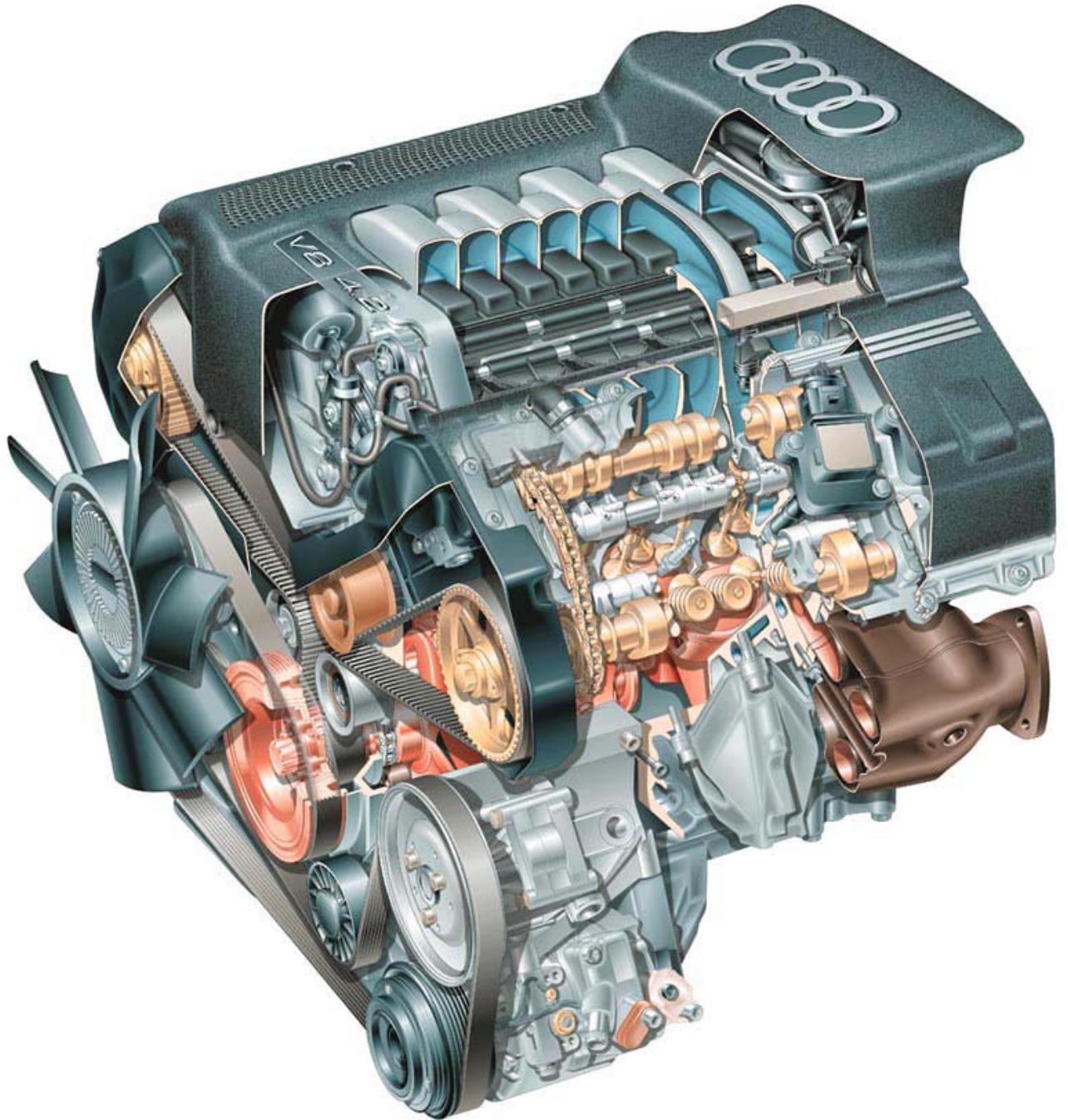


1997 AUDI A8 4.2L V8

TIMING BELT REPLACEMENT PROCEDURE



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A8 TIMING BELT REPLACEMENT PROCEDURE

Parts (for a 1997 US Spec A8 4.2 Quattro):

077109119E	Timing Belt	1 ea.
077109246B	Timing Belt Damper	1 ea.
N 905 428 01	Harmonic Balancer Bolt	1 ea.
077109244A	Idler pulley	2 ea.
077109243A	Tensioner pulley	1 ea.
077903137Q	Serpentine belt	1 ea.
078121113F	Thermostat	1 ea.
077121004H	Water Pump	1 ea.
078121043A	Water pump gasket	1 ea.
G001200 (Red)	Pentosin coolant	4-5 liters
4D0807300	Body Pin	1 ea.
026103085D	Camshaft cover oil seals	2 ea.!
054115147B	Front main crank seal	1 ea. OPTIONAL!

Various silicone sealants and Loctite products.

Tools: (All tools are metric unless otherwise specified.)

Set of open-end wrenches (10mm, 12mm, and 13mm are most commonly used)

Set of socket-drive allen wrenches (4mm, 5mm, and 6mm are most commonly used)

Set of deep-well 3/8" drive socket wrenches (10mm, 12mm, and 13mm are most commonly used)

Set of normal depth 3/8" drive socket wrenches (10mm, 12mm, and 13mm are most commonly used)

Set of normal depth 1/2" drive socket wrenches (10mm, 12mm, and 13mm are most commonly used)

Set of deep-well 3/8" drive socket wrenches (10mm, 12mm, and 13mm are most commonly used)

Set of socket drive Torx bits, #30 most commonly used

Screwdrivers, both slotted and Phillips drive, various sizes and lengths

3/8" and 1/2" drive socket wrenches, fine ratchet on the 3/8" drive helps a lot

SPECIAL TOOLS:

AS4394 Camshaft sprocket holding tool

3197 Harmonic balancer pulley holder

3341 Camshaft Locating fixtures

2079 Harmonic balancer pulley wrench

NOMENCLATURE: When a position is referred to "Right Side", this means the passenger side of the vehicle. "Left side" is therefore the driver's side of the vehicle (Left-hand drive models!!)

