

2006 997 C2S WATER PUMP AND COOLANT PROCEDURE WITH PICS

by

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CHAPTER 1: INTRODUCTION

Following the completion of my first water pump and coolant procedure on my 997 I decided to do this write-up so that I could use it the next time I do the job (hopefully not for several years). This write-up is, indeed, newbie rated and, consequently, every step is presented in great detail and the document is picture intensive. In doing my research for this procedure, I drew from a number of sources including less detailed write-ups and posts on the internet (e.g., Rennlist, Renntech, http://www.pedrosgarage.com/Site_3/Flush_Coolant_System.html). While these were very helpful, I would have liked a newbie-rated write-up. So, I have decided to post my notes from the procedure in case it will be of benefit to others. Thanks to 'JFP in PA', Loren, 'logray', and 'Dharn55' on Renntech for their helpful advice.

While I was told that this is a "low risk" procedure, there are an infinite number of ways for things to be done incorrectly and one takes on such a project at their own risk. While what is being accomplished in this procedure is simple, I would not describe this as an easy task. I'd characterize it as a 6/10. It consumed the better part of a weekend, but I was working slowly, carefully, and, because I have never done this procedure before, I spent quite a bit of time figuring things out. Next time, with the help of this write-up, I should be able to complete it in one day.

My 997, at the time of writing, only has 15,400 kms. Although Porsche states that its coolant is good for a "lifetime," the conventional wisdom among enthusiasts is that it should be changed when the pH gets below 9.5. After 7 years, my car's coolant pH was 9. The other concern is that water pumps can fail even with low mileage. The thinking is that over time the coolant can degrade the plastic impeller. A plastic impeller is a superior design to a steel impeller because, drawing on my knowledge of 928s, which originally had water pumps with steel impellers, when bearings on pumps with steel impellers fail the impellers can severely score the block. Nevertheless, if the plastic impeller breaks the pieces that fall off can damage the engine and be difficult to remove from the cooling system. Another consideration is that Porsche coolant is very expensive. There are other less expensive coolants that have been used in lieu of the Porsche coolant (some say that VW G12 is the same as the Porsche coolant), but I did not want to take any chances. Given all of these factors, it seemed to me to be a reasonable preventative measure to replace the water pump while changing the coolant.

CHAPTER 2: PARTS, SUPPLIES, TOOLS, AND PRELIMINARY WORK

A. Parts and Supplies:

- Coolant drain plug (900-219-007-01)
- Coolant drain plug crush ring washer (900-123-144-30)
- Porsche Water pump (997-106-011-05)
- Steel water pump gasket (996-106-340-54)
- 5 M6 x 25mm bolts for water pump
- 2 M6 x 30mm bolts for water pump
- 6 M8 lock nuts for threaded catalytic converter flanges to exhaust manifold
- Container to catch old coolant
- Clean container to hold new coolant
- 11.34L of Porsche coolant (000-043-301-49)
- 12L of distilled water (it would have been better to have 3.78L sized containers of distilled water)
- Acetone
- Degreaser
- Optimoly HT/copper anti-seize (used when dissimilar metals are making contact—aluminum to steel)
- Optimoly TA/silver anti-seize (used when similar metals are making contact—steel to steel)
- Shop towels (to clean up coolant from everywhere)
- Latex/water proof gloves (several pair)
- Penetrating oil
- Zip tie
- Painter's tape or suitable substitute
- Sharpie

B. Tools:

- UView Airlift 555000
- Air compressor (with at least a 5 gallon tank and an in-line drier)
- Metric socket set including:
 - 10mm socket
 - 13mm socket
 - 15mm socket
 - 19mm deep socket
 - 18mm deep socket
- 5mm hex socket
- 25mm Torx socket
- 27mm Torx socket
- 14mm E-Torx socket
- 10mm E-Torx socket
- Various length socket extensions

- 1/4", 3/8", 1/2" torque wrenches (which ones you need depends upon the torque range of your particular wrenches)
- Impact gun or medium sized breaker bar
- 22mm metric open-ended wrench (if removing the oxygen sensors)
- 24mm metric wrench or socket
- Jack
- Needle nose pliers
- Water pump/Channellock pliers

C. Preliminary Work:

- Note, only work on the coolant system when the engine is cool and wear eye protection and gloves.
- If you have a service cover or some suitable protector, place it on the car. I bought the Colgan service cover and I'm very happy with it.



- Turn on ignition switch and set the temperature to high (this may not help, but people seem to do it).
- Safely raise and support the car to a comfortable working height. Search Rennlist and/or Renntech for how to safely put a 997 on jack stands. I used my lift.
- Note that throughout this document the Porsche convention of 'left' and 'right' side of the car is used. So, in North America, left is the driver side and right is the passenger side of the car.

CHAPTER 3: REMOVE UNDERBELLY PANS AND WHEEL-WELL LINERS

- To gain access to some of the coolant pipes it is necessary to remove the belly pans. Given that these pipes are lower than the radiators, it may not be necessary to remove the wheel-well liners to access the hoses that enter the radiators. However, I had read that others do this so I thought, to be thorough, I would do so as well. If, in the future, I learn that this is not necessary I will, of course, eliminate the step of removing the wheel-well liners.
- The underbelly pans are held on with a combination of fastening screws and fastening nuts. These are not on tight. The torque spec for most of these is a maximum of 1.5 ftlb so they are easy to remove.
- The fastening screws are Torx 25. The exception is the 2 fastening screws that hold each wheel-well liner to the front valence, which are Torx 27.
- The fastening nuts are all the same and require a 10mm socket.
- There are 6 interlocking underbelly pans. Below is a pic of the removed belly pans and wheel-well liners.

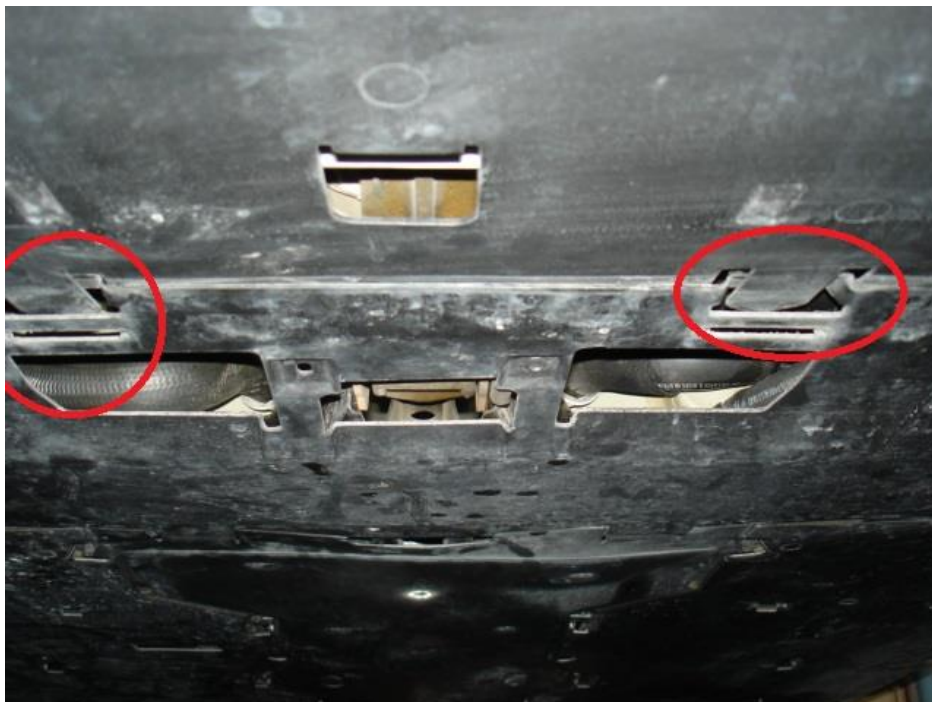


- To remove the belly pans, I start from the rear-most pan. My count of the fastening screws and nuts is based on memory, and so may not be 100% accurate. This pan is held

on with 4 fastening screws. It hooks over two bars at the back (right side circled in the pic below)....



- ...and slides into the next panel at the front.



- The next panel is held on with 4 fastening nuts toward the front of the pan and 3 fastening screws toward the back of the pan.
- This pan interlocks with the next pan in front of it...



- ...and also fits over 4 studs at the back. Two of the studs are on an angle and it is imperative to release the pan from these studs before pulling the pan away from the one in front of it. It takes some fiddling with pressures in different directions to remove the pan from these angled studs.



- Next remove the two side pans. These pans are affixed with one fastening screw at the front by the jack plate. Note that these pans slide under the next pan at the front by the jacking plate, as shown below.



- The rest of the fasteners for these pans are nuts.

- Next remove the centre belly pan. Having removed both side pans, at this point the centre pan should be held on by only two nuts (which are on the third stud from the back on each side; it is possible to remove these when removing the nuts for the side pans, but on one side of mine it does not line up perfectly for this and it is also nice to leave these two on so that the centre pan doesn't fall off when removing the side pans)...



- ...and the overlap points with the pan in front of this pan.



