

## **2008 Porsche Cayenne S: Valve Lift Solenoid Replacement**

By

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## Table of Contents

- Chapter 1: Introduction
  - Background
  - ACHTUNG!
  - Parts
- Chapter 2: Removing the Windshield Wiper Arms
- Chapter 3: Remove the Cowl Panel
- Chapter 4: Remove the Vacuum Pump
- Chapter 5: Remove the Valve Lift Solenoid
- Chapter 6: Install the New Valve Lift Solenoid
- Chapter 7: Reinstall the Vacuum Pump
- Chapter 8: Reinstall the Cowl Panel
- Chapter 9: Reinstall the Windshield Wiper Arms

## Chapter 1: Introduction

### Background

My wife's Cayenne has had a rough idle for a few months. I checked the plugs and coils and did find one coil cracked. Replacing that coil did not solve the problem. I tried cleaning the throttle body, checking for vacuum leaks, inspecting the engine torque bar, etc., and could not identify the source of the problem. No check engine light was present. However, when I'd read codes I'd intermittently get a 'P1355 Valve Lift Control, Cylinder 3, Implausible Signal'. I found one post on Renntech from a member who'd had a rough idle and, after having the dealership replace a few other parts, the variable valve lift solenoid was what solved the problem. I toyed with getting the parts but decided that I should take the car to the dealership to confirm the diagnosis. Their diagnosis was that this solenoid was likely responsible for the problem and that it had resolved the issue on previous cars. So, \$470 later (\$270 for parts and \$200 for the diagnosis), I set about to replace the solenoid. Unfortunately, in my case all of this effort did not solve the rough idle.

What follows is a write-up I completed following replacing the solenoid. I wrote this so I'd have the instructions to use if I ever have to go back in. I thought I'd post this in case it helps anyone else who needs to do this job. This write-up is detailed and pic-intensive for illustrative purposes and one undertakes this job at their own risk (i.e., I take no responsibility for any consequences to anyone or anything that result from use of this write-up). In fact, that makes a nice segue to the next section...

### ACHTUNG!

If you are a hand model or the antithesis of the former (i.e., have gorilla hands), stop reading here and take your car to a mechanic! It's difficult to get one's hands behind the vacuum pump to remove and install the lowest of the bolts that holds it in place. The firewall material scratches the backs of your hands. My hands are quite beaten up from this, but that's largely because I spent a long time trying to see if I could do the job by feel rather than removing all of the components detailed in this write-up. Gloves without fingers would be ideal for this job (I don't have any and didn't want to defile my good ones but cutting the fingers off) so that you can feel the bolts while protecting your hands from the firewall material.

An alternative is to remove the intake manifold, but I didn't check to see how much clearance one would have doing it that way (cf. the Pelican write-up which illustrates that method: [http://www.pelicanparts.com/techarticles/Porsche-Cayenne-GTS/07-ENGINE-Vacuum\\_Pump\\_Replacement/07-ENGINE-Vacuum\\_Pump\\_Replacement.htm](http://www.pelicanparts.com/techarticles/Porsche-Cayenne-GTS/07-ENGINE-Vacuum_Pump_Replacement/07-ENGINE-Vacuum_Pump_Replacement.htm)). Apparently, the vacuum pumps often need to be replaced and the vacuum lines have become oil-fouled and expanded such that they will not correctly reinstall onto their fittings. If that is the case then the intake needs to be removed anyway to replace one of the vacuum lines. Fortunately, I did not see any oil in the vacuum lines that I removed from the vacuum pump. Prior to performing this procedure, I had also used my mighty vac to test the vacuum at the test T coming from the vacuum pump. The vacuum was 26 in Hg and rock steady at idle, indicating that the system was working properly.

Nevertheless, if I were to do this again I would remove the intake instead of the method that follows. Removing the wipers and installing the cowl are major PITA jobs. Now that I've done it I'm fairly confident that I could do it again without breaking anything, but I had to replace the cowl and the one cowl end cap because they broke (cheap plastic). There is also a risk of cracking the windshield when removing the wiper arms and when installing the cowl. Of course, intake removal has its own risks (e.g., dropping something into the cylinder), so one must weigh their options.

