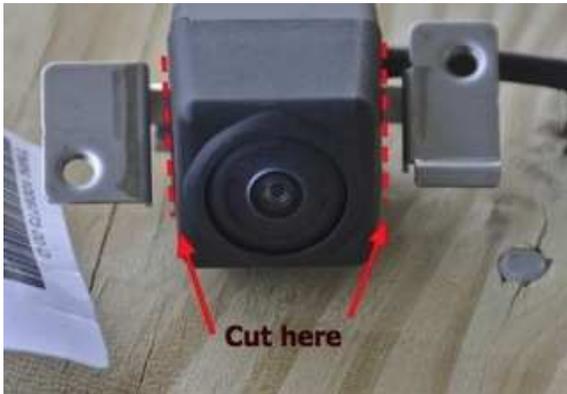


Next carefully thread the other end of cable into the channel slots along the top of the fender to the front of the car in the nose cone area. This will hide the cable and makes for a much easier and neater installation. Next thread the cable through the openings behind/around the right side of the nose cone near the fender channel.

Now, working from the front of the car near the nose cone, attach the camera cable to the end of the long Chinese cable you threaded through the frunk and nose cone area. Make sure the connector tabs lock into place. The cable from the camera itself has a rubber grommet about 8" from the camera back. With the camera in one hand, thread the cable through the gap between the bottom of the crash bar and the top of the grille, taking care to thread the grommet on the camera cable into the space under the driver's side of the crash bar, as shown in the photos. Pull the camera and the cable carefully to the center of the grille, with enough slack to curve the cable to the left (passenger side) and into the slot between the grill and crash bar.

You have several options for mounting the camera on the front of the car, as follows:

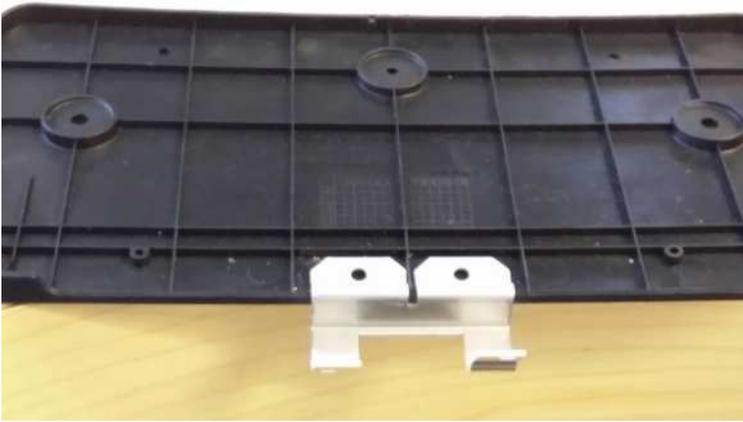
***Option 1: Without a front license plate***



The camera mounts on the center upper front grille just under the nose cone. While the photo shows some of the grille elements cut out, no alterations to the grille are necessary. To mount the camera in this position, the two wings on the metal camera mounting bracket must be first cut off. Using a Dremel tool with a cut off disc or a hack saw, cut the mounting bracket as indicated in the photos below.

As an alternative to cutting the wings off the mounting bracket you can replace the metal bracket with the replacement 3D printed back available as an option (shown in the photos). To install the replacement back remove all of the metal bracket mounting screws and mount the replacement back using the same screws, being sure to tighten them carefully. For more information on the replacement bracket go to Jason Nemeth's web site

With the bracket wings cut off or the back attached, cut a small square of 3M double sided auto tape the size of the camera bottom and attach it on the chrome strip as shown in the photo on page 13. With the camera cable to the left and curved up, into the slot between the top of the grille and the bottom of the crash bar place the camera loosely on the tape to test alignment. Then place a generous dab of clear silicone adhesive on the back of the camera and press it firmly into place against the grille and on top



of the tape. Make sure it is properly aligned. Then, use some duct tape to hold it in place while the adhesive dries (about an hour). "

***Option 2: With standard Tesla mount front license plate***

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For this mount, the wings must remain on the camera. Do not cut them off. For this installation, you will need the optional license plate frame camera mount. Several photos show how the bracket is used to mount the camera on the license plate frame. Using the machine screws and nuts provided with the bracket attach the camera mount on the bottom center back of the license plate frame. You'll have to drill two holes through the plate frame. Mount the camera on the bracket using the machine screws and nuts provided with the kit.