Procedure:

NOTE: Whenever a part is removed from the engine, all corresponding attachment hardware should be kept with it for easy reinstallation. Clean all parts before installing back onto the engine.

1. Remove the air intake breather tubes (2) from the front of the engine compartment to the air box. The cover at the front of the engine is clipped in place- simply lift it straight up and it will come free.



2. Remove the air duct that runs from the air box to the throttle body. Loosen the two hose clamps (one on each end) and carefully loosen the rubber from the attach points.



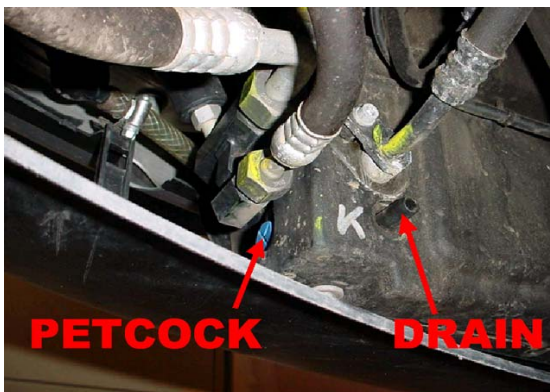
3. Remove the three plastic engine beauty covers. Start with the two outer pieces (held in place with two allen head bolts each). Then remove the center cover (held in place by four allen head bolts).

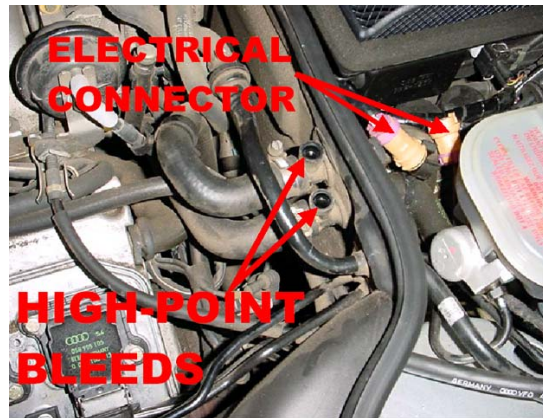
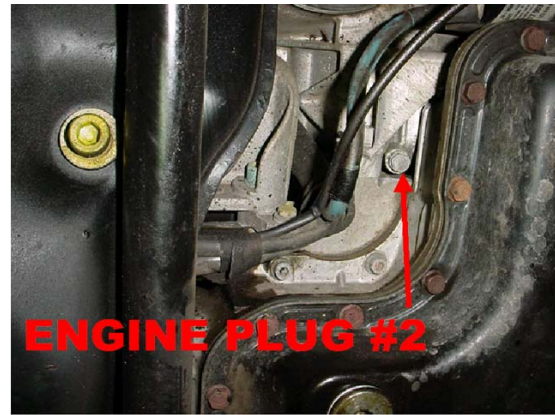
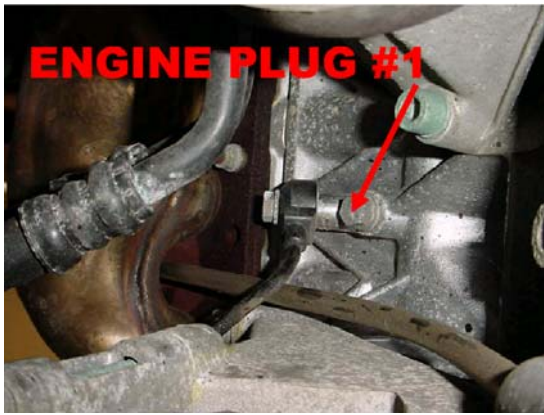


After removal of the covers, you should see this (replace the oil filler cap so junk doesn't fall in!):

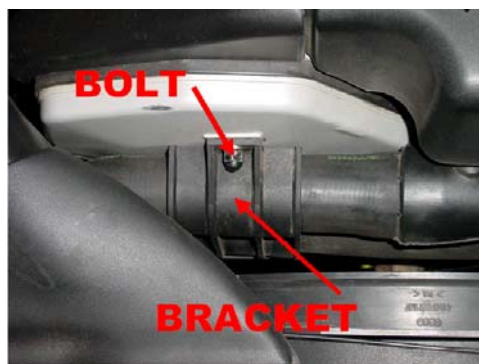


4. Remove the noise insulation panel under the engine (large plastic cover). Then drain the radiator by opening the overflow reservoir and:
 - a. Place a bucket under the car that can hold 3 gallons
 - b. Connect a short length of tubing to the radiator drain (see photo)
 - c. Remove the oval-shaped bumper cover from the driver's side front bumper (pry out with small flat-blade screwdriver- the slot for the screwdriver is towards the center of the car)
 - d. Open the two high-point bleed ports at the driver's side rear of the engine compartment.
 - e. Disconnect the auxiliary water circulation pump electrical connector.
 - f. Open the blue stopcock several turns and drain the radiator. If you are changing the radiator fluid at the same time, then remove the two lower (engine mounted) drain plugs.
 - g. Use low-pressure air to blow out the radiator through the overflow canister's fill port.

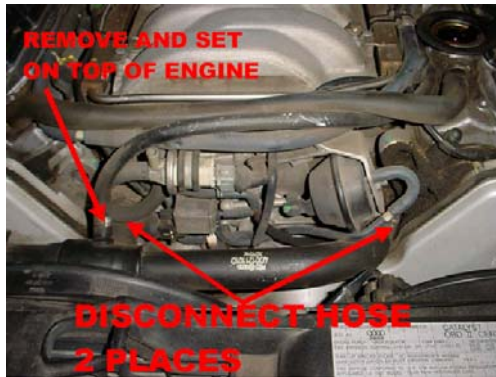




5. Once the radiator has been drained, remove the two water hoses from the front of the engine.
 - a. Remove the plastic bracket attached to the passenger side timing belt cover that holds the two hoses in place.



