VW Type A-4 Timing Belt Replacement Procedure

www.tdiclub.com

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Introduction

Finally the procedure we have all been waiting for: the "A4 Timing Belt Procedure", including the automatic and manual transmission differences. Some people have argued till they are blue in the face that "mark and pray" was the easiest way to change one of these belt, and it has been proven that this belt can be changed in under 2 hours using the full factory method as demonstrated here in this thread. The procedure utilizes all the factory tools and processes. The reason for going to the extreme of utilizing all the tools is the elimination of all possibilities of making a $2500.00+ mistake and destroying the head. You do not need many tools to complete this job. What you do need is a thorough understanding of the procedure and what you are about to accomplish.

When changing a timing belt, you are doing more than just replacing an old belt.What you are doing, whether performing a 40K on the auto or 60K on a manual, is inspecting the entire engine area that has been covered up since the engine was new or since the last belt change. The second most important thing this procedure accomplishes is it totally resets ALL timing settings on the engine and restores them back to factory new settings.

While on the topic of timing, we need to understand that there are three types of timing involved here:

1. The first and most overlooked type of timing is the cam and crank timing.This keeps the cam spinning in perfect time allowing the engine to produce great low-end power as well as allowing the engine to rev to it's full redline of 5100 rpm.

2. The second type of timing is "basic" injection timing. I concocted the word "basic" timing because it is used to initially set and assure that the engine will start.This is accomplished by inserting the injection pump lock pin: positioning the pump shaft in relation to cam and crank timing in such a way that injection will occur within the ignition window.

3. Once the cam & crank timing have been set and the Injection pump is positioned, you will need to adjust the injection timing utilizing the Vag-Com®. (www.ross-tech.com) If you do not have this, then get it before attempting to perform this procedure.

This leads me to my next point: tools. Everybody wants to know where to get them and how much they cost.The simple fact is they are not cheap, but neither is your engine. I use the factory tools that I got from www.zelenda.com.They sell all the tools you need for the job and they are the same tools the factory used to assemble your beloved engine so again it's your engine and your money.

dribiwire

The VW Factory tools you are going to need are:
1.) 3036 camshaft holding bar
2.) 3418 camshaft setting bar
3.) 2587 2 pin spanner wrench (don't use a bicycle wrench this one costs the same!)
4.) 3359 Injection pump lock pin
5.) T40001 puller set

Specialty tools you are going to need from Sears:
1.) 41831 serpentine belt tensioner tool
2.) 44360 11mm&10mm 45 degree offset wrench
3.) 5mm 3/8 drive allen socket
4.) 6mm 3/8 drive allen socket

Other tools and "stuff"
1.) T25 Torx® specialty tool from AutoZone
2.) Flat band clamp pliers
3.) Block of wood, a 2x4 6" long will work great
4.) Jack stands (strong enough to support your car
5.) Hydraulic floor jack
6.) You will also need a set of metric 1/4”, 3/8” and 1/2" drive sockets and extensions

Materials
1.) Blue Locktite®
2.)
3.)
4.)

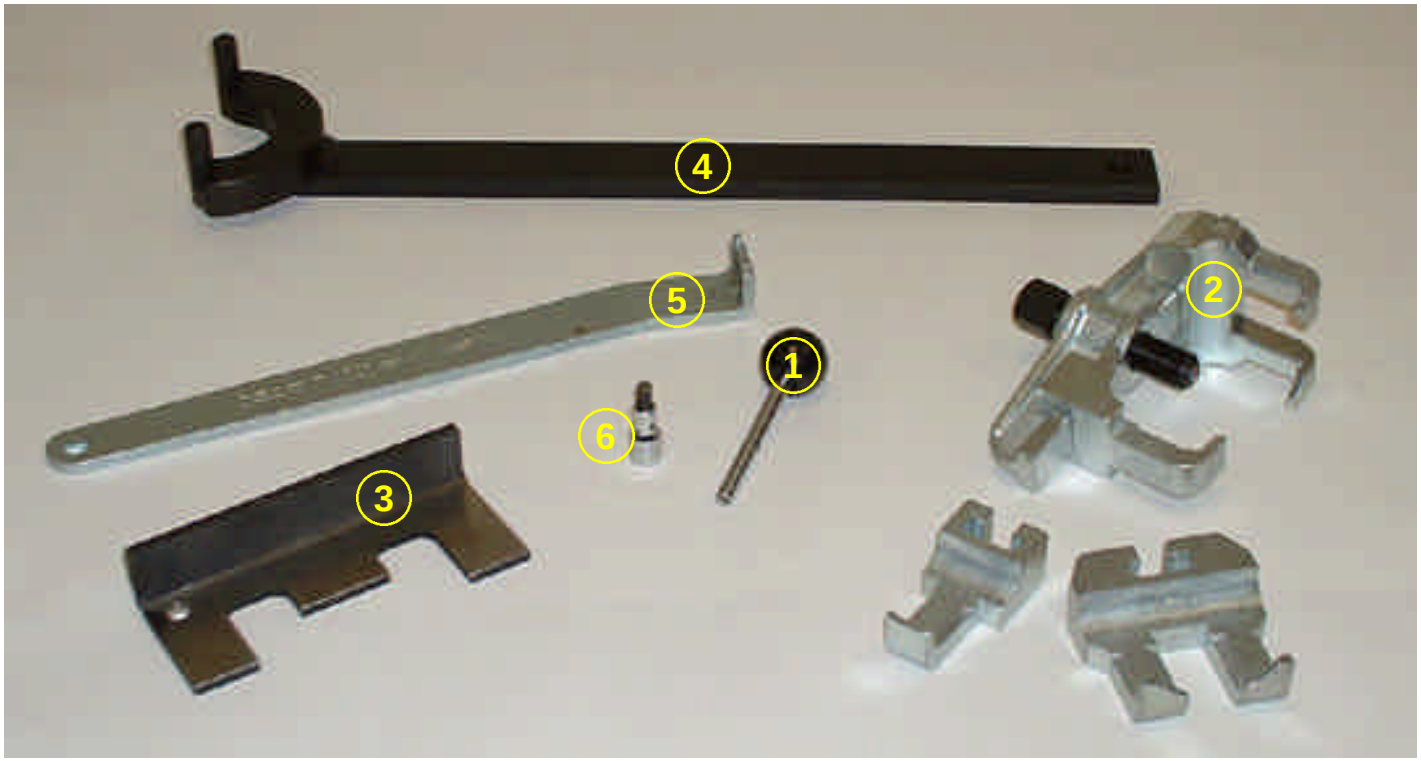
Tools you can make:
Cut them or grind them down

stubby 5mm 1/4" drive socket
stubby 6mm 1/4" drive socket

Now the fun part! I have to add that if I have to explain how to remove the belly pan and the engine cover you may want reconsider performing this job and take it too your local dealer...

no joke.

Notes

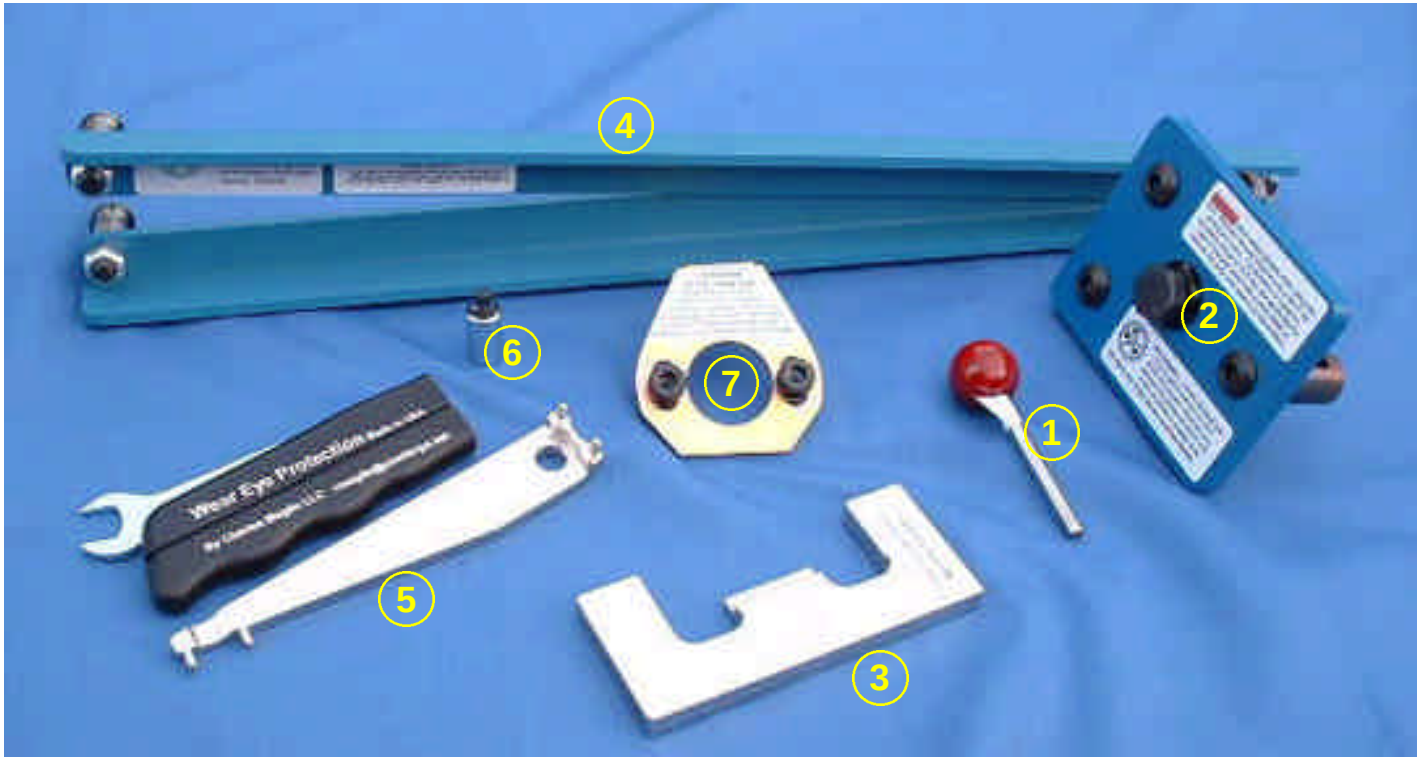


http://www.zelenda.com

A4/NB TDI Engine Tools for 1999.5 Golf/Jetta and all New Beetle TDI timing belt replacement:

1. Injector pump alignment pin (3359)
2. Cam gear puller (4001)
3. Alignment guide plate (3418)
4. Cam gear holding bar (3036)
5. Toothed belt tensioning tool (T1020)
6. Stubby 5mm Driver (1/4” drive)

Notes



Notes

http://www.charterpa.net/cmeglio/metalnerd

A4/NB TDI Engine Tools for 1999.5 Golf/Jetta and all New Beetle TDI timing belt replacement:

1. A4/NB Pump Pin (MN3359) (Hardened, vented stainless steel)
2. A4/NB Cam Sprocket Puller (MN4001) (Durable, heat treated arms and jackscrew)
3. Universal Cam Locking Plate (MN3418) (Hardened alloy steel with a protective nickel finish)
4. Universal Sprocket Buster Counterhold Tool (MN3036) (For any sprocket, including gasser cam and intermediate shaft sprockets)
5. Compact 3-way Tensioner Wrench (MN3333) (Machined from 1 piece of solid alloy steel ñ no pins to rip out, includes handy flat wrench and vinyl grip)
6. Stubby 5mm Driver (1/4” drive) (MN0005) (Allows you to reach those valve cover bolts in the back & simply attach to your 1/4” socket set swivel joint and socket extension bar)
7. A4/NB Crank Lock (MN4004) (Gently holds the crank sprocket at TDC when you wrap the new belt on ñ a real convenience)

http://www.sears.com

Serpentine Belt Tool #41831
Band Clamp Pliers
Also shown are wooden dowels and clear hose used to plug fuel lines, fuel filter and radiator overflow line.

Notes

Parts list

(not all parts may be needed)

Serpentine belt (with AC)	038 903 137 J
Timing belt (old style)	038 109 119 D
Timing belt (new style)	038 109 119 M
Tensioner (old - manual)	038 109 243 G
Tensioner (old - automatic)	038 109 243 H
Tensioner (new - all)	038 109 243 N
Camshaft seal (old)	028 103 085
Camshaft seal (new)	038 103 085 C
Vacuum pump seal	038 145 345
Valve cover bolt (in case any strip-7 total)	N 101 725 01
Vibration damper bolt (in case any strip-4 total)	N 903 396 01
Injection pump sprocket bolts (non-stretch)	N 903 285 04
Engine mount to body bolt (2 total)	N 905 906 02
Engine mount to engine bracket (2 total)	N 102 096 03
Engine bracket bolt (2 short ones)	N 907 124 01
Engine bracket bolt (long one)	N 102 043 04
Large idler roller	038 109 244 H
Large idler roller bolt	N 905 969 02
Small roller top	058 109 244
Small roller bottom	038 109 244 E
Water pump	038 121 011 A
Camshaft sprocket	038 109 111 A
Camshaft	038 109 101 K
Oil cap seal	06A 103 483 D
Top cover black cap (2 for NB, 3 for others)	038 103 937
Top cover nut (2 for NB, 3 for others)	N 901 326 03
Top cover grommet (2 for NB, 3 for others)	038 103 638 A
Top cover stud (2 for NB, 3 for others)	028 103 665

(Accurate at time of typing. Subject to change at the whim of VW.)

Notes

	Torque (Ft-lbs)
Wheel Bolts	87
Oil Drain Plug	22
Camshaft Bearing Cap to Cylinder Head	15
Camshaft Sprocket to Camshaft	33
Vacuum Pump to Cylinder Head	15
Valve Cover to Cylinder Head	7
Toothed Belt Tensioner	15
Injection Pump Bolts Stage 1 (stretch type)	15
Injection Pump Bolts Stage 2 (stretch type)	additional 1/4 Turn
Injection Pump Bolts Stage (non-stretch)	18
Ribbed V-Belt Tensioner	18
Engine Mount to Body Bolt	30 Plus additional 1/4 Turn
Engine Mount Bracket to Body Bolt	18
Engine Mount to Engine Bolt	44 Plus additional 1/4 Turn

Notes

EGR valve/ Intake hose

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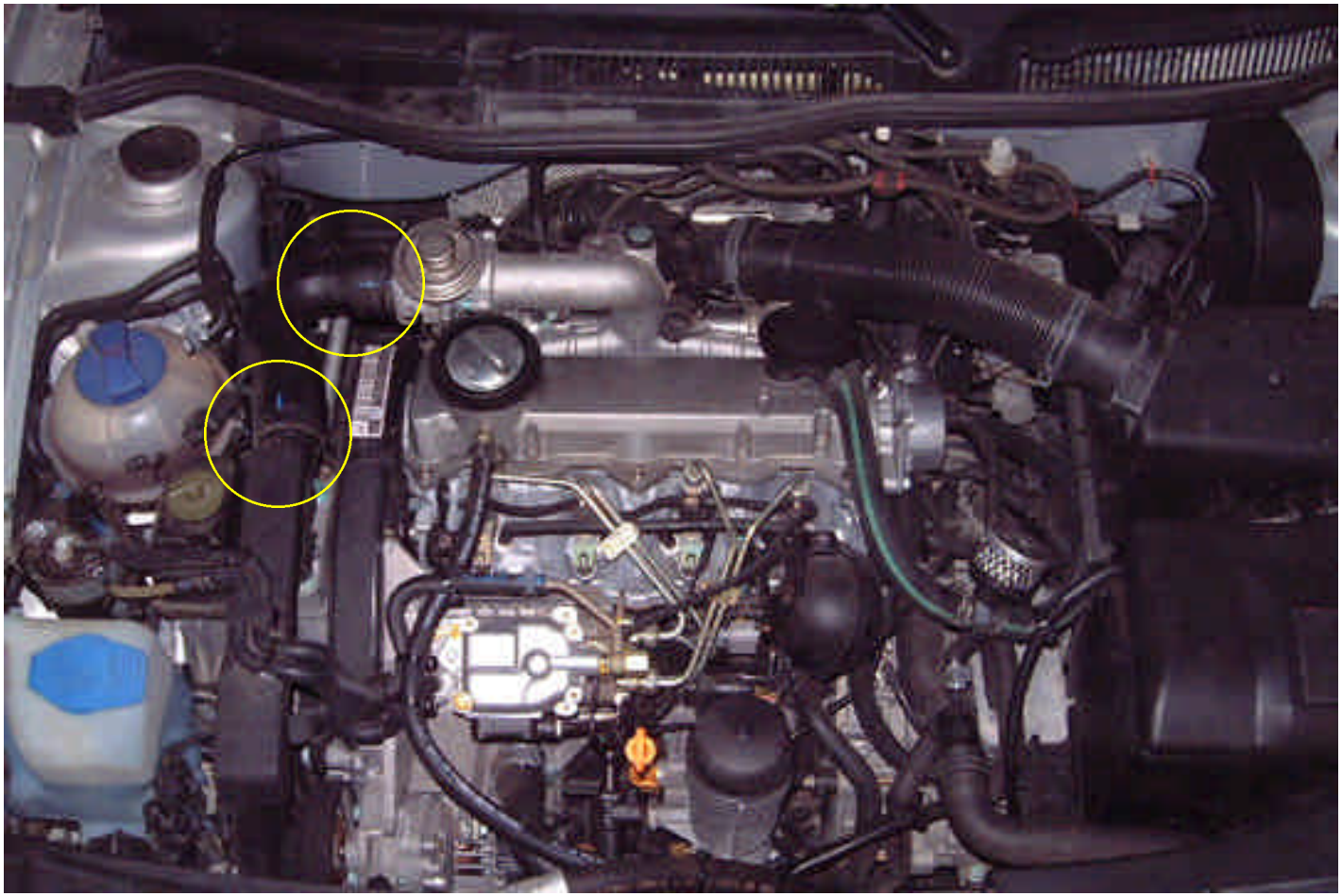
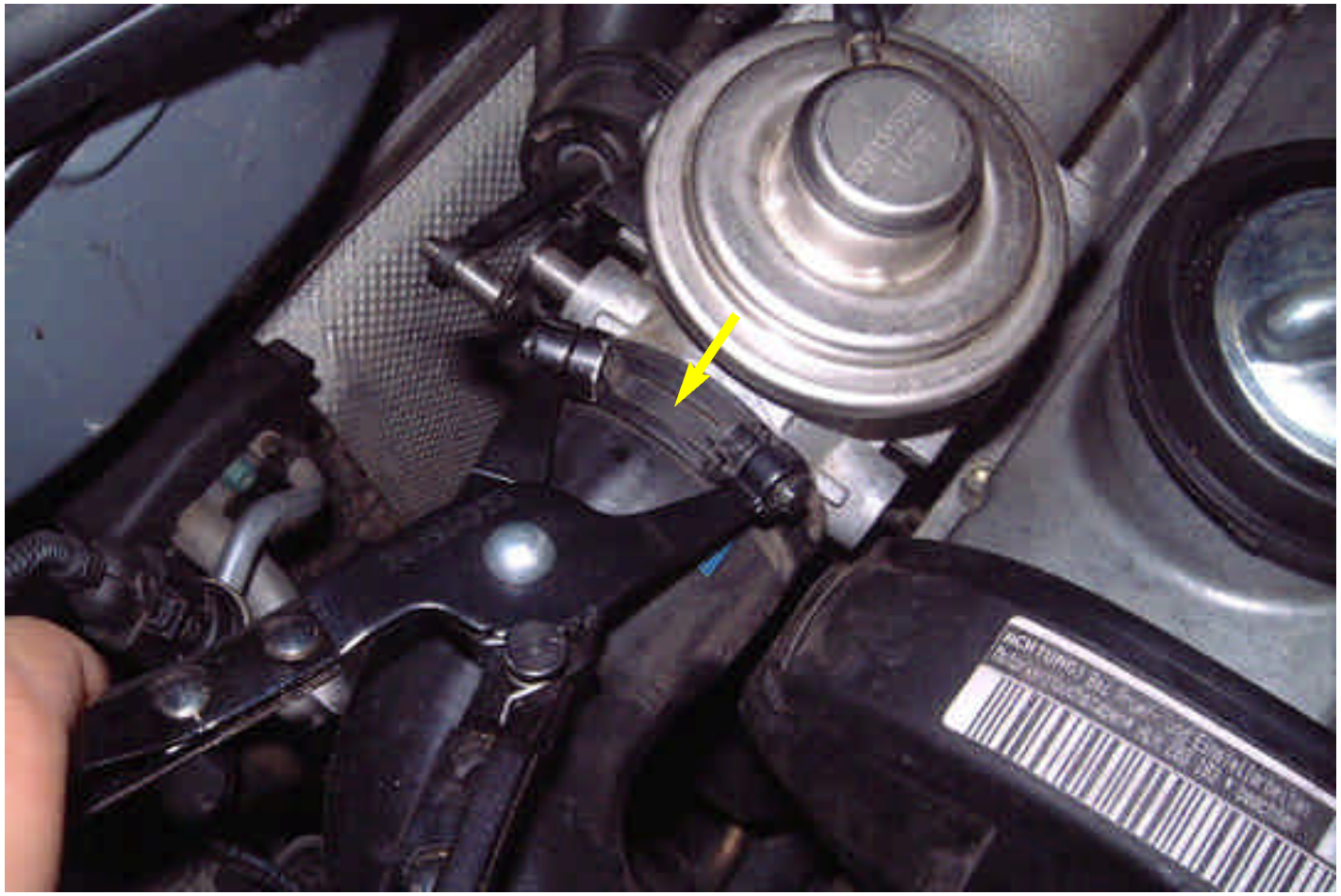
1.1

Notes



Let's get started! Location of the band clamps. This engine represents a majority of forum members in that it has an oil bypass filtration system, bypassed CCV system (thank God for no oil to drop on me.) and is a proud member of Epsilon®!

EGR valve/ Intake hose



1.Using the "flat band clamp" pliers, remove the intake tube going into the EGR/intake manifold.

Notes

EGR valve/ Intake hose

Notes

Stuff some paper towels into the intake to prevent "Murphy's Law" from kicking in.This prevents you from dropping that flying spring clamp into an intake duct!! (been there, done that, got the T-shirt)

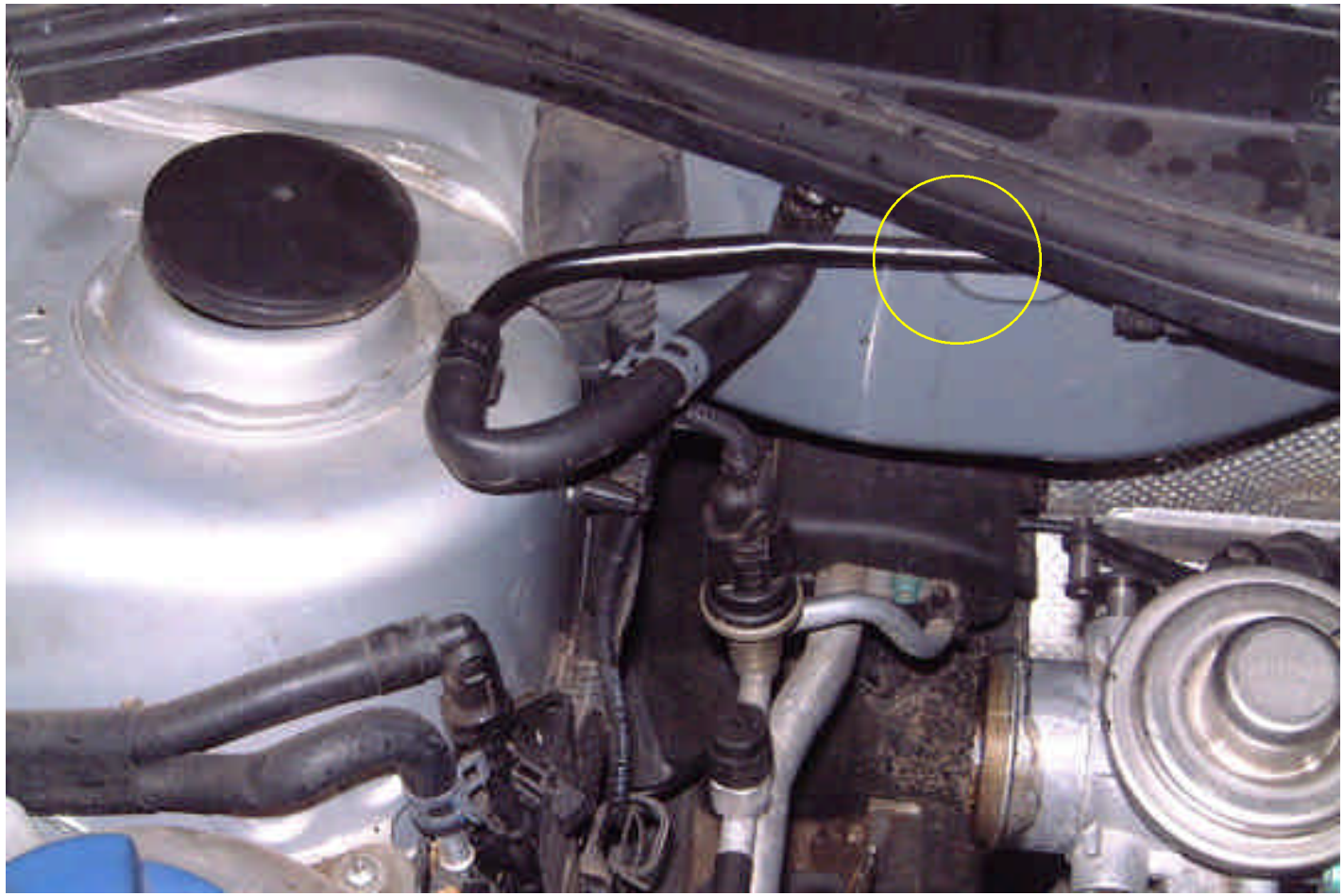
Notes

Remove connector.

Notes

Undo the clamp, pull off overflow tube.

Notes



Secure the hose by pushing it up under the firewall.

Notes

Cap off the end of the tube.

Notes

Using a Phillips head, remove the two screws holding the tank.

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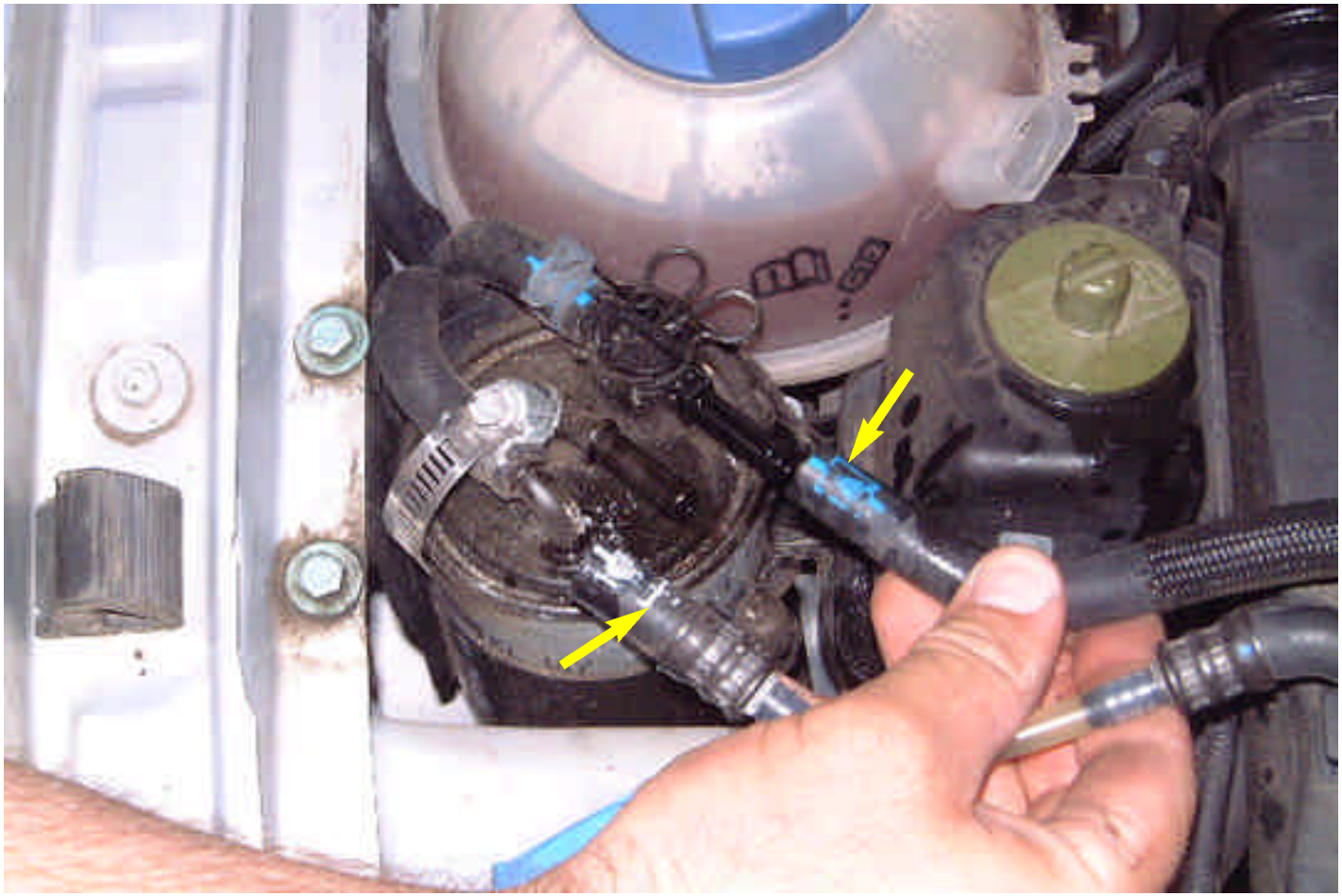
Using a 5mm 3/8 drive allen socket and extension, remove the allen bolt securing the power steering reservoir to the engine mount.

Notes



Remove the two fuel lines coming off of the fuel filter and cap them off.