### **Parts**

- 1 948-105-308-03 Valve lift solenoid
- 1 999-707-581-41 O-Ring for vacuum pump
- 1 999-707-582-41 O-Ring for vacuum pump
- 2 900-385-112-01 Torx screws for valve lift solenoid (Porsche recommends changing them, which probably isn't necessary, but it's good to get them and have the old ones as spares in case one gets dropped into the abyss of the engine compartment)
- 3 900-385-072-01 Torx screws for vacuum pump

## Chapter 2: Removing the Windshield Wiper Arms

- (Prior to beginning, remove all of the engine design covers. I didn't take pics of this but if you've never done that, then this whole procedure might not be something you should be doing. What is being accomplished is very simple, but accomplishing it is finicky, fiddly, and at times frustrating.)
- Open the hood and remove caps that cover the bolts holding on each arm. I used a flathead screwdriver to gently pry them up.



- Unscrew the nuts. Note that the nut on the right side (throughout this document the Porsche convention of left--NA driver's side--and right--NA passenger's side--is used) has an aluminum washer that comes off. Also note that there are hexagonal washers under the arms in the plastic holders (to be shown later).



- Put something protective around the hood shock and clamp it to hold it in the extended position (I used a glove)



- Place something on the windshield to protect it from the hood (I used a foam kneeling pad; shown in a pic below).



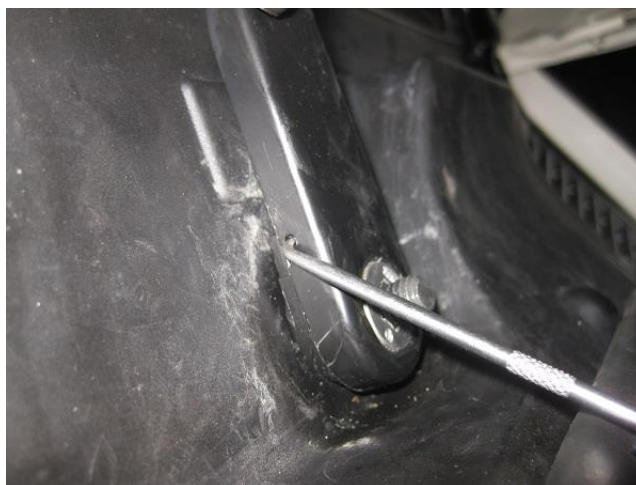
- Then, use a flathead screwdriver to disengage the clip that holds the shock to the hood.



- While holding the hood in one hand, with the other hand remove the shock from the ball on the hood and gently raise the hood so that it rests against the protection that has been placed on the windshield. Let the shock rest in the engine compartment.



- Insert a pick tool into the hole on the side of the passenger wiper arm (in both locations for this arm) to dislodge the plastic base from the arm. Run the pick tool around the perimeter of the plastic base to ensure it is separated from the wiper arm. This is done to allow placing a puller on the wiper arm without contacting the plastic base (which would break if a puller were placed underneath it).



- I had a fair amount of trouble getting a puller to fit (I don't have a wiper arm puller, but the one's I found locally for sale would not work anyway because there would not be enough gap to fit them between the plastic base and the wiper arm). It's difficult to fit the puller between the cowl and the arm. The trick is to manually move the wiper arm up the windshield. I was eventually able to get the specific puller shown below to pull the arm up to the end of the bolt (it would not pull further because the nub on the end of the bolt was larger in diameter than the opening on the wiper arm)....



- ...and then to use a different puller with a thinner bolt to get it the rest of the way (this puller's arms had hooks on the pulling arms that were too curved to fit for the initial pull).



- With the right wiper arm free at both locating points, it can then be removed.





- Note for reassembly that the right-most plastic base for this wiper arm is thicker than the left one (recall that I'm using the Porsche convention for R and L).



- Also note the hexagonal washer that sits on top of each plastic base.



- Next put a puller on the left side wiper arm. There is not a plastic base on this one. I had to adjust my puller as shown below (in an L rather than an H configuration) to get it to fit.



- Once loose, remove the arm and set aside.



### Chapter 3: Remove the Cowl Panel

- Use a trim removal tool to unclip the side cover on both sides.