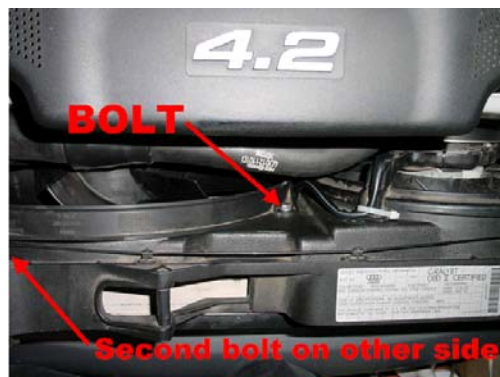
- b. On the upper hose, loosen the hose clamps and **CAREFULLY** break the hose free from its mounting points. The upper hose is connected to the engine in two places and the radiator in one place. Completely remove this hose.



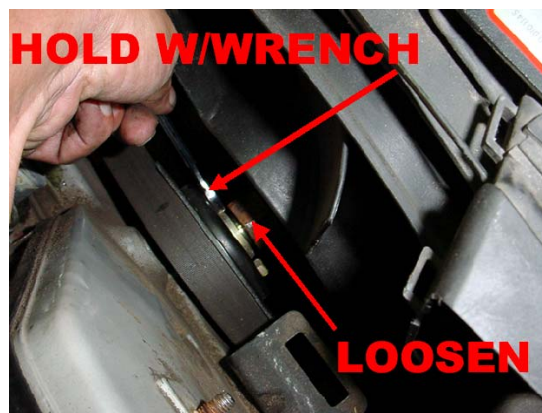
- c. After the removal of the upper hose, a second hose becomes visible. Loosen the hose clamp on this hose where it attaches to the engine and carefully remove from the engine. Simply swing this hose out of the way to the passenger side of the engine- no need to disconnect at the other end.

6. Remove the two cooling fans:

- a. Remove the two bolts holding the passenger side fan shroud onto the radiator.



- b. Using a 10mm wrench on one of the three fan pulley bolts to hold the fan still, loosen the large nut holding the fan onto the pulley (big Crescent works great). NOTE- THIS IS LEFT-HAND THREADED- DO NOT TURN TO THE LEFT TO LOOSEN!!!!! DAMAGE MAY RESULT!

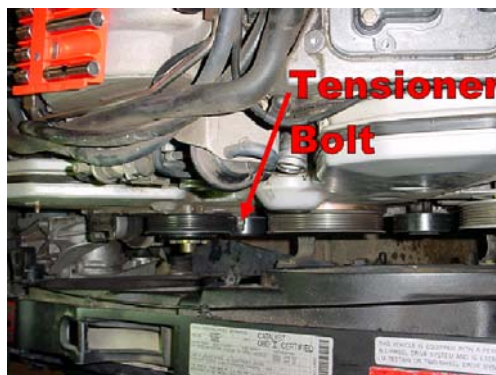


- c. Once completely loosened, remove the fan and shroud as an assembly by lifting straight up. (The lower portion of the shroud is held in place by clips that are disengaged by lifting the shroud straight up.)
- d. The electric fan removal is a little trickier. First, remove the body pin holding the fan in place- it is located on the fan shroud towards the center of the engine and lower (it would appear at 8:00 if you look at the fan from the front of the car). Use a long flat-blade screwdriver to break the pin- there is no way to remove without breaking it. See photo-



Once the pin has been removed, the electric fan and shroud can be removed as a single unit by carefully lifting up on the small tab located at the 3:00 position (viewed from front of car) on the fan shroud and rotating the entire assembly clockwise (viewed from front of car- the top of the fan shroud moves towards the driver's side of the car) approximately 5 degrees. Then the assembly can be pulled out of the radiator shroud towards the back of the engine. Several zip-tie electrical cable tie downs must be removed in order to set the fan assembly off to the driver's side of the engine compartment. These are reusable, and can be loosened by pressing down on a small tab while pushing on the end of the tie.

7. Using a permanent marker, mark the serpentine belt's direction of rotation (I use clockwise for consistency) so that it can be reinstalled in the same orientation. Remove the serpentine belt by pulling up on the tensioner stud (counter clockwise rotation viewed from the front of the engine) using a 13mm deep socket and 3/8" drive, with the drive handle towards the center of the engine. By pulling up on the tensioner, it should loosen the belt, and you should be able to easily remove the belt from the myriad pulleys it involves. In the photo below, the serpentine belt has been removed in order to see the tensioner bolt.



8. Remove the fan pulley from the front of the passenger side timing belt cover by removing the three bolts holding it to the bearing assembly.

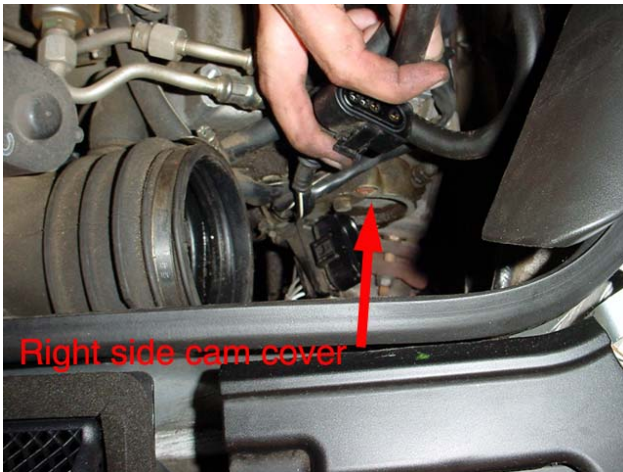


9. Remove the driver's side timing belt cover by removing the two large hex-head shoulder nuts from the face of the cover. You may need to gently tap the cover with a rubber mallet to loosen it for removal.
10. Using special tools 3197 and 2079, loosen (do NOT remove yet) the large bolt at the center of the harmonic balancer. The engine must be rotated such that the holding tool engages the harmonic balancer AND fits in the grooves in the passenger side timing belt cover casting (see the photo below). Use a 1/2" drive breaker bar with the special tool to loosen this VERY tight bolt. Loosen approximately 1 turn until it loosens.