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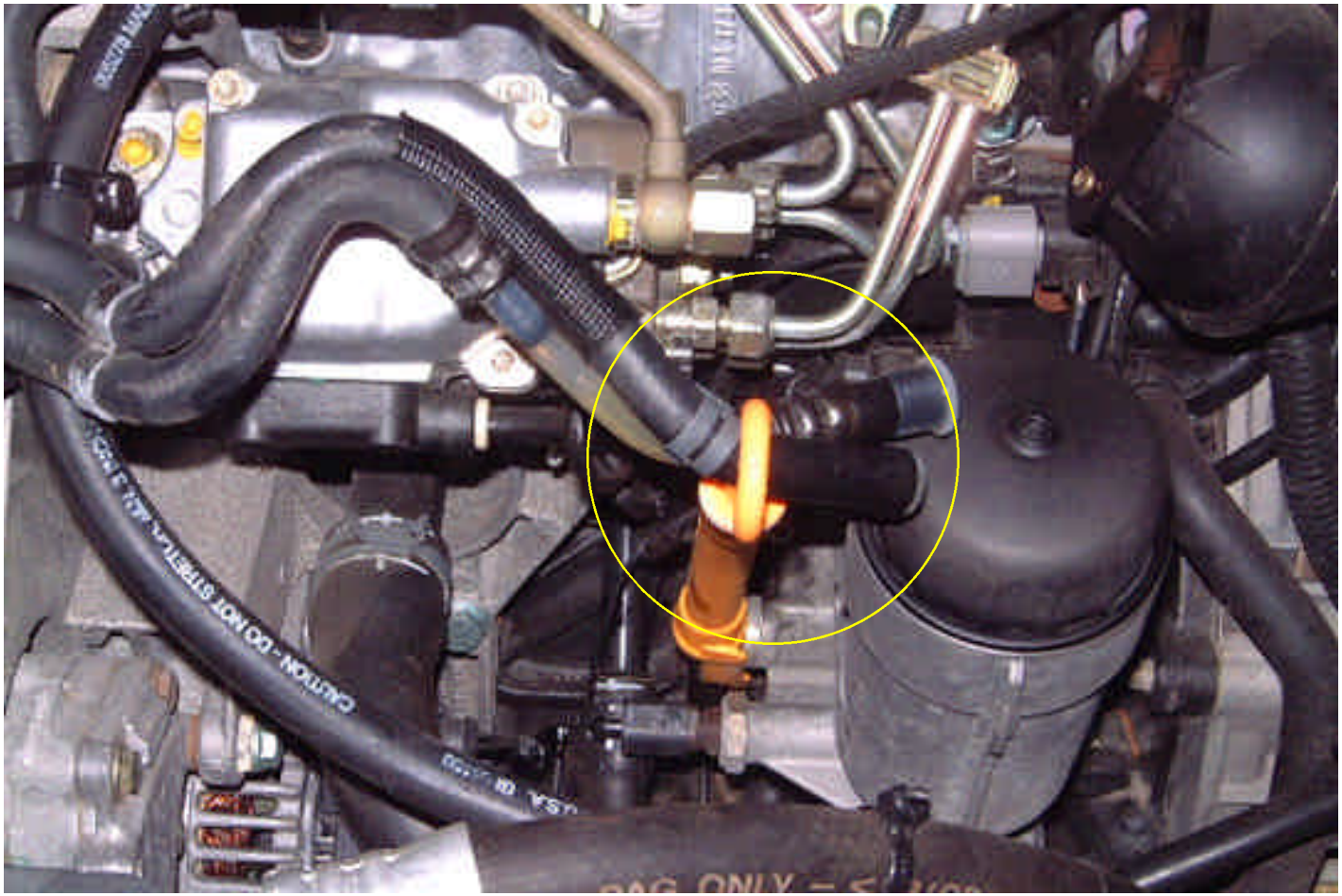


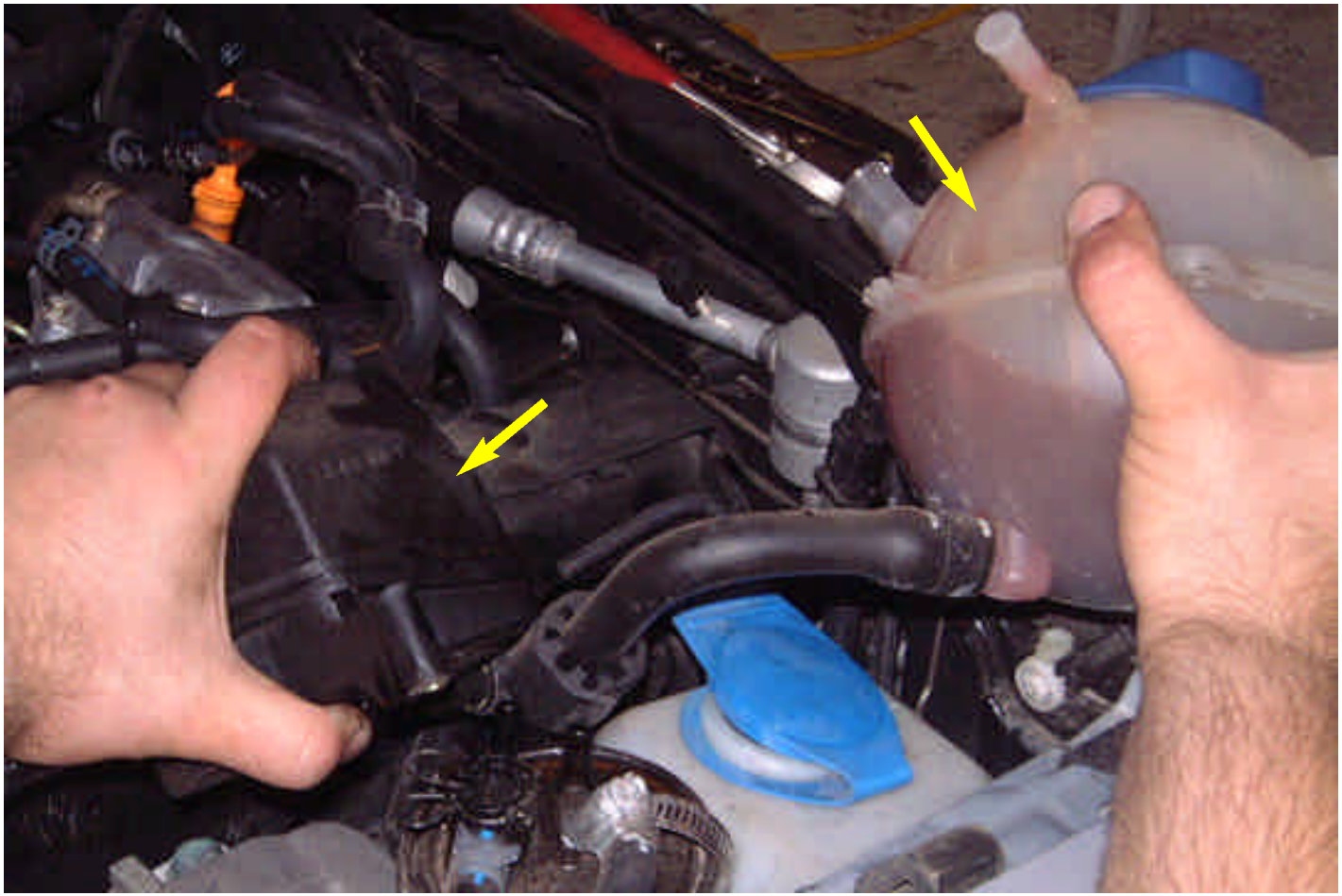
Take the capped-off fuel lines and insert them through the oil dip stick.

Notes

Note paper towels stuffed into the intake to prevent "Murphy's Law" from kicking in.This keeps you from dropping that flying spring clamp into an intake duct!!

Notes

Coolant tank, power steering reservoir, fuel lines



Raise up the power steering reservoir and pull the coolant reservoir hose under and to the front of the car.

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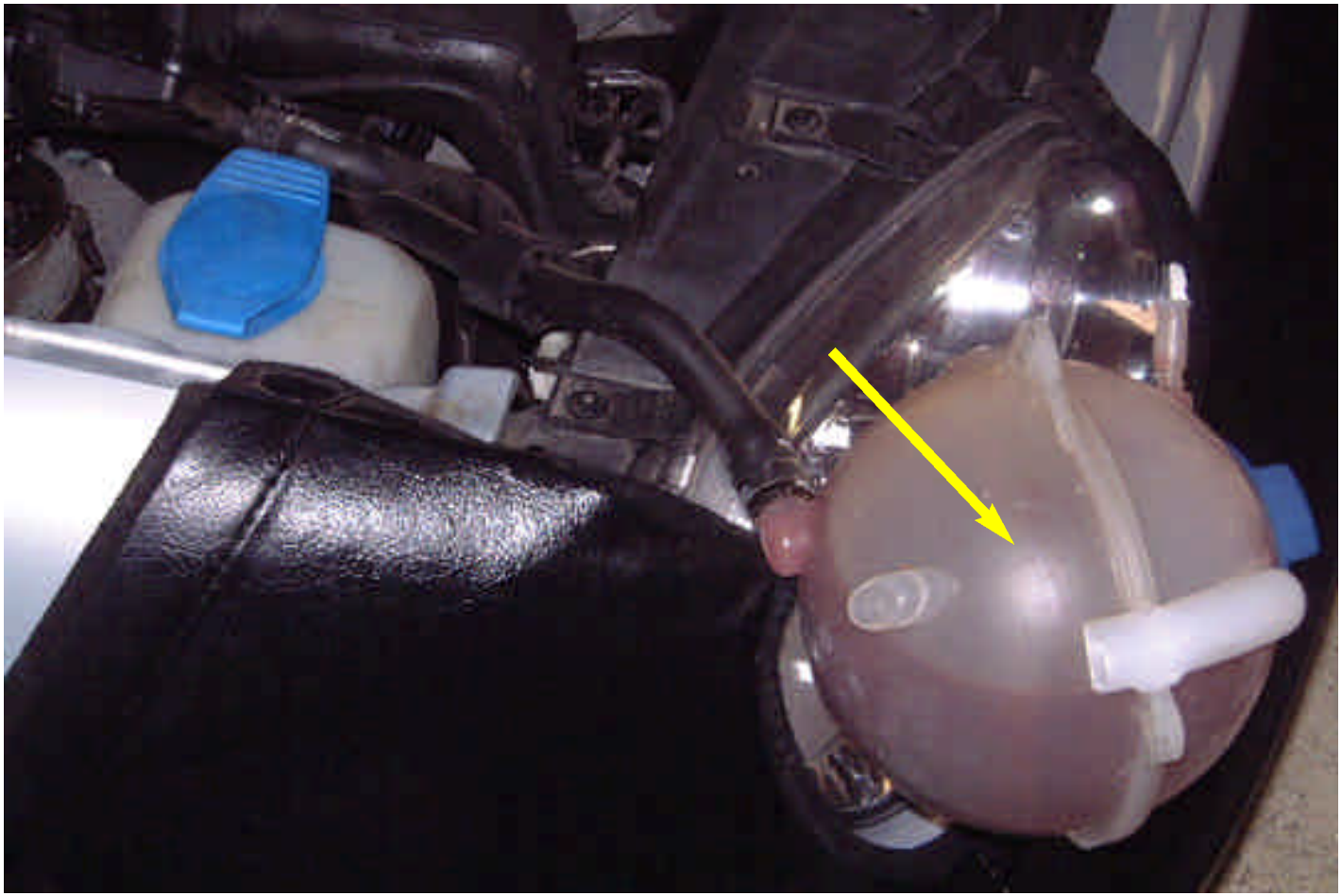
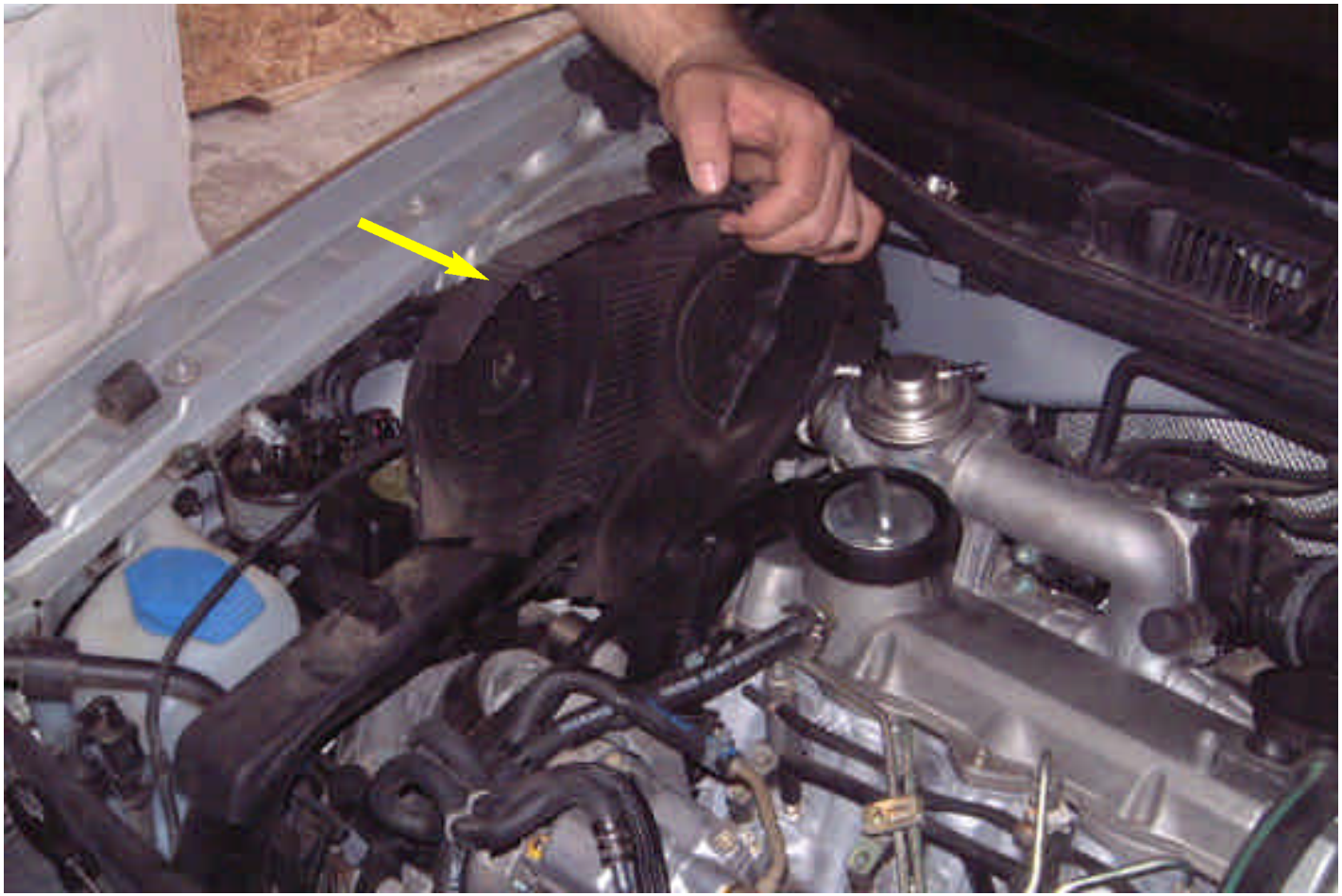


Cover the fender and let the coolant reservoir hang on the front of the car.

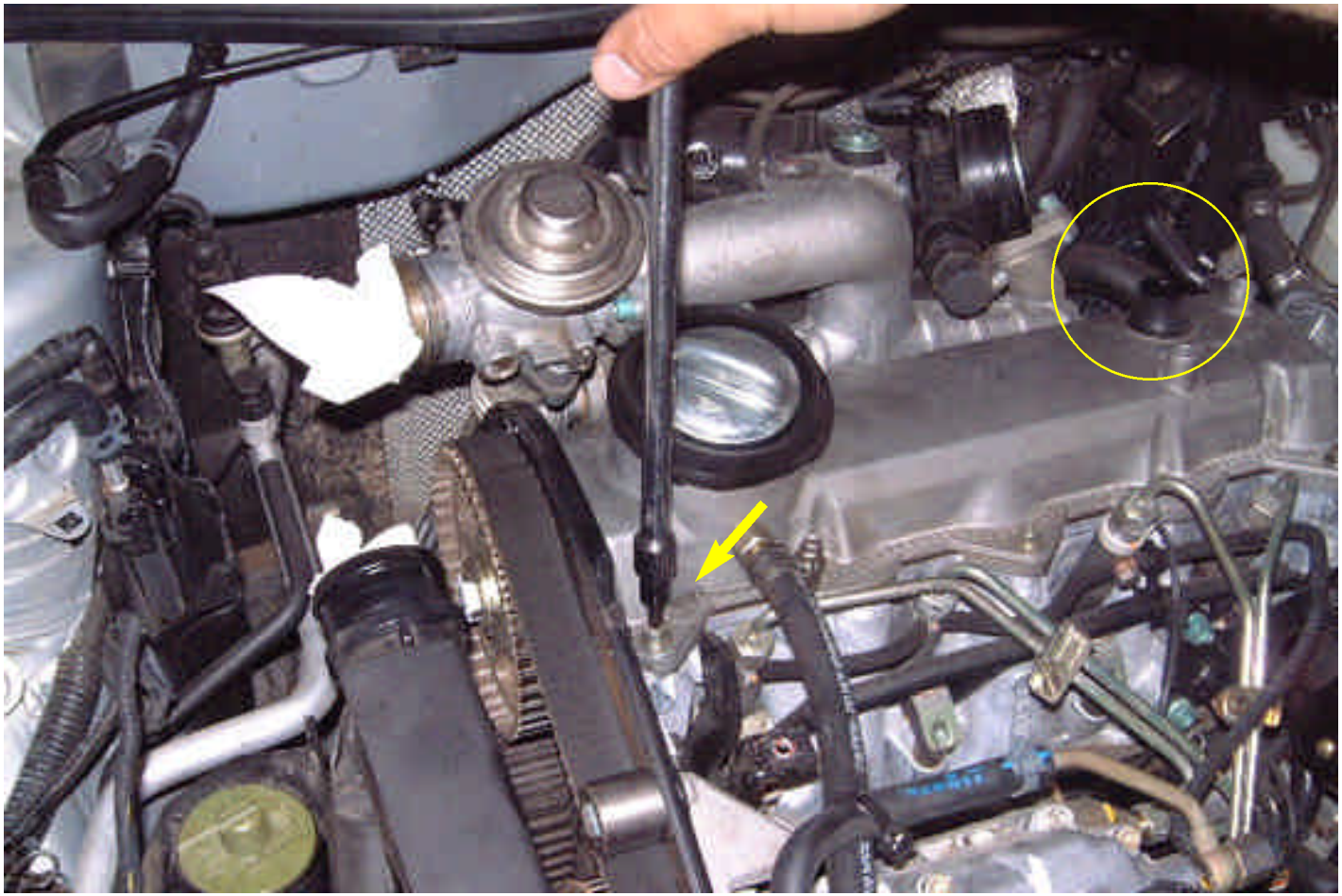
Notes

Timing belt cover



Remove the upper timing belt cover and the flex line coming from the air filter going to the engine.
I strongly suggest stuffing some paper towel in both holes to prevent you from dropping something into the turbo inlet.

Notes



Using a 5mm 3/8” drive allen socket, remove all the front and driver side rear allen bolts except for the two by the oil filler cap. For those use the special cut-off 1/4" drive socket that you made to remove them. Believe me when I say this, I have tried **EVERY** possible way to do this and I have stripped out a few heads in the process and this by far is the only true easy way to do it. Also disconnect hose to the valve cover, plug and and secure it.

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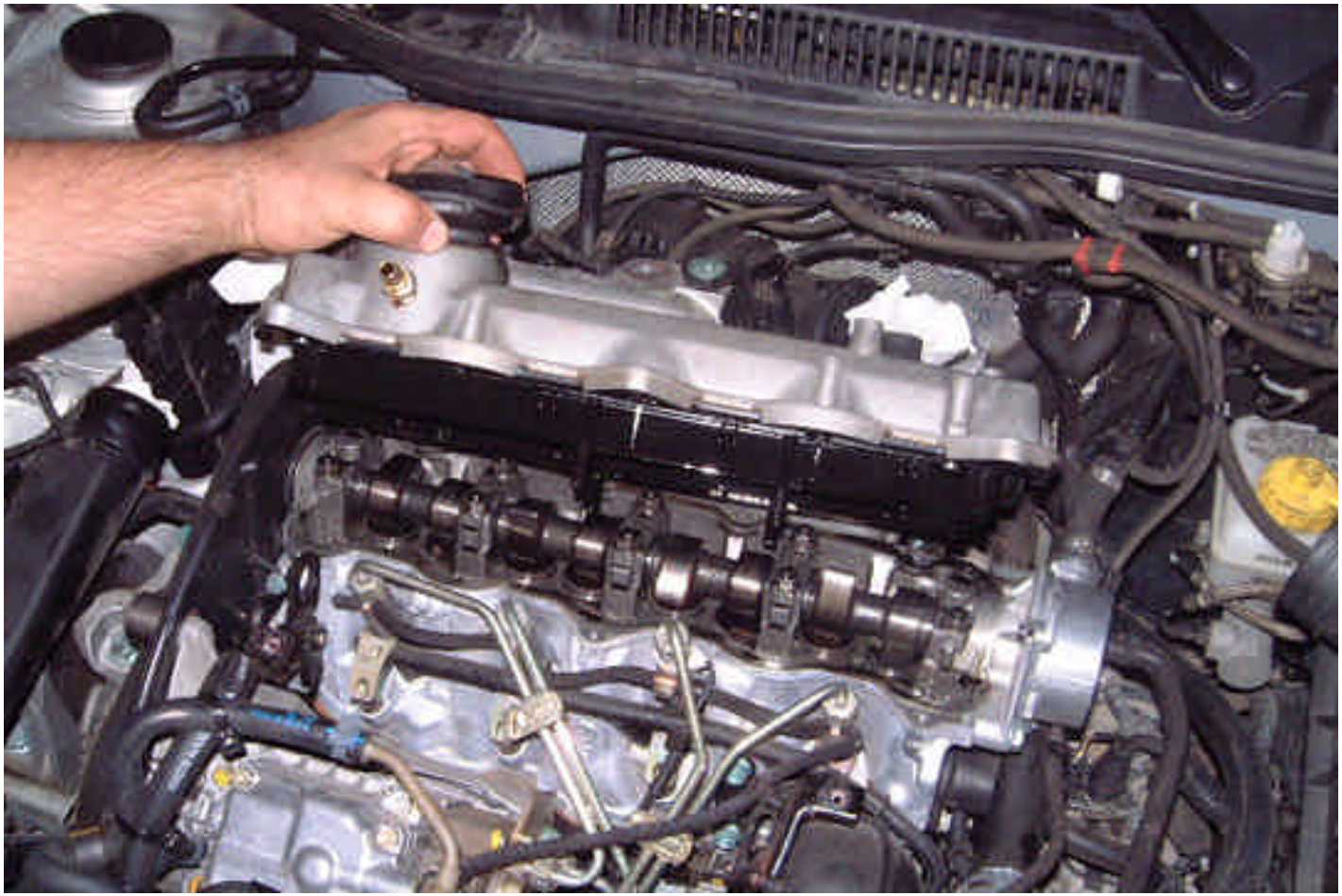

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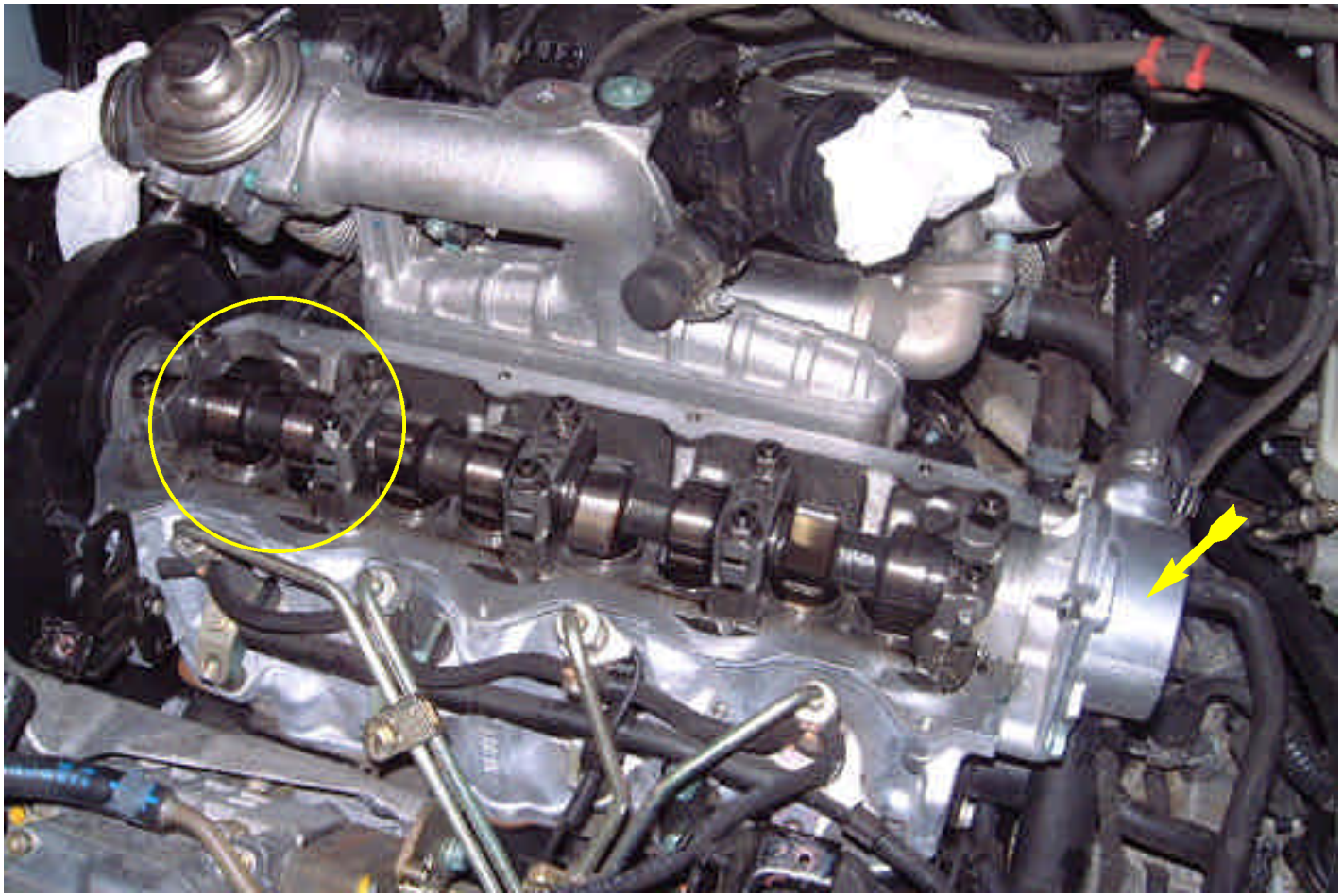
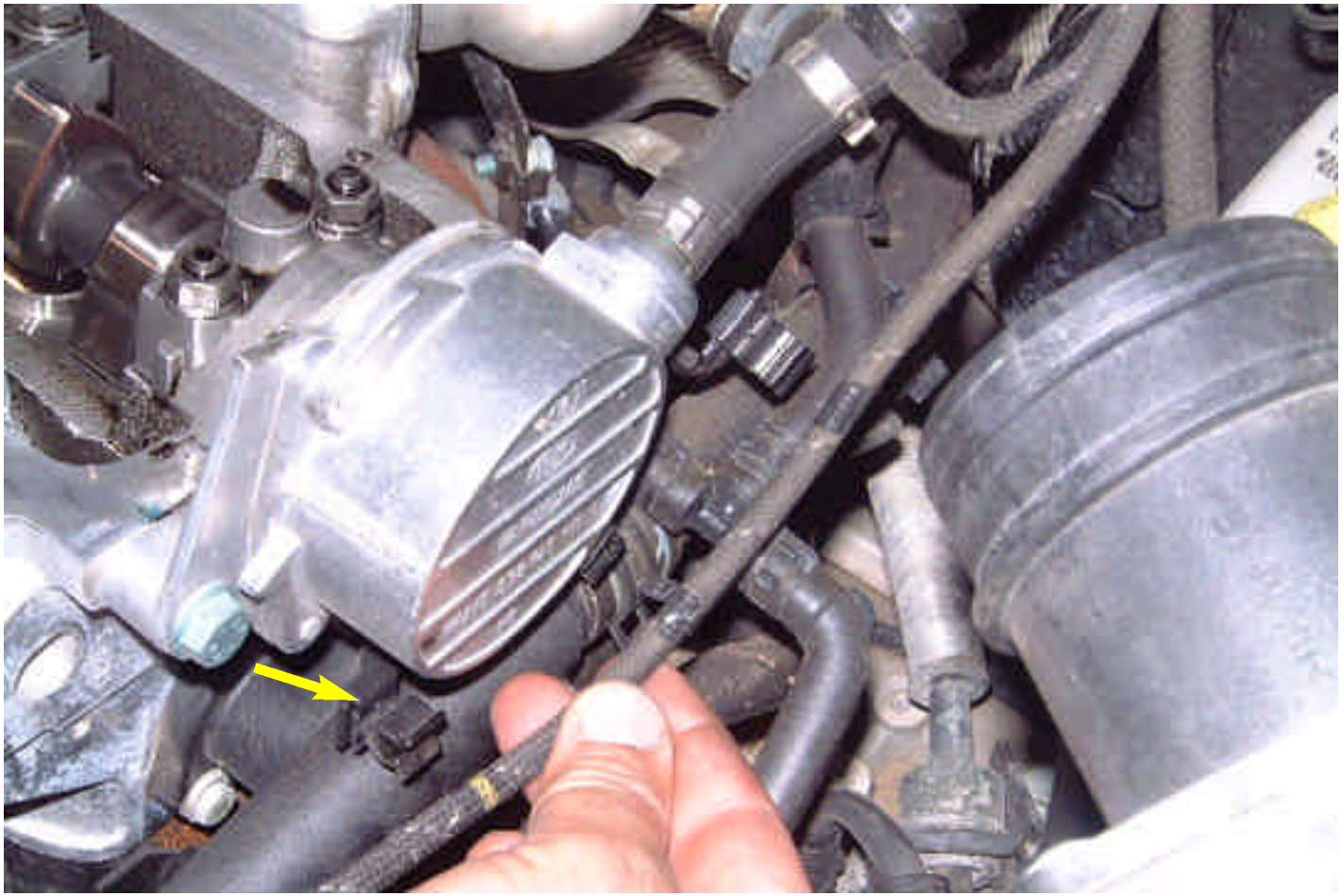
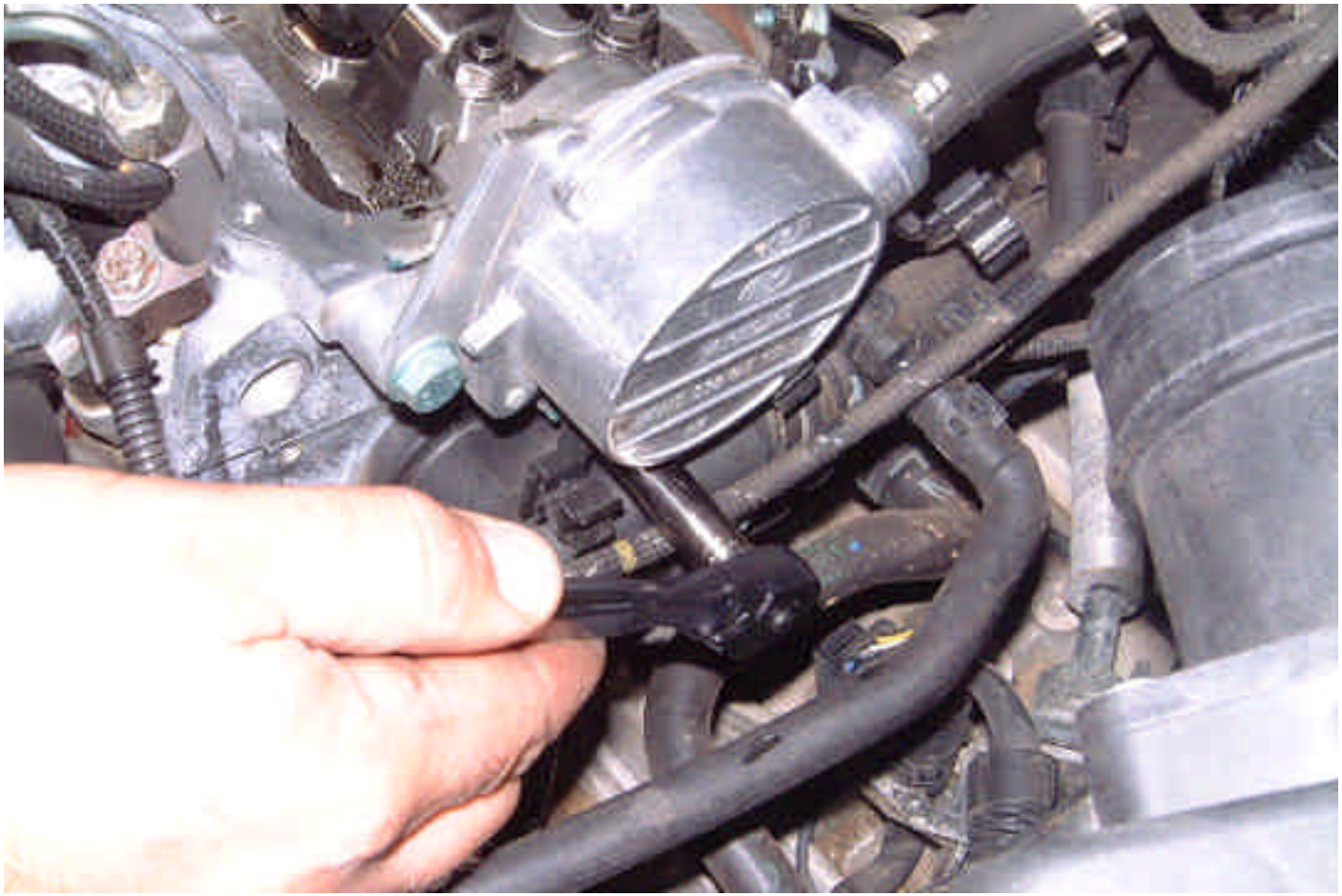


Lets look at the head and gauge what we are going to do. On the right side of the camshaft is the vacuum pump, there is a slight difference in removal procedure between the auto and manual (not a big deal by the way). Anyway, on the left side of the cam look at the first two lobes. These two lobes **MUST ALWAYS** be returned to the "both up" position, why you ask? If you don't its not a matter of if but you WILL set the cam timing 180 degrees out of time. Don't ask. I can only say from my experience and that of others that it can and does happen. By the way this is a great example of a SUPER clean engine using Delvac® 1 5w40 full synthetic, the best oil out there that meets the VW TSB oil viscosity specifications....had to throw that in there.



Remove the vacuum line running under the vacuum pump. MANUAL TRANSMISSION OWNERS, REMOVE THE CENTER GLOW PLUG WIRE AT THIS POINT AS WELL.
Using a 1/4" drive deep socket remove the lower 10mm nut. MANUAL TRANSMISSION OWNERS, USE THE 45 DEGREE OFFSET 10MM WRENCH AND REMOVE THIS NUT. THE NUT WILL BE BETWEEN THE COOLANT HEATER HOUSING AND THE VACUUM PUMP AND THIS WRENCH IS THE ONLY WAY TO GET IT OUT WITHOUT REMOVING THE COOLANT HEATER HOUSING.

Notes



Using the 10mm deep, remove the aft 10mm nut, this is the same for the manual transmission as well.