- Finally, the front-most pan is held on by two threaded studs at the back,....



- ...slides over a clip in the middle,....



- ...and tucks under the front valence.



- With the belly pans off, move on to the wheel well liners.
- First, of course, it is necessary to jack the front of the car and remove the wheels (don't forget to use a breaker bar/impact gun to crack the lug bolts loose before taking the weight completely off of the wheels).



- The wheel-well liners tuck under the front valence in two places and are held on in this location with two fastening screws (T27). Remove the two screws.



- Next remove the fastening screws on the front-most wheel-well liner. This liner fits under the next piece of wheel-well liner, and so it is necessary to remove the two fastening screws immediately above it.



- Just aft of these screws, in the top of the wheel-well, is a fastening nut. Remove this nut to facilitate removal of the front-most liner (sorry, I didn't get a pic of this one).
- Then, pull the liner back and out. It takes some wiggling.





CHAPTER 4: REMOVE AIR CLEANER HOUSING

- First, disconnect the electrical connection for the Mass Air Flow (MAF) meter. This requires pressing the locking lever on the bottom of the connector until you hear a click, and then pulling the connector away from the housing. I find this locking lever difficult to press and it usually takes a while for me to get it to click open. Once the locking lever clicks, the plug easily pulls away from the flange.



- Below is a pic of the locking lever on the bottom of the connector.



- Next, open the omega clip that holds the MAF meter in place.



- Next, locate and disconnect the cable from the electric switch-over valve (3.8L engine). Simply press on the wire and lift it off of its flange.



- I cover the ends of these connectors with some painter's tape to keep dust out.



- On the right side of the air cleaner housing is an omega clip holding the wire for the electric switch-over valve. Open the clip and remove the wire (sorry for the blurry pic, but it's the best that my old digital camera that goes through a pair of AAs every two hours would do).



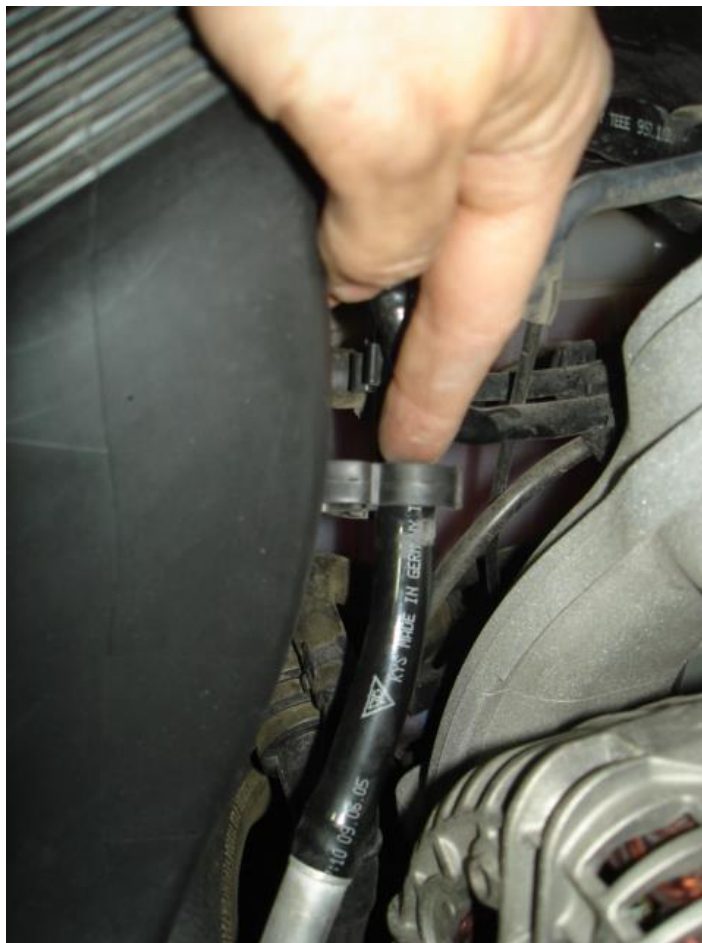
- Next loosen the hose clamp on the intake for the MAF, and pull the rubber moulding from the throttle body.



- Then lift the oil filler neck from the air cleaner housing.



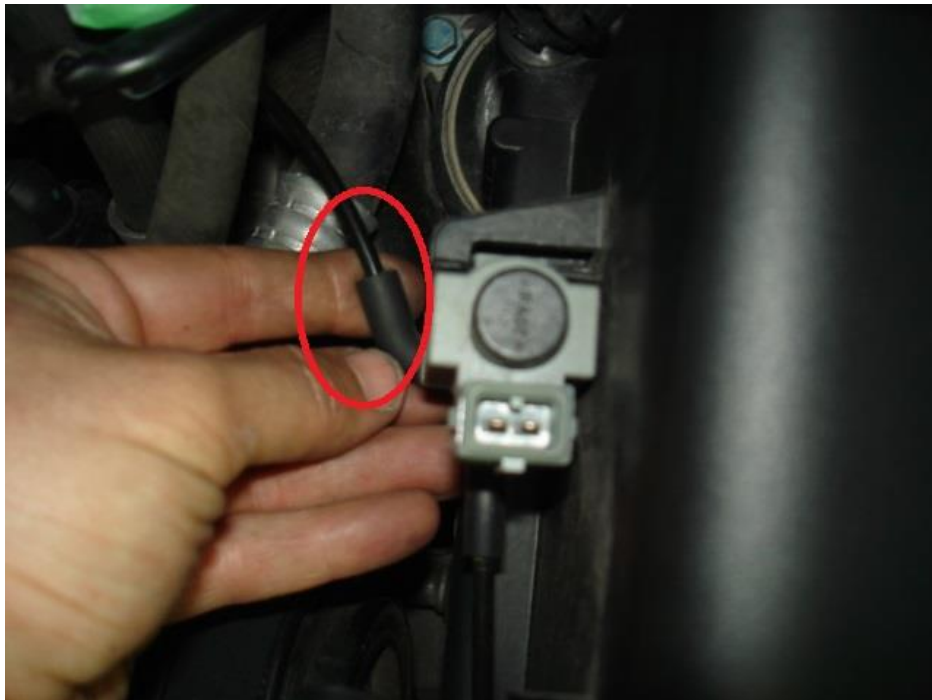
- There is an omega clip holding a hose on the back side of the air intake on the air cleaner housing. Open the omega clip and remove the wire, as shown below.



- Gently lift the air cleaner housing out of the fastening lug (pictured below), but not all the way out of the engine compartment because there is one more thing to disconnect.



- Once the air cleaner housing is loose, it is possible to access the vacuum line shown below.



- Disconnect the line.



- Finally, remove the air cleaner housing and set it aside in a safe place.



- The air cleaner housing rests in two locating holes in the engine compartment, and there are two rubber grommets (shown below) that sit between the air cleaner housing and the engine compartment. They are loose and usually come out with the air cleaner housing,

but fall off shortly thereafter. Locate these two grommets and place them back in their location in the engine compartment so that they do not get lost and are ready for reinstallation of the air cleaner housing.

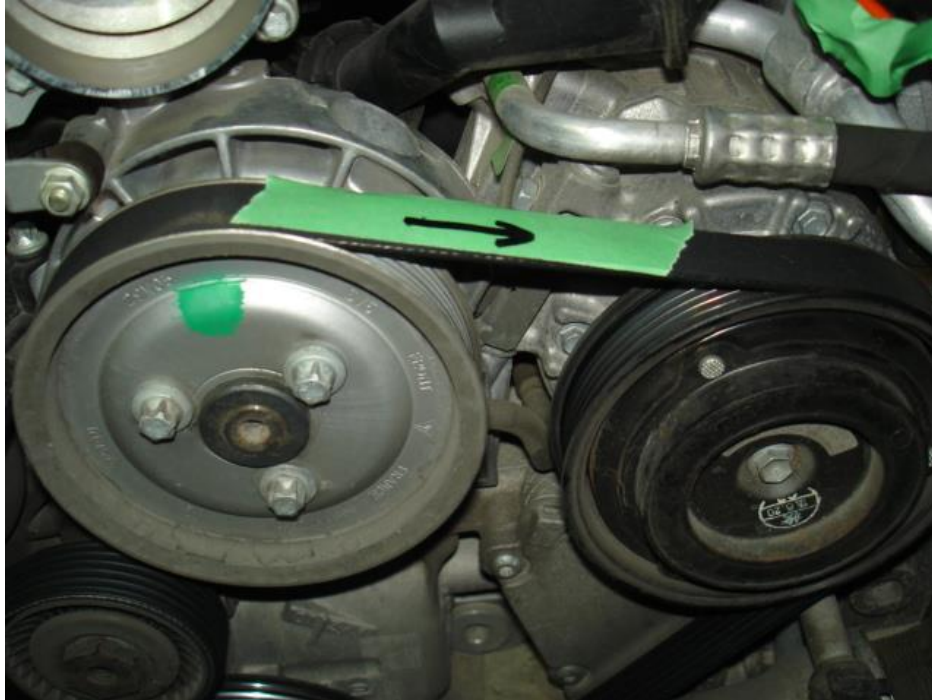


- To keep the throttle body clean, I place a latex glove (the kind without any kind of powdery coating on it) over it.