11. Remove the left and right rear cam covers- located at the rear of each cylinder head.
 - a. Remove the driver's side camshaft position sensor cover using a 6mm hex wrench. An electrical connector bracket is removed with the assembly.
 - b. Remove the position sensor (1 bolt in center). Under the position sensor is another cover that needs to be removed- remove that cover too (2 bolts on outside radius).
 - c. Remove the passenger side camshaft cover (there are two on the passenger side- the one you need to remove is the outboard/lower one).

- d. Using WD-40 as a solvent, thoroughly clean the cam covers by removing the flat o-ring seals and removing all contamination and varnish from the face and groove of the cover. A brass brush may be needed to remove the varnish. Replace the seals with new 026103085D seals and place the covers in a clean bag.
- e. Using WD-40 on a rag, clean the face of the heads where the cam covers mate. Remove all varnish/contamination from the flat mating surfaces. Inspect with a mirror to be sure the area is VERY clean. (This is where almost all A8s leak oil- it is very important to clean these surfaces and install new seals to prevent/stop oil leaks.)



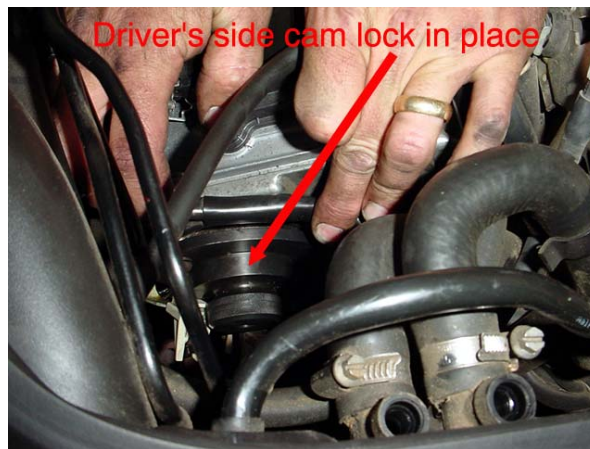
12. Rotate engine to 0° Top Dead Center (TDC) using special tool 3197.

13. Install the two cam holding fixtures (3341) on the back side of the engine. If they don't fit, rotate engine one revolution back to TDC and try to reinstall the 3341s. The engine crankshaft may need to be jiggled slightly for the tools to engage, but NOT MUCH. NOTE- The deeper of the two 3341 holding fixtures goes on the driver's side camshaft, the shallower one on the passenger side.

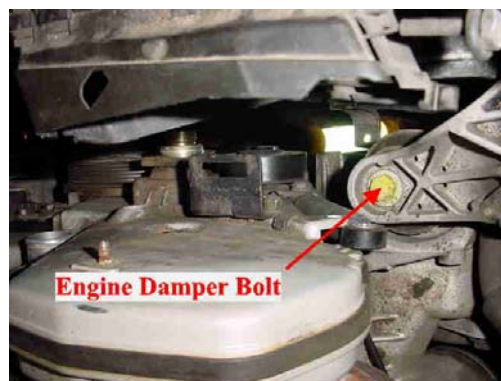


WARNING

Make SURE BOTH cam tools are both fully engaged and held in place with at least two bolts apiece before proceeding!!!



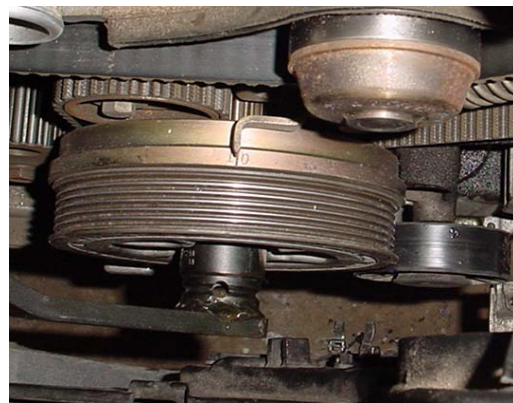
14. Remove the bolt holding the front engine damper (torque damper) to the right front timing belt cover.



15. Remove the 5 bolts and one flanged nut holding the right side timing belt cover onto the engine. **MAKE SURE TO NOTE WHERE THE LONG AND SHORT BOLTS GO.** Two of the bolts can only be accessed by rotating the serpentine belt tensioner up out of the way. (This is where a friend comes in handy.) Once the 5 bolts have been removed, remove the TB cover. This may take a few taps with a rubber mallet or dead-blow hammer to loosen.

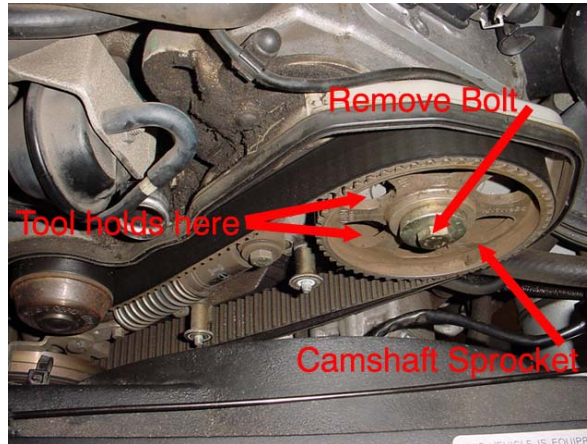


16. This is now what you should see!!



17. Remove the center bolt and the 4 smaller bolts holding the harmonic balancer on and remove the harmonic balancer.

18. Using special tool AS4394 Camshaft sprocket holding tool to prevent the camshaft sprockets from trying to turn (do NOT rely on the camshaft locating tools to hold the engine!!), remove the two bolts from the camshaft sprockets.