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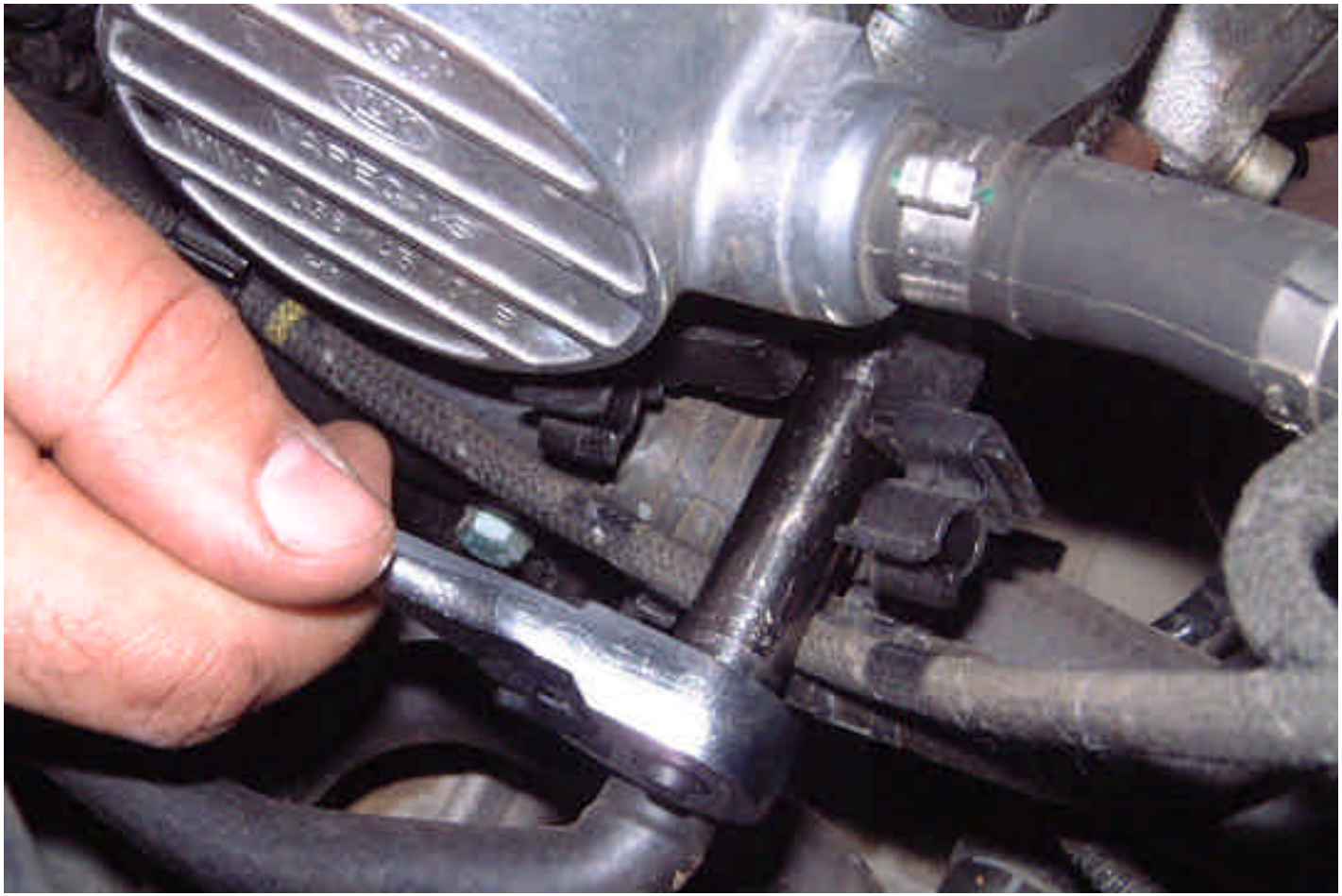

Remove the vacuum line support bracket.

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The support bracket.

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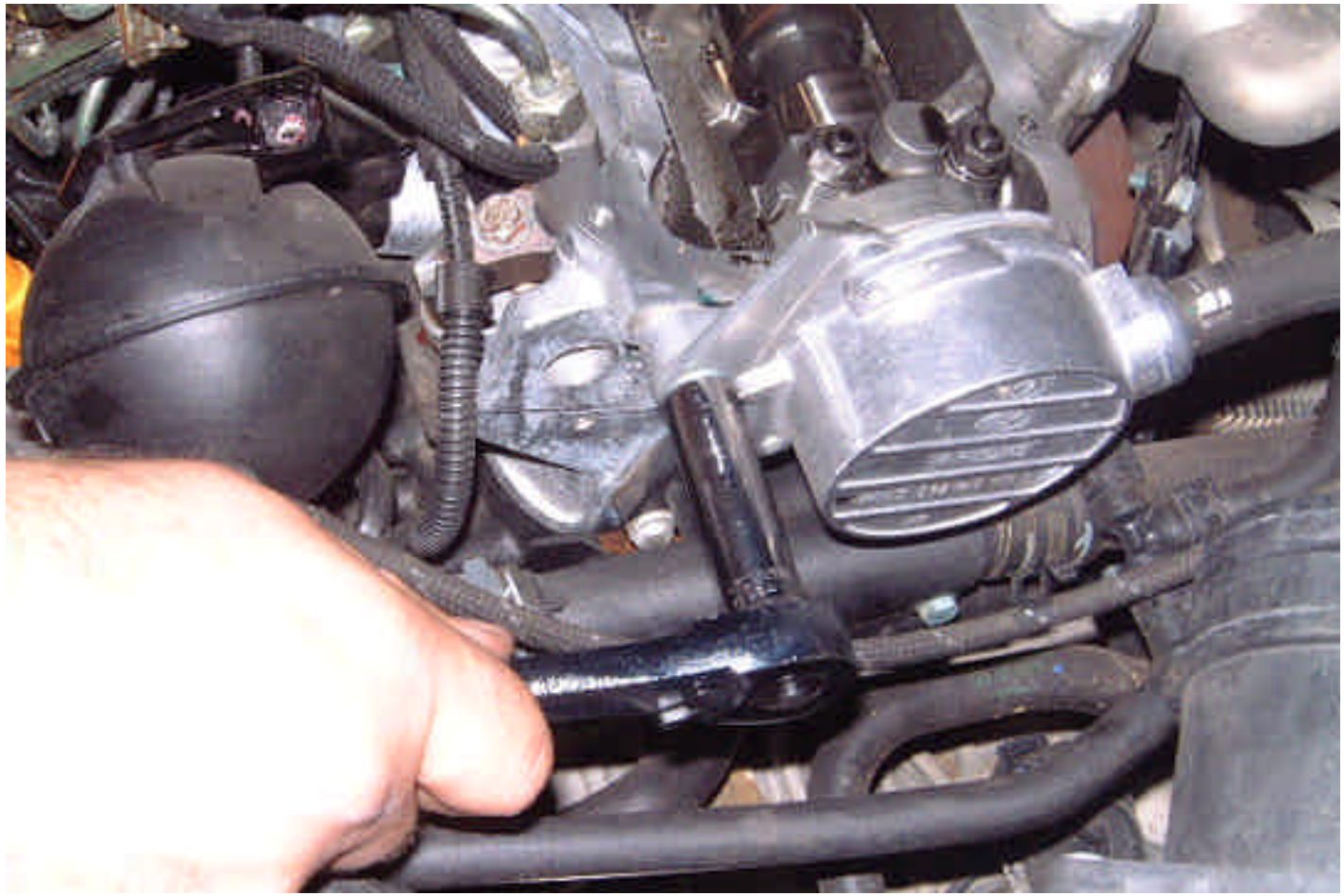
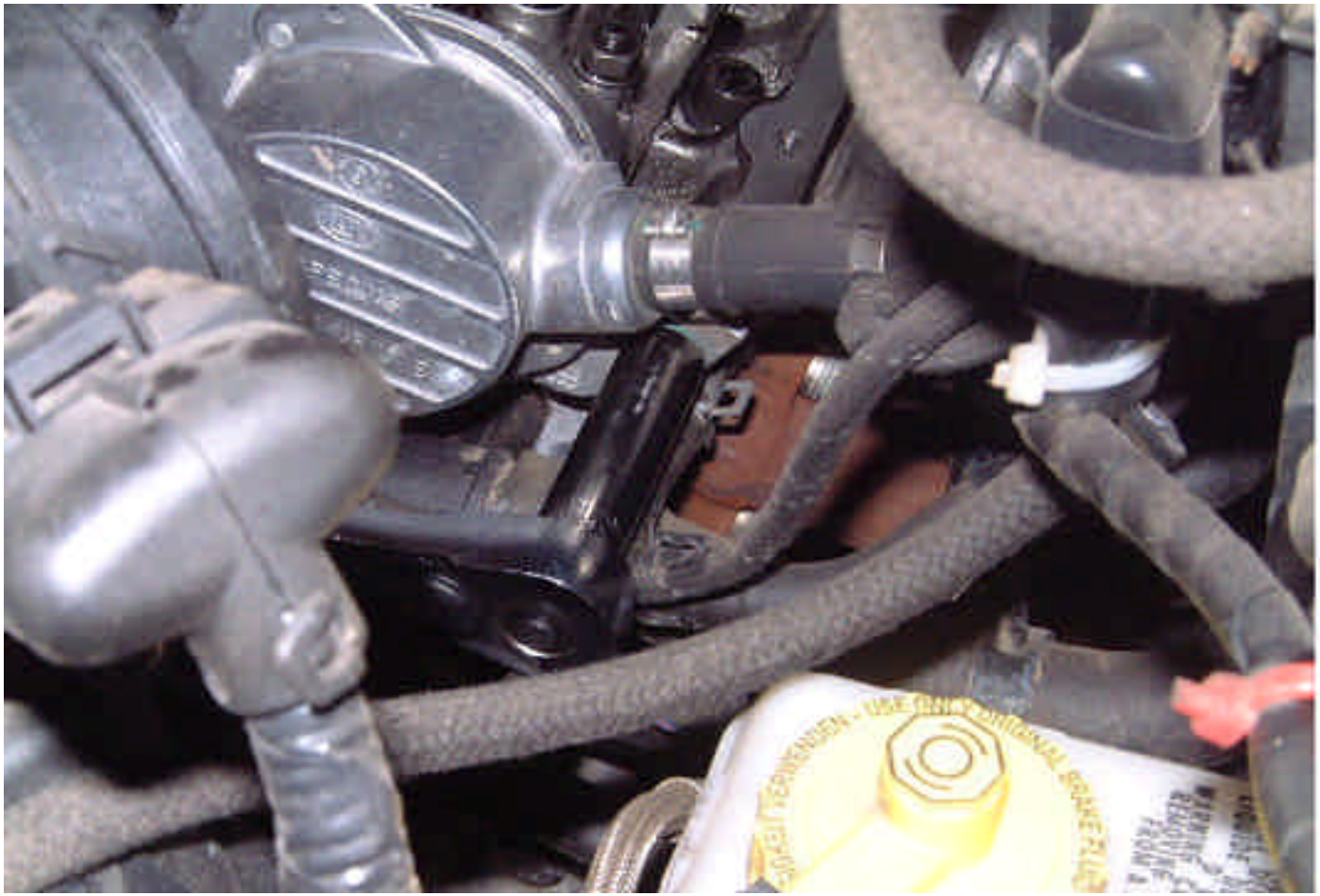
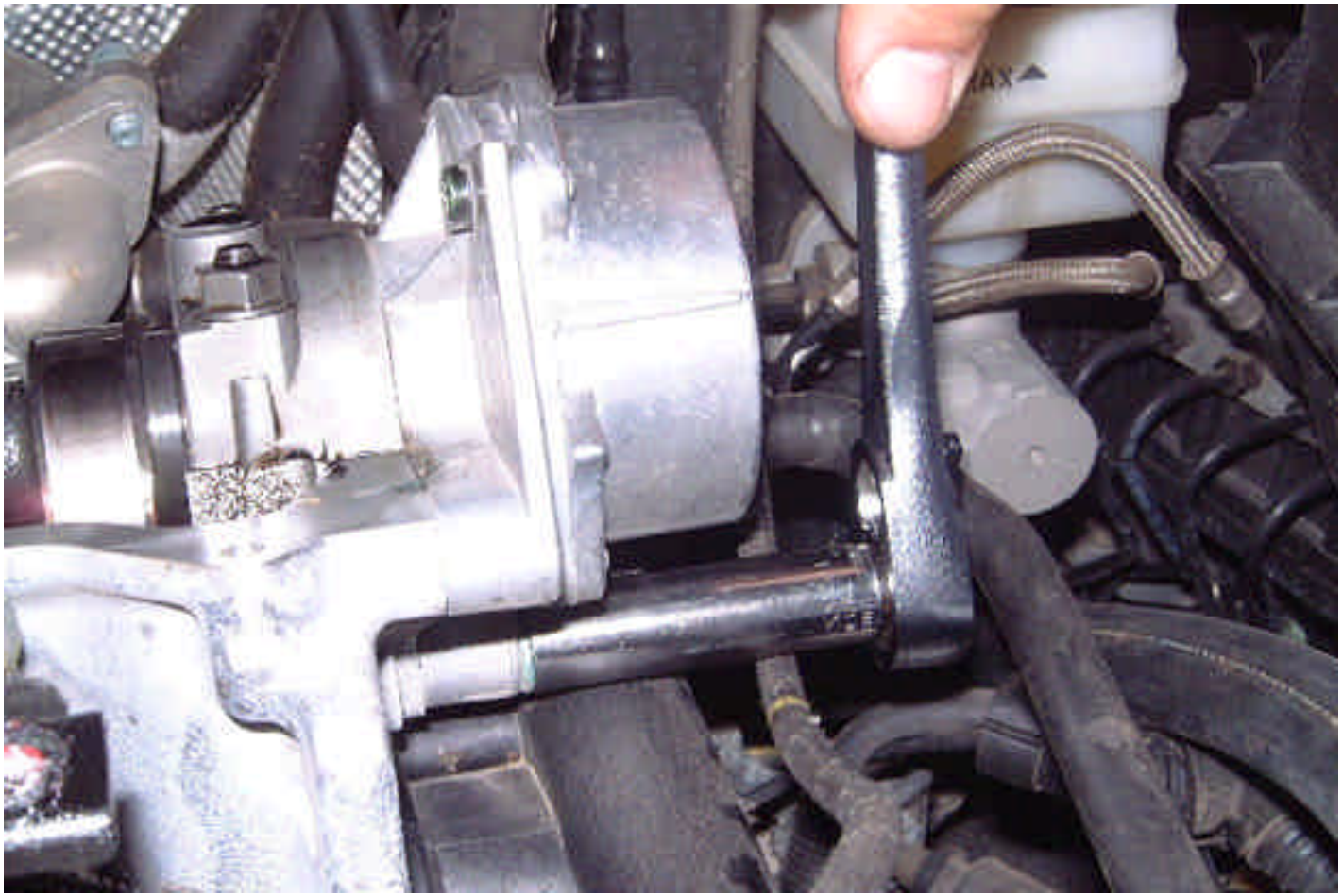


Using a 13mm deep socket, remove the front vacuum pump bolt There are three of these 1 normal bolt and the other two have a threaded bolt on the top for the vacuum line support bracket.



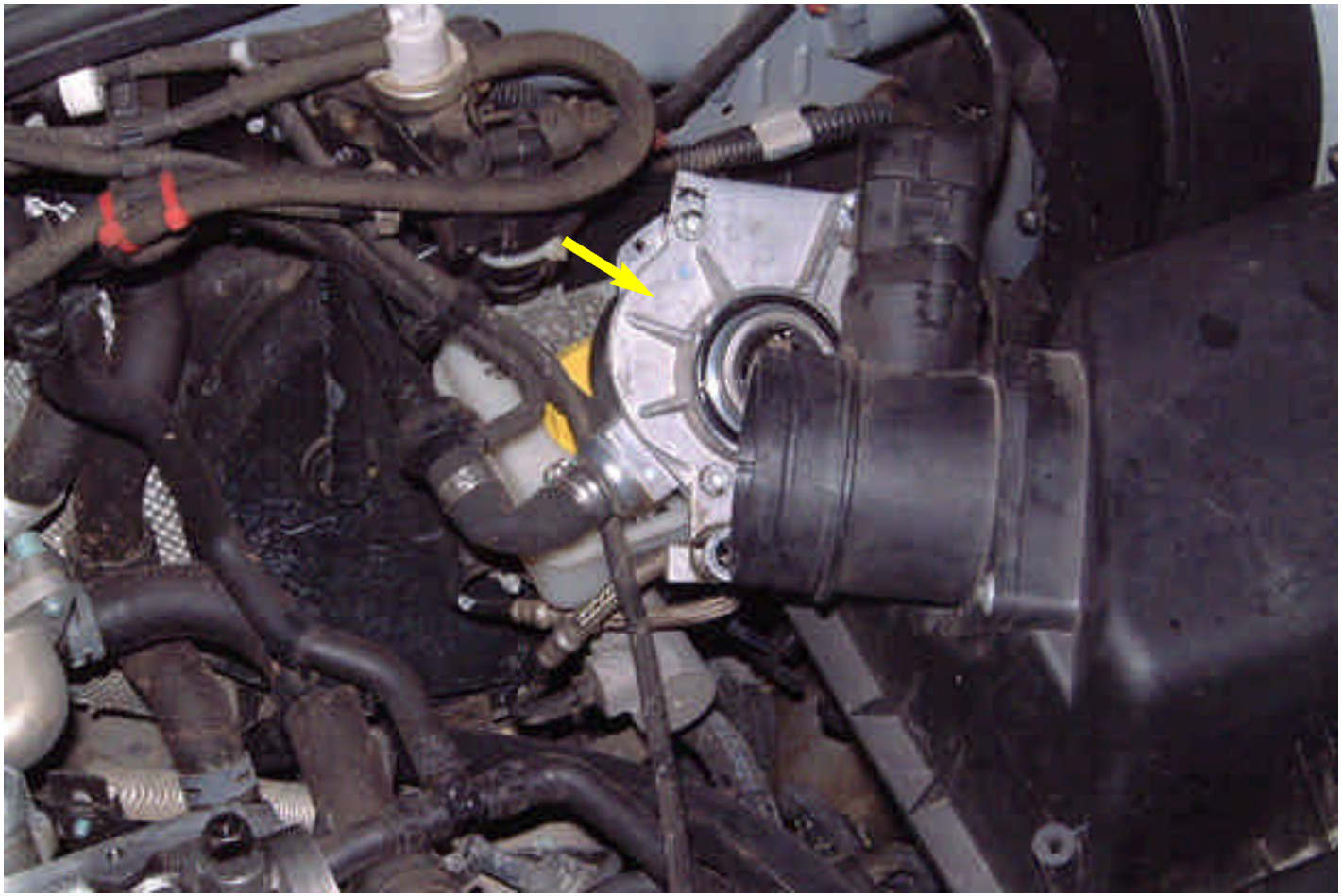
Remove the rear vacuum pump bolt. Remove the lower 13mm bolt. MANUAL TRANSMISSION OWNERS, USE A 13MM BOX WRENCH TO GET IN AND REMOVE THIS BOLT. THE COOLANT HEATER HOUSING WILL PREVENT YOU FROM USING THE DEEP SOCKET (BUT I SUPPOSE YOU HAVE NOTICED THAT...)

Notes



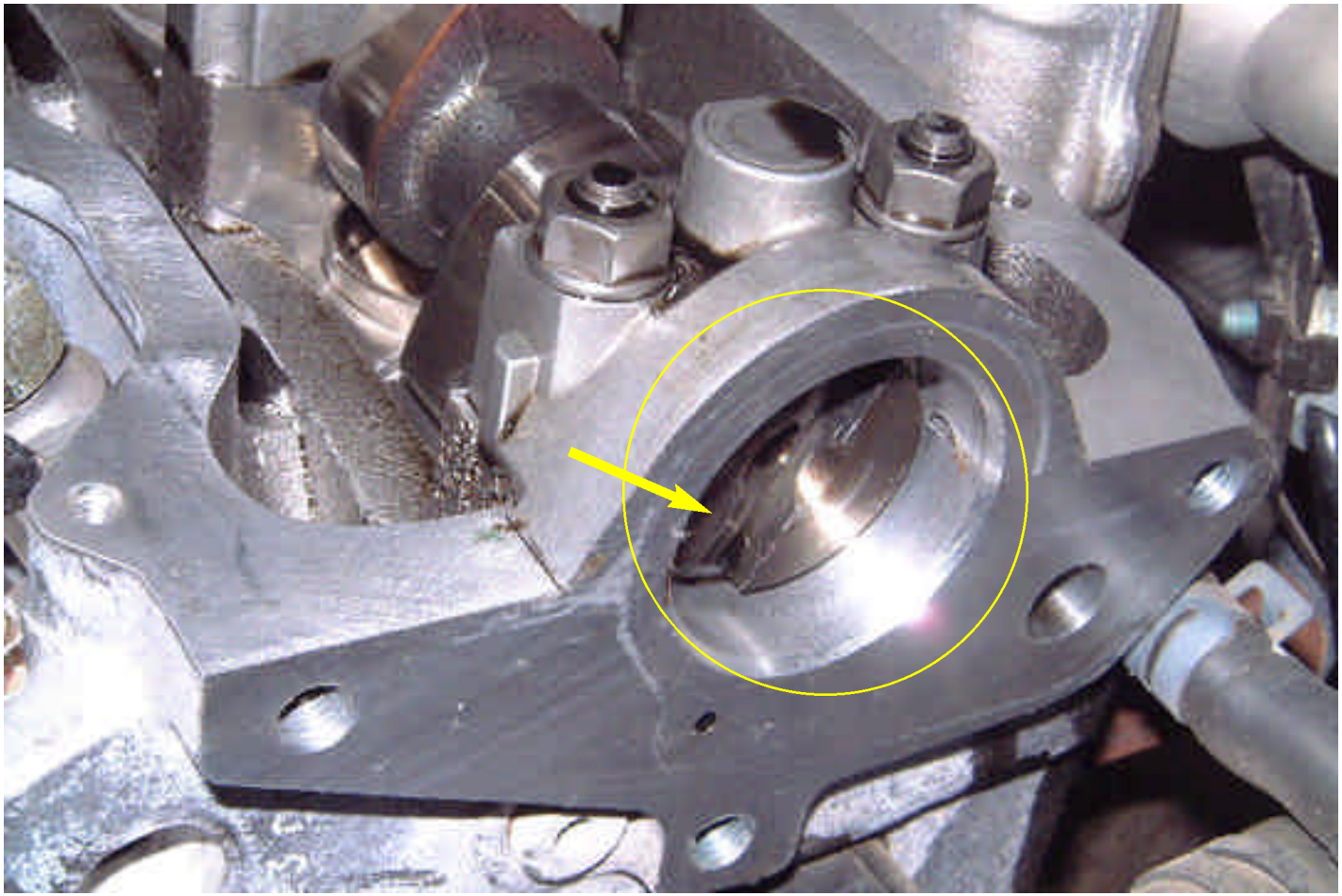
Remove the lower 13mm bolt. MANUAL TRANSMISSION OWNERS, USE A 13MM BOX WRENCH TO GET IN AND REMOVE THIS BOLT. THE COOLANT HEATER HOUSING WILL PREVENT YOU FROM USING THE DEEP SOCKET (BUT I SUPPOSE YOU HAVE NOTICED THAT...)

Notes



Remove the vacuum pump and bend it out of the way, you won't damage the line by bending it just make sure it does not fall as damage could result.

Notes



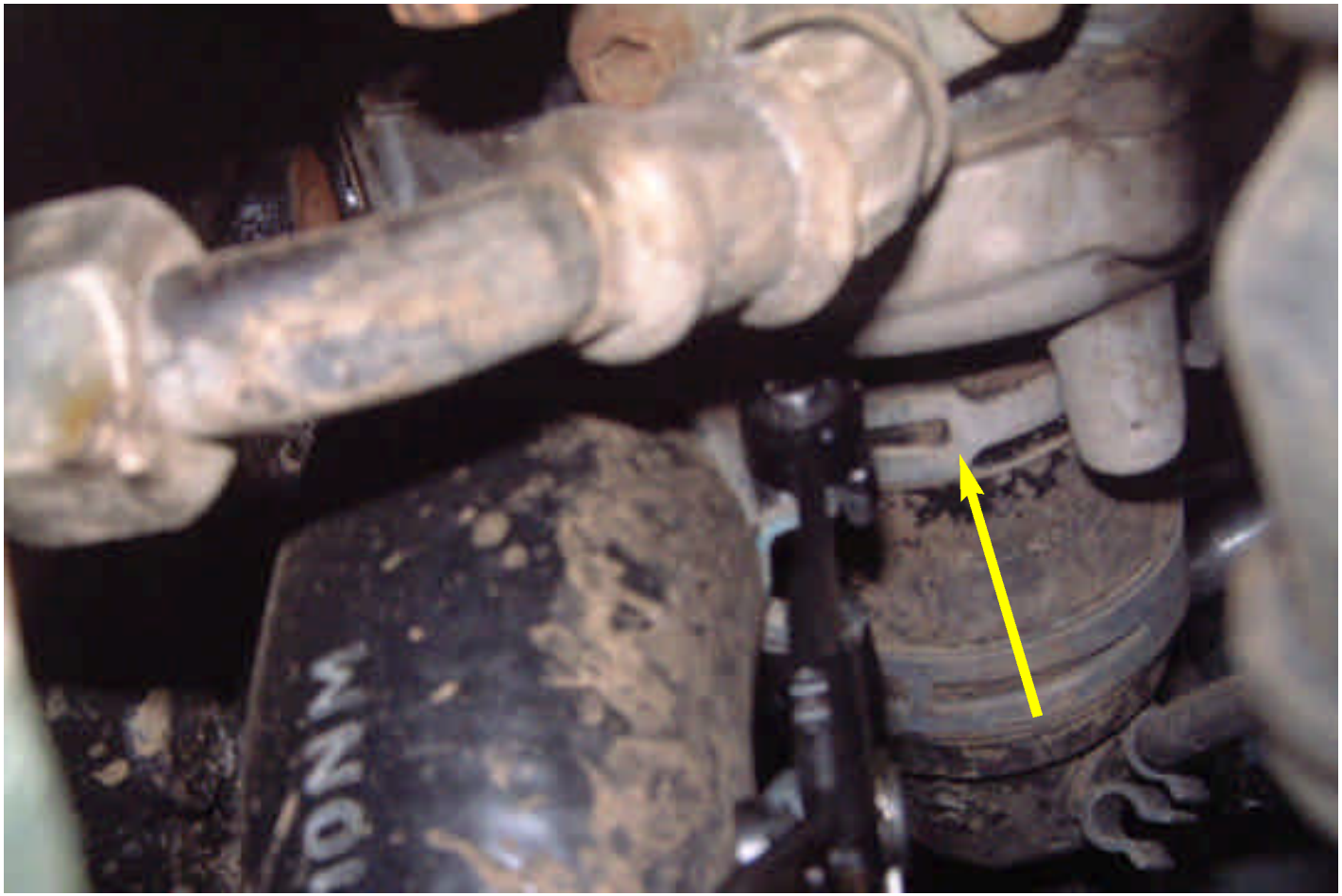
Here is a picture of the end of the camshaft.The groove in the end of the cam is where the 3418 cam setting bar is inserted. In a later step the groove as you would suspect will need to be rotated, the 3036 cam holding bar will be used to turn the engine into the correct position.

Notes

Using your two jack stands and a hydraulic jack, lift the car and support it at a height that is comfortable for you to get under the car. Now crawl under and remove the engine belly pan.

Notes

Turbo compressor outlet pipe



Crawl under the car and at the back of the engine above the passenger side drive shaft is the turbo compressor outlet pipe. Using your flat band clamp" pliers, remove the spring on turbo compressor outlet.

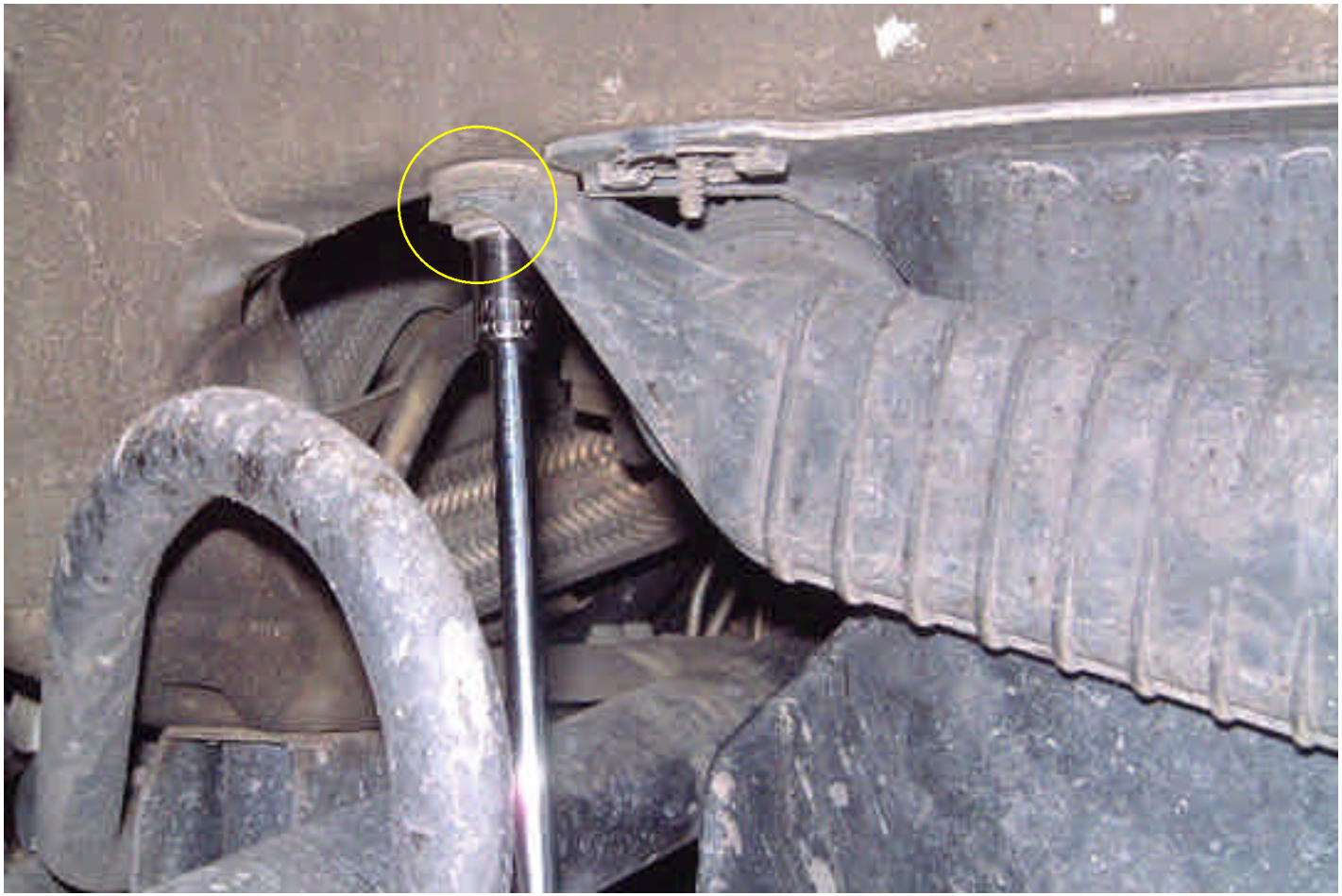
Notes

Pull the hose off of the outlet.

Notes

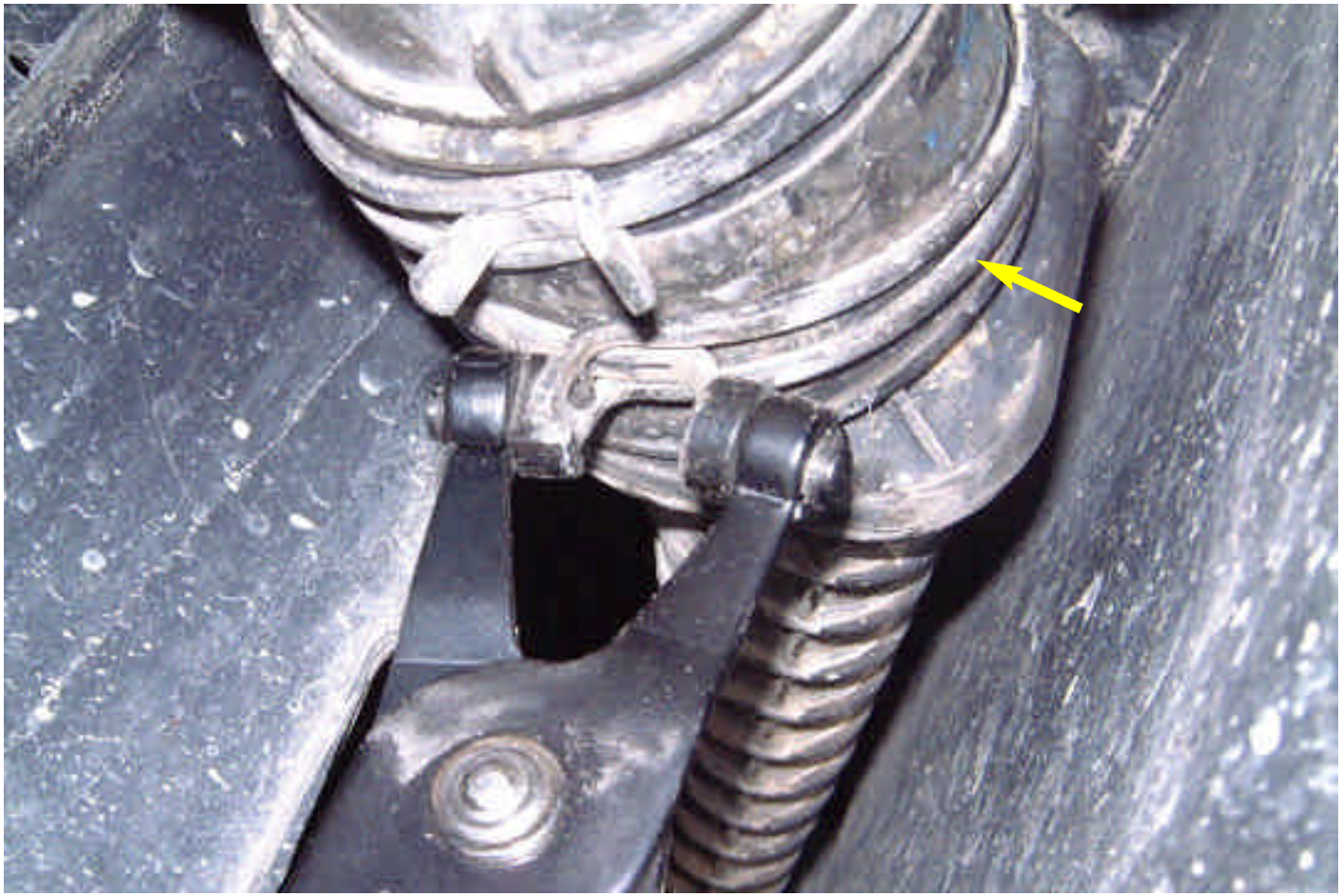
Turbo compressor outlet pipe

5.4



Use a 10mm socket and remove the nut on the turbo to intercooler pipe.,

Notes



Use the clamp pliers to remove the clamp on the intercooler and remove the whole duct assembly.