- Loosen the four screws on the cowl (these do not come out completely so just loosen them).



- Remove the small panel that covers the brake fluid reservoir.



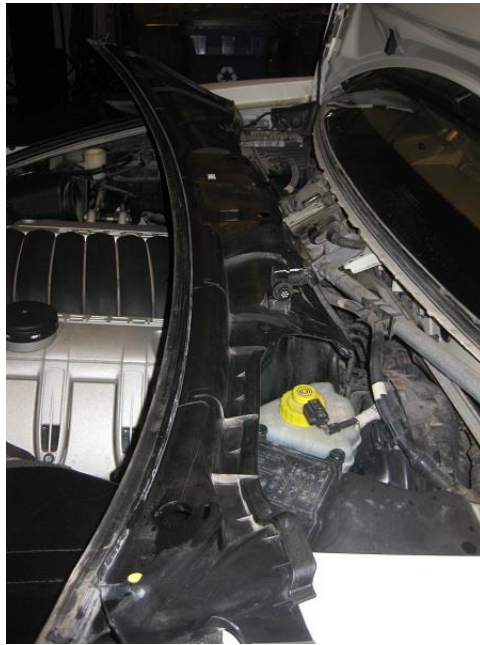
- Take a trim removal tool and gently lift under the rubber at the windshield to release it from the channel in the windshield.



- Then VERY GENTLY remove the cowl. I broke this piece trying to get it out from around the hood hinges, and I'm quite gentle with things. On reinstallation of a replacement cowl I realized that the key for me is to stand on the left/driver's side and gently press the cowl toward the right/passenger's side (such that it flexes up in the middle toward the hood). Do this just enough so that the flimsy tangs can get past the hood hinge on the left side. Note that there is an electrical connection underneath the cowl so, once the cowl is loose, reach underneath and disconnect the connector.
- Here's a pic to illustrate.



- The pictures below show the cowl flipped over so the connector can be seen.



- Depress the far side of the connector (as shown in the pic below) to separate the connector, then set the cowl aside.



### Chapter 4: Remove the Vacuum Pump

- With the engine off, pump the brake pedal a few times to relieve vacuum pressure in the system.
- Open the clamp holding the wire harness under the cowl and release the harness from the clamp.



- Pull back the engine bay seal.



- Open the clamp on the smaller wire harness under the cowl and release the wire.



- Using a flathead screwdriver, gently pry up the **two** connectors holding the wire harness to the rear of the right-hand engine compartment side panel.





- Gently lift the main electric wire harness with its rubber seal out of its installation position. It will move just far enough to allow the removal of the right-hand engine compartment side panel.



- Unclip all of the hoses/vacuum lines and electrical wires from the assembly holder on the right-hand engine compartment side panel.
- Here it is prior to removing anything.