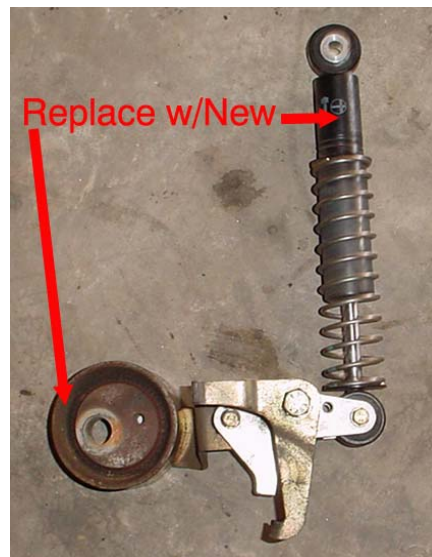
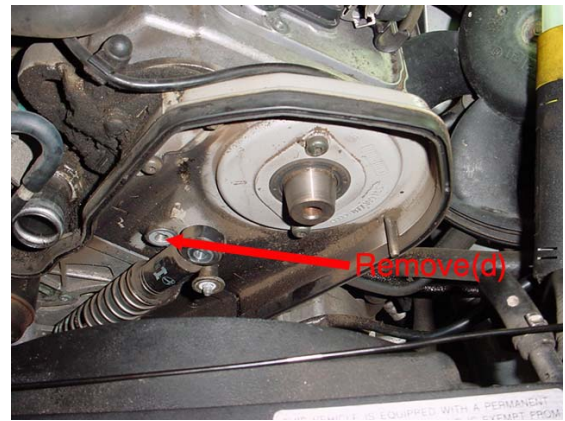
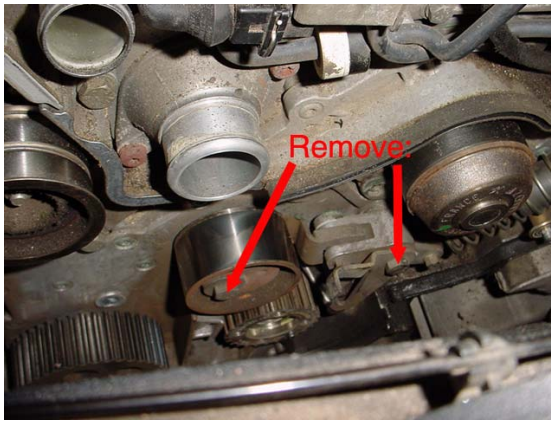


19. Using a plastic dead-blow mallet, tap the cam sprockets off of their tapered shafts. This will also loosen the timing belt. NOTE THAT THERE ARE NO LOCATING KEYS ON THE SHAFT/SPROCKET- SIMPLY A TAPERED FIT!! After the sprockets are removed, this is what you will see:

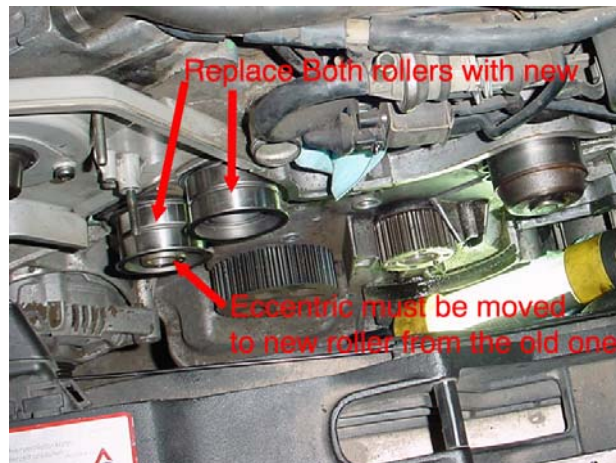


20. Remove the old timing belt from the rest of the sprockets and discard.

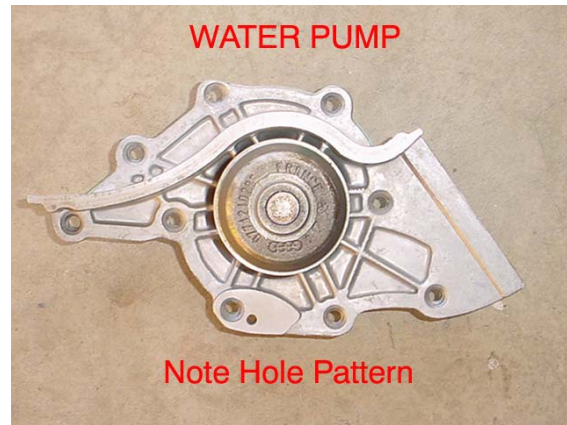
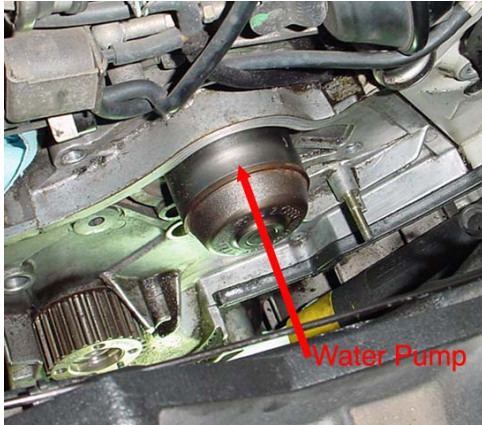
21. Remove the timing belt tensioner/pulley assembly. Replace the damper (077109246B, Timing Belt Damper) and tensioner pulley (077109243A, Tensioner pulley). Do not re-install onto engine yet.



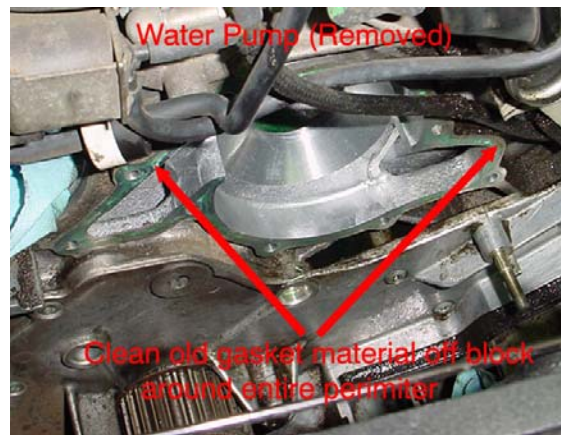
22. Remove and replace both idler pulleys (077109244A, Idler pulley, 2 places). The center eccentric from the lower idler pulley must be removed from the old pulley and installed into the new one. Torque the upper idler pulley center nut to **18 lb-ft**. **DO NOT TIGHTEN THE NUT ON THE LOWER PULLEY WITH THE ECCENTRIC YET!!**



23. Remove the old water pump. There are 9 Torx drive bolts holding it in. You may need to tap the water pump with a mallet/piece of wood to dislodge it from the block.