CHAPTER 5: REMOVE DRIVE BELT

- First, note the direction of travel on the belt so that you can reinstall it in the same orientation. To do this I put a piece of painter's tape with a directional mark, as shown below.



- Ensure to make/obtain a diagram of how the drive belt is routed so that you will reinstall it correctly.
- Place a 24mm closed ended wrench/socket on the tensioner bolt and turn the bolt clockwise to release tension on the belt. While holding the tensioner down, remove the belt from the idler pulley and then gently release the pressure on the tensioner.



- Then remove the belt from the pulleys. The most difficult part of removal (and installation) of the drive belt is fishing it between the water pump pulley and engine carrier. This takes some fiddling.
- Then do the “drive belt disco” (This is an ode to the “Timing Belt Boogie” that is familiar to 928 wrenches. It is much more involved to get to the timing belt on a 928, but removal of the 997 drive belt is still satisfying).



CHAPTER 6: DRAIN THE COOLANT

- Open the cap on the coolant expansion tank and remove it.



- Place the coolant cap in something to keep it clean. I used a zip lock bag.



- Next, open the steel chamber on the bleeder valve into its vertical position.



- Locate the coolant drain plug (5mm hex socket) and place a catch container under the plug. Then remove coolant drain plug.





- Once the coolant had drained to a trickle, I then turned to the hose at the inlet side of the water pump. Undo the spring clip on the hose, slide it to the side.

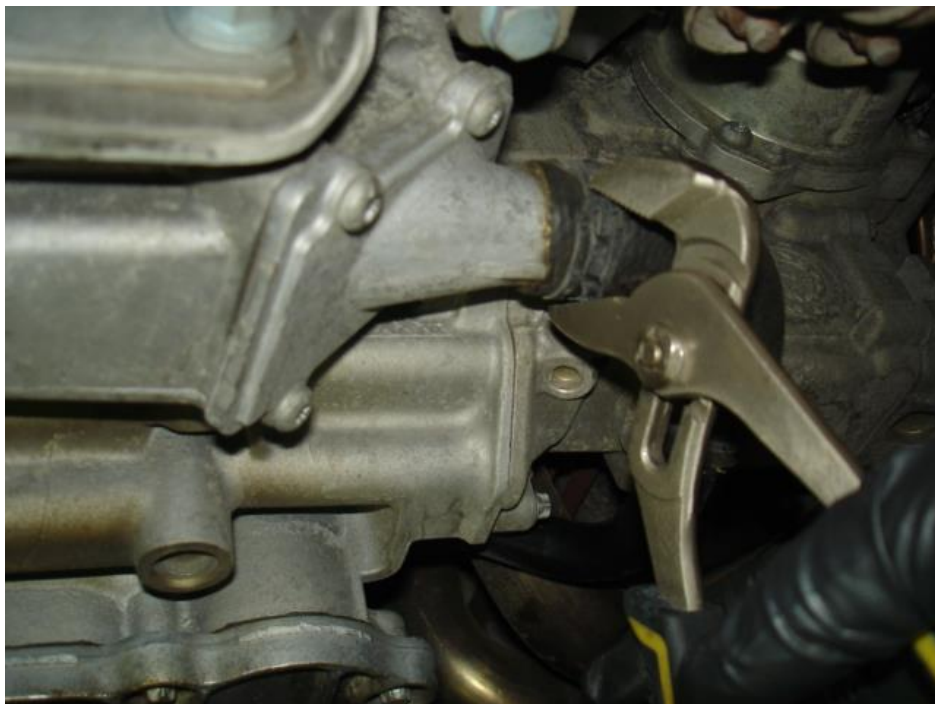


- Place the catch can under the hose, and remove the hose. The hoses held on by spring clips were often somewhat adhered to the pipe on which they seat. To get them off, if

necessary, I would gently grab them with my channellock pliers and twist them to break them free, and then they would easily pull off.



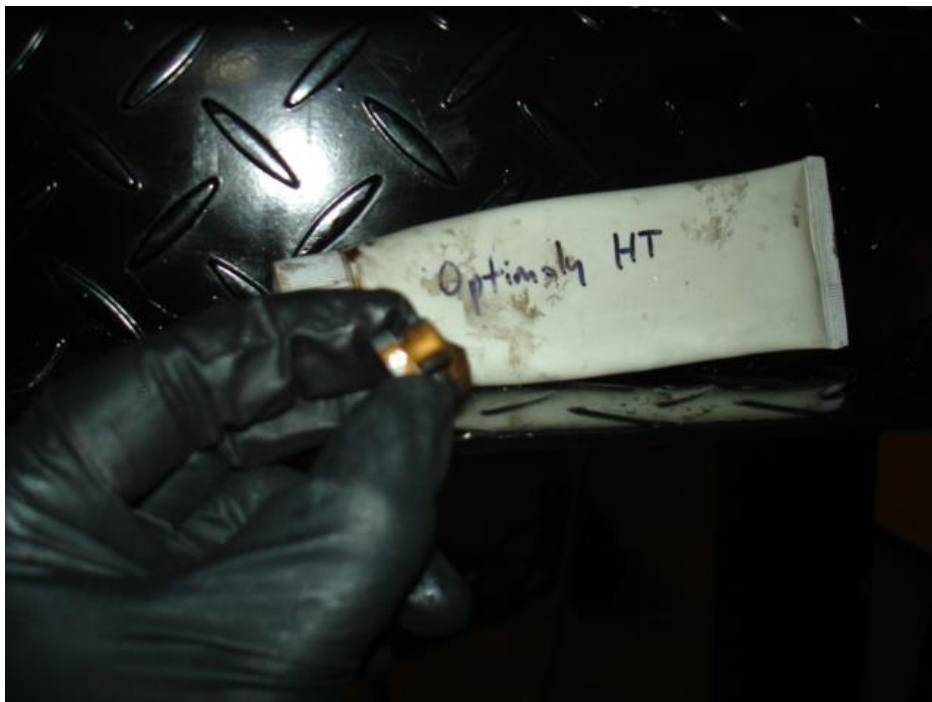
- Let these two locations (coolant drain plug and water pump inlet hose) drain completely.
- I also removed the hose on the other side of the coolant housing, but there was virtually no coolant left in that hose.



- When the water pump inlet hose had finished draining, to keep any dirt out I placed a latex glove over it and secured the glove with a zip tie.



- Once the coolant drain has finished draining, install a new coolant drain plug with new crush washer. I placed some Optimoly HT on the drain plug.



- Torque the drain plug to 7.5 ftlb (90 inch pounds).



- Next, place the catch container under the radiator hoses at the front of the car by the wheel-well (it doesn't matter which side you do first).
- Open the Henn coupling on the hose (I used a pair of angled needle nose pliers).

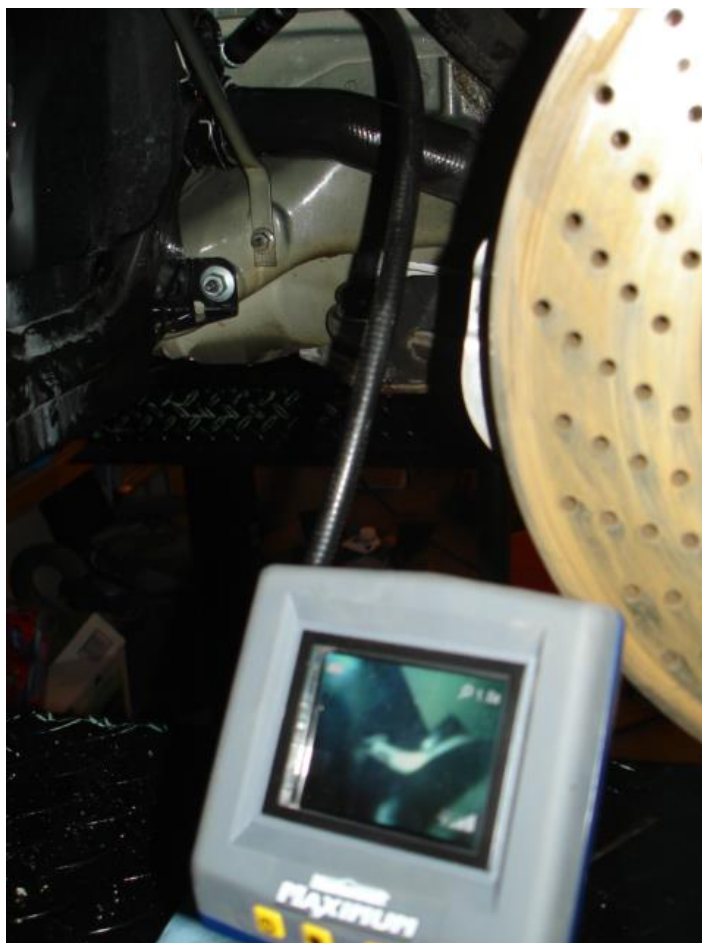


- To do so simply grab the end of the clip on the coupling and lift it so that it is unseated. Do so on both sides of the coupling (in cases where the other side is not accessible, you can grab the clip from another location to unseat and move it. Then the hose can be pulled away from the coolant pipe and drained.