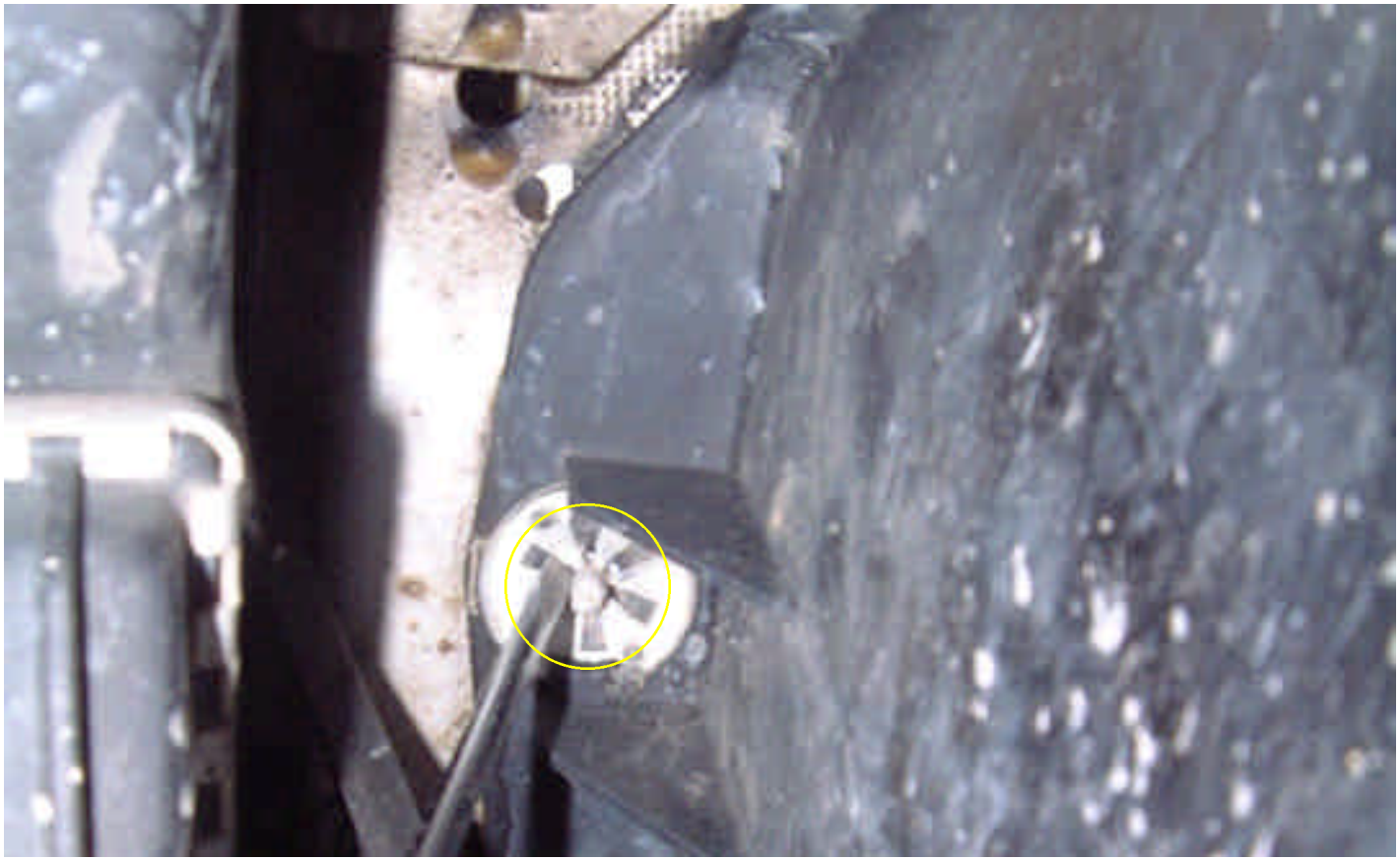
Notes

Notes

Outlet pipe. Note that the outlet pipe does not have to be removed in every application and if it doesn't get in the way, just push it over to the side.

Notes

At the top of the engine side cover, Remove the washer nuts using a long screwdriver by un-screwing them, or you can just pull off with some force but you may damage the washer so try this as a last resort.Then remove the side lower panel.



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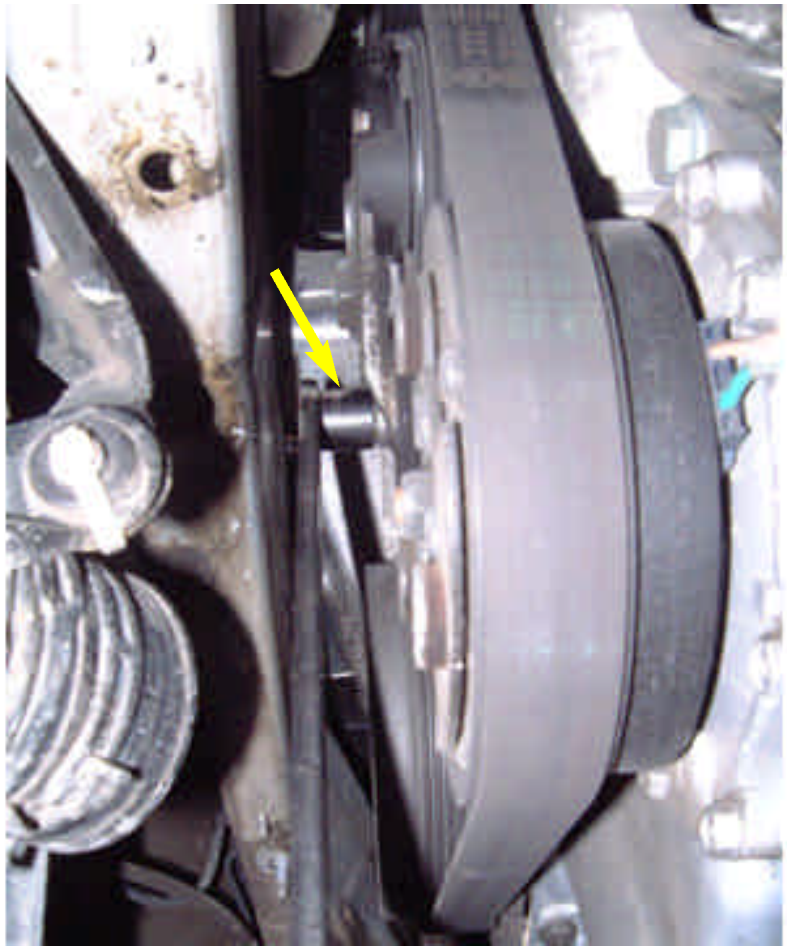

Using the Craftsmen 41831 serpentine belt tensioner tool and the special short 16mm socket that came with the tool. (FYI a standard socket **WILL NOT** fit in this small space)

Notes

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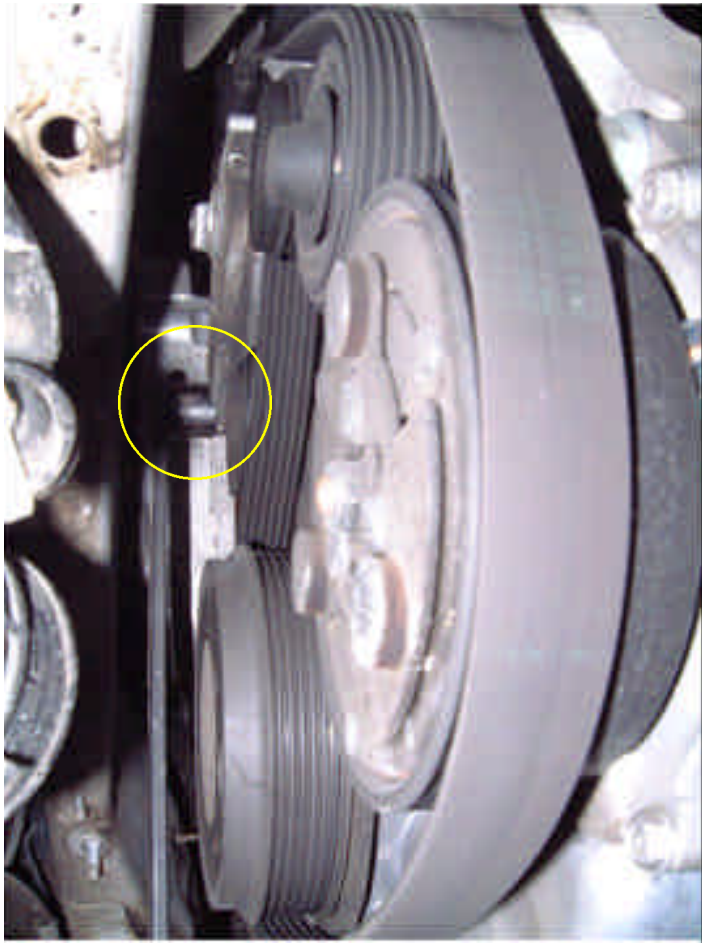
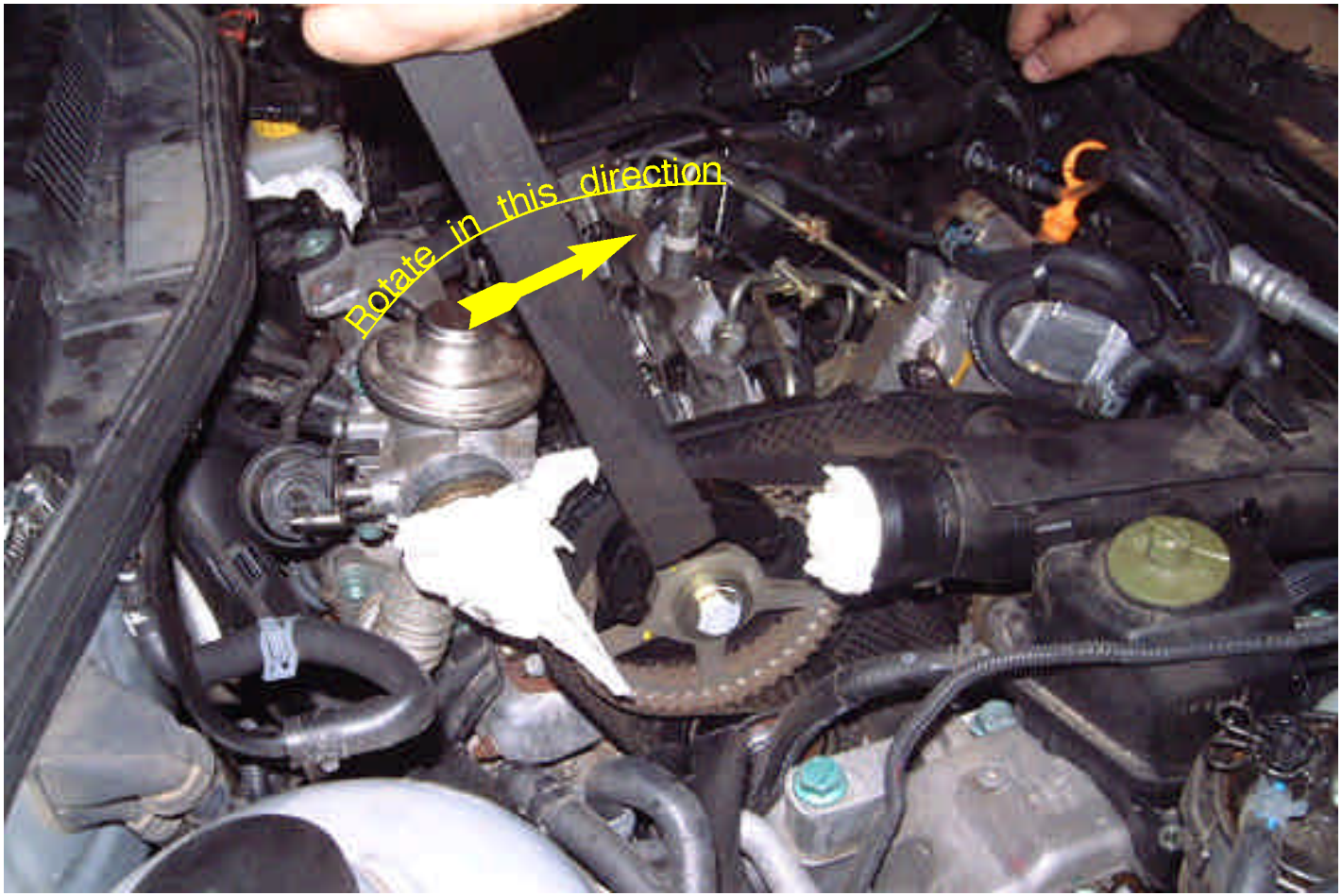
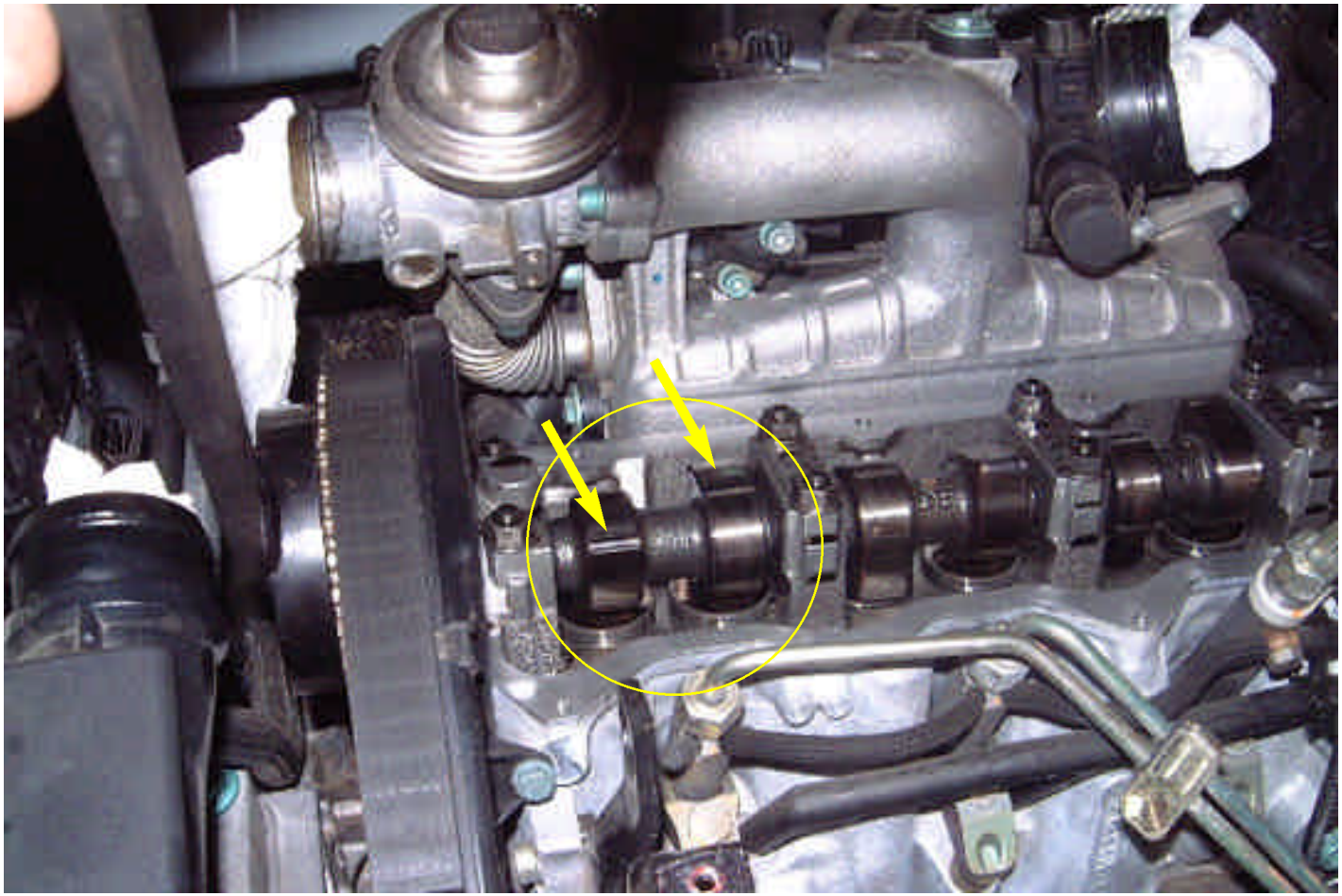


Relieve the tension on the serpentine belt tensioner and remove the belt.



Using the 3036 cam holding bar, rotate the engine clockwise until the cam lobes on the #1 cylinder (passenger side in “normal world") are in the "lobes up” position and the groove in the cam pulley is level with the machine finished valve cover deck.

Notes



Lobes up.

Notes

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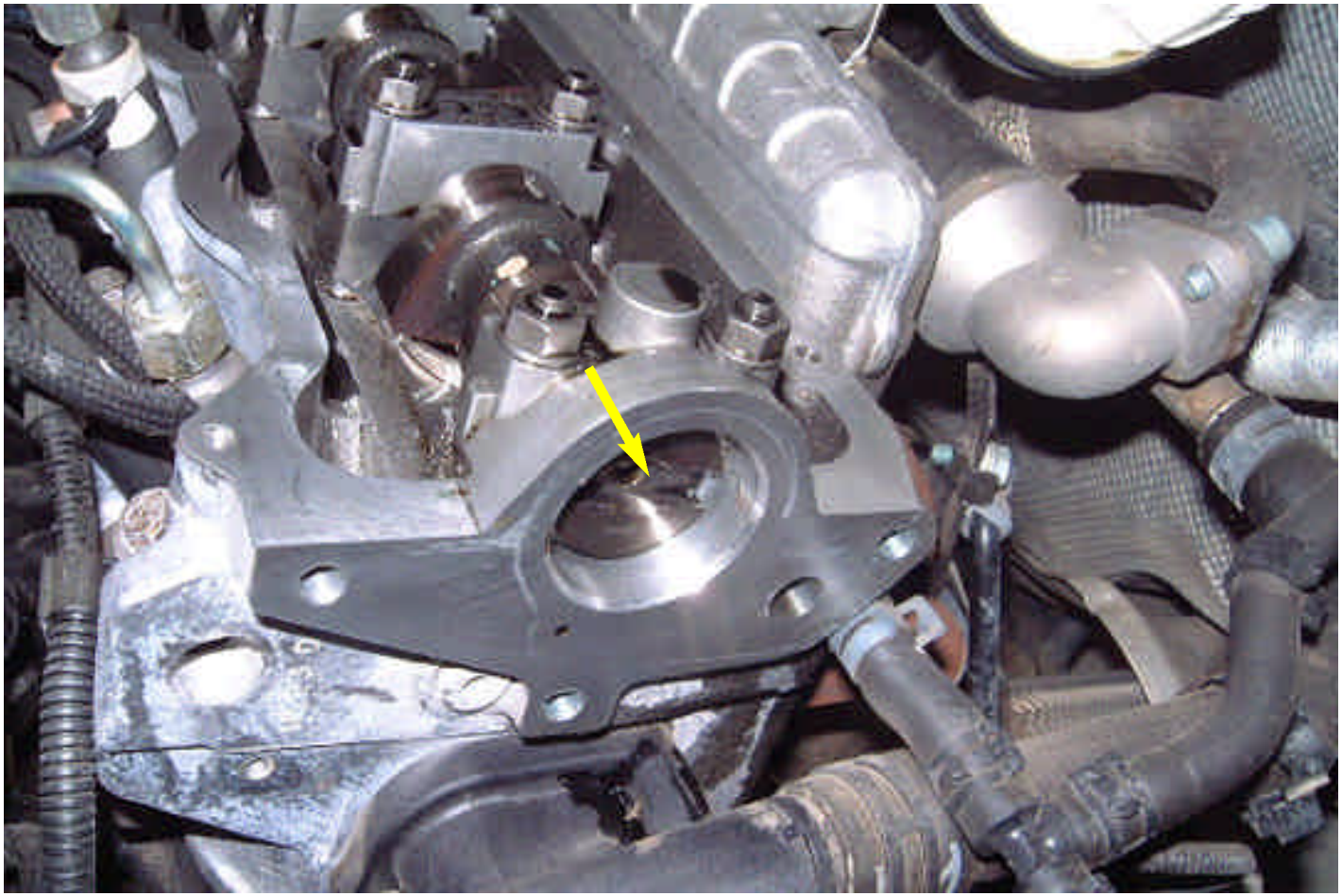
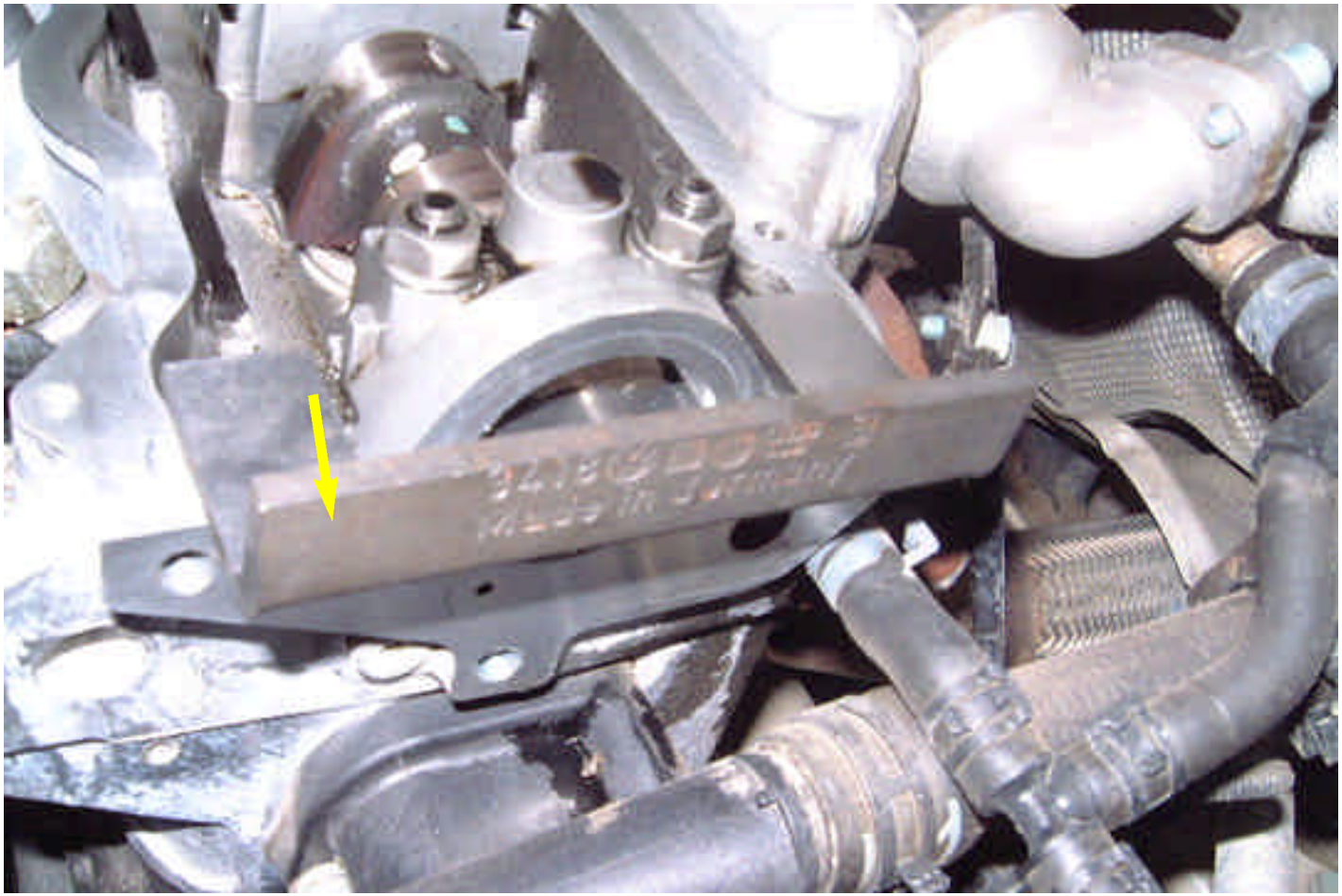


Lobes up, groove horizontal.

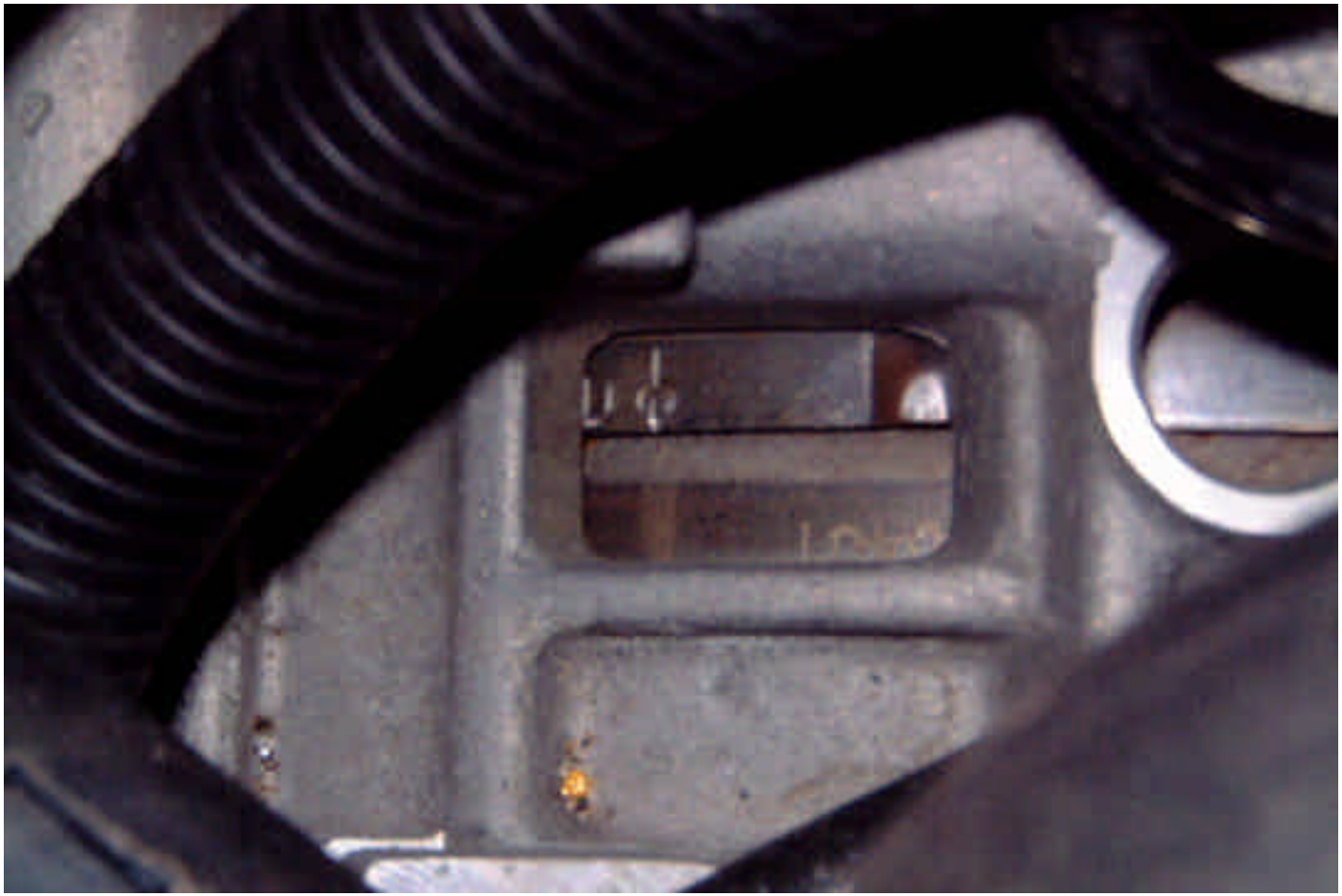
Notes



Install the 3418 cam setting tool into the groove, you may need to work the cam back and forth a bit with the 3036 tool. The 3418 has a nit of flex to it so it holds the bar nice and tight in the groove preventing the cam from moving. In the A3's you needed to use feeler gauges but in the design of this tool they built in tension that eliminates the need to use feeler gauges as depicted in the Bentley Manual. **THIS IS A "GOT-YA", MAKE SURE THE #1 LOBES ARE IN THE LOBES-UP POSITION BECAUSE OF THE FLEX IN THE 3418 TOOL IT IS POSSIBLE TO FORCE IT INTO THE GROOVE ON THE CAMSHAFT EVEN THOUGH ITS 180 DEGREES OUT, TRUST ME ON THIS ONE.**

Bell housing/ flywheel timing mark

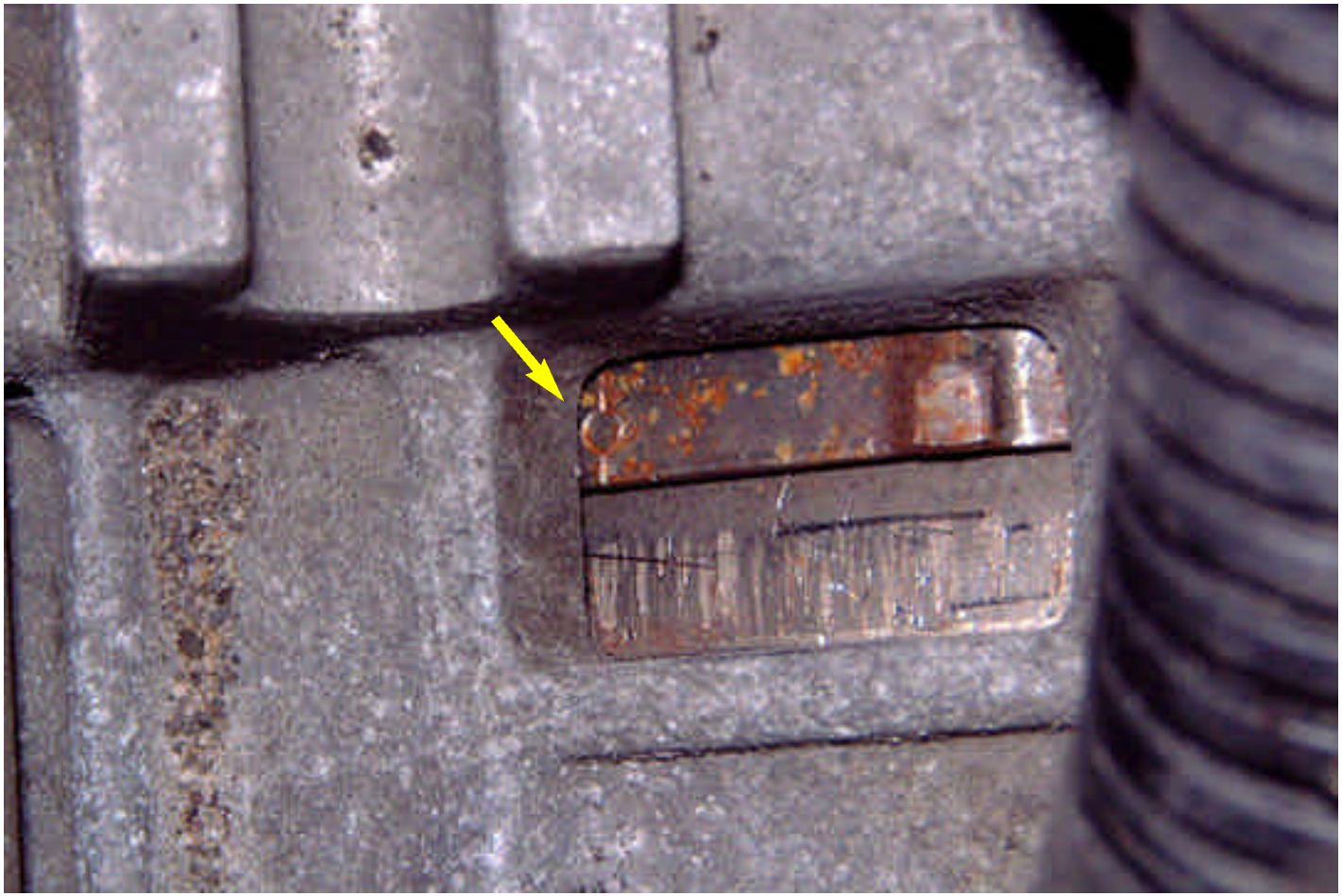
9.1



On the flywheel you are looking for a stamped circle (A) with a "minus" sign on either side. The first line shows the timing mark when the cam setting bar was first installed. It should look like the second picture (9.2) with the circle and dashes at the very bottom of the window. At this point do not worry about the crank timing it is however **VERY** important for you to know what it looks like because of all the marks that can be construed as a "TDC" mark.