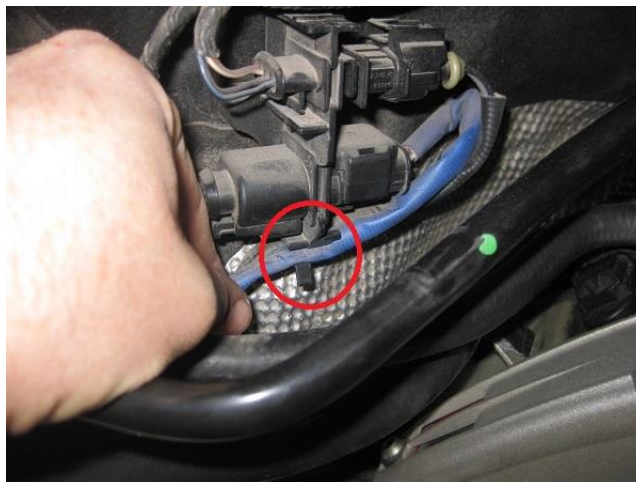




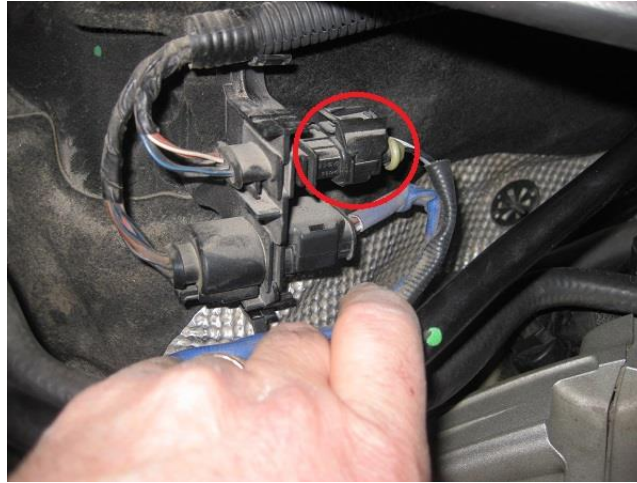
- Note how the clip that holds the hose and vacuum line separates from the clip that holds on the electrical wires.



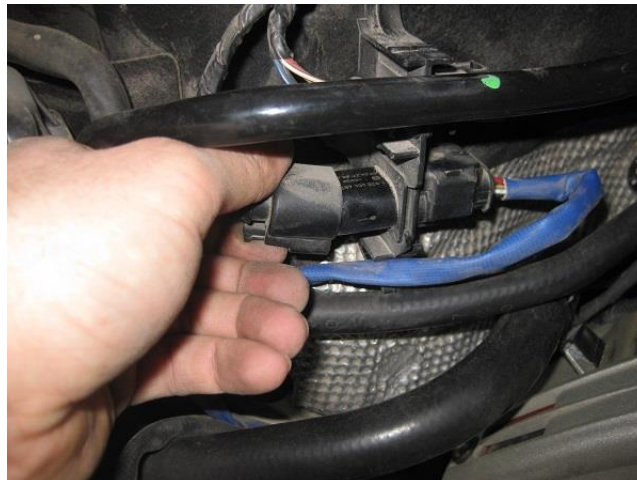
- Gently remove the wires from the clip on the bottom (circled in red).



- Unclip the wire connector circled in red below. Gently lifting up on the tang with a flat head screwdriver worked well (shown below).



- Unclip the lower connector as shown below (press on the release).



- Slide the top connector from the clip on the right-hand engine compartment side panel. This one slides easily off of the clip.



- The bottom one has a small hook on the connector holding it in the clip. So, gently twist it up and away from the right-hand engine compartment side panel and it will then slide out of the clip.



- Gently lay the wires out of the way. You're left with an empty clip that is attached to the right-hand engine compartment side panel.
- Next remove the 3 screws shown below that hold the right-hand engine compartment side panel in place.



- Note that the screw on the fender has a washer.



- The third screw is under the main wire harness, as shown below.



- Now gently lift the right-hand engine compartment side panel, being careful not to snag it on any wires/hoses/lines.





- Next, remove the coolant hose clip from the tang on the right cylinder head.



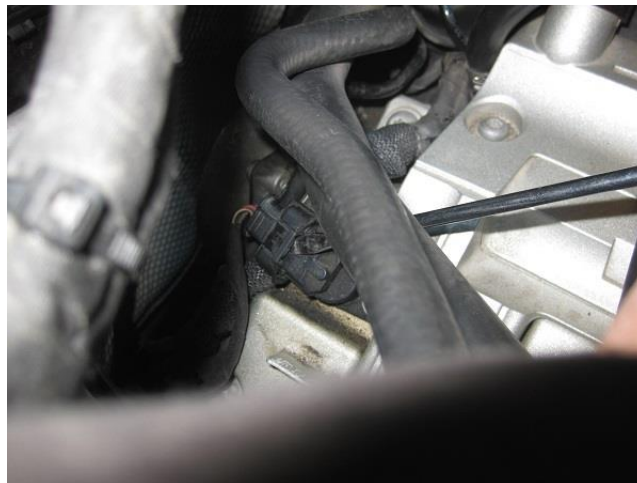
- Remove the clip and set aside.



- All of that so that one can achieve the ‘access’ shown below. That fire resistant material on the engine compartment panel, and a protruding screw holding it to the engine compartment panel, is what is responsible for the damage to my hands (the exposed edge is a bit sharp).



- To get a little more clearance, remove the wiring clip from the camshaft position sensor. Lifting on the tab with a flathead screwdriver releases it.