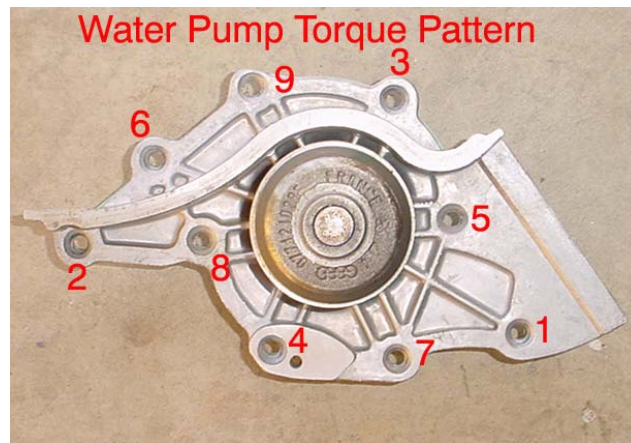
24. Remove ALL of the old water pump gasket material form the block using WD-40 and a brass brush. Clean the WD-40 off the gasket surface using IPA (rubbing alcohol) once all the gasket material has been removed.



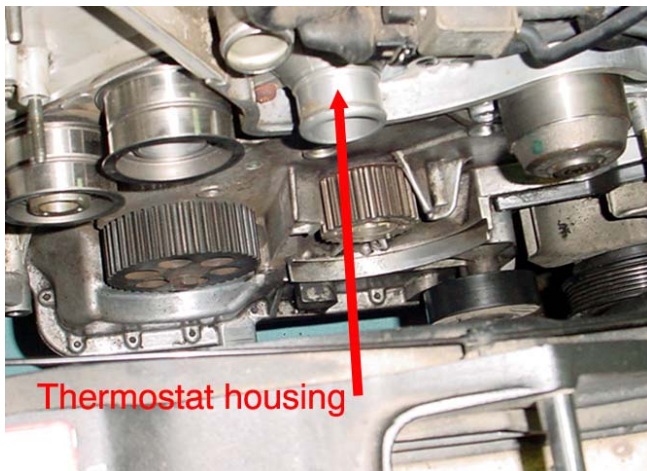
25. Get new water pump for installation (077121004H, Water Pump). There should be a gasket already installed on the pump, if not install gasket (078121043A, Water pump gasket) to pump using gasket sealer.



26. Install new water pump onto the block. Thread all 9 bolts into the water pump FINGER TIGHT. Using a torque wrench, torque all 9 bolts to **20 lb-in** USING THE TORQUE PATTERN INDICATED BELOW!) once all 9 bolts have been torqued to 20 lb-in, torque them to **89 lb-in** using the SAME TORQUE PATTERN!!

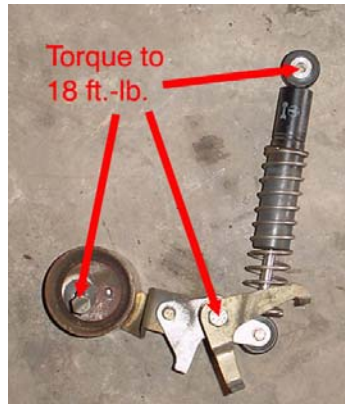


27. Remove the thermostat housing (2 bolts) and the old thermostat. Note the orientation of the old thermostat (vent valve facing UP). Clean both thermostat housing and block surfaces and remove all traces of old gasket material. Install the new thermostat vent valve facing UP.



28. Reinstall the thermostat housing with a new gasket. Torque the bolts snug (no torque value can be found for these bolts).

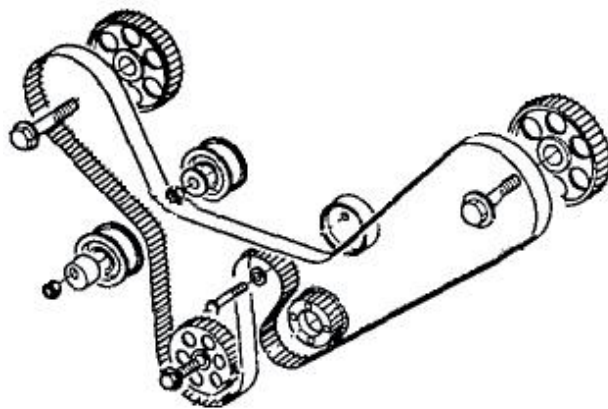
29. Reinstall the timing belt tensioner/damper assembly. Torque the lever arm bolt, tensioner pulley, and the end of the damper to **18 lb-ft**.



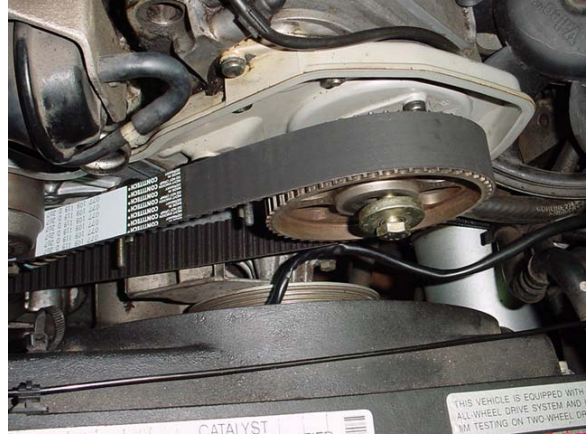
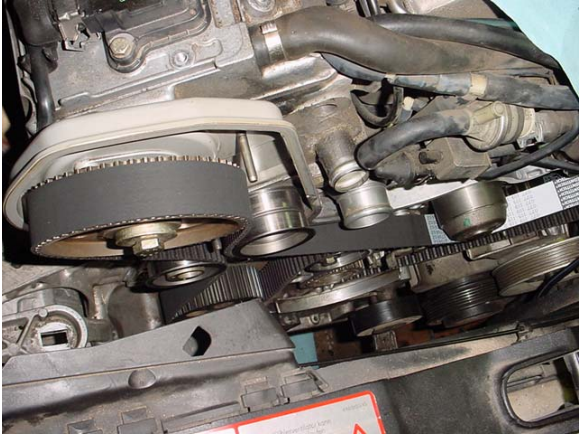
30. **LOOSELY** install the two camshaft sprockets onto the tapered shafts. **MAKE SURE THE DIRECTION OF THE TAPER ON THE SPROCKET MATCHES THE TAPER ON THE SHAFT.** Tighten the center bolts until approximately 1 turn remains before coming in contact with the sprocket. Note that there are no keyways on the shaft, so rotational orientation is not important.