Notes

Bell housing/ flywheel timing mark



Flywheel at TDC.

Notes

Notes

Moving back over to the pendulum engine mount by the power steering reservoir, use a 13mm with an extension to remove the steel engine mount alignment plate.

Remove the two lower bolts using a 1/2" drive and 16mm socket If you have to use an 18mm these are the **WRONG** BOLTS!

Notes

Notes

Engine mount alignment plate.

Notes

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Notes

Grab your hydraulic floor jack and the 6" 2x4 piece of wood, position the wood and the jack on the rear passenger side corner of the oil pan. NOTE: MAKE SURE THE WOOD IS ON THE EDGE THE REASON IS STRUCTURALLY THIS IS THE ABSOLUTE STRONGEST PART OF THE PAN AND WILL PREVENTYOU FROM CRUSHING IT IF ANYTHING WERE TO SHIFT OR DROP. Once the jack is positioned under the pan lift the engine until the engine weight is off of the mount and so that the engine mount is off the car frame by about an inch.

Or, as an option, you can use an engine hangersuch as the Herm-o-hanger pictured above, constructed by GeWilli. Plans to build this can be obtained at www.tdiclub.com.

If you prefer to buy an engine hanger, checkout www.harborfreight.com
.

Notes

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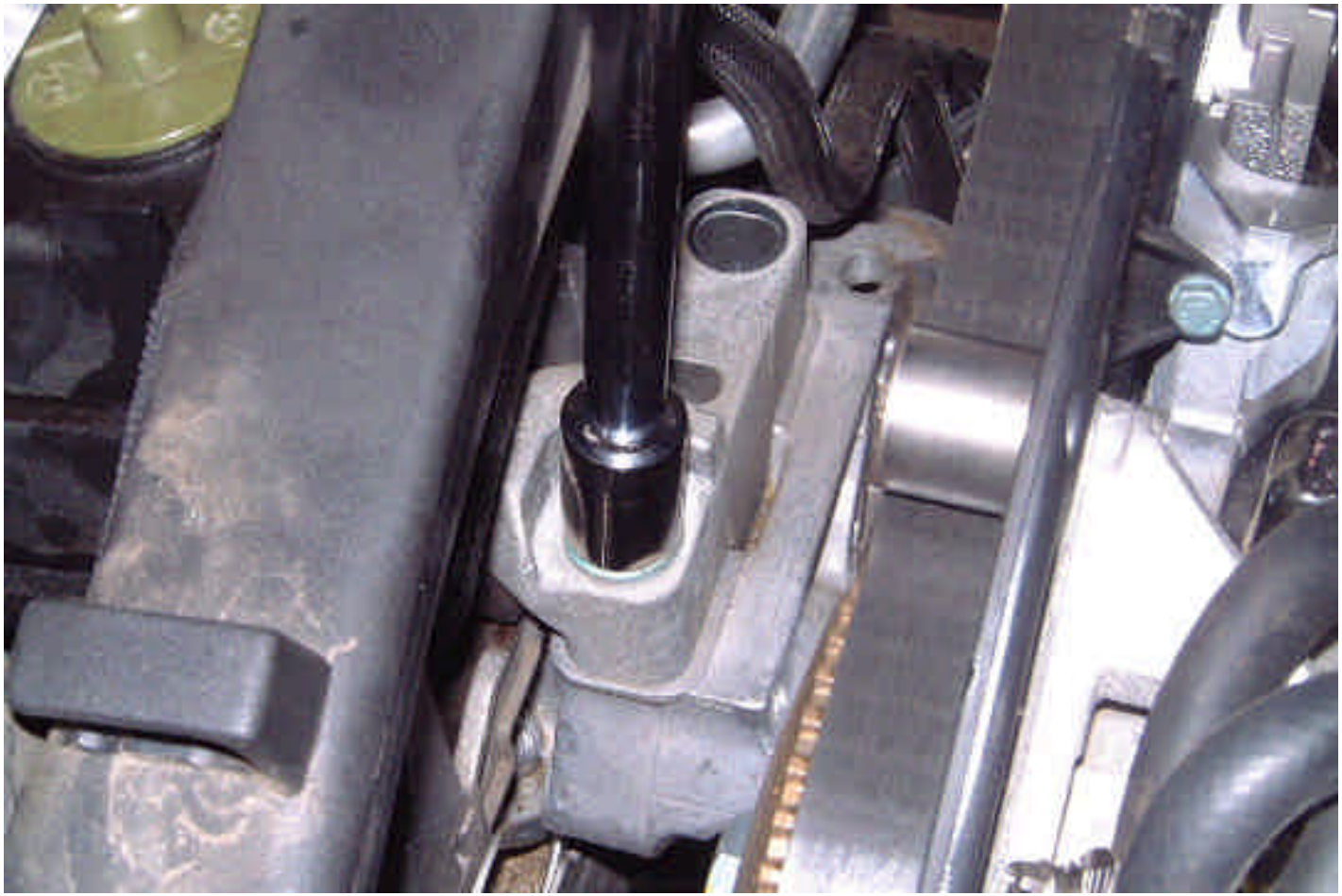
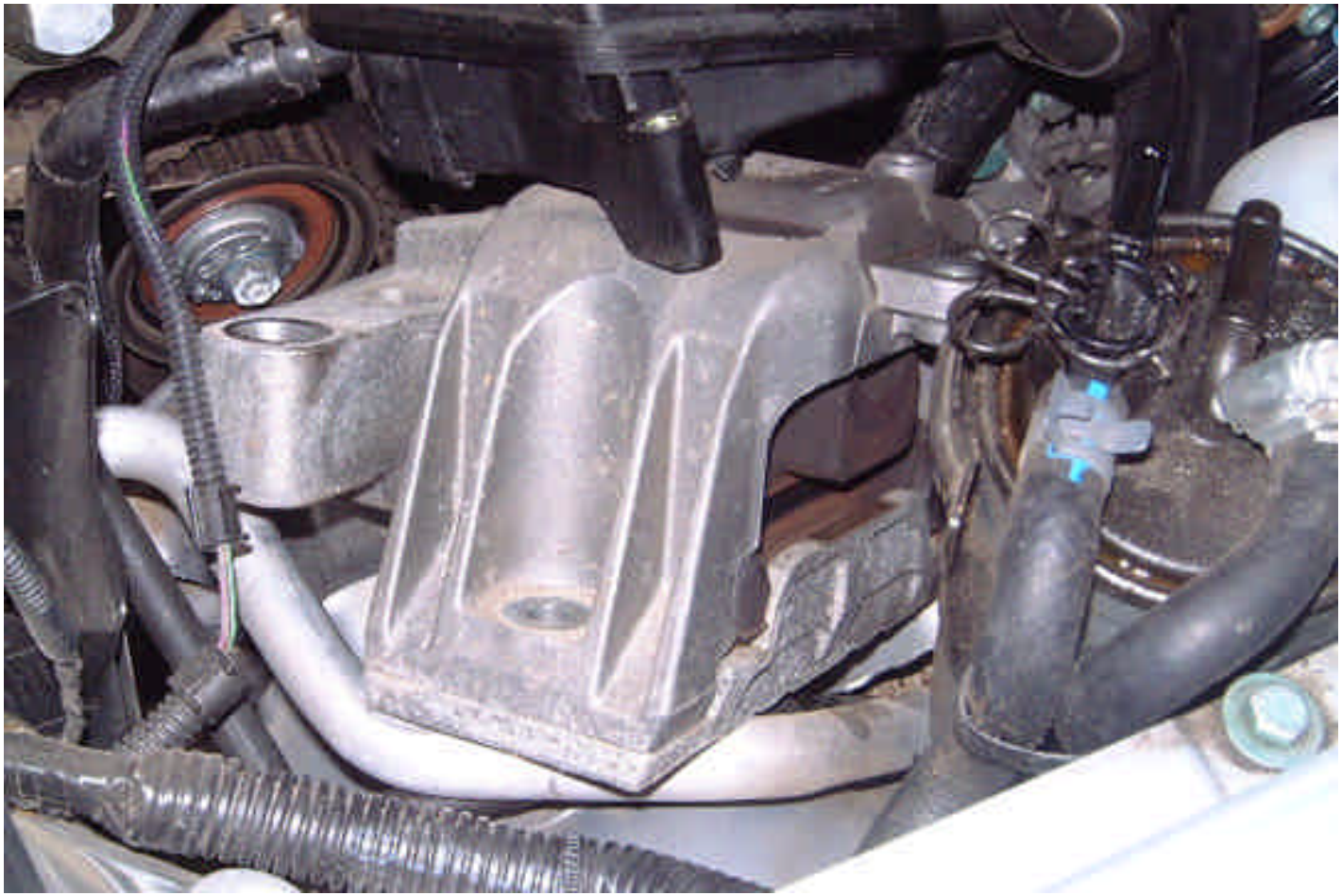
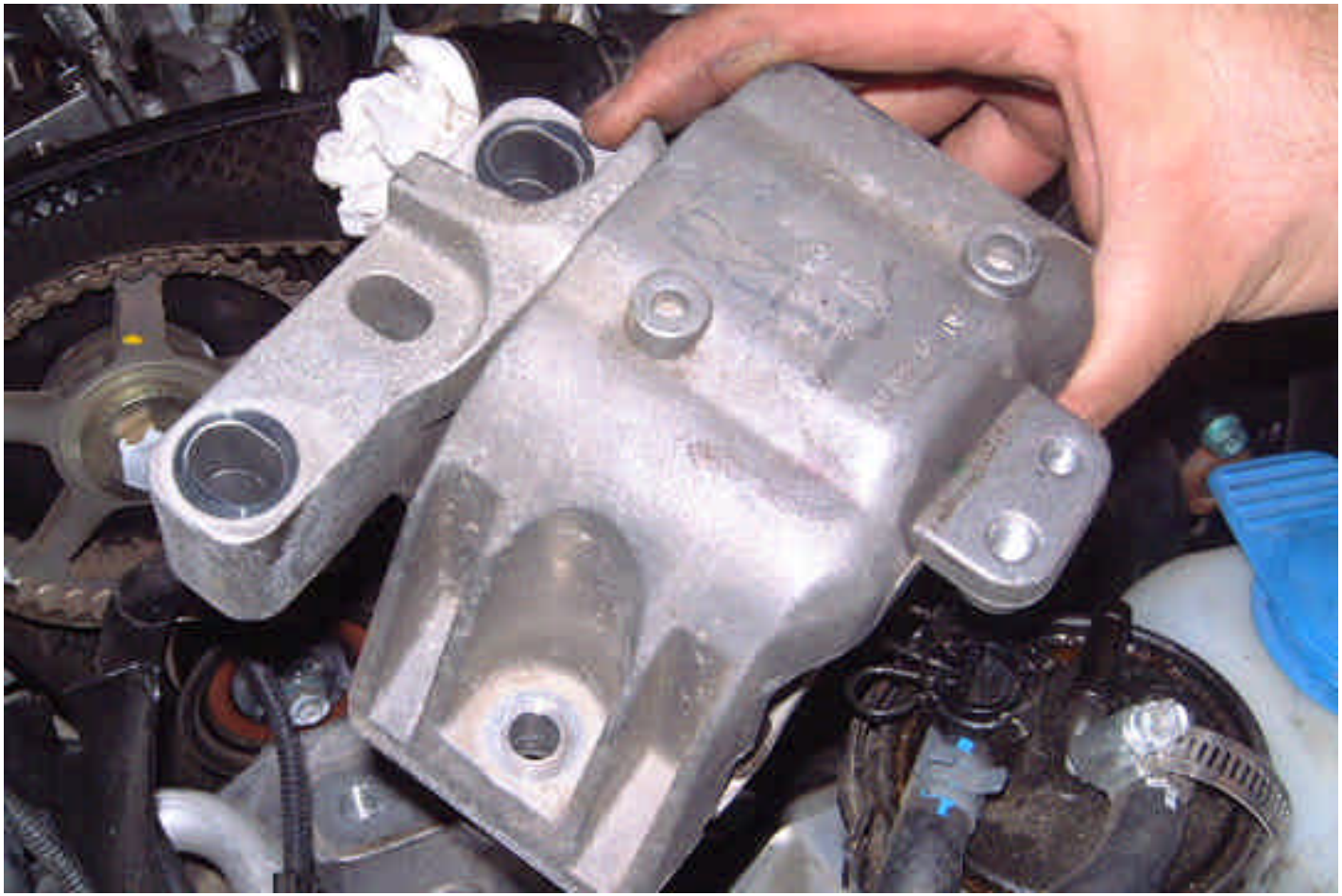


With the engines weight off of the engine mount use a 1/2" 18mm socket and breaker bar (this is a tight bugger) and remove both of the remaining engine mount bolts.

Notes



Slide the engine mount out of its position and remove from the car.



Removed!

Notes

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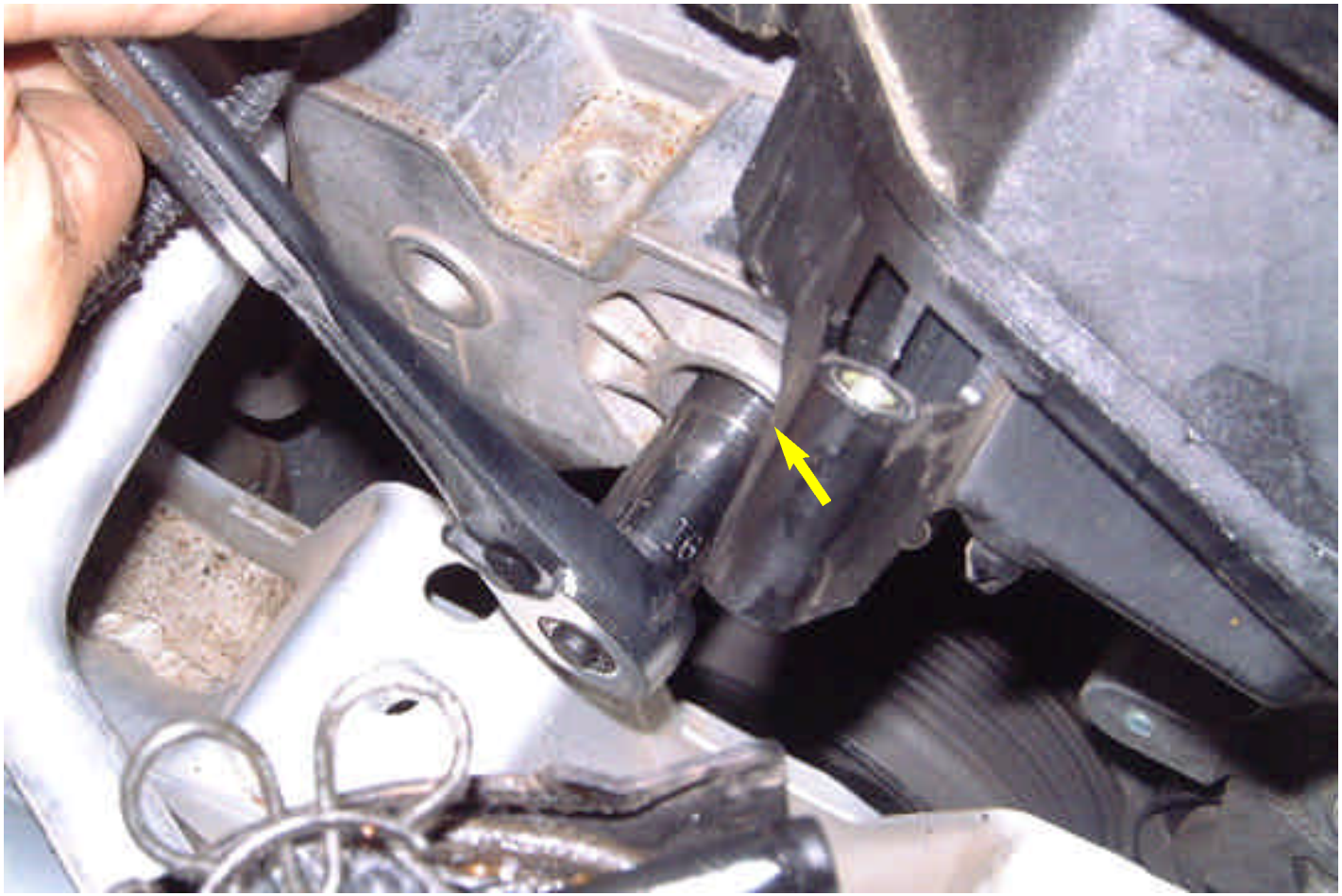
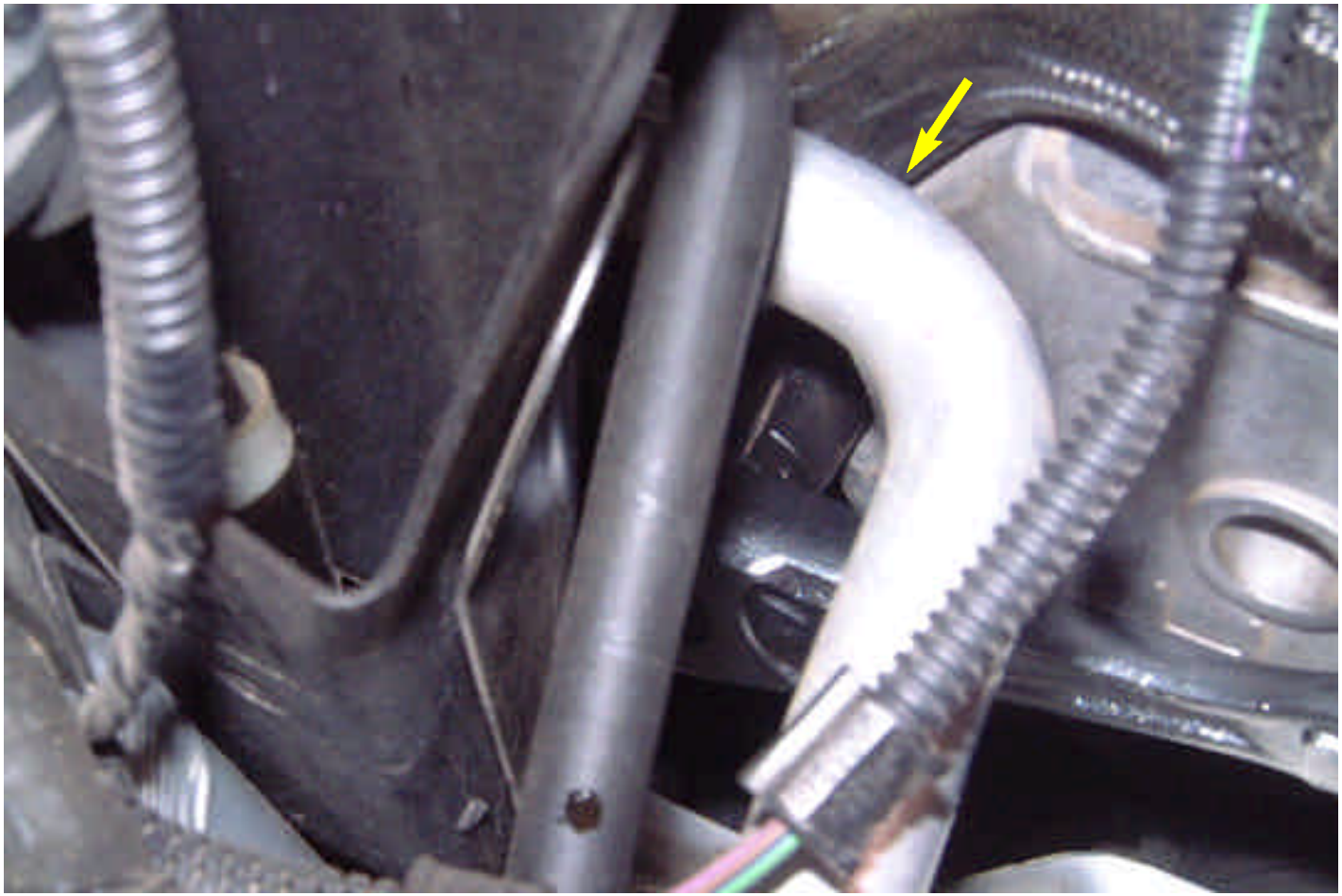
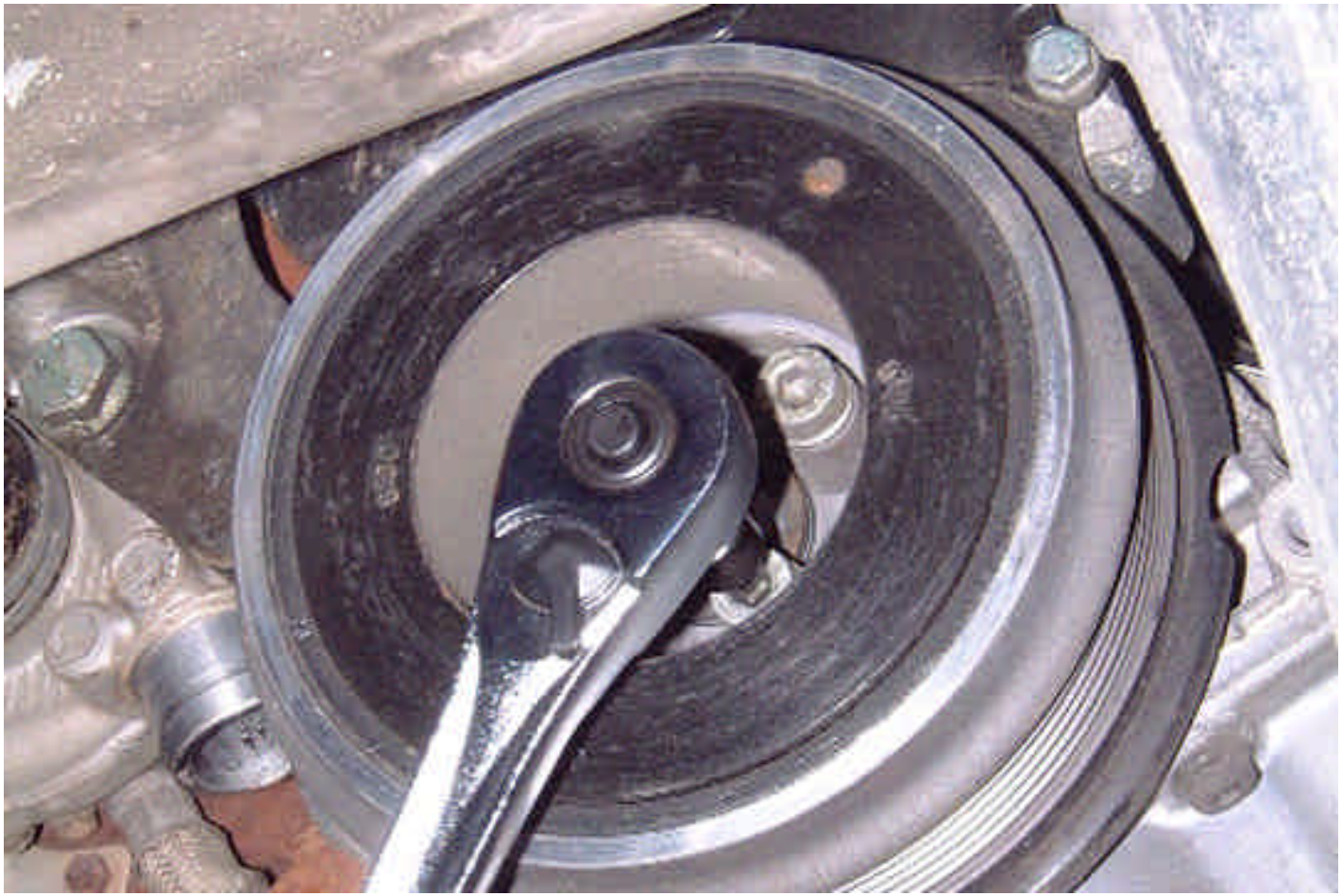


Now carefully raise the engine on the jack until the engine mount bracket hole is exposed so you can get a socket in. Don't worry you will not damage the other mounts in doing this. You may have to raise the engine quite a bit so don't be surprised (your knuckles will thank you the higher you raise it...) Now use a 3/8 drive ratchet and a deep 16mm socket and remove the front and center engine mount bolt.

Notes



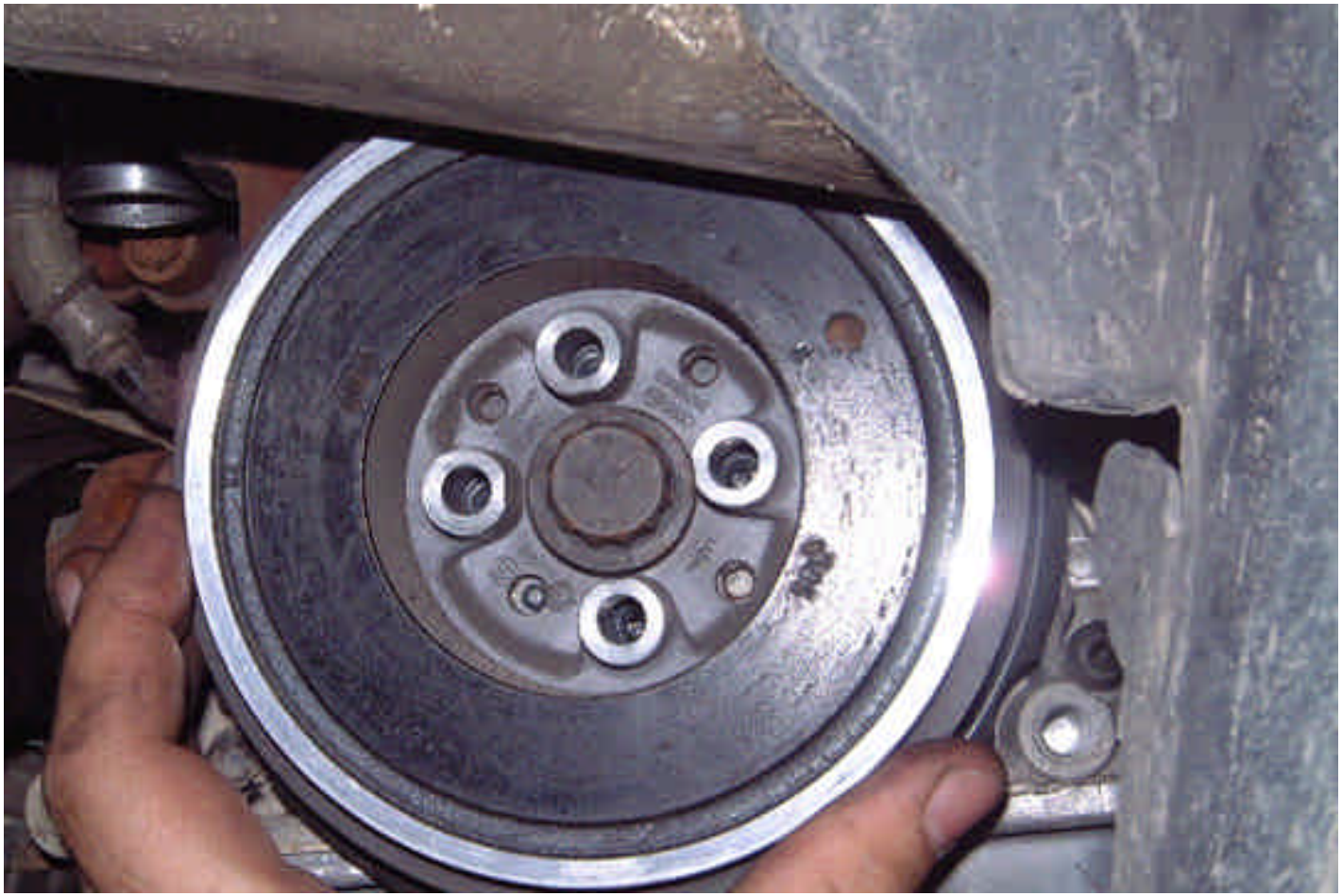
The super secret hidden rear one: this one you will have to find by feel, but I can assure it is there!



Lower the engine on the jack so that you can have access to all four of the allen bolts on the harmonic damper. The balancer is suprisingly heavy and easy to drop when you take out the last bolt so don't let it fall on you. Use a 3/8 drive ratchet or breaker bar and a 3/8 drive 6mm allen socket break loose and remove the allen bolts.

NOTE: DO NOT USE AN EXTENSION OR ELSE YOU RISK STRIPPING THE BOLT HEADS.
FYI the cam setting bar will keep the engine from moving. On the manual you could put the engine in gear and keep it from moving by having somebody hold the brake pedal down, so this method works for both but at least the manual tranny folks know there is an option.

Notes



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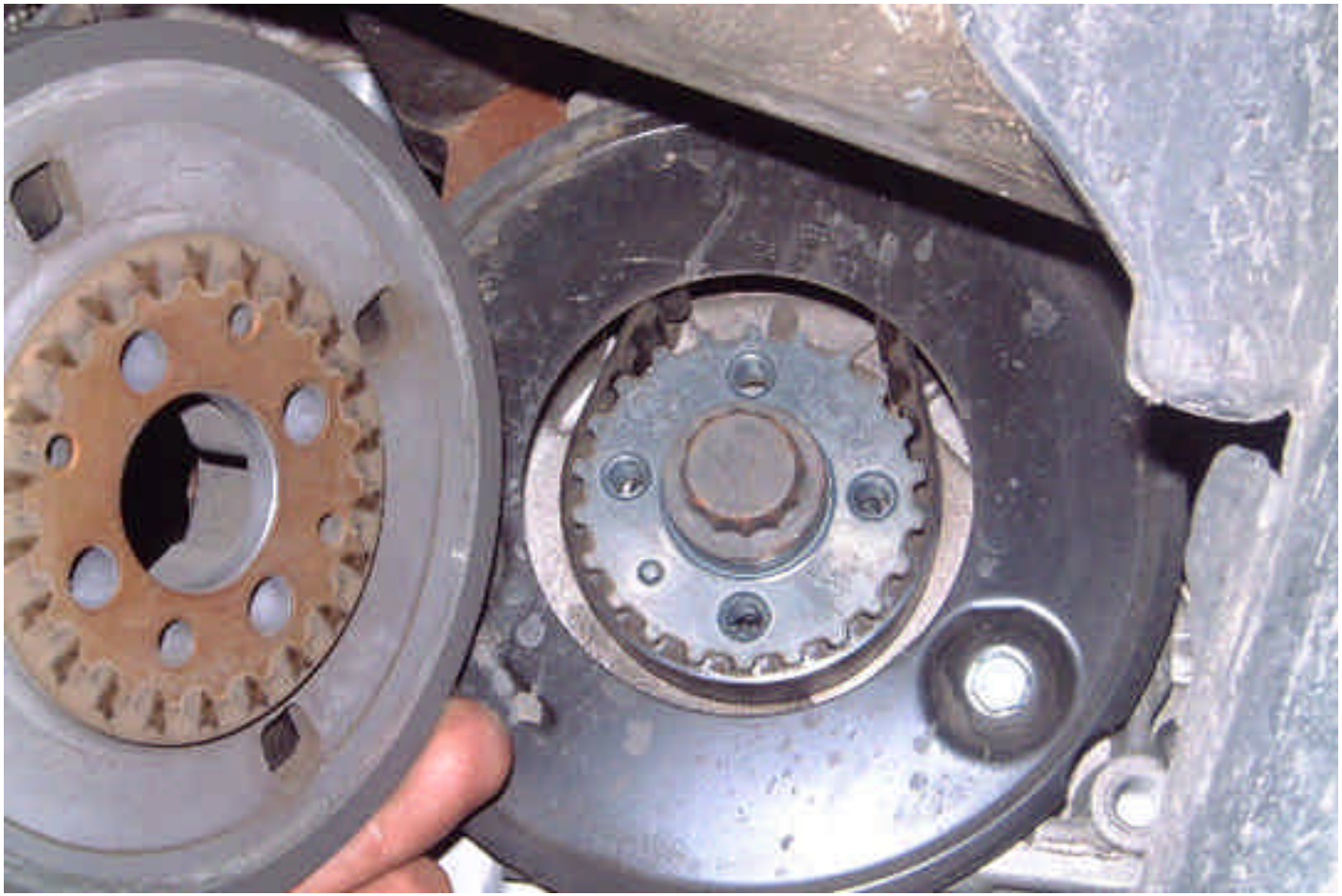

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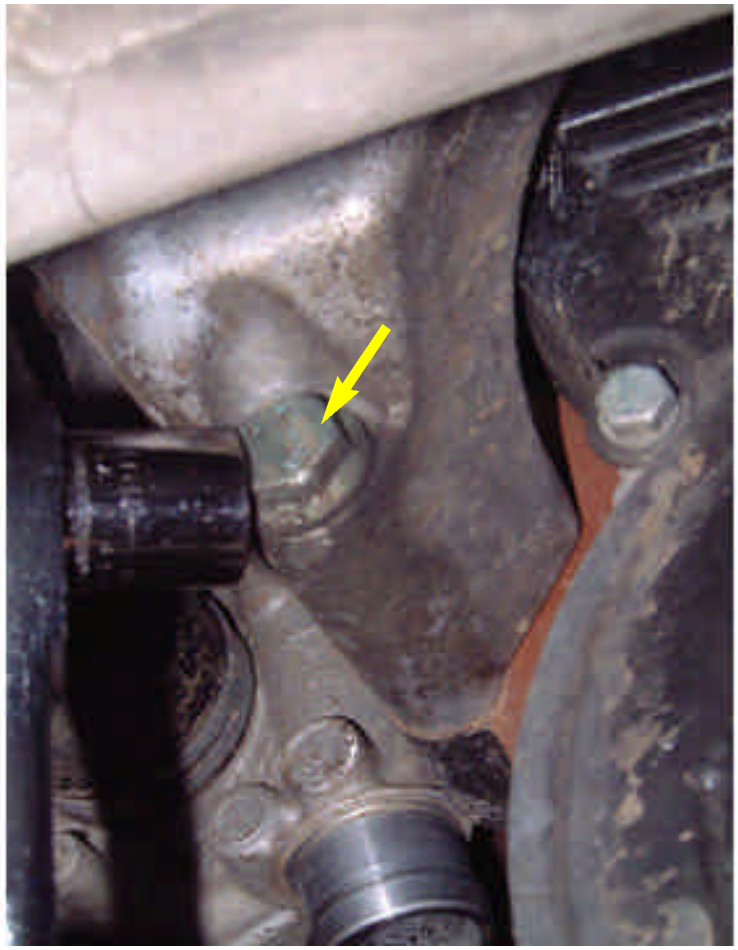

Use a 3/8 drive ratchet and 16mm socket to break loose the engine mount **but don't remove the bolt yet**.