- Next release and pull off the vacuum hose. I had some difficulty with this connector. Pressing in on both sides would not produce enough diameter to release it. What worked for me was to use my flathead screwdriver to release both sides of the connector.





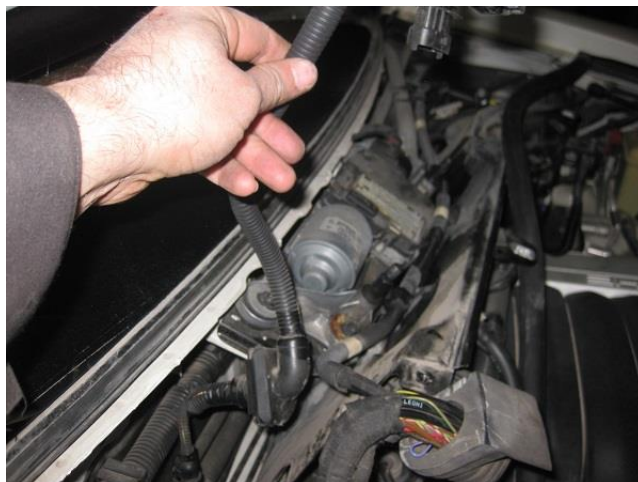
- Gently move the vacuum line toward the front of the car, out of the way. This line goes through a grommet on the flange on which the right-hand engine compartment side panel sits, so it can be released from that flange to move it more out of the way. Below is a pic of the line with its rubber grommet sitting in the flange.



- Now remove the small vacuum line that sits on the barbed fitting on the vacuum pump. I used long needle nose pliers to assist with gently pulling it off.



- For more clearance, remove the smaller wiring harness from the centre panel of the engine compartment by sliding its rubber grommet out and setting it aside on the cowl.



- Now the vacuum pump can be removed. There are 3 size 12 E-Torx screws that hold on the vacuum pump. I tried every combination of ratchets with extensions to get to these 3 screws. I needed two hands to do this so I wasn't able to take pictures. The upper right screw is reasonably easy to access. For the upper left screw I used a small E-Torx ratcheting wrench. The bottom left screw was the worst. It can only be accessed by feel. An extension is needed because the ratchet will hit the vacuum pump. But my shortest extension was too long and so the set-up would not fit in the available space. There's also a pucker factor here with fear of dropping a socket, wrench, or screw into the abyss of the engine compartment, perhaps never to be seen again. What I finally came up with was to wrap electrical tape around a universal joint that was just the right length, as shown below.



- Here is the vacuum pump removed. Note that the gear must fit back in the same way so be careful not to move it.



- And here is a pic of the access you now have to the valve lift solenoid. Of course, to get this kind of view one needs to be laying on top of the engine.



## Chapter 5: Remove the Valve Lift Solenoid

- Remove the two size 8 E-Torx screws holding in the solenoid. I left the electrical connector attached because I wasn't sure how to disconnect it, and I also wanted it attached in case I developed butter fingers and dropped the solenoid when removing it. Here's the solenoid in the process of being removed.



- The solenoid has an o-ring, so ensure that the old o-ring comes out with the solenoid. If it didn't, use a mirror and a light to find and remove it. The o-ring is shown in the (blurry) pic below (circled in red).



- The connector has a wire on it that simply gets depressed to allow it to disengage, as shown below.