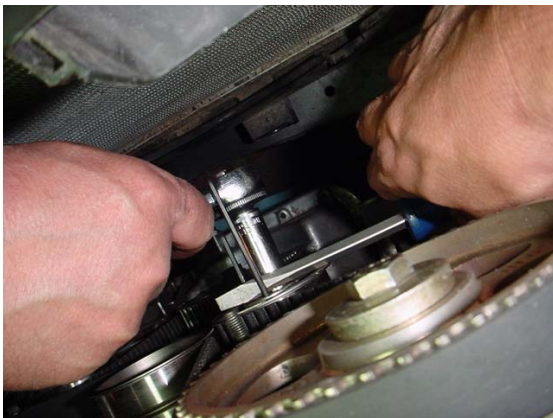
31. Time to install the new Timing Belt!! Using two small Allen wrenches and a screwdriver, move the eccentric inside the tensioner pulley so that the belt tension is minimized. Get the new TB (077109119E, Timing Belt) and install into the engine per the routing diagram below. Since the TB is new, direction of travel is not important.



32. Install the harmonic balancer onto the crankshaft using the four smaller bolts **MAKE SURE THAT THE TDC MARK ON THE BALANCER IS ROTATED TOWARDS THE METAL POINTER!!** - torque the 4 bolts to **18 lb-ft**. Install a new lightly oiled center bolt (905 428 01) and the old washer. Tighten the center bolt **hand tight** using the 3197 Harmonic balancer pulley holder and 2079 Harmonic balancer pulley wrench.
33. Verify that the crankshaft is still at TDC (0 degrees). If the crank has moved during the procedure, move it back into position. Your engine should look like this now:



34. Timing belt tensioning. Using two allen wrenches in the tensioner eccentric holes, a screwdriver, and a socket wrench (see photo below), rotate the tensioner eccentric until the length of the damper is within the tolerances shown in the photo below. Use a pair of 6" dial calipers to determine this measurement, and pay close attention to the locations that are used to make the measurement. As soon as the damper length is correct, tighten the center bolt of the tensioner eccentric and lock the adjustment in place. Re-verify the damper length to make sure it didn't change during the tightening of the bolt (it probably did). Re-adjust as necessary. Torque the eccentric tensioner center bolt to **18 lb-ft**. Re-check the damper length again, just to be sure.



35. Tighten the two bolts holding the camshaft sprockets on finger tight. Using the AS4394 Camshaft sprocket holding tool to react the torque, torque the sprocket bolts to **41 lb-ft**. Your new timing belt should now look like this:



36. Remove the two 3341 Camshaft Locating fixtures from the back of the engine.
37. Install the driver's side camshaft cover with new flat o-ring seal (026103085D). Tighten the two bolts to **15 lb-ft**.
38. Install the camshaft position sensor onto the end of the driver's side camshaft. Verify that the metal tine in the position sensor engages the hole in the camshaft. Tighten position sensor center bolt tight.



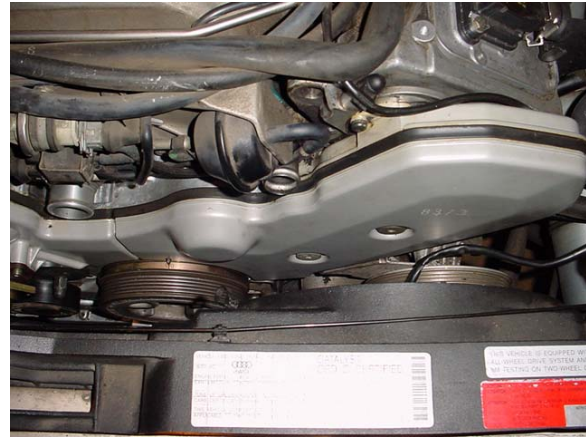
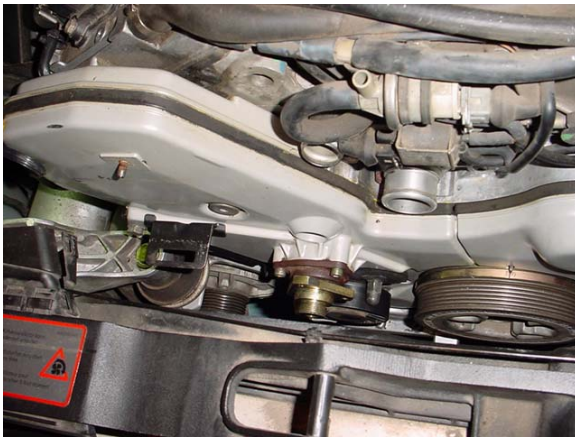
39. Install the driver's side cam position sensor cover- remember to attach the electrical connector support bracket. Torque bolts to **15 lb-ft**. Plug the sensor electrical connector into the receptacle.
40. Install the passenger's side camshaft cover with new flat o-ring seal (026103085D)- remember to attach the electrical connector support bracket. Tighten the two bolts to **15 lb-ft**.

41. Using the 3197 Harmonic balancer pulley holder to turn the engine, rotate the engine through at least two full revolutions, back to TDC. Verify that all items appear to be rotating smoothly, there are no noises or binding, and the TB tracks properly on all pulleys/sprockets.