- At the radiators I removed the top hose first, then the bottom hose, then reinstalled the bottom hose followed by the top hose. Ensure all hoses are clean before they are reinstalled. I reinstalled the hoses and then reattached the clips in their original position. In one case, to confirm that I had the clamp properly seated in the coupling on a side of the hose that I could not see, I used an inspection camera.



- However, in retrospect, I think it is possible to reinstall the clip, and then reinstall the hose. This would make a click letting you know that the hose is seated in the coupling. I'll try this next time. In either case, tug on the hose to ensure that they are secured.
- I cleaned up the splashes of coolant using shop towels....



- ...and compressed air.



- Because my jack was blocking the next coolant pipes to be disconnected, at this point I replaced the wheel-well liners and wheels so that I could move the jack.
- To replace the wheel-liners, I placed the liner under the fold of the fender-well...



- ...then slid the front-most part of the liner into the front valence and then seated the liner in position under the liner in the top of the wheel well. Replace the fastening screws (remember that the two Torx 27 are for the two screws at the valence).



- Then reinstall the wheels, and torque to 96 ftlb.



- Next I located the heating hoses on the underside of the car. Place catch container under the hoses, remove spring clips, and drain hoses.



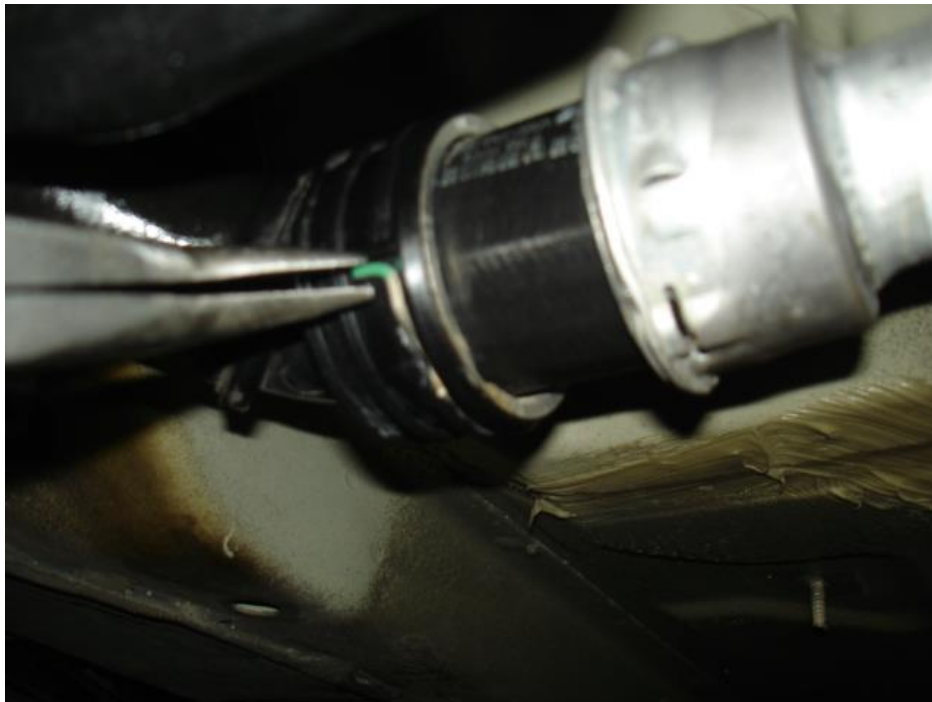
- Reattach the hoses and reinstall the spring clips.
- Next I disconnected the large coolant hose right next to the heater hoses. It has a Henn coupling.



- This was followed by the large coolant hose on the left side of the car. Follow the same procedure as for the others with Henn couplings.



- Next I moved to the connections of the large hoses at the front of the car.



- These were the most difficult ones to disconnect. They are attached to hard lines. On the right side, I removed the plastic bracket that holds the hard line in place...



- ...which then allowed me to raise the hard line out of its brackets...



- so that, in turn, I could pull the Henn coupling apart



- On the left side I also removed the plastic bracket that holds the hard line in place.



- However, the brackets on the rest of the hard line did not allow the hard line to be moved. It was still necessary to have removed this plastic bracket so that I could twist the hard line down at the Henn coupling. I removed the clip for the Henn coupling...



- ... and had to use some force to get the hose out of the coupling, but it did come apart enough to drain the coolant (It required both hands to keep these hoses apart, so I could not get a better picture than the one below).



- Once all of the hoses were reattached, I double-checked them to ensure that they were all connected.

- Next I poured the coolant I had collected into containers to measure how much I had removed.



- Not including that which had spilled on the floor, I had removed 20 litres of coolant.

CHAPTER 7: WATER PUMP AND GASKET REMOVAL

- I had seen several posts on forums (996 and 997) which indicated that the water pump can be changed without removing the catalytic converters and the engine carrier bracket. So, I attempted to do it this way. However, in my opinion the space with the engine carrier bracket only loosened was insufficient. I could not see how I was going to get a proper torque on the bolts that way and the correct torque on these bolts is crucial to prevent a leak. Consequently, the peripherals in a few of the pictures in this chapter may appear to be out of order. This is because I have organized the presentation in the order that I will do it the next time.
- So, begin by removing the catalytic converters. Remove the bolt on the clamp of the catalytic converter holder (13mm), and remove the clamp. Do the same for the other side.





- Each catalytic converter has two oxygen sensors. The wires for these sensors must be disconnected. They are located in the engine bay, as shown below.



- The wires are held in place with a number of clips. Remove the wires from the clips.



- Disconnect the oxygen sensor connectors from their flanges.



- For the black connector, disconnect it, then remove it from its plastic holder. To do the latter, twist the connector side to side in its holder and it will come out.



- Do the same for the other side.
- Next, remove the oxygen sensor wires from their clips on the engine carrier and take note of how each wire is routed. They are routed on different sides of the engine carrier. The blue wire routes on the front side of the engine carrier, and the black wire routes on rear side of the engine carrier
- Feed the oxygen sensor wires down from the engine bay and ensure that they, and the oxygen sensors, do not get damaged when removing the catalytic converter.



- I removed the oxygen sensor from the pipe section ahead of the catalytic converter (the one with the blue wire attached) because I thought I might need the clearance to get the catalytic converter out. In retrospect, I think there would be sufficient clearance to leave all of the oxygen sensors attached to catalytic converters. Next time I will try it that way. In case it does need removal, after having disconnected the wires in the engine bay (so that they can spin with the turning of the oxygen sensor), use a 22mm open ended wrench to remove the oxygen sensor.



- Next, loosen the two 13mm bolts on the clamping sleeve on the pipe behind the catalytic converter.



Slide the clamp to the exhaust side.



- Do the same for the other side.
- Start with the catalytic converter on the right side of the car. Now remove the lock nuts (10 mm) from the threaded flange joint to the exhaust manifold. Some of these bolts were corroded from heat exposure so I sprayed them with some penetrating oil.



- The pics below are of the left side because I had better pics of that side.



- Note the orientation of the gasket so that it will be replaced correctly. The beading faces the exhaust manifold.

- Now gently remove the catalytic converter from the car on the right side, ensuring not to hit the oxygen sensors and that the oxygen sensor wires do not get hung up on anything. Then do the same for the left side.



- Next, remove the two bolts (14mm ETorx) that hold the catalytic converter holder to the engine carrier.



- Remove the catalytic converter holder and set it aside.

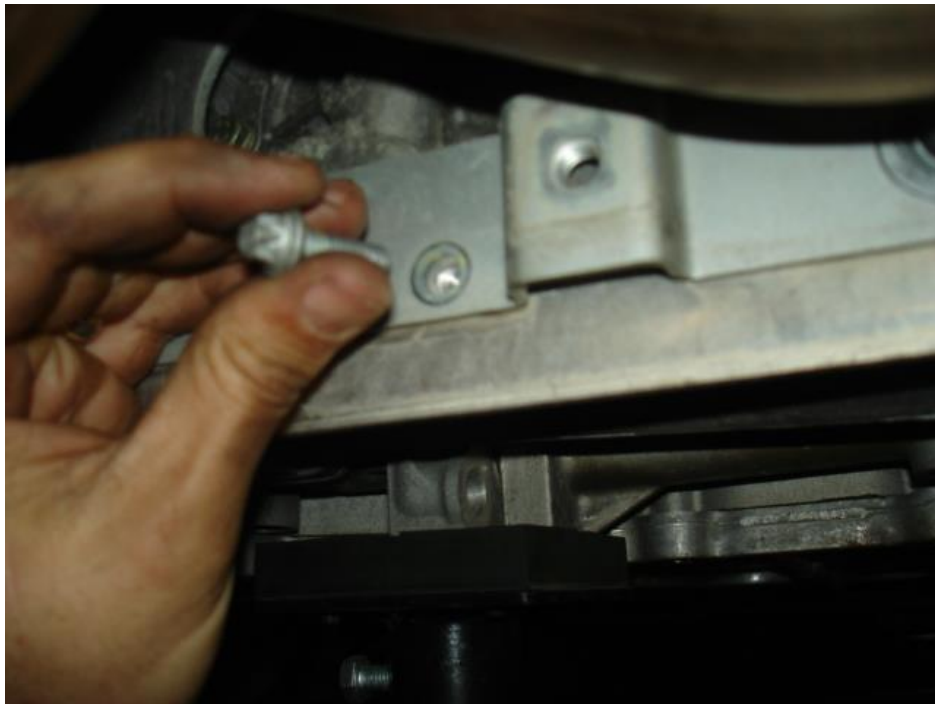


- Next support the engine in its installation position using a jack. This means to support the engine in its current, installed, position. Ensure to support the engine from the correct spot. Below are pics of the engine being supported from the correct point. Do NOT support the engine from the oil pan.