Get a 1/4 drive and a 10mm deep socket and remove the (5) bolts that hold the timing belt cover plates on. Remove the last 16mm bolt holding on the engine mount and push the mount upward to remove the top timing belt cover plate NOTE: THE TOP COVER CAN ONLY BE REMOVED ONCE THE LOWER ENGINE MOUNT BOLT IS REMOVED. WHEN RE ASSEMBLING THE ENGINE THE LOWER COVER MUST BE INSTALLED FIRST FOLLOWED BY THE TOP COVER THEN THE ENGINE MOUNT CAN BE INSTALLED IN THAT ORDER. Also notice the rotational direction of the timing belt. Look for oil leaks or anything that is out of order, now is when you want to find it.

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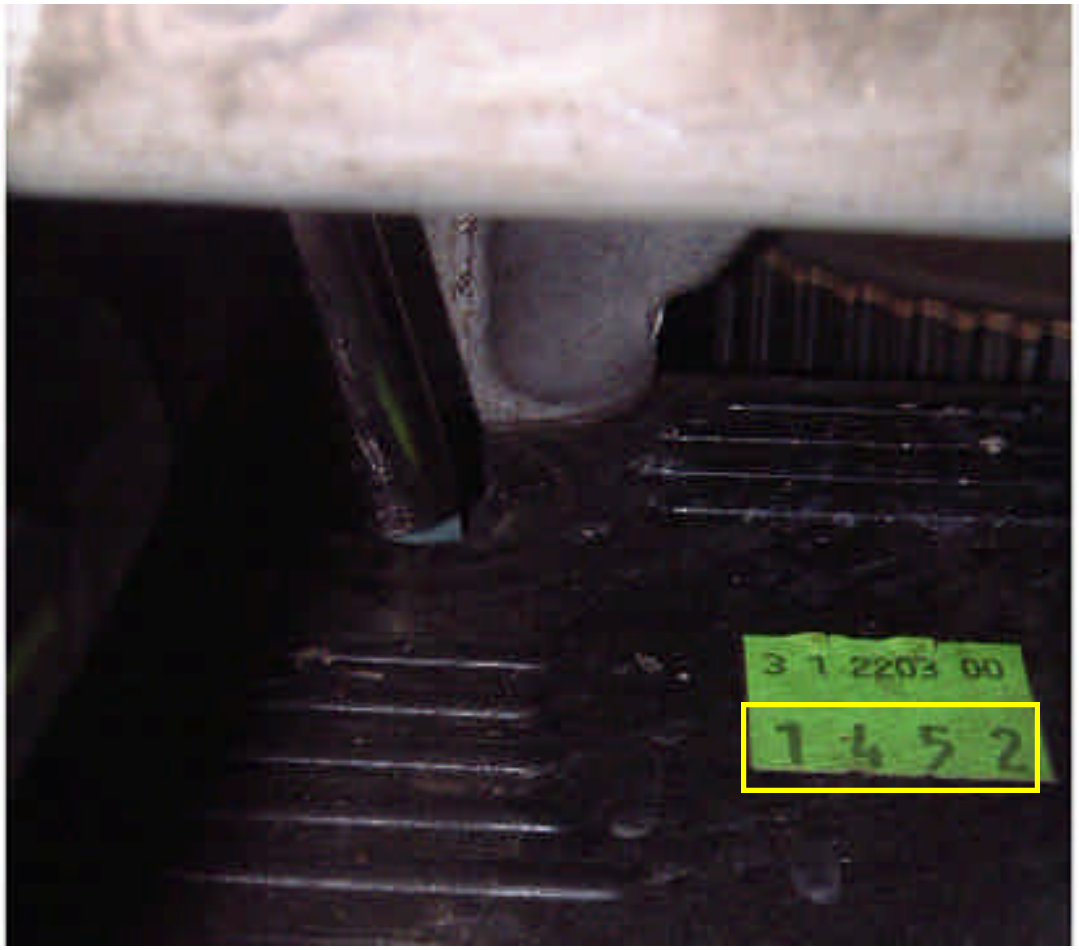
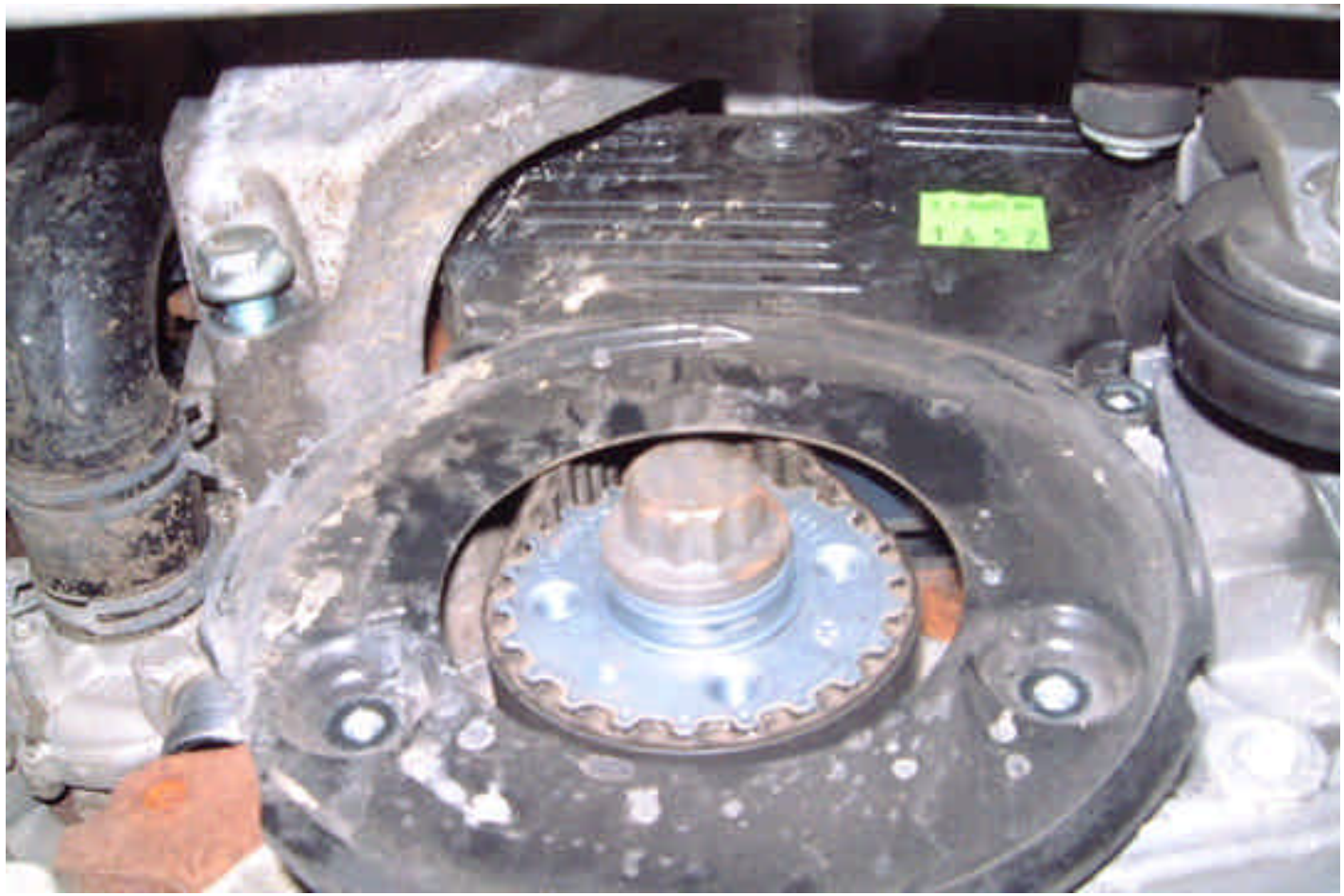
Note: Due to manufacturing tolerance differences on some cars, it may necessary to move and hold the serpentine belt tensioner out of the way while removing this cover bolt.

Notes



This is **NOT** how many hours it takes to do this job...



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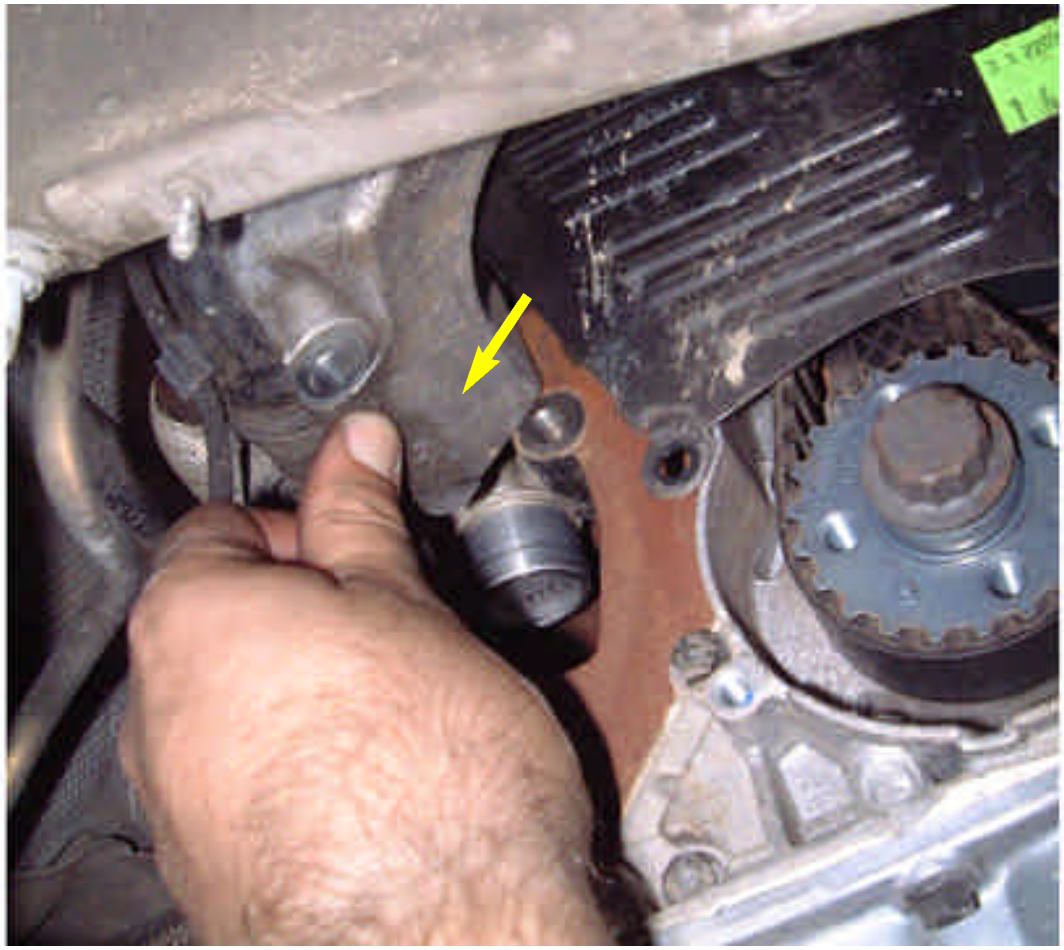
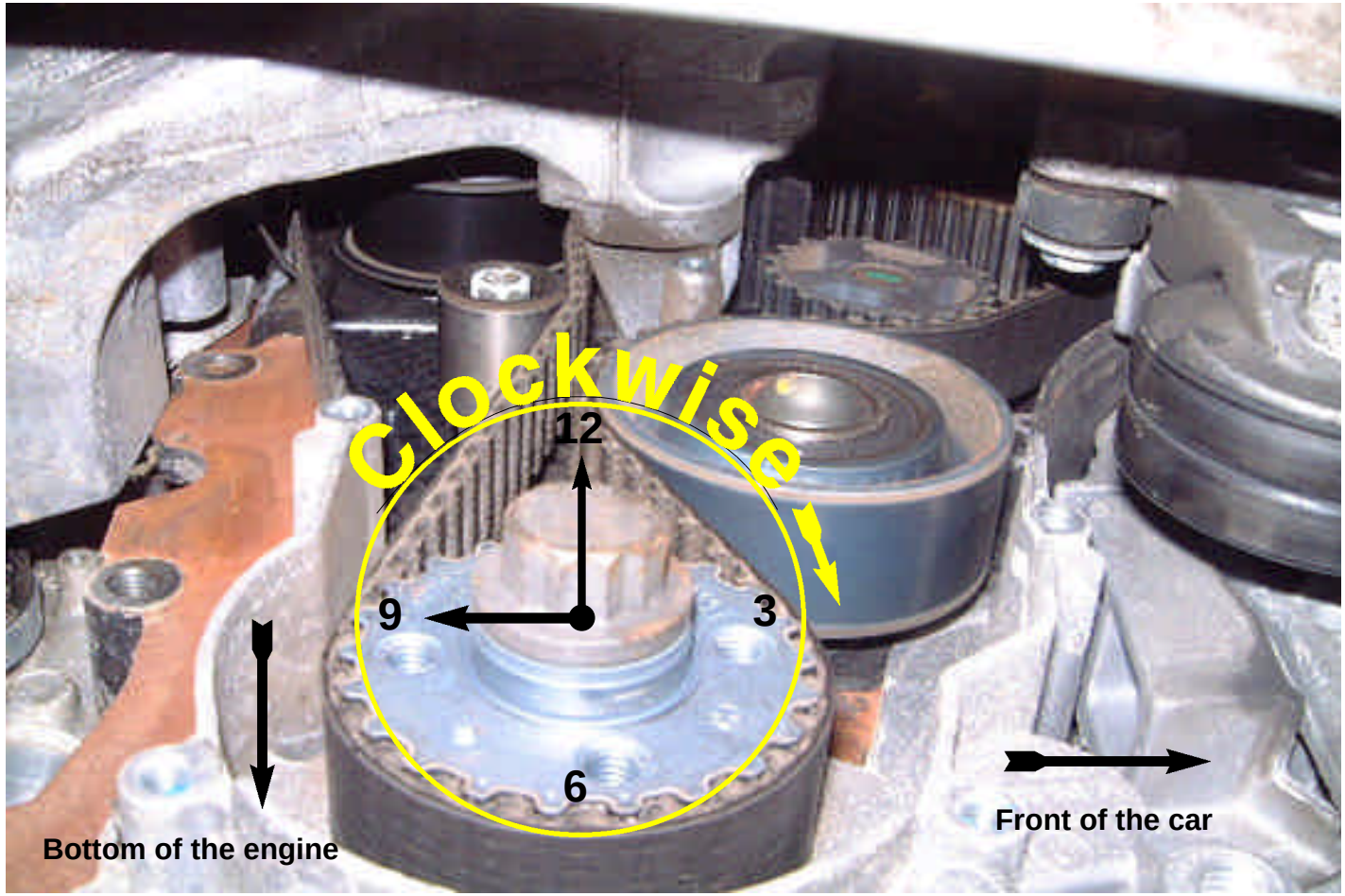


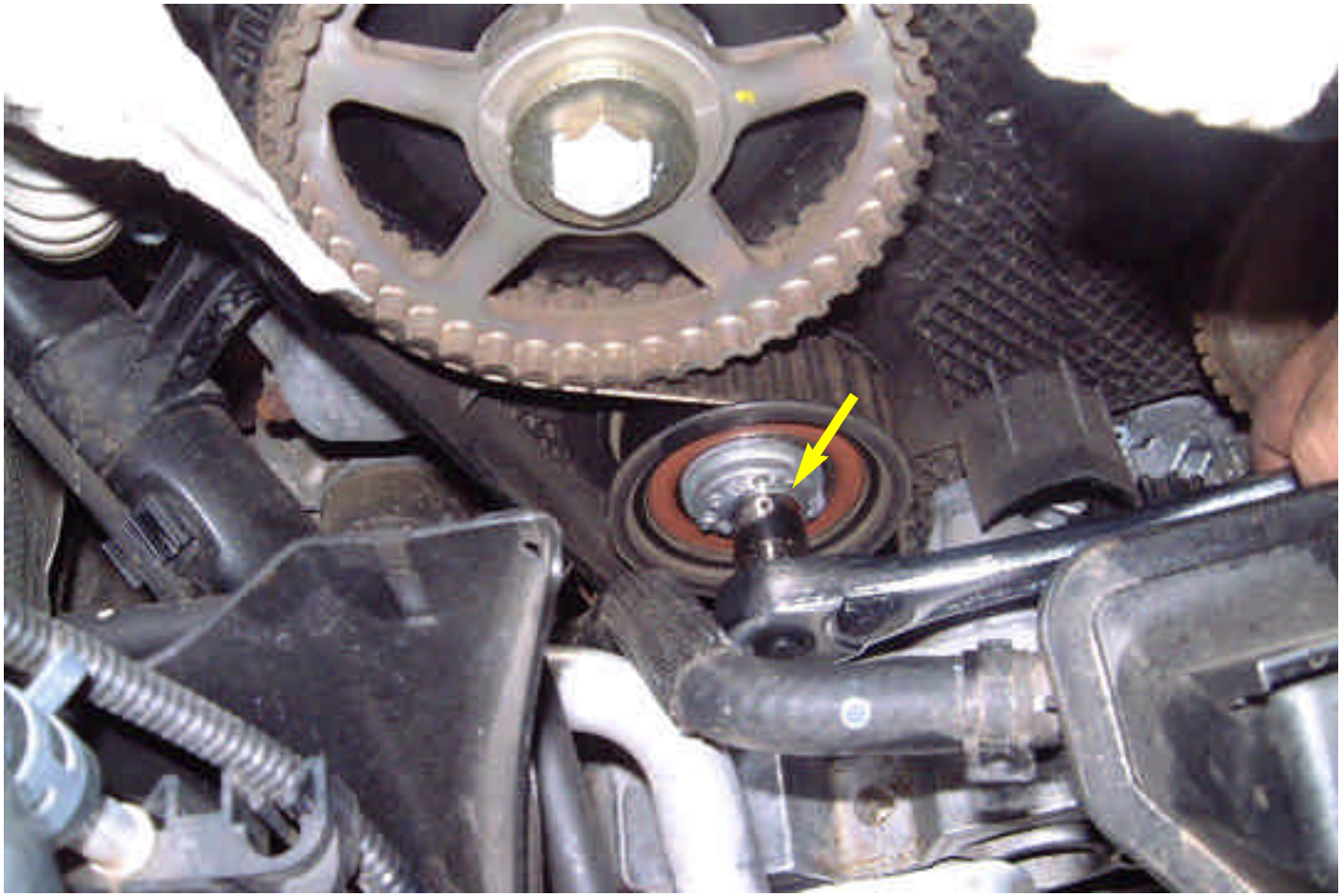
Now push the mount out of the way and pull out the timing belt cover.

Notes



Cover removed with orientation.

Notes



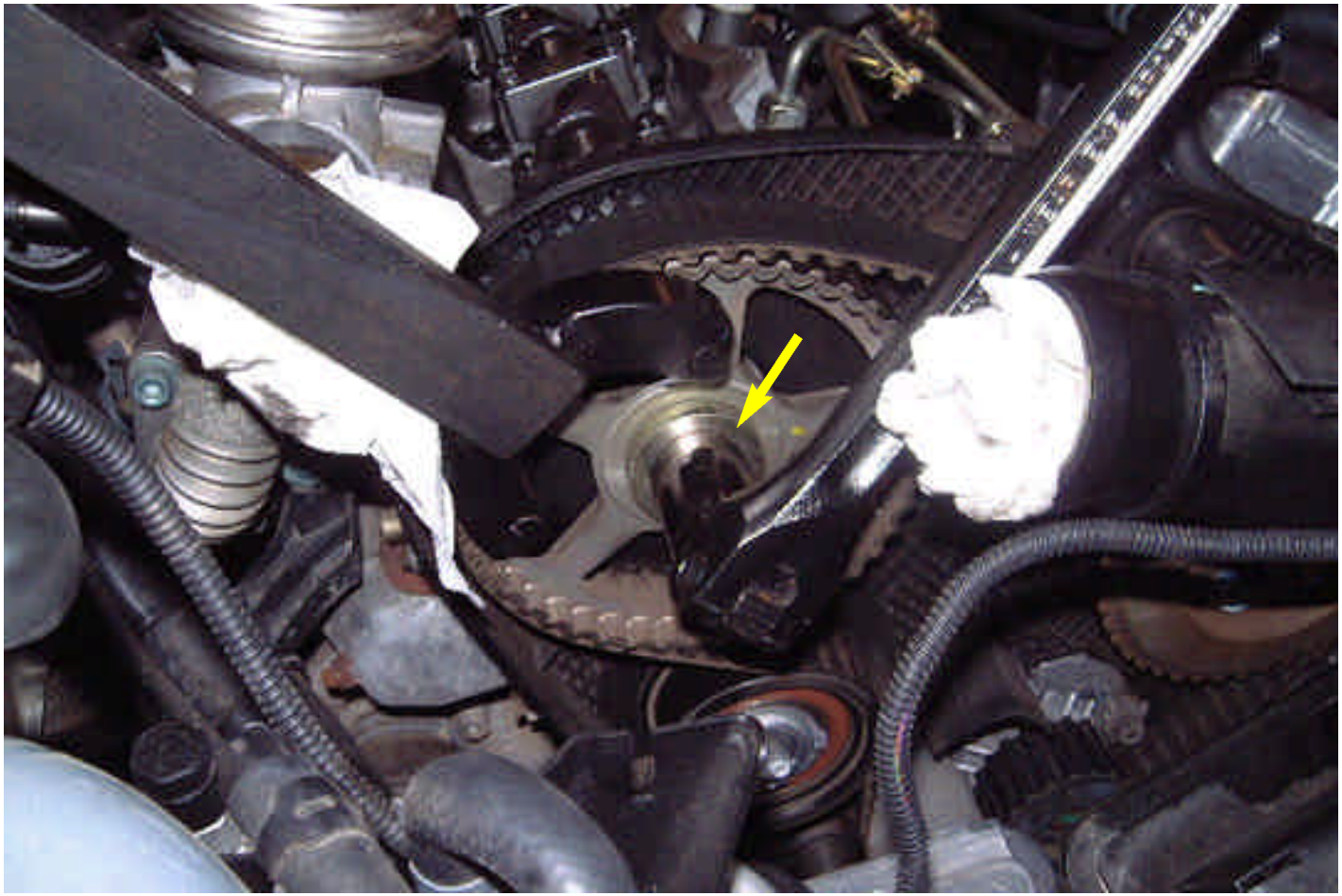
Remove the 13mm nut on the tensioner.

Notes

Using the 2587 Two pin spanner wrench and relieve the tension on the timing belt tensioner by rotating the wrench counter-clockwise.

Notes

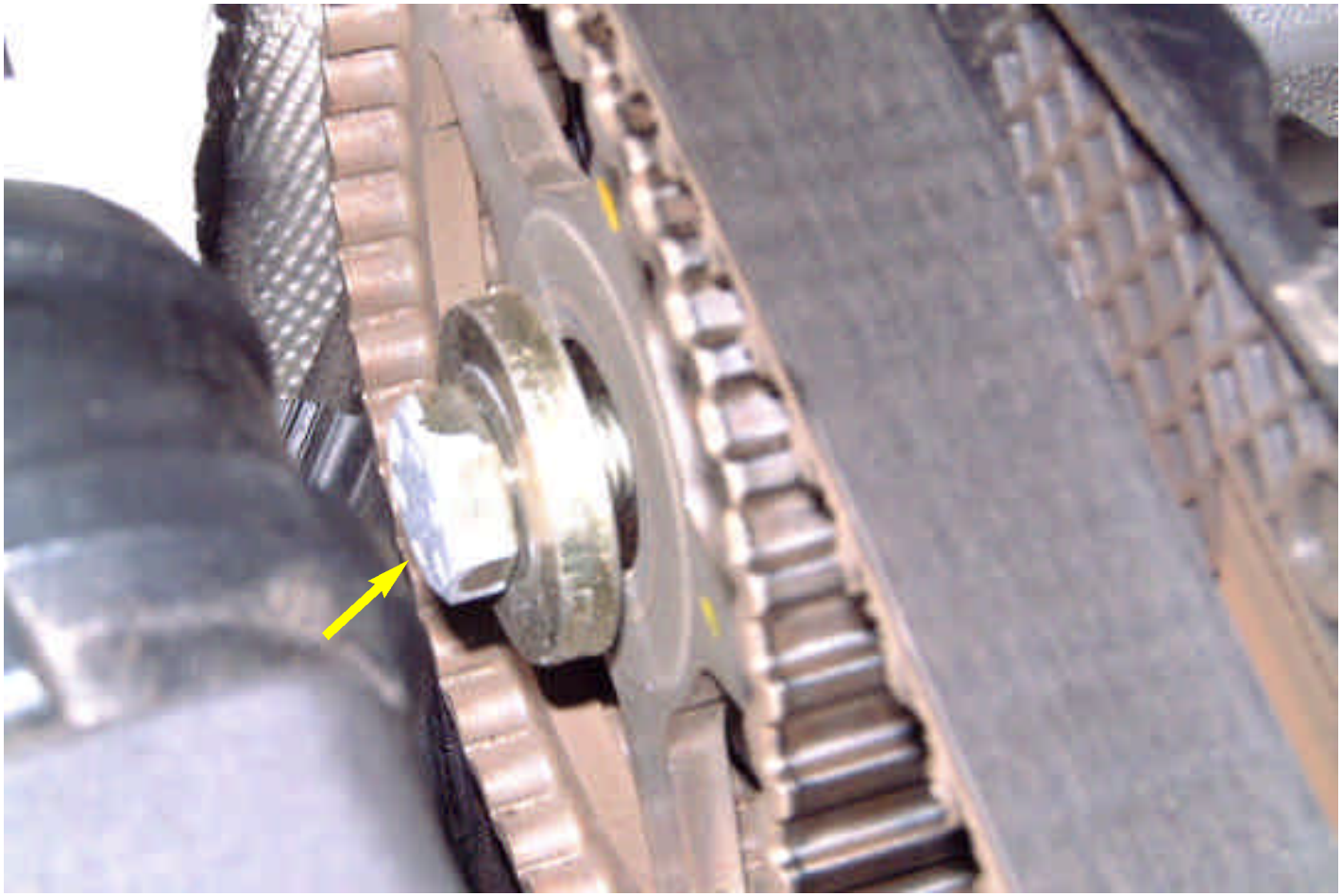
Notes



Using the factory cam holding bar and a 19mm 1/2” drive socket, loosen but **DO NOT REMOVE THE BOLT ON THE CAMSHAFT PULLEY.** The bolt at the factory was tighten to only 33 ft-lbs... so it should not require much force to loosen it.

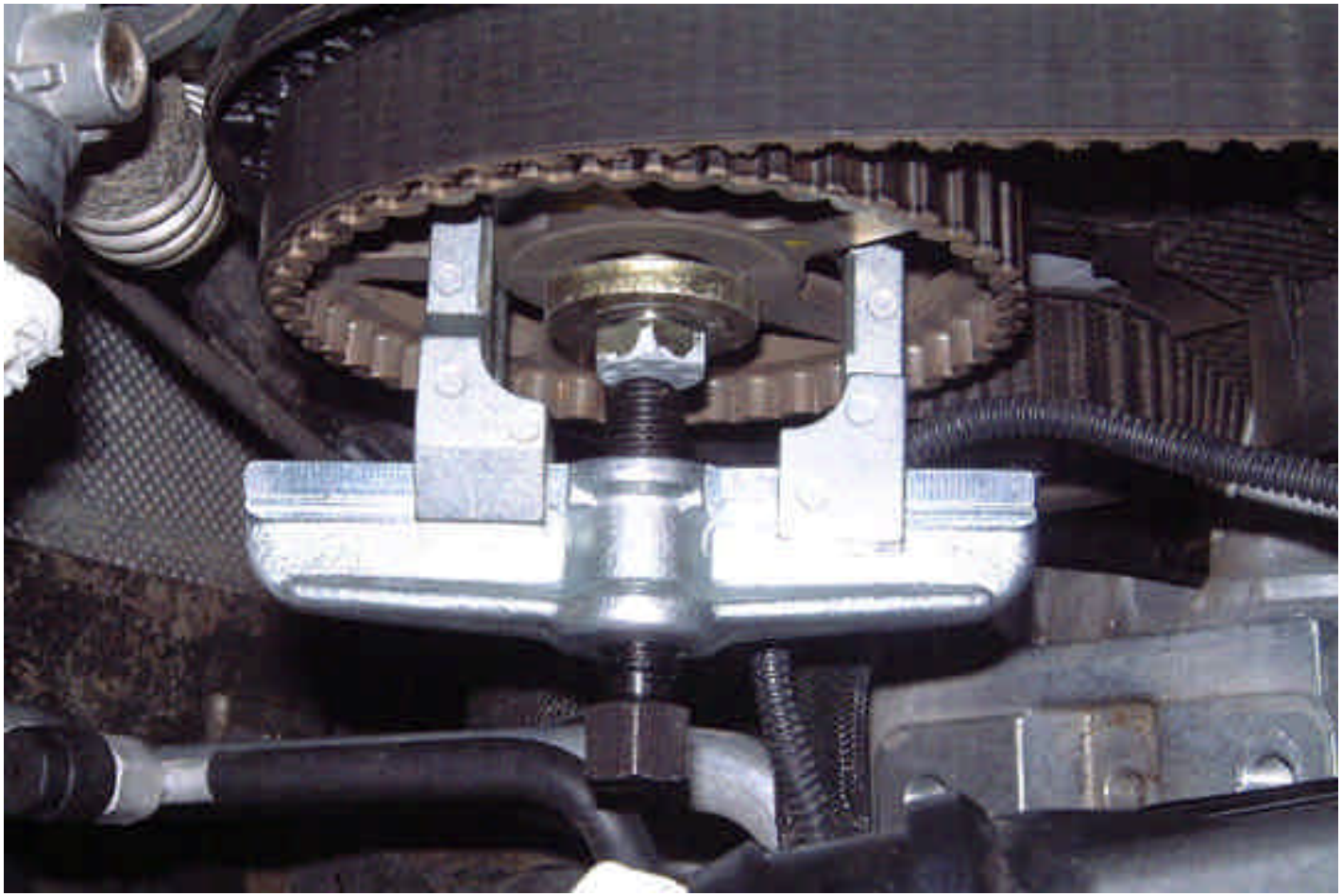
NOTE: I HAVE RUN ACROSS A FEW BOLTS THAT WERE WAY OVER-TIGHTENED, SO USE EXTREME CARE IN REMOVING THESE BOLTS.!!!! IF THIS IS THE CASE, I STRONGLY SUGGEST REMOVING THE CAM SETTING BAR UNTIL THE BOLT HAS BEEN LOOSENED.