NOTE

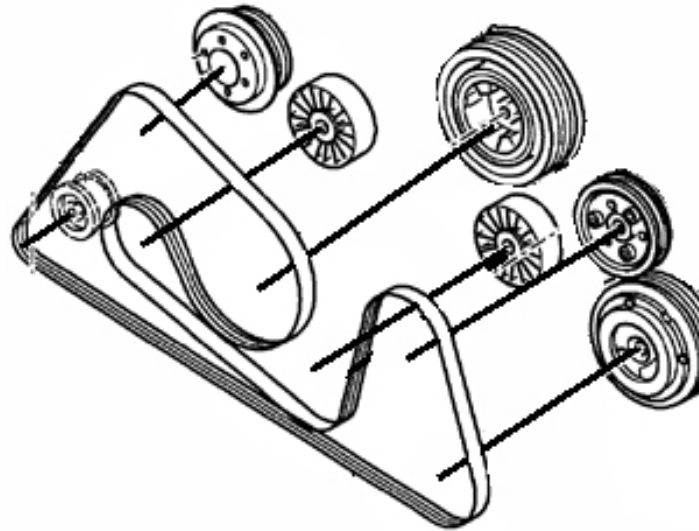
Clean all parts thoroughly inside and out before reinstalling them

42. Install the passenger side TB cover onto the block using the 5 bolts and one shoulder nut. Install all 6 fasteners loosely before tightening any of them- take care to get the correct bolts into the correct holes (different lengths)!. Align the TB cover so that the arm on the cover is as close to touching the engine torque damper as possible, and the black rubber gasket aligns with the outline on the block. Tighten the 5 bolts to **33 lb-ft**, and the shoulder nut to **89 lb-in**.
43. Install the torque damper bolt into the torque damper and torque to **33 lb-ft**.
44. Install the driver's side TB cover onto the block using the two shoulder nuts. Align the cover with the outline on the block and torque the two nuts to **89 lb-in**.
45. Using the 3197 Harmonic balancer pulley holder (engaged into the passenger side timing belt cover slot) and 2079 Harmonic balancer pulley wrench, torque the harmonic balancer center bolt to **258 lb-ft**. A cheater bar is highly recommended!!! The engine may need to be rotated to get the 3197 engaged in both the harmonic balancer and the TB cover. Your engine should now look like this:



46. Install the fan pulley onto the front of the passenger side timing belt cover using the three grade 8.8 bolts. Torque to **18 lb-ft**.

47. Install the serpentine belt. NOTE which direction the belt was traveling when you removed it and replace in the same orientation! Route the belt per the diagram below, except do not try to put it over the tensioning pulley yet.



48. Using a 13mm deep socket and 3/8" drive, with the drive handle towards the center of the engine, pull up on the tensioner until you can slip the belt over the tensioner pulley. Release the pressure on the tensioner and check that the serpentine belt is properly aligned on all 6 pulleys.
49. Reinstall the fan/clutch and shroud assembly as one piece. The fan must be put into the shroud and the fan/shroud combination lowered down into the front of the engine as a nested pair. Using a 10mm wrench on one of the three fan pulley bolts to hold the fan still, tighten the large nut on the fan onto the pulley (big Crescent works great). NOTE- THIS IS LEFT-HAND THREADED- DO NOT TURN TO THE RIGHT TO TIGHTEN!!! Once the fan nut is snug, slip the fan shroud down into the slots at the bottom of the radiator. Fasten the top of the shroud to the radiator with the two bolts removed earlier. Tighten snug.
50. Install the electric fan onto the radiator by lowering it down into the three slotted holes it came from. Rotate the fan approximately 5 degrees counter-clockwise (viewed from front of car- the top of the fan shroud moves towards the passenger's side of the car) until it snaps into place. Install a new body pin (4D0807300) into the hole located at the 8:00 position (as viewed from the front of the car). Press it in all the way.
51. Reconnect the fan electrical cable to the back face of the radiator using the nylon zip-ties the factory installed, or if the factory items broke during removal, replace with new zip ties. Verify that there is no way for the electrical cable to come in contact with any of the rotating/moving engine or fan parts.
52. Reinstall the lower (1 connect point) and then the upper (3 connect points) radiator hoses on the front of the engine. Tighten the hose clamps snug, but do NOT over tighten!
53. Reinstall the plastic radiator hose holder to the front of the passenger side TB cover using the cap nut. Tighten snug.

54. Using a large flat-blade screwdriver, close the radiator drain valve (blue) at the bottom of the radiator behind the front lower grille. Reinstall the two coolant low-point drain plugs into the bottom of the engine if they were removed earlier. (Leave the high-point bleed plugs off.) Add 5 liters of G001200 Red Pentosin coolant to the coolant reservoir and inspect all ports for signs of leakage.
55. Add demineralized water until coolant exits the high point bleed ports. Install both high point bleed plugs and tighten snug. Connect the auxiliary water circulation pump electrical connector (just behind the two high point bleed ports).
56. Reinstall the oval cover in the cutout in the lower driver's side bumper (where the coolant drain valve is accessed).
57. Reinstall the 3 engine beauty covers, starting with the center cover. Tighten all 8 bolts snug.
58. Reinstall the air duct that runs from the air box to the throttle body. Tighten the two hose clamps (one on each end) snug.
59. Reinstall the air intake breather tubes (2) from the front of the engine compartment to the air box. The cover at the front of the engine is clipped in place- simply push it straight down into the slots.
60. ***THE MOMENT OF TRUTH!!!!*** Verify that the coolant level in the coolant reservoir is still within acceptable limits. Install the coolant reservoir cap if not already installed. **START THE ENGINE- BE READY TO IMMEDIATELY SHUT OFF THE IGNITION IF ANYTHING SOUNDS EVEN SLIGHTLY WRONG!**
61. If all has gone well, the engine should run smoothly and evenly. Allow the engine to get up to operating temperature and turn ON the heater. Make sure that hot air is coming out of the air vents, and allow it to run for a minute.
62. Shut OFF the engine, and re-check the coolant level in the coolant reservoir. If low, carefully remove the reservoir cap and add demineralized water until the proper level is reached. Reinstall the reservoir cap.
63. GO OUT AND ENJOY YOUR A8!!!!
64. Come home, clean up the mess, and take the old chemicals to a recycling facility.