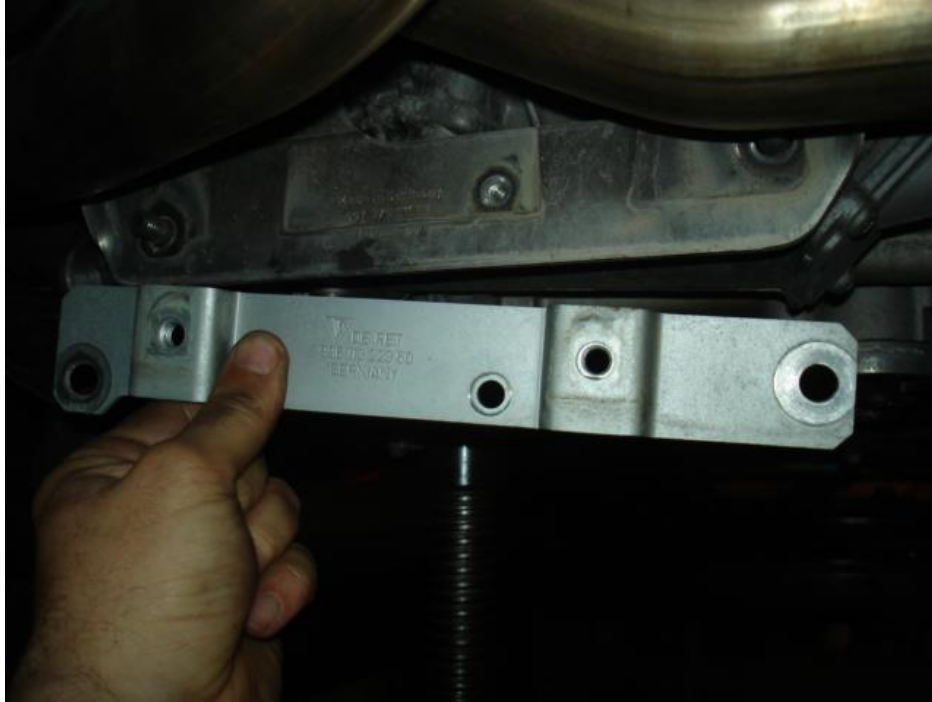




- Then remove the two M10 collar nuts (15mm) and one M6 screw (10mm ETorx) from the engine carrier.



- And remove the bracket.



- Next remove the remaining two M10 collar nuts (15 mm) on the engine carrier.



- Using an 18mm deep socket, unscrew the M12 collar nuts on the engine mounts.



- Then very carefully and slowly lower the engine until the carrier can clear the threaded bolts of the engine mounts. Then remove the engine carrier.



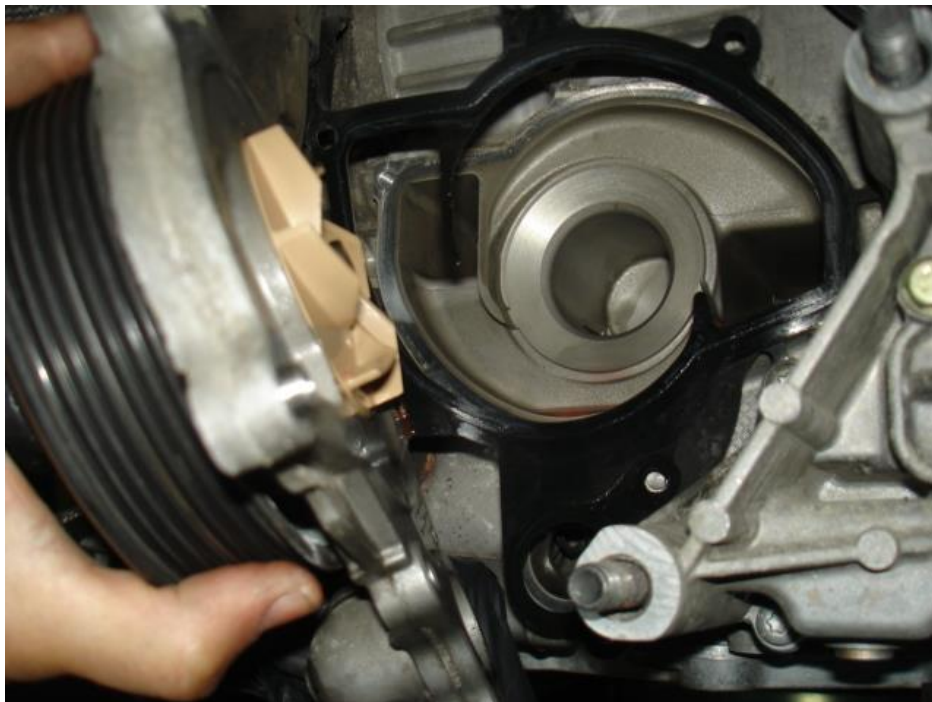
- The pictures below reflect how much the engine is lowered to allow removal of the engine carrier.



- And this is the clearance you now have to work with to remove the water pump....much better.



- Remove the 7 water pump bolts (5 are M6 x 25 and 2 are M6 x 30). As I remove each water pump bolt, I place it in its location in the new water pump so I would know where it belongs. The locations of the two M6 x 30mm bolts are circled in blue in the pic above.
- You can now remove the water pump from the engine.



- Inspect the condition of the water pump. If you're going to reuse the old pump, check for cracks in the impeller with a magnifying glass.
- Next remove the original water pump gasket. The water pump gasket is a combination seal and if it has not previously been separated you will need to cut the gasket at three connection points (circled in red in the pic below).



- Remove the gasket.



CHAPTER 8: INSTALLING NEW WATER PUMP AND NEW GASKET

- Using acetone, clean the sealing surface of the crank case.





- Apply some degreaser to a clean shop towel to degrease the sealing surface.



- Transfer the bolts from their locations in the new water pump to the old water pump. This will facilitate ensuring that the bolts are reinstalled in their correct location on the new water pump. I also replaced the bolts with new ones.



- Clean the sealing surface on the new water pump in the same way that the sealing surface on the crankcase was cleaned.



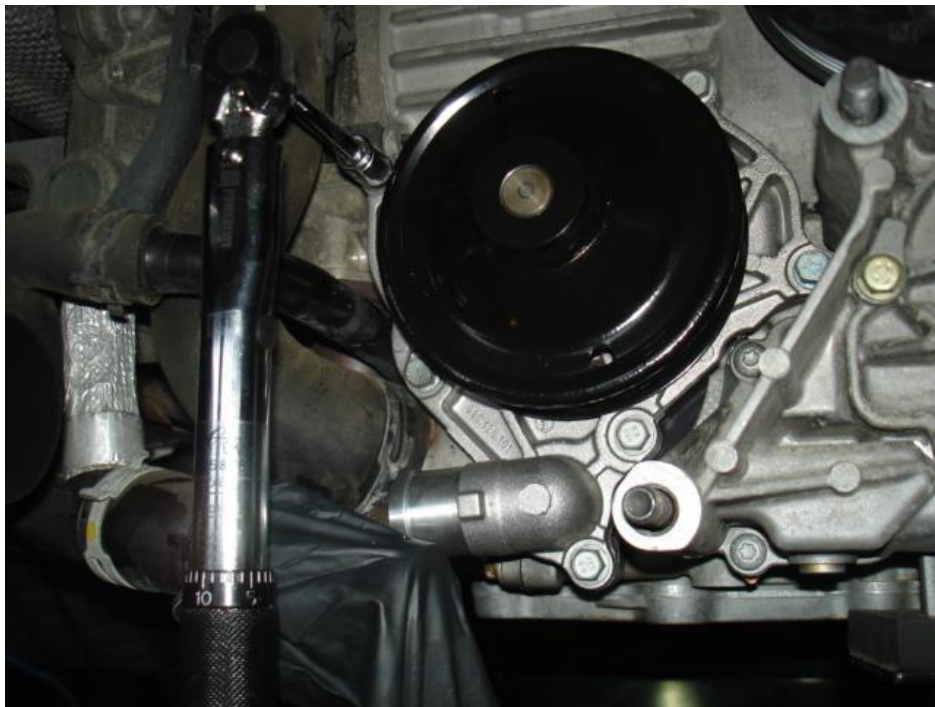
- Next fit the new gasket to the new water pump, and cut the gasket at the 3 connecting points.