Notes



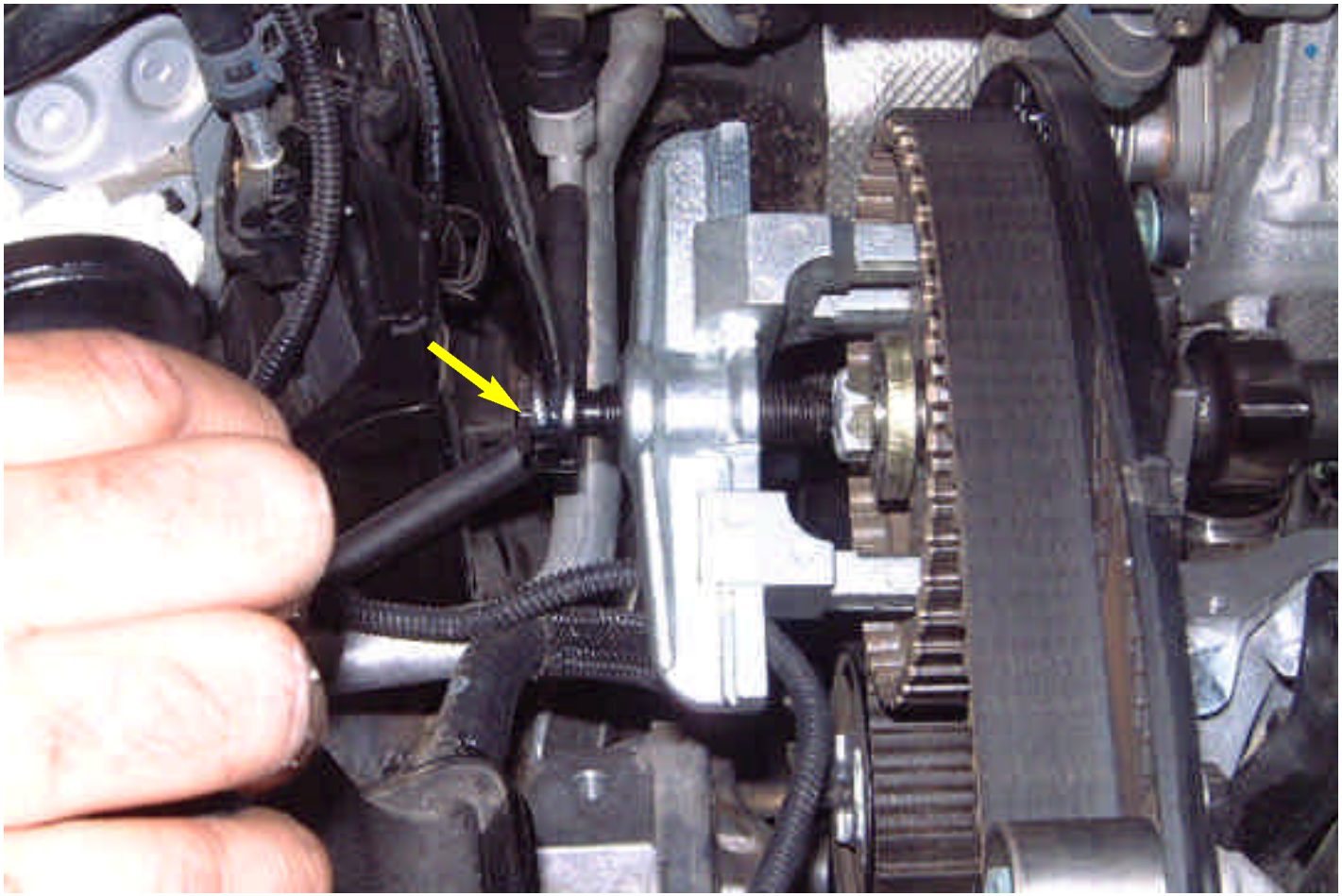
Loosen, but do not remove.

Notes



Install the T4001 puller using the 2 prong puller and one of the single prong pullers (it comes with 2 single prongs and one 2 prong grippers). Install the puller making sure that there is a gap between the washer and the pulley. Use a 17mm box end wrench and turn the puller until the pulley "SNAPS" (it will scare you if you don't expect it) off the tapered end of the camshaft.

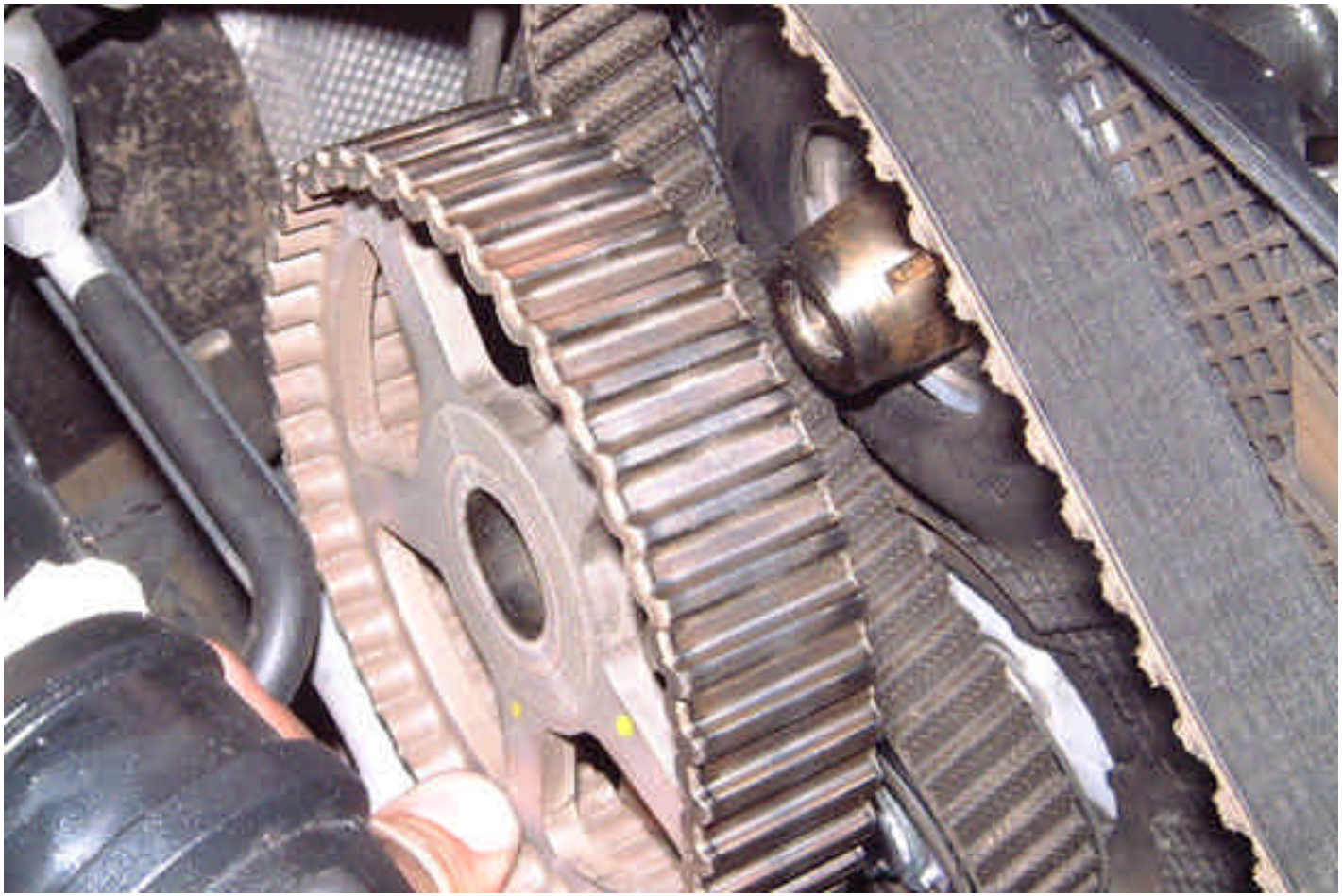
Notes



Notes

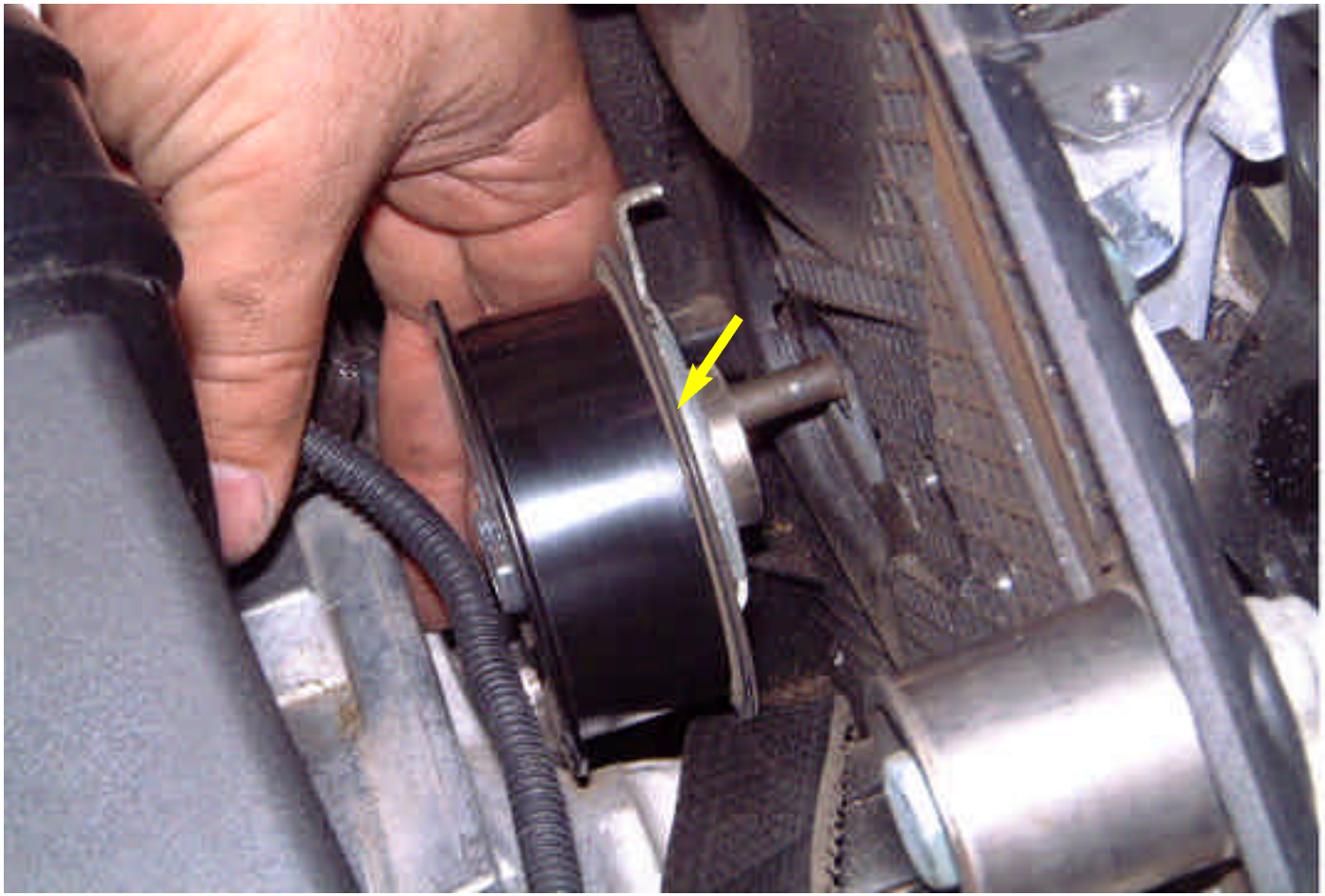
Remove the cam pulley bolt, the pulley and the tensioner pulley from its shaft.

Notes



Cam shaft pulley removed.

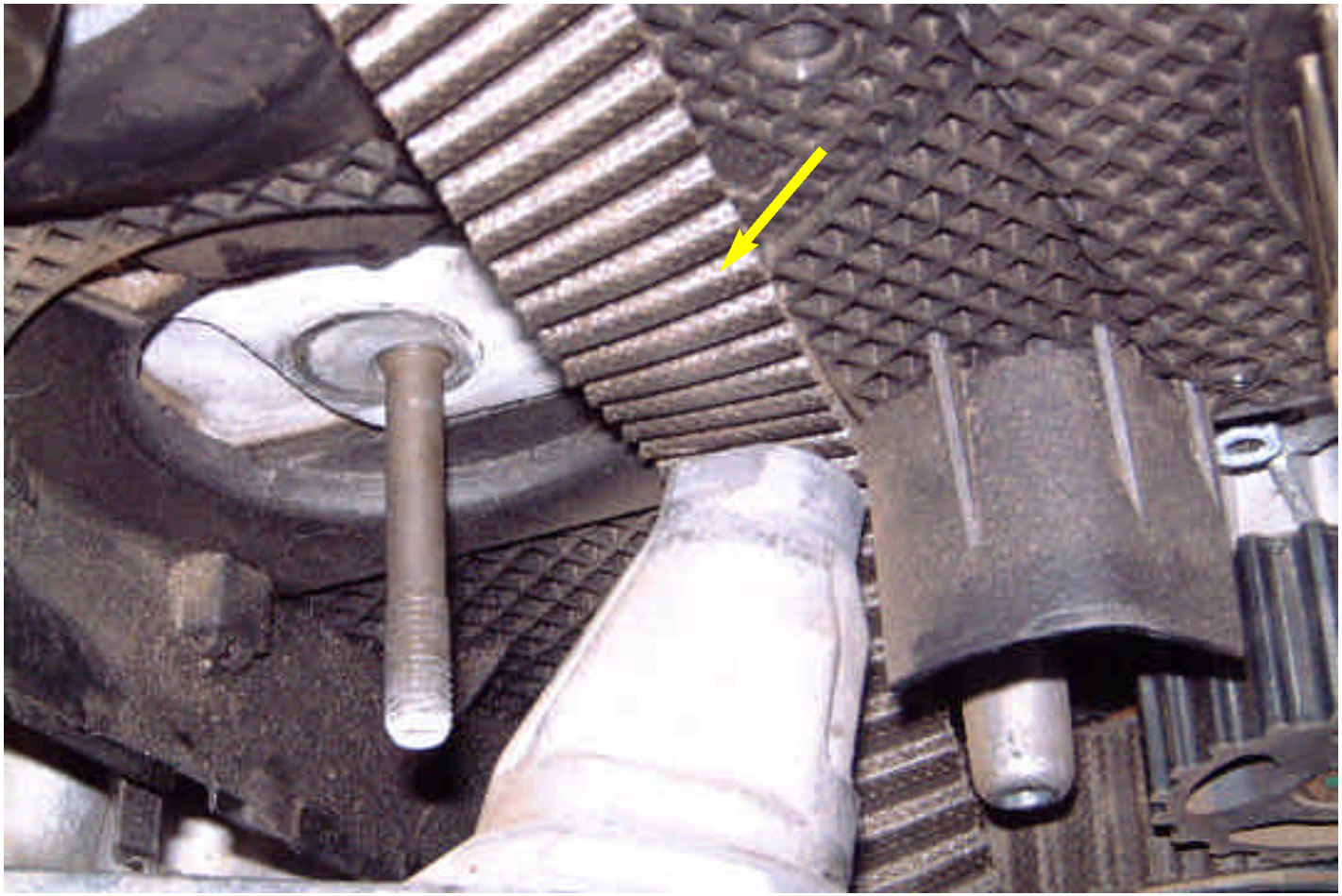
Notes



Remove the old tensioner.

Remove old timing belt

Notes

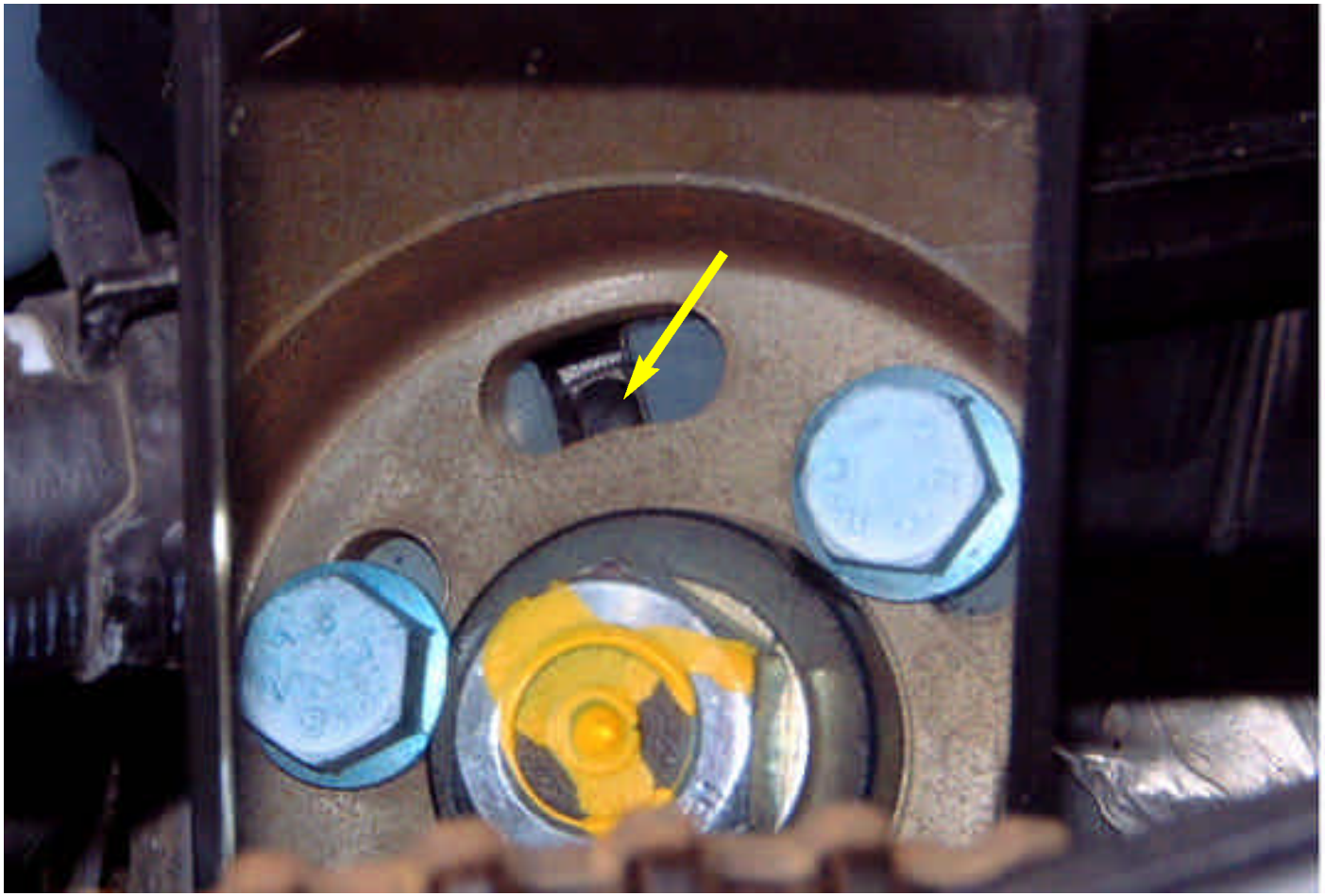


While holding the engine mount away from the engine, slide the old belt between the mount and the block, if you have not noticed yet the mount cannot be removed unless the engine is removed from the car... Remove the belt and inspect it for any cracking or rubbing damage. This is when you want to make sure the belt was wearing normally with only minor cracking or wear marks visible. If any abnormal wear marks are present you need to determine how and where they came from so that you do not install a good belt in a poorly aligned engine pulley system.

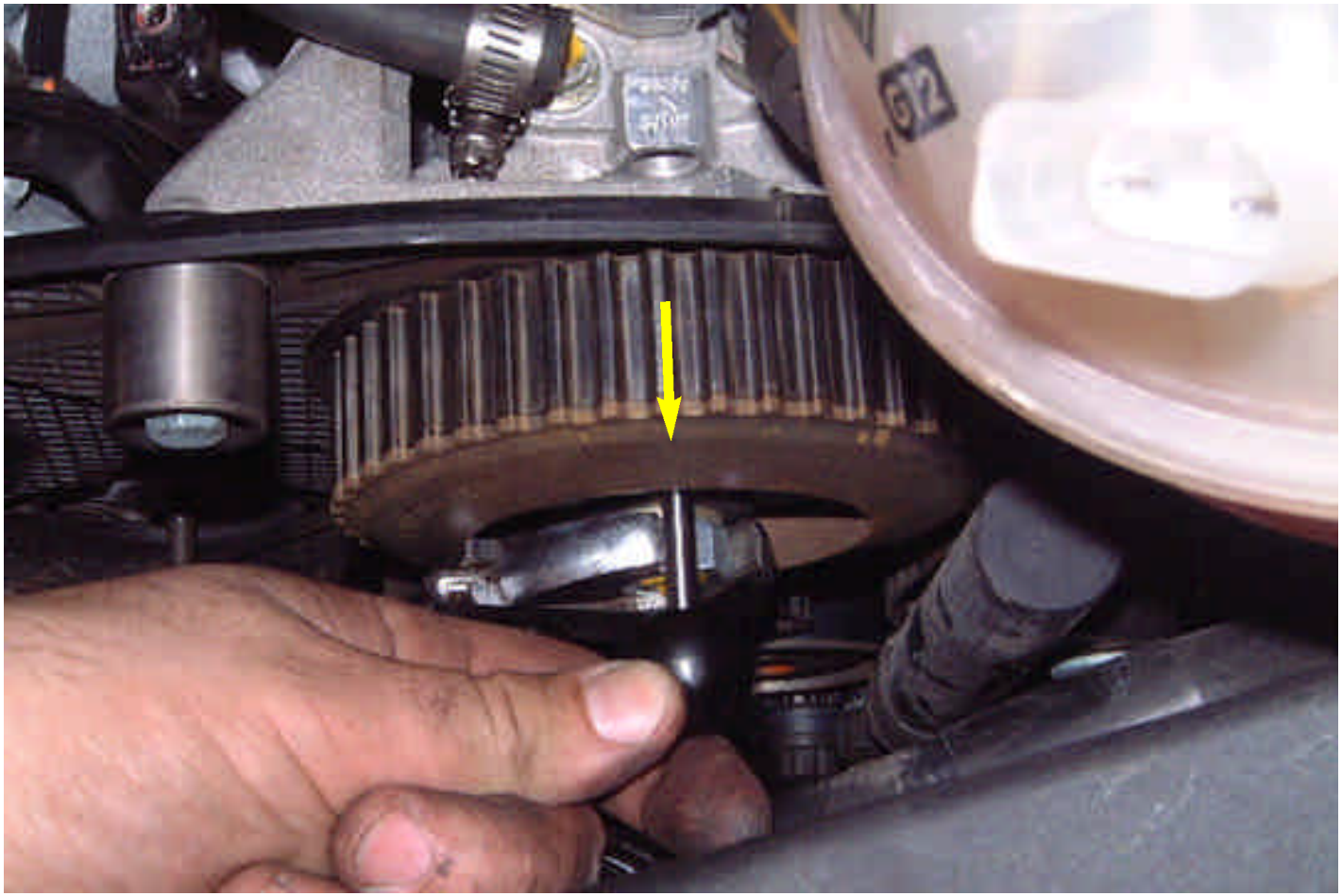
Injection pump lock pin

18.1

Notes



The first picture is a shot of the hole that the 3359 Injection pump lock pin gets installed into. (mirror image)
Note: If you are looking at the pump from the right side of the car, the hole for the pin is approximately in the one o'clock position.



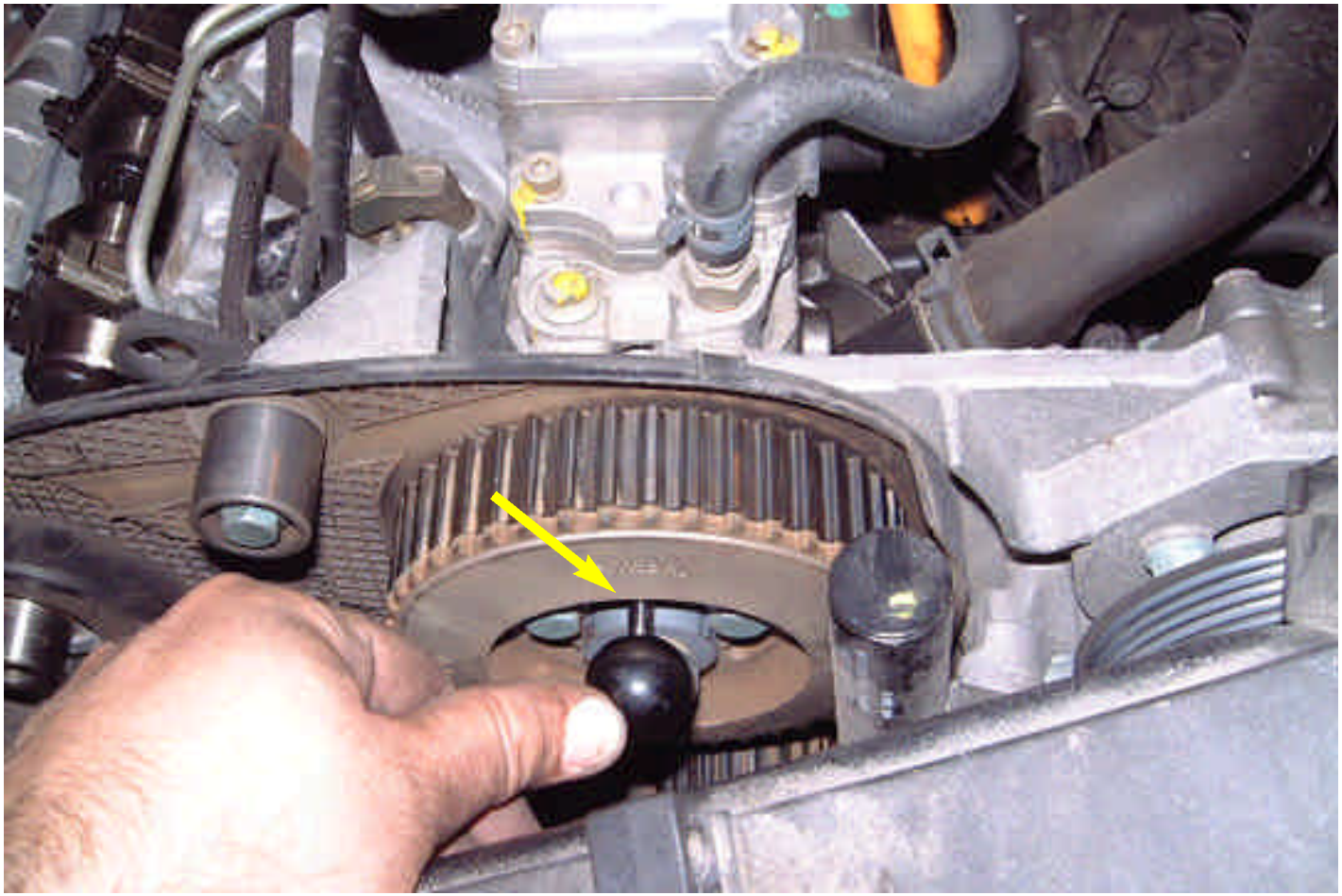
I'm using a crescent wrench to turn the center bolt to align the pin hole so that I can insert the lock pin. This also shows the orientation of the pin relative to the center of the pump.

NOTE: IT IS POSSIBLE TO INSTALL THE PIN TO THE RIGHT OF THE HOLE AND HAVE THE INJECTION TIMING OFF BY ABOUT 30 DEGREES,WHICH HAPPENS TO BE OUTSIDE THE IGNITION WINDOW, A NO START WILL RESULT.

FYI DO NOT try and turn the whole motor over using the injection pump center bolt! Use the 3036 tool. Rotating only the pump such as I have demonstrated will not loosen or throw the pump shaft alignment off since I am only turning the pump's pulley without a timing belt installed.

Notes

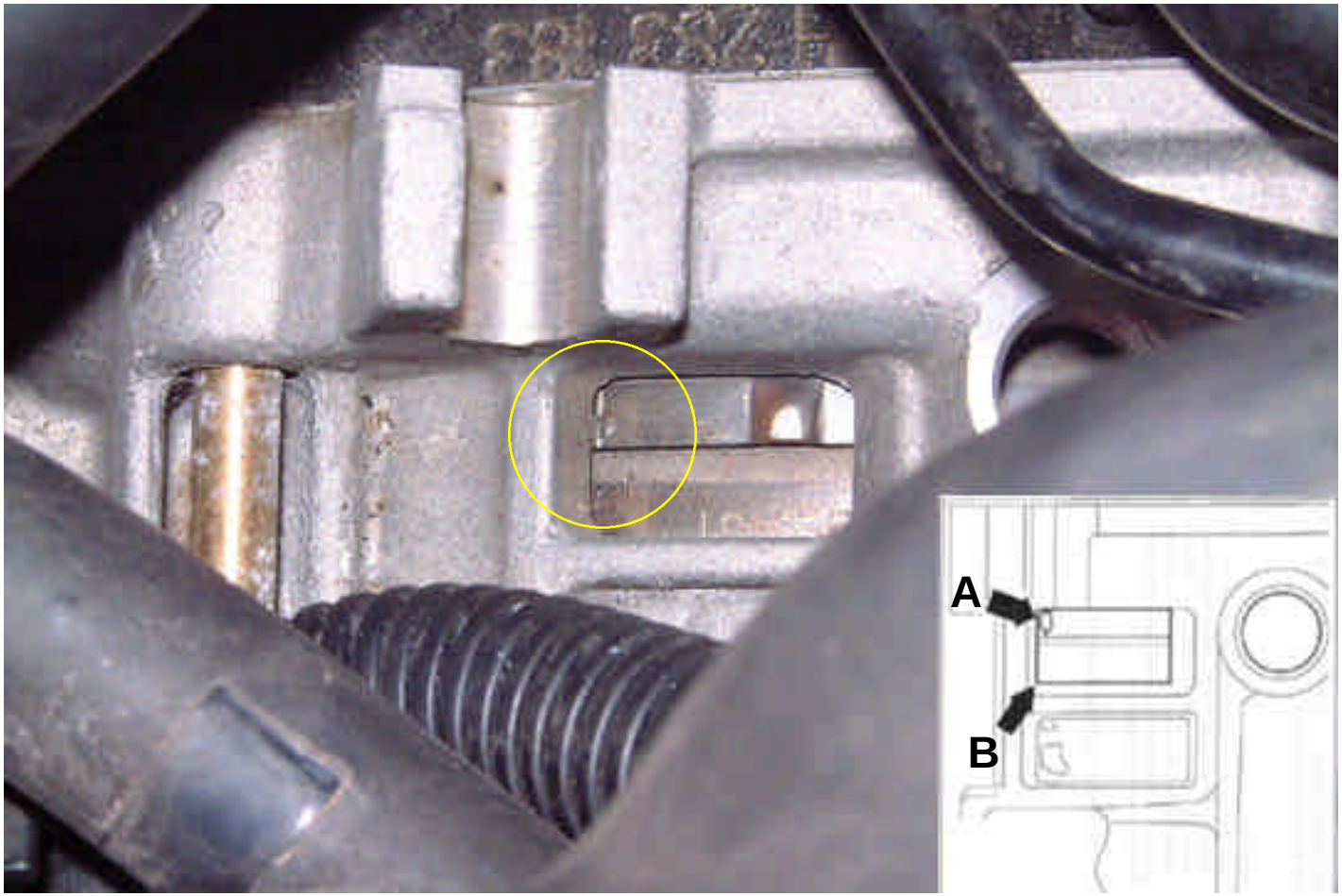
Notes



The locking pin is pushed into the hole.

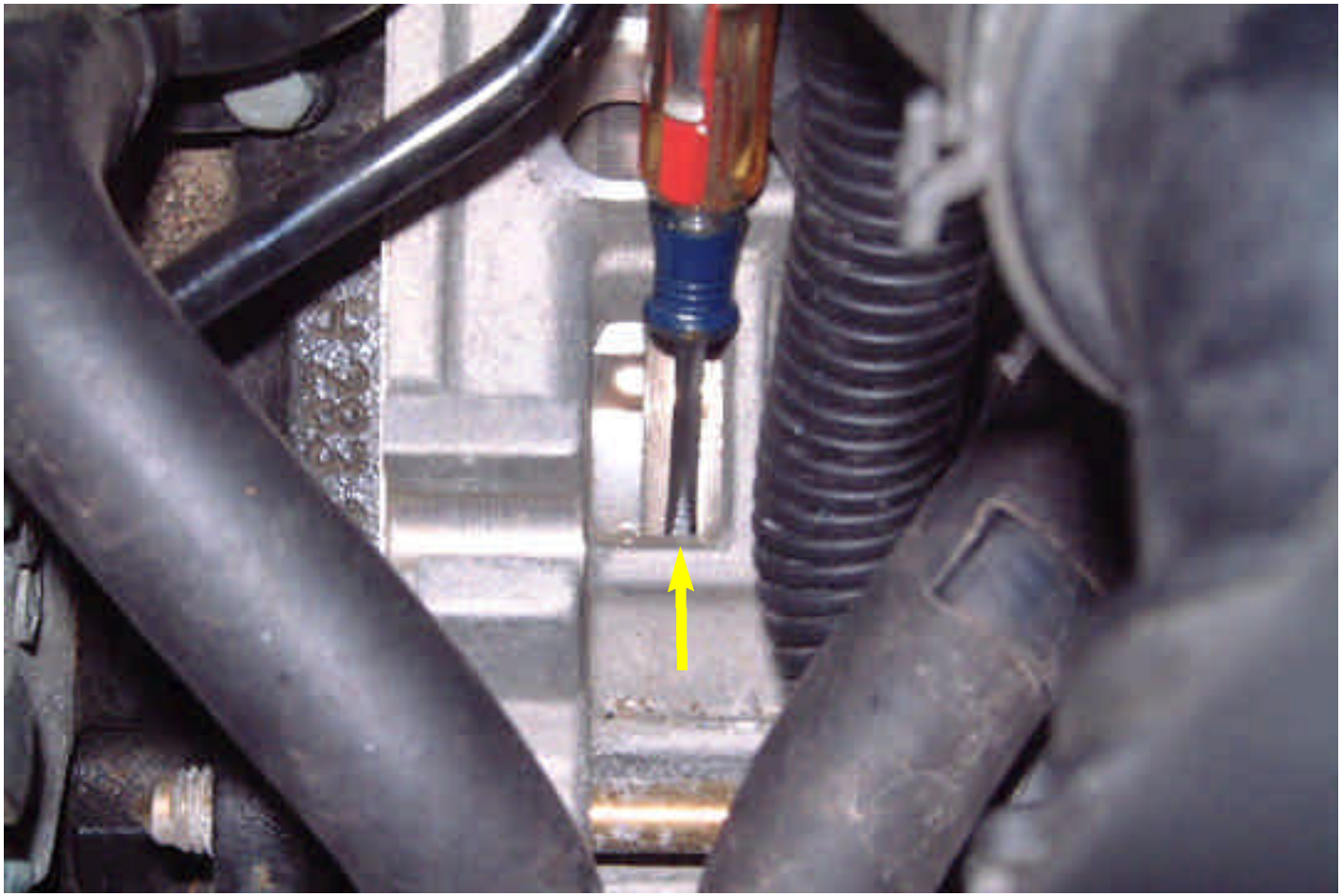
Auto transmission TDC flywheel timing mark

Notes



NOTE: THIS IS THE AUTOMATIC TRANSMISSION TDC TIMING MARK. Notice that the circle **(A)** is at the base of the window **(B)**, this is what you want. If you have to turn the crank use a screwdriver and gently push the fly wheel in the direction you need to go to get the TDC in the correct position of the window.