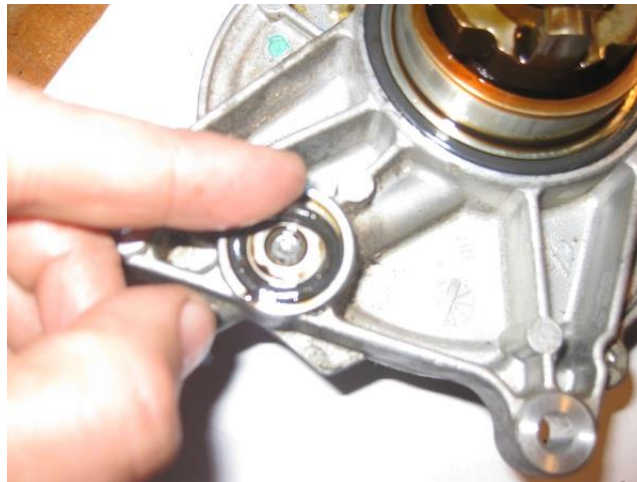
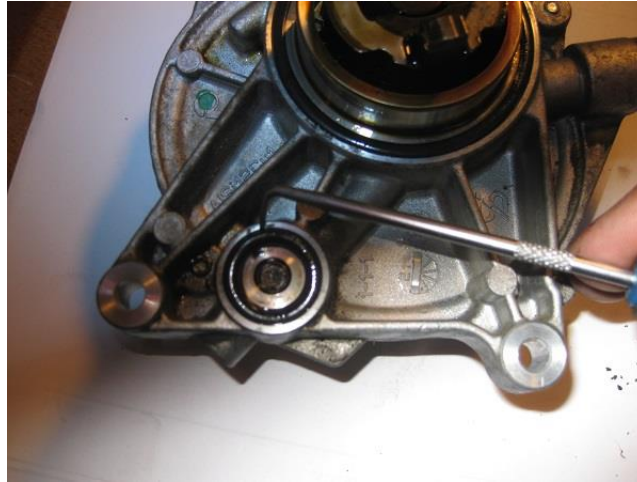
## Chapter 6: Install the New Valve Lift Solenoid

- Now get the new solenoid and place some fresh 0w40 motor oil (or whatever is in your engine) on the o-ring.
- Next connect the wiring to the solenoid, gently install it, and install the two screws. The torque for these screws is 4.5 ftlb (54 inlb). I was able to torque the right screw, but could not get my torque wrench on the left screw, so had to guesstimate.



## Chapter 7: Reinstall the Vacuum Pump

- With a pick tool/screwdriver, gently remove the old o-rings from the vacuum pump, and clean these areas.





- Apply some motor oil to the new o-rings and install them in the vacuum pump.



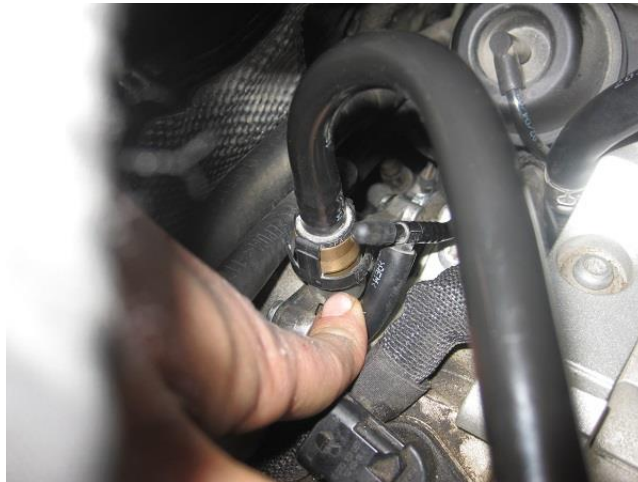
- Prior to installing the vacuum pump, clean the area on the head with a clean, lint free shop towel.



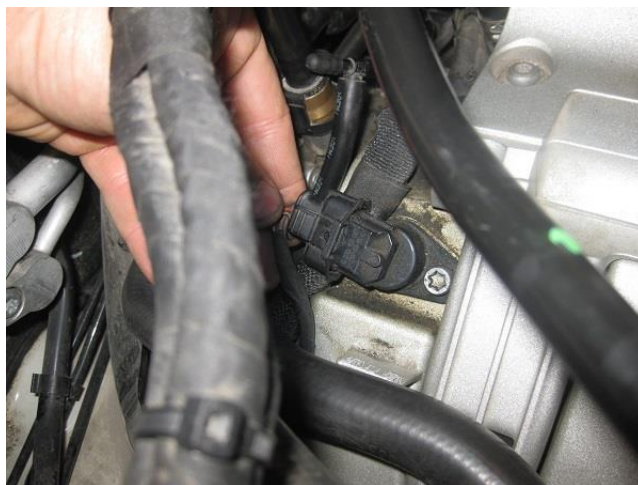
- Now gently re-install the vacuum pump, very carefully thread in the screws and tighten them. I think I was only able to torque one of the screws to spec (7.5 ftlb/90 inlb). Of course, as it was a two hand job, I do not have pics of the installation.
- Next re-attach the vacuum line to the vacuum pump. I used long, angled needle nose pliers to press it on all of the way.