***Option 3: With low-mount front license plate***

For this mount wings must be cut off the camera bracket or the replacement back installed. If you have a low mounted plate frame, follow the instructions for mounting the camera without a license plate frame. So that it has an unblocked view forward over the plate frame, you may have to mount the camera higher. We recommend mounting it just under, but not touching, the nose cone.

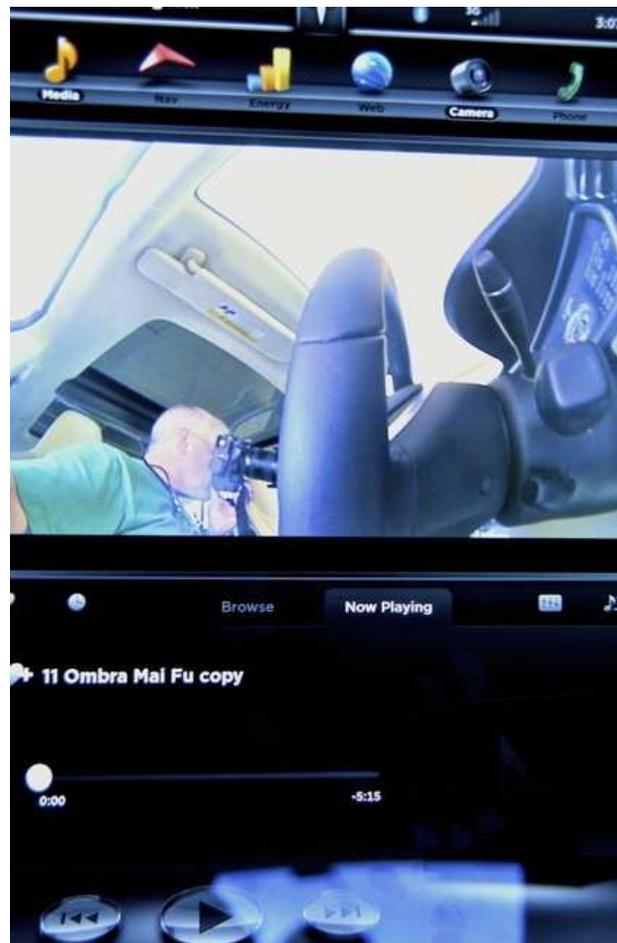


## Mounting the PCB Case behind the Dash and Final Operational Test

Disconnect the camera cables and green wire connector from the PCB case. Carefully thread the wires with the green end attached and the camera and touchscreen cables into the space behind the open dash panel. Then slip the PCB case into the best location in that space that will provide room for attaching the cables. Then, plug in cables and wires back in. The cables will keep the case from sliding around. The touch screen cable does not have much slack so check its threading under the dash and pull it firmly but gently to provide as much slack as possible.!"



Next, using the remote that came with the camera switch kit, test the system again before you snap the dash panel back into place. Sit in the driver's seat to turn on the car and when it's on, push the camera button on the touchscreen. The front camera should appear. If the rear camera view appears, use button D on the remote(it's basically a toggle switch) to switch to the front camera and back to the rear camera. There's a brief delay and the words "Camera Unavailable" appear before the image shows on the touchscreen. Using the remote, set the default to the front camera. Now, with the front camera on, switch the car into reverse. The rear image should automatically appear on



the touchscreen. Then put the car in Park or Drive. The front camera image should automatically appear. !"

15. If you leave these settings as is, automatic operation of the front and rear camera will be assured. However if you want to drive with the rear camera view, you'll have to use the remote to switch from the front to rear camera. To resume automatic operation you have to use there emote to make the front camera the default again.

Here are the remote functions:

C: When held will always force camera to rear if on front or stay on rear if on rear. When the button is released the view will revert to the default you set with toggle switch D.

D: When pushed acts as a toggle, switching the camera view.

"

If you want to control the camera switch with Homelink, following the standard HomeLink programming instructions on the touchscreen, then program HomeLink with the remote. Test that the Homelink commands work properly.

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With everything tested and operational, snap the dash panel back into place and reinstall both kick panels, the two triangular dash end pieces, and the vertical pieces on the door jamb



Test the operation of the camera switch one more time. Then reinstall the various panels you removed in the cockpit and frunk. Sync the remote with Homelink if you'd like Homelink control of the camera switch, as shown in the photo

The photo to the left shows how the camera presents on the touchscreen the view of a 4" high curb. The lower edge of the front diffuser is about 3" from the curb. Once you learn how the camera presents obstacles on the touch screen you can park the car front-in with great confidence that no damage will be done. The front parking sensors do not make possible this level of accuracy or confidence.