- Note in the picture above that there are two dowel sleeves on the water pump that hold the gasket on and also situate the water pump in the correct position on the crankcase (these are the two locations on the pump that get the 5mm longer bolts).
- Place the water pump with gasket on the crankcase using the dowel sleeves to seat the water pump correctly.
- Then replace the water pump bolts. I put some Optimoly HT on these bolts.



- Tighten all 7 screws in a diagonally opposite sequence (like you would when installing a wheel) to 7.5 ftlb (90 inch pounds).



- Next remove the glove from the water pump inlet hose. The glove had collected quite a few drips of coolant.



- Reinstall the water pump inlet hose and reinstall the spring clip.



- Next reinstall the engine carrier bracket. Begin by placing it on the threaded bolts of the engine mounts.



- Place the engine carrier bracket on the threaded mounting studs on the crankcase.



- Next, using your jack raise the engine to the installation position.



- Screw in the two M12 collar nuts on the engine mounts (but do not tighten them yet).



- Reinstall the small engine bracket on the engine carrier mounting studs.
- I put some Optimoly TA on the 4 larger mounting studs and then installed the 4 M10 collar nuts (15mm). Torque these nuts to 48 ftlb.



- I put some Optimoly HT on the M6 Torx screw and torqued it to 7.5 ftlb.



- Tighten the M12 collar nuts on the engine mounts to 63 ftlb.



- Then gently lower and remove the jack.
- Next install the catalytic converter holder using two M8 ETorx screws (14mm). Torque them to 17 ftlb.



- Next, reinstall the catalytic converters. Before installation, ensure that the gaskets for the threaded flange joint to the exhaust manifold are oriented correctly. Mine did not fall off so I knew they were correct.
- Install the left side first.



- To install the left side catalytic converter, install the threaded flange end first, then slide the clamping sleeve over the exhaust pipe to hold the catalytic converter in place.



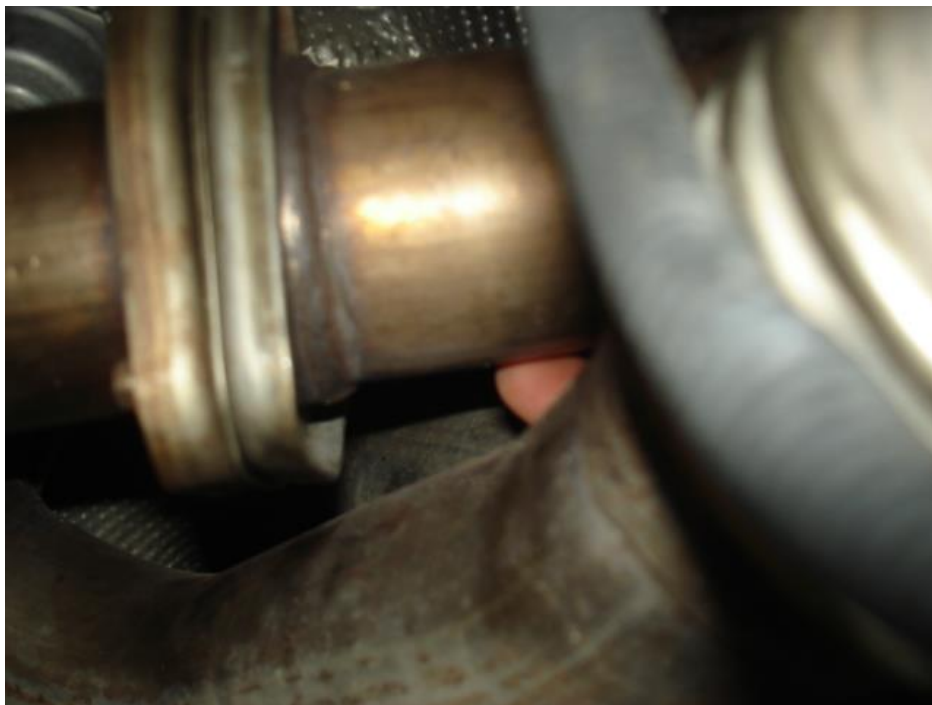
- I placed some Optimoly TA on the threaded studs of the flange joint to the exhaust manifold.



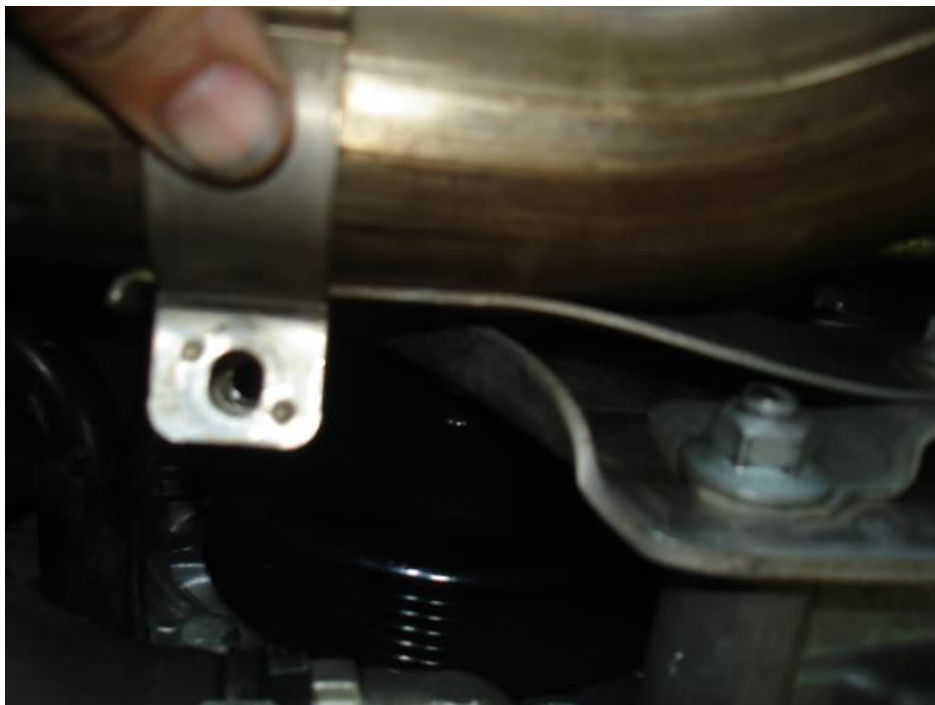
- I also replaced the M8 lock nuts (10 mm) with new ones.



- Next install the right side catalytic converter. To install this side I first put the clamping sleeve on to hold the catalytic converter in position, and then I worked it onto the threaded flange joint to the exhaust manifold.



- Apply Optimoly TA to the threaded flange joint to the exhaust manifold and install new lock nuts.
- Next, install both clamps on the catalytic converter holder.



- I put some Optimoly TA on these bolts prior to installation.
- If you removed the oxygen sensors, reinstall them. I put some optimoly TA on the threads of the oxygen sensors.



- Tighten the oxygen sensors so they are snug (22mm).



- Now tighten down all of the connections for the catalytic converters. They are all torqued to 17 ftlb. Begin with the lock nuts on the threaded flange joint to the exhaust manifold (10 mm). I had to use a few different length socket extensions to accommodate the end of my torque wrench.



- Then torque the nuts on the clamping sleeve (13mm)



- Now torque the 13mm bolt on the clamp on each end of the catalytic converter holder (I didn't get a pic of this).
- Next route the oxygen sensor wires in their correct orientation back into the engine compartment.



- The pic below shows how the black wire routes aft of the engine carrier and the blue wire routes fore of the engine carrier, and both have clips that hold them in place on the engine carrier.



- Next, reconnect the connectors to their flanges and place the black connector back into its plastic holder.



- Then place the wires into their plastic holders. These plastic holders are not very strong so be gentle with them.



- Do the same on the other side.





CHAPTER 9: REFILLING COOLANT

- I used the UView Airlift 550000 to refill the coolant. Since I drained about 20 litres of coolant mix from the car, I prepared about 22 litres of coolant mix for the refill. It is necessary to have about 2 more litres than you need to prevent air from entering the line of the Airlift. It is recommended to have the coolant at about the same height as the coolant tank, so I used a lift table.



- The coolant comes in 1 gallon jugs (3.78L), and the distilled water comes in 4L containers. To get a 50/50 mix, I first marked the actual level of the coolant in each container.



- I bought a new 5 gallon pail at Home Depot to use for this job. Before putting coolant in it, I cleaned out any dust with distilled water and a microfiber cloth.



- I then put the first container of coolant in the pail.



- Next, I filled that container with distilled water to the same level the coolant had been.