- If you removed the grommet from the flange with the vacuum line, reinstall it and then reinstall that vacuum line on the top of the vacuum pump.



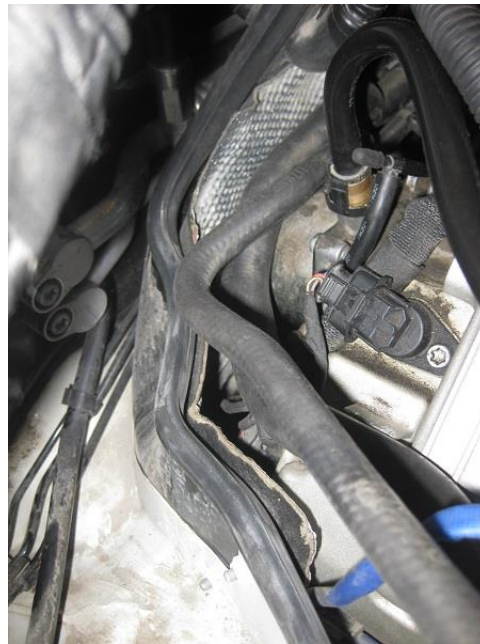
- Next, reinstall the electrical connector on the camshaft position sensor.



- Now reinstall the smaller wire harness with grommet in its location on the centre engine compartment panel.



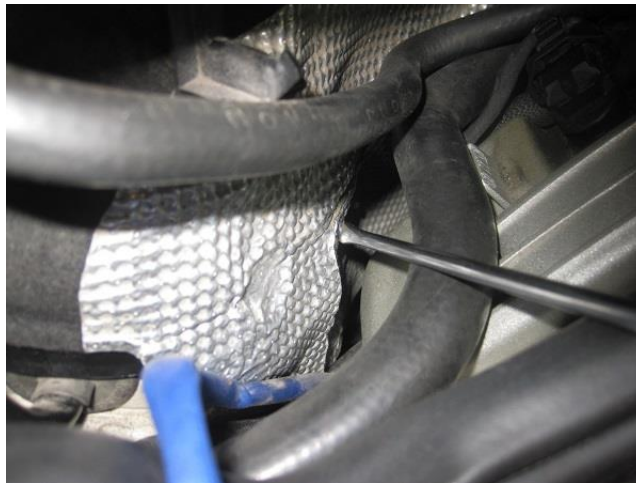
- Now it's time to reinstall the right-hand engine compartment side panel. After many unsuccessful attempts, I realized that the key to this is to remove the seal from the panel and install it first, then install the panel. The seal fits into the panel and has a V that sits over the flange on which the panel rests. Here's a pic of the seal in place on the flange.



- Then gently fish the panel into place, ensuring that it is properly seated everywhere. There were at least 3 spots that needed finessing to ensure a proper installation, as shown in the pics below.
  - One spot was on the seam of the centre engine compartment, where the felt-like material needed to be pulled in front of the rubber seal.



- A second spot was the fire retardant material shown below. The flanged piece of it has a tendency to go to the back side instead of the front side of the flange, and the seam needed some adjustment (shown below).



- And the third was the felt-like material at the bottom by the coolant reservoir, which also has a tendency to go on the wrong side of the flange.



- You know it is properly seated when the above has been checked and there is a nice fit at all of the screw locations.



- Now reinstall the main wire harness, as shown below.



- When doing so, ensure that the grommet is properly fitted into the flanges on both sides.



- Then reinstall the 3 screws holding this panel in place, remembering that the one with the washer goes on the fender.
- Next reinstall the clip on the coolant hose and place it on the tang on the valve cover.





- Next reinstall the hoses/pipes/electrical connections on the right-hand engine compartment side cover as shown below (I didn't take pics of the reinstallation, so refer to the removal pictures as reinstallation is the opposite of removal).
- Don't forget to tuck the wires into the clip on the bottom. Below is everything reinstalled.