- Then I added the water to the pail.
- I repeated this process for the next jug of coolant.
- At that point there were 4 gallons of coolant mix in a 5 gallon pail. I'm sure there is an easier way to do this, but this is what I came up with off the cuff. Because the pail would

hold only half of the next bottle, I measured the height that the coolant had been in one of the empty coolant jugs, and divided it in half to get the level of a 50/50 mix. Of course, this is 2 quarts (4 quarts in a gallon; Canada is metric and that's my excuse 😊).





- Then I filled the jug to the 50% mark with coolant. Following that, I filled it to the full mark with distilled water. I then poured the 50/50 mix into the pail. I then poured the remaining coolant (which should be half a jug) into the jug with the 50/50 marker to make sure it came to the 50% mark, and added distilled water to the full mark. This way I had mix ready to add to the pail when the level of mix in the pail became low.
- Next, place the correct sized adapter for the coolant expansion tank onto the rubber end of the Airlift. In this case, the correct adapter was the smallest round one.



- Apply some lubricant (i.e., coolant mix) to the rubber end of the Airlift to help make a good seal.
- Place the Airlift into the filler neck of the coolant expansion tank and tighten it by turning the hand wheel clockwise.



- Then attach the venturi tube to the Airlift. I left the ball valve on the Airlift in the closed position.



- Attach a compressed air line to the venturi tube. Note that the air line should have a desiccant drier so that there is no moisture in the air. Also, you need an air compressor that makes at least 90 psi with at least a 5 gallon tank. Mine has a 20 gallon tank and it worked fine.
- The Airlift instructions indicate that it may be necessary to clamp the coolant reservoir overflow hose. I did not do so and had no problem.
- I placed the plastic hose of the venturi tube into an empty coolant bottle in case any old coolant came out, but none did.



- Next, pull a vacuum on the system by opening the ball valve on the Airlift. It is normal for the rubber coolant hoses to collapse, as shown below.



- When the vacuum needle reaches about 25 inHg (which takes less than one minute; mine maxed out at 24 inHg), close the ball valve and watch the vacuum level for about 30 seconds to ensure that the system holds vacuum.



- If the system does not hold vacuum there is a leak. In this case, tighten all connections/fix the leak such that the vacuum can be maintained.
- Next disconnect the air supply and venturi assembly from the filler neck adapter of the Airlift.
- Attach the refill hose with the ball valve on the refill tube in the closed position.
- The refill hose needs to be primed to remove air from the hose (so that the air is not introduced into the cooling system). I obtained the following method for purging air from the refill line from a January 2010 article in *Motorcycle Consumer News* by Steve Larson entitled “uView 550000 Airlift Cooling System leak Checker and Airlock Purge Tool Kit,” pp. 28-28. I used this method but noticed that my vacuum did not go quite as high afterward (maybe 22 inHg). Next time I will try simply submerging the line in the 5 gallon pail of coolant and see if I can get all of the air out of the line that way. Anyway, here’s the method I used from the article.
- Slowly open the ball valve on the Airlift and gently crack open the valve on the refill tube until coolant has filled the entire tube.
- Then close both ball valves.
- Disconnect the coolant-filled refill tube from the Airlift.



- Reinstall the venturi and pull a vacuum on the cooling system again.
- Then remove the air line and venturi tube and reinstall the coolant-filled refill tube.
- Next open both ball valves to begin filling the system with coolant.



- Ensure the end of the refill hose remains completely submerged during the refill. I added some coolant mix to the pail to ensure there was enough.



- The needle on the vacuum gauge drops because the vacuum decreases as the coolant mix fills the system. When the needle on the gauge reaches zero, the system is full.
- Close both ball valves, place a shop towel under the connections to collect coolant any dribbles of coolant, disconnect the refill line from the Airlift and dump the coolant in the line back into the pail.



- The resulting fill was at the perfect level. If necessary, top up the coolant level in the expansion reservoir to the appropriate level.



- Loosen the Airlift by turning the hand wheel counter-clockwise, and remove the Airlift from the coolant reservoir filler neck.
- Separate the adapter from the Airlift tool, open the both ball valves, and try to get as much coolant mix as possible out of the tool and lines.



- Put away the Airlift tool.
- If you pinched off the overflow tube of the coolant fluid reservoir, remove the pincher.
- Install the expansion tank cap.
- Leave the steel chamber on the bleeder valve in its vertical position for the time being.
- Check the water pump and all coolant connections for signs of leaking. Incidentally, the reason I had not yet installed the drive belt and air cleaner housing at this point was so that I could check the water pump for signs of leakage from the top in addition to from underneath.

CHAPTER 10: INSTALL THE DRIVE BELT

- Orient the drive belt in the engine compartment so that it will turn in the same direction in which it was turning before it was removed.



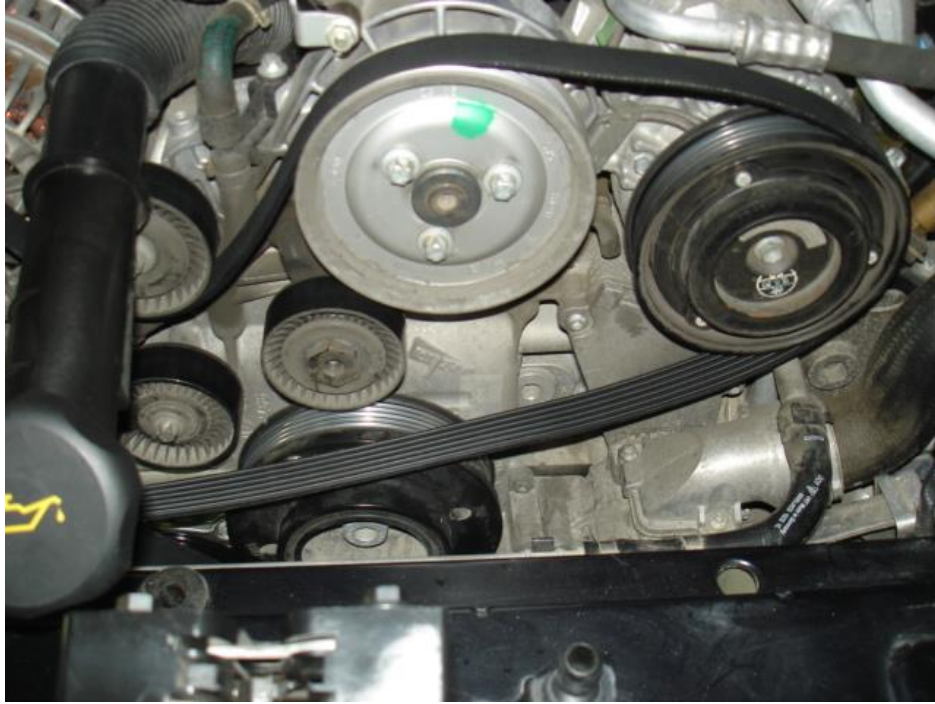
- Fish the belt between the water pump pulley and the engine carrier bracket and place it around the water pump pulley.



- Then hang it over the alternator pulley (upper left in the pic below).



- Next route it under the top idler pulley and over the pulley on the power steering pump, and around the air conditioner compressor pulley.



- Then route the belt down around the crankshaft pulley...



- ...and loop it around the tensioner pulley.



- Place a 24mm wrench/socket on the tensioner bolt, turn the bolt clockwise, slip the belt over the idler pulley beside the tensioner, and then release pressure on the tensioner bolt.



- Check the belt carefully to ensure that it is properly seated on all of the pulleys and that it is properly routed.
- Also ensure that nothing is in danger of being caught in the belt.

CHAPTER 11: INSTALL THE AIR CLEANER HOUSING

- Installation of the air cleaner housing is simply the reverse of its removal.
- Begin by opening the omega clips on the housing (if you closed them after removal of the housing (I like to do so to protect them from breaking)).





- Next, gently rest the air cleaner housing in the engine compartment.



- Connect the vacuum line.



- Line up the air cleaner housing locating pegs with the locating holes (make sure the rubber grommets are present), and gently lower the housing over the fastening lug.



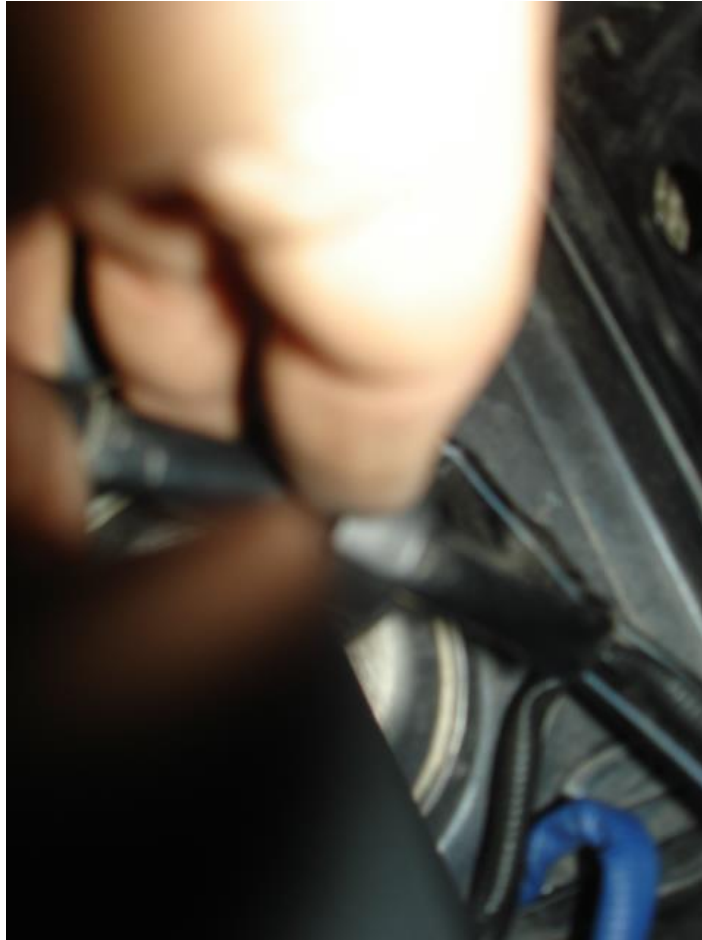
- Remove the latex glove from the throttle body...



- ...and place the rubber moulding on the throttle body. Tighten the hose clamp on the intake for the MAF.



- Route the wire for the electric switch-over valve (3.8L engine) into the omega clip on the right side of the air cleaner housing (sorry for the blurry pic.).



- Connect the cable from the electric switch-over valve by simply pressing it onto its flange.



- Connect the MAF to the housing. It clicks when it's in place.



- Place the wire for the MAF into its omega clip.



- Place the hose that runs along on the back side of the intake portion of the air cleaner housing into its omega clip.



- Press the oil filler neck into place on the air cleaner housing.



CHAPTER 12: INSTALL THE UNDERBELLY PANS

- Before installing the belly pans, start the car (leave the steel chamber on the bleeder valve in the vertical position) and check for coolant leaks. If there are no coolant leaks proceed to install the belly pans.
- Installation of the belly pans is the reverse of their removal. Surprisingly, I found the belly pans easier to install than to remove. Perhaps this was simply because I knew how they all fit together.
- I took the opportunity to clean off the pans that I'd not previously had off.



- Get the ratchet, Torx 25 socket, and 10mm socket.
- Begin with the front-most pan.
- I gently put pressure on it from the sides so that it would slide under the front valence.



- Also ensure that it has slid over the clip in the middle.

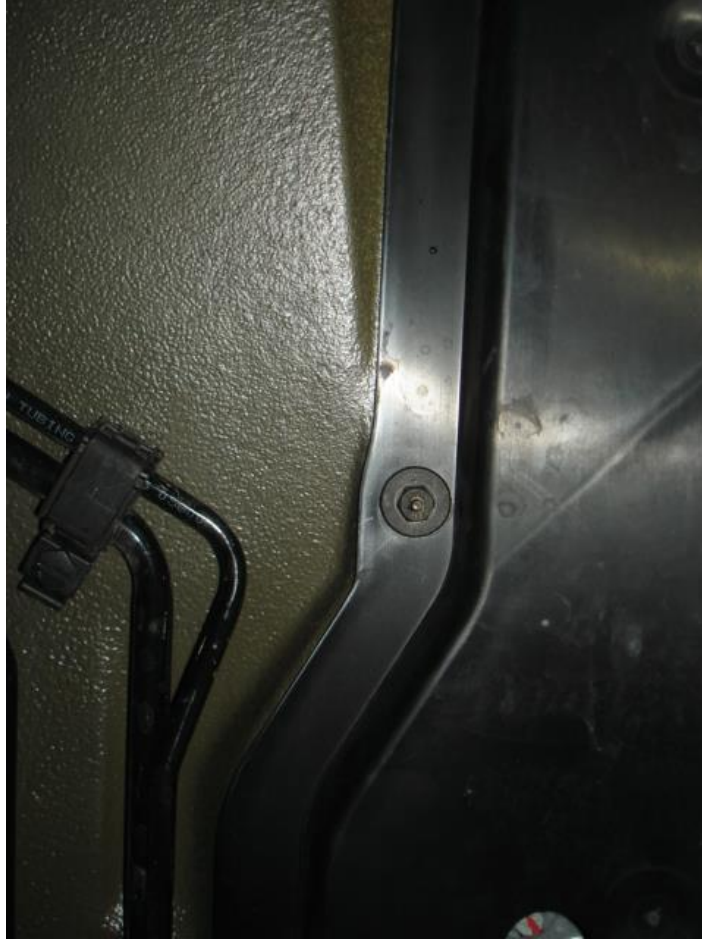


- Then seat the pan over the two threaded studs at the back of the pan.
- Do not tighten any of the fasteners until all of the pans are installed. This will provide some flexibility in the pans if they need to be adjusted. Also, fasteners leave off fasteners that are close to the back area of each pan in case the fastener also holds up the next pan.

- For the front-most pan, there are 11 screws that hold it on (in addition to the two nuts on the studs at the back, but they get installed after the middle panel is in place).
- Next, install the middle panel. Place it in the correct overlapping orientation with the front panel....



- ...and then install a nut on the third threaded stud from the back on each side of the pan.



- Next install the side pans. Tuck the pan around the jack point and slide it into the next pan at the front by the jack plate.



- Then simply push the panel into place on the centre side. There is one screw at the front of each of these panels, and the rest are nuts. The procedure is the same for both side pans.
- In some cases the speed nuts that receive the screws had moved out of alignment. To put them back into alignment I used a pic tool.



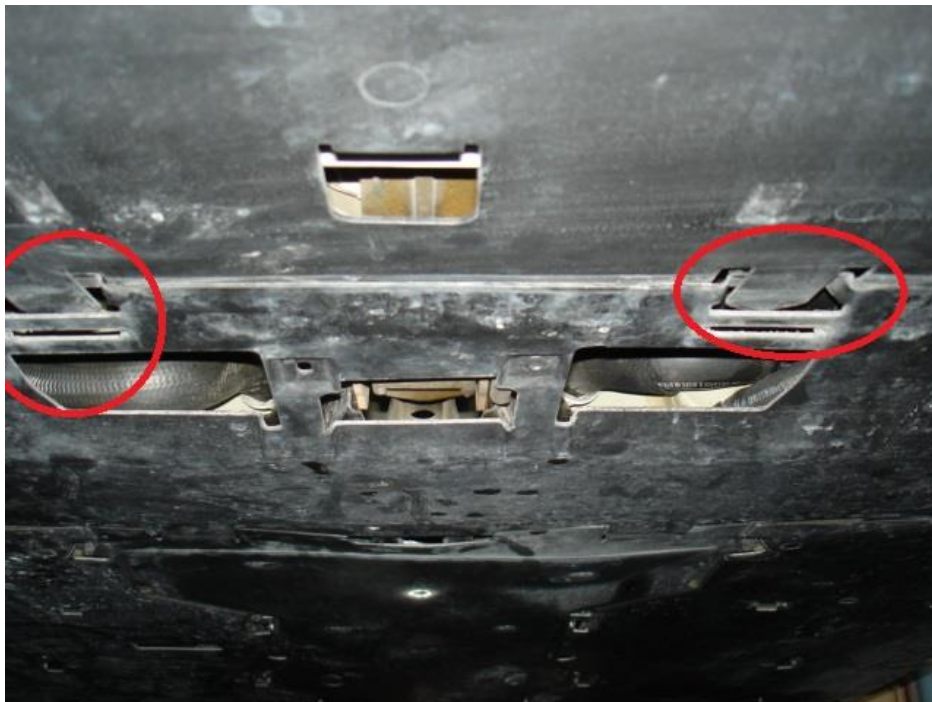
- Next is the 5th panel. Line up the flaps at the front of the pan so that the overlap is correct....



- ...and then lift the back of the pan and place it over the threaded mounting studs paying special attention to getting the pan over the two angled studs.



- This pan is held on by 4 nuts and three screws.
- Install the final pan. Slide it into the previous pan at the front...



- ...while at the same time ensuring that it hooks over the two bars at the back.



- Then tighten down all of the fasteners. Check to make sure that they have all been installed.

CHAPTER 13: WRAP-UP

- Check the coolant level again in the expansion tank. If it has gone down, top it up (assuming the engine has cooled off from the start-up prior to installing the belly pans)
- Start the car and check again for any signs of leaks.
- Close the steel chamber on the bleeder valve.
- Go for a spin. I left the heater on high for the first little bit of the drive.
- Keep an extra close eye on the gauges, especially the engine temperature.
- Now for the fun part: Upon return, with the engine up to temperature, rev the engine from idle to just over 6,000 rpm a few times to ventilate the system.
- Check the coolant level on the expansion tank again. If the level is low, top it up once the engine has cooled.
- Keep a close eye on the gauges (this should always be done) and the coolant level for the next little while and top-up as necessary.