- Reinstall the wiring harness to the right-hand engine compartment side cover by pressing the clips over the threaded screws on the panel.





- Reinstall the small wiring harness in its clip on the centre engine compartment shield and reinstall the main wiring harness in its clip on the same shield (I didn't get a pic of the latter but you can't miss it).



## Chapter 8: Reinstall the Cowl Panel

- First, clean the channel on the windshield by spraying foaming glass cleaner in the channel and blowing it out with compressed air. Note that at this point the hood should be supported by the hood shock. This gives enough room to fish the cowl around the hood hinges.



- Gently lay the cowl on the car, and reconnect the electrical connector.





- Standing on the left side of the car, GENTLY place the flimsy plastic tangs of the cowl behind the hinges on the right side. Here is what one of the flimsy tangs looks like (circled in red). The pointy piece in front of that tang is also highly susceptible to breaking off (not visible in the pic below because it is blocked by the hood, but it also sits behind the hood hinge).



- Note that on each end there is a hook that goes beside the channel on the windshield (circled in red). These also look highly breakable.



- Then, ensuring that the tangs on the right side are safely placed, as described above for removal of the cowl, gently press the cowl toward the right side causing it to flex up toward the hood and when there is sufficient clearance GENTLY fish the cowl around the left hood hinge (note that you also have to, at the same time, ensure the opening for the left windshield wiper arm is clearing the bolt for said wiper arm).





- Next ensure that the cowl is correctly positioned side-to-side and front-to-back.
- Now starting at one side, press the flange on the cowl into the channel on the windshield and work your way across to the other side. This bugger is difficult to get in. Apparently, windshields are known to crack at this point. The channel was cleaned to help prevent cracking the windshield (in case there was something like a small grain of sand in it). Also, resist the urge to tap the channel in with anything. Just use pressure.
- Next put the hood back up against your padding on the windshield to improve your ability to put pressure on the area of the cowl where it goes into the channel.



- The flange does not easily stay seated in the channel. To help with putting pressure on the flange, at this point I installed the 2 screws in the right side and installed the panel that sits on the left side of the cowl.



- In my case the flange would still not stay seated in the channel across the left half of the cowl.
- To exert a bit more pressure I next took a rubber hammer and pushed against the flanged area of the cowl all the way along the cowl (Again, do NOT tap with the rubber hammer).



- When you get to the end, use the handle of a screwdriver where the rubber hammer won't fit.



- Now reattach the hood shock to the hood.



- Close the hood. To ensure the flange of the cowl is fully seated, run the rubber hammer across the full length of the channel.



- Next reinstall the cowl side covers (one of these cheap plastic pieces broke on me as well).





- Reinstall the engine compartment seal. Make sure to go around the whole perimeter of the seal to ensure that it is seated correctly.





### Chapter 9: Reinstall the Windshield Wiper Arms

- Recall that the correct position for the wipers is the right side sitting below the left side.
- Place the left wiper arm in position and start the nut.



- Place the each plastic base over its respective wiper bolt for the right side wiper arm and put the arm in position.



- Put the washer in the right-most position, then start both nuts for this wiper arm.



- Before tightening the nuts, ensure that each plastic base is correctly seated in the wiper arm.
- Then tighten the nuts, but not all of the way in case the arms need to be removed for adjustment.
- To get a socket on the left arm, press down on the joint of the arm.
- Note that these nuts need to be more than finger tight or they will come loose during the adjustment stage.



- Here's a pic that shows the correct orientation of the wiper arms.



- Next, the position of the wiper arms needs to be checked. Close the hood (the wipers will only work with the hood closed). The way to do this is to operate the wipers once. In my case they were out of time and the right wiper ran over the left wiper. Next time I'll try lifting the left wiper off of the windshield so that the two arms can move without hitting one another (I'll need to check first to ensure the arm won't hit the hood if it's operated in that position). After a couple of operations the wipers worked in correct time.
- Do a final tightening and torque of the wiper arms. I torqued each nut on the right wiper arm to about 24 ft lb and the nut on the left wiper arm to about 13 ftlb.



- Finally, reinstall the caps on the wiper arm nuts.