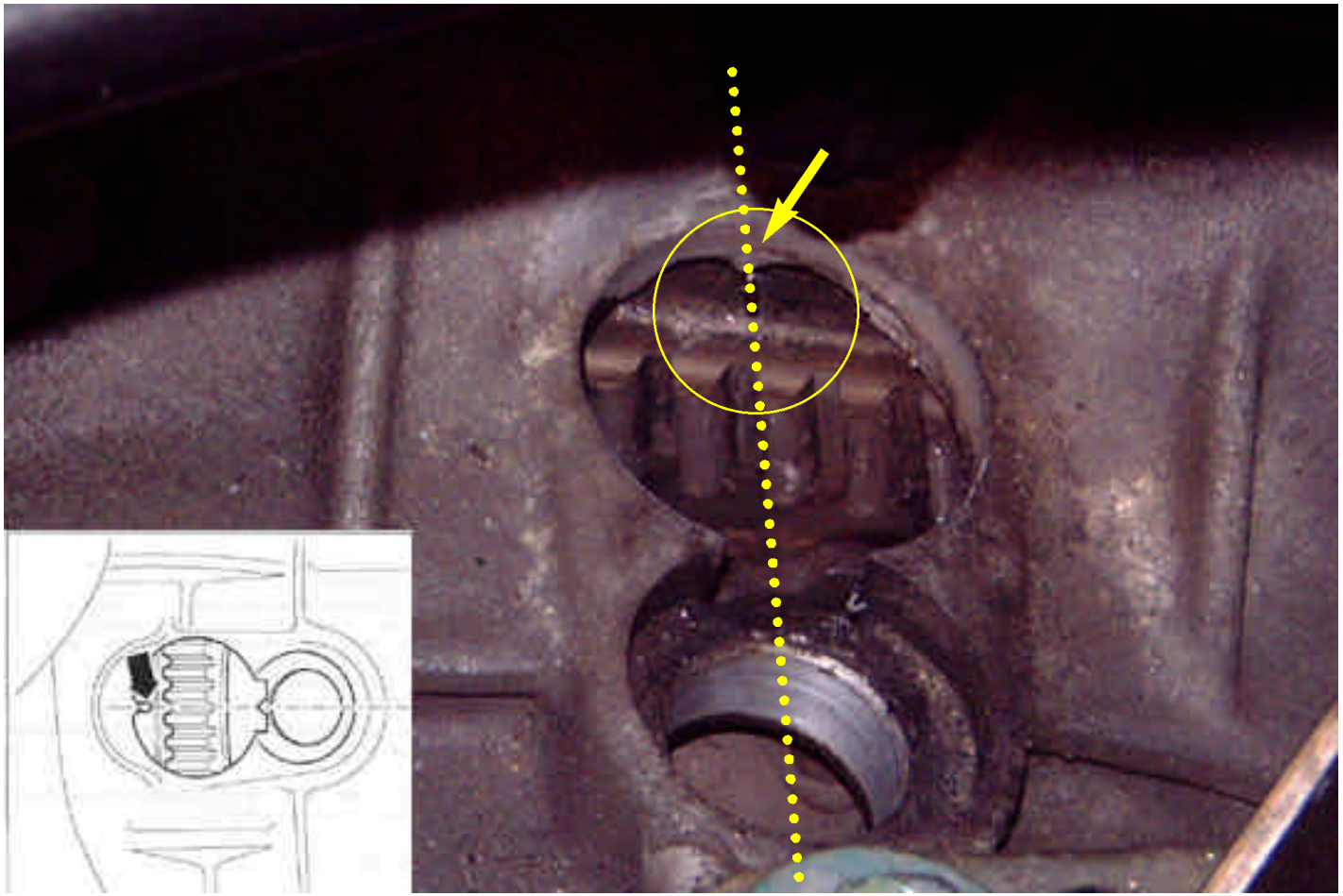
Notes



Insert the small screw driver to prevent the flywheel from spinning when installing the new belt.

Manual TDC flywheel timing mark

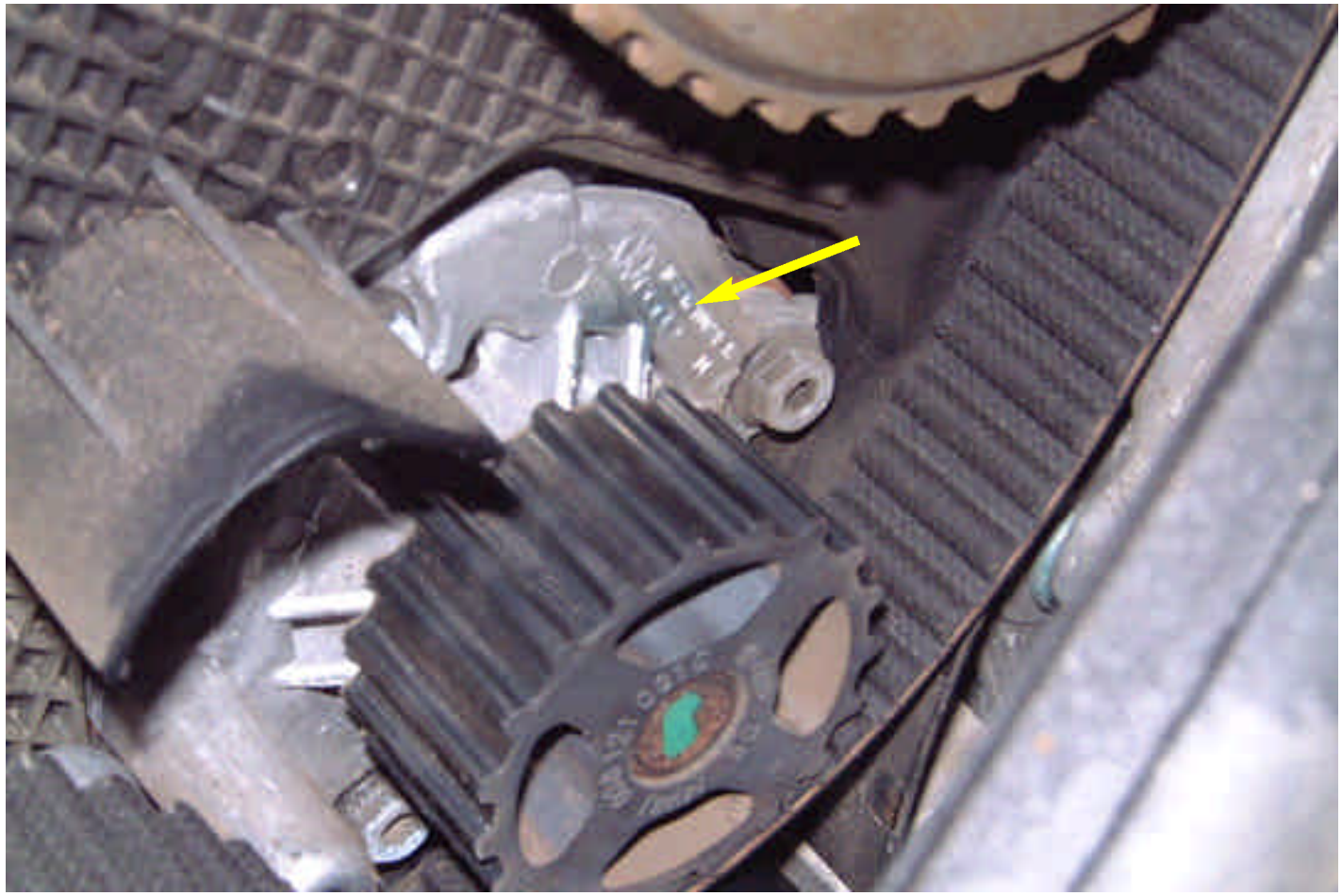
Notes



NOTE: THIS IS THE TIMING MARK ON THE MANUAL TRANSMISSION. Make sure the mark lines up with the aluminum tooth at the top of the hole.

Notes

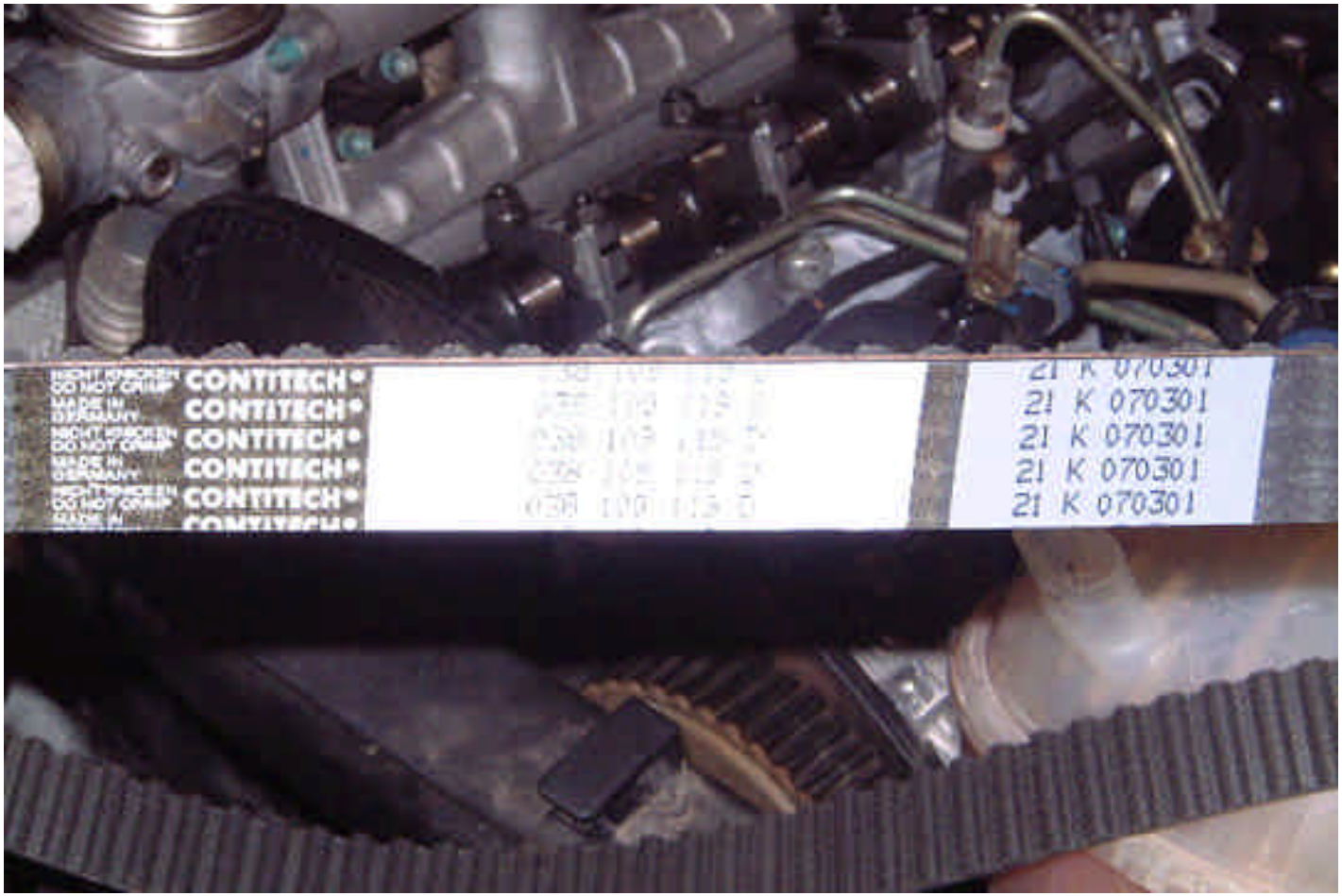
Time to install the MN4004 cranklock.



This is a picture of the water pump. If you have 120,000 miles or more consider replacing it. It's only a few bolts and a gallon or so of coolant.This is a great time to do the job if you have high mileage.

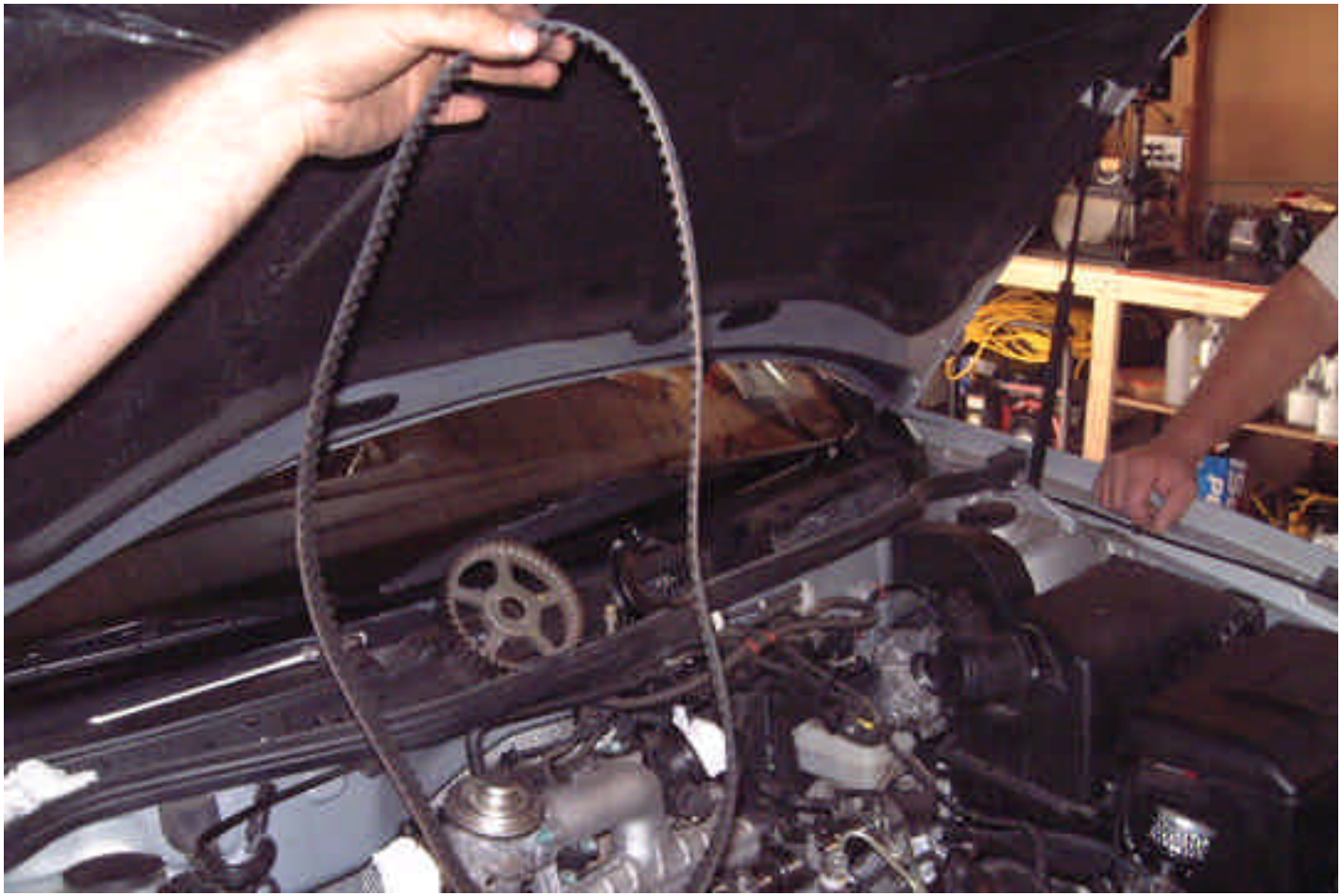
Notes

Notes



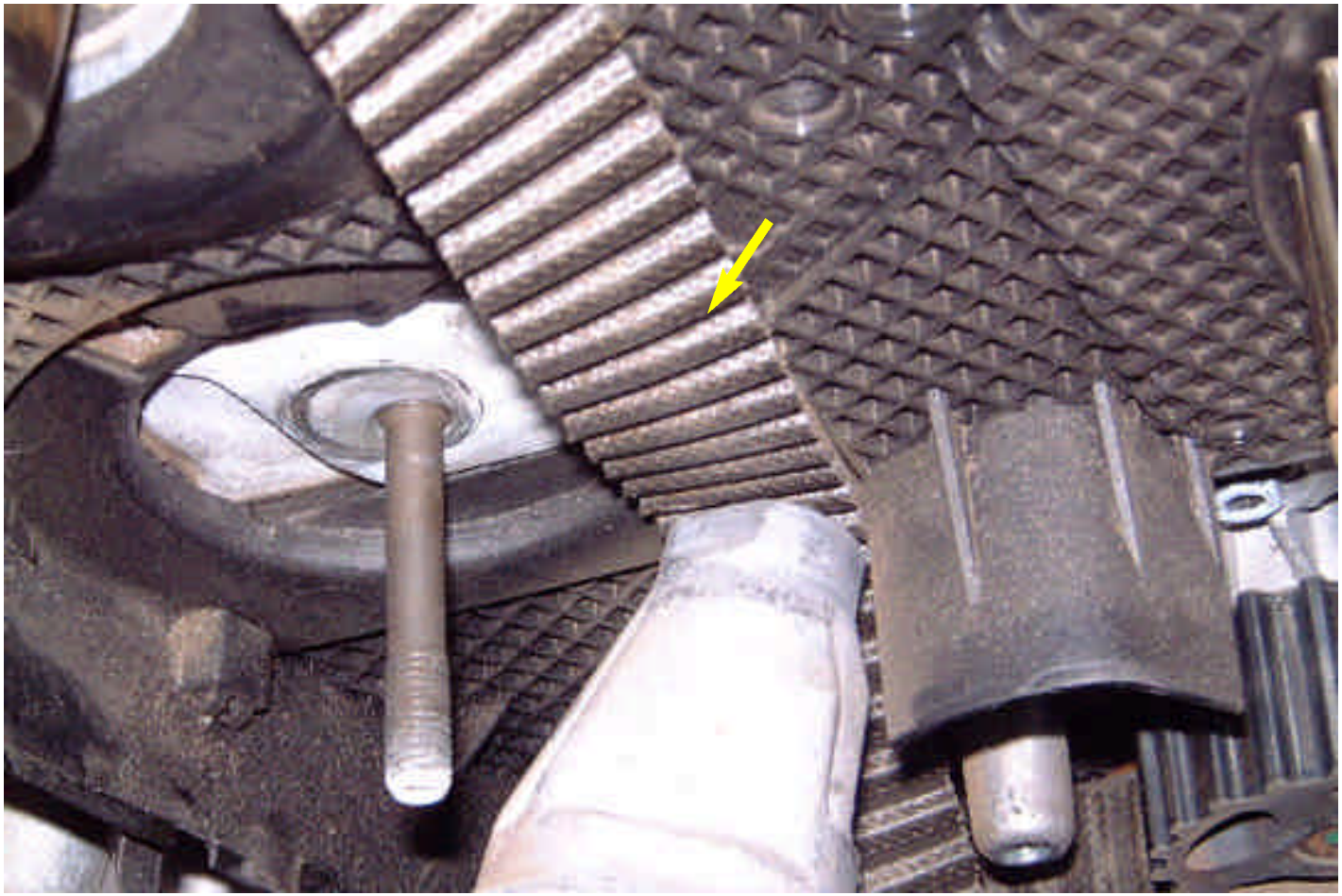
Here is a picture of the timing belt and its part number for the A4 TDI. I strongly suggest making it very clear to the part supplier what type of car you have. It has happened more than once a part counter guy has looked up and sold the wrong part leaving you with a car that is out of commission and the possibility of facing a back-order!. Take your time when researching the parts and double check you have the correct parts before beginning this job, at this stage in the game is the last time to realize the belt or tensioner DO NOT fit!

Notes



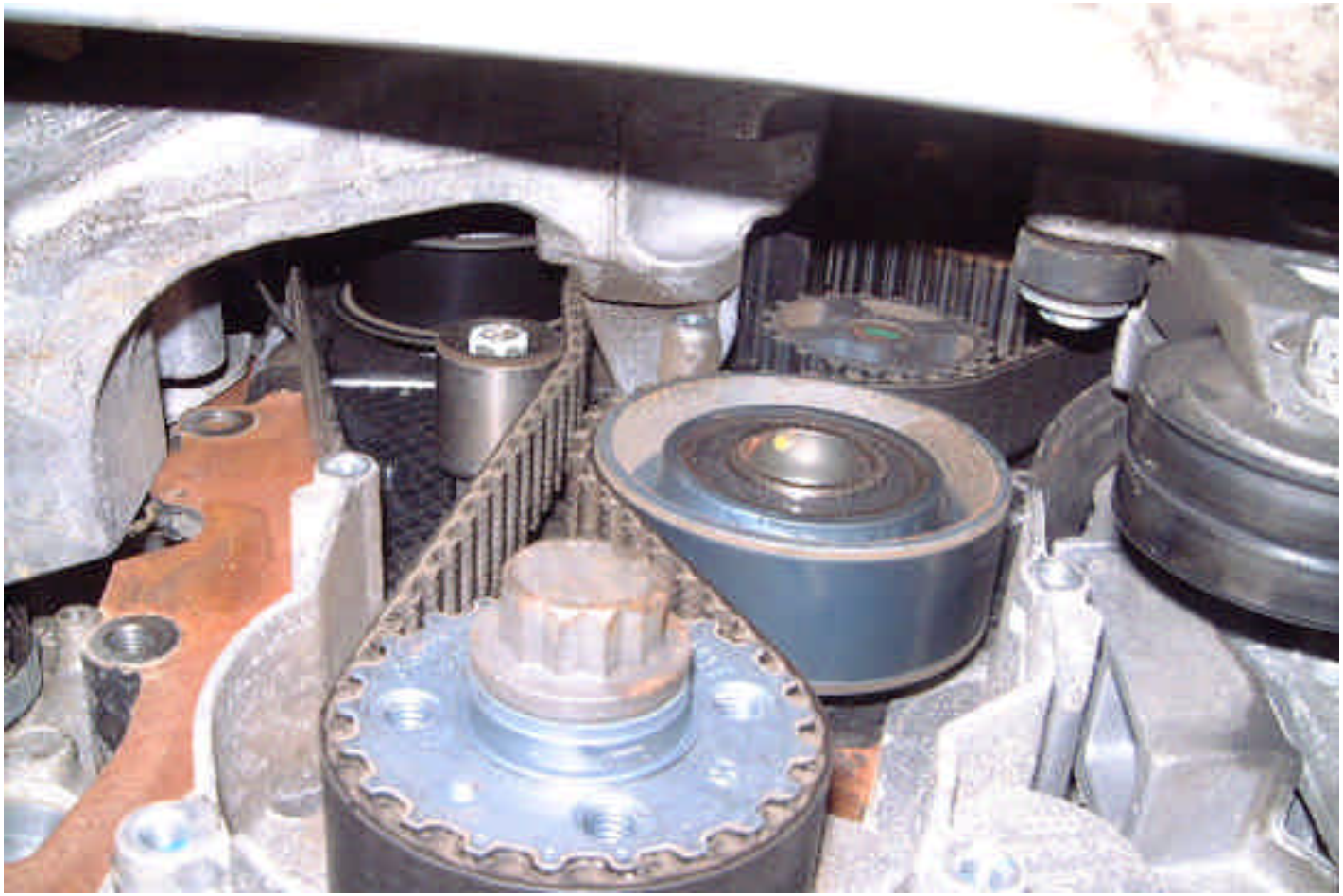
Hold the belt up and install it so that the curves go this way, it makes it easier to install the belt around the pulleys.

Notes



Holding the engine mount away from the engine, slide the new belt back under and onto the engine. Route the belt around the appropriate pulleys.

Notes



In case you forgot how they go on the lower pulleys, here is a snap shot for you.

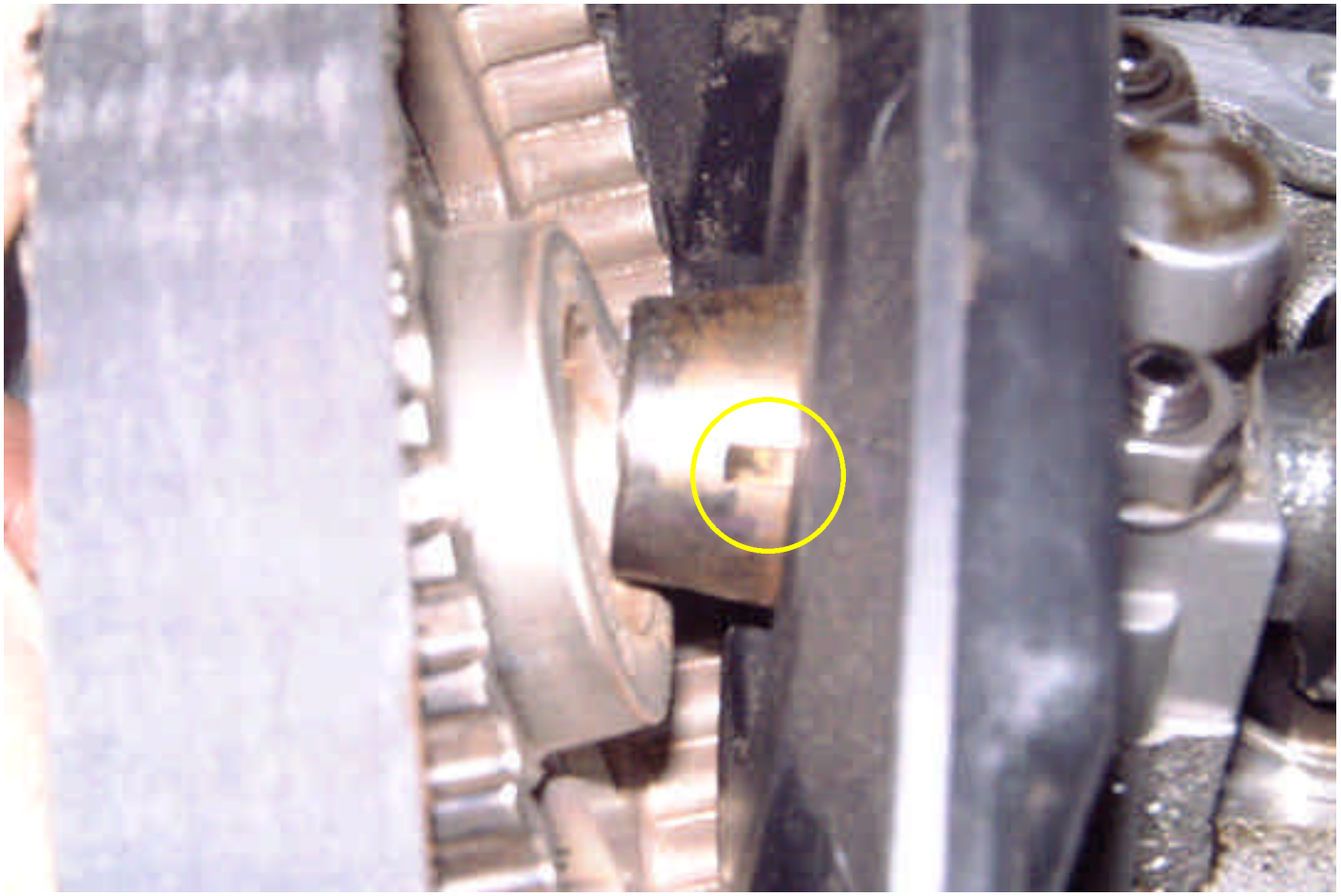
New tensioner

Notes

Install the new tensioner. In this picture you see the two holes on the inner hub at the top of the shaft. You **DO NOT** want it here. **Rotate** the two holes so that they are at the bottom. Also make sure that the alignment prong on the backside is engaged in the slot in the head. Go ahead and install the nut finger tight only.

23.1

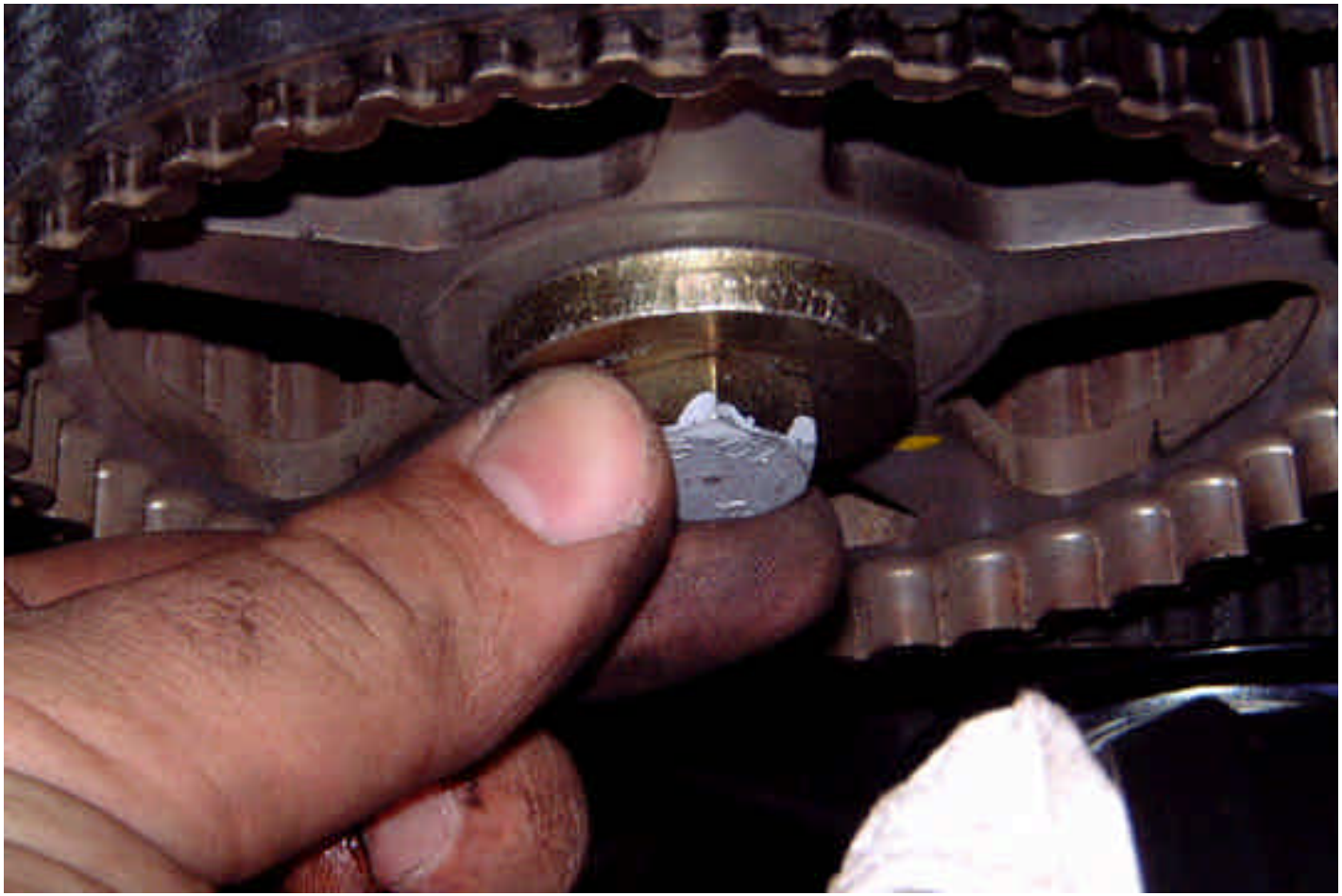
Notes



Starting from the crankshaft and working counter clockwise of the belts path around the pulleys, take out the slack and make sure the belt is engaged in all the pulley teeth on all the pulleys.Once you work your way back up to the camshaft install the cam pulley into the belt and slide the pulley onto the cam.This may take a couple of tries but it will go on, the belt is going to be very snug. What you are working against is injection pump pulley.

FYI No, you didn't lose the key. Even though there is a key slot on the cam side, there is no keyway on the cam pulley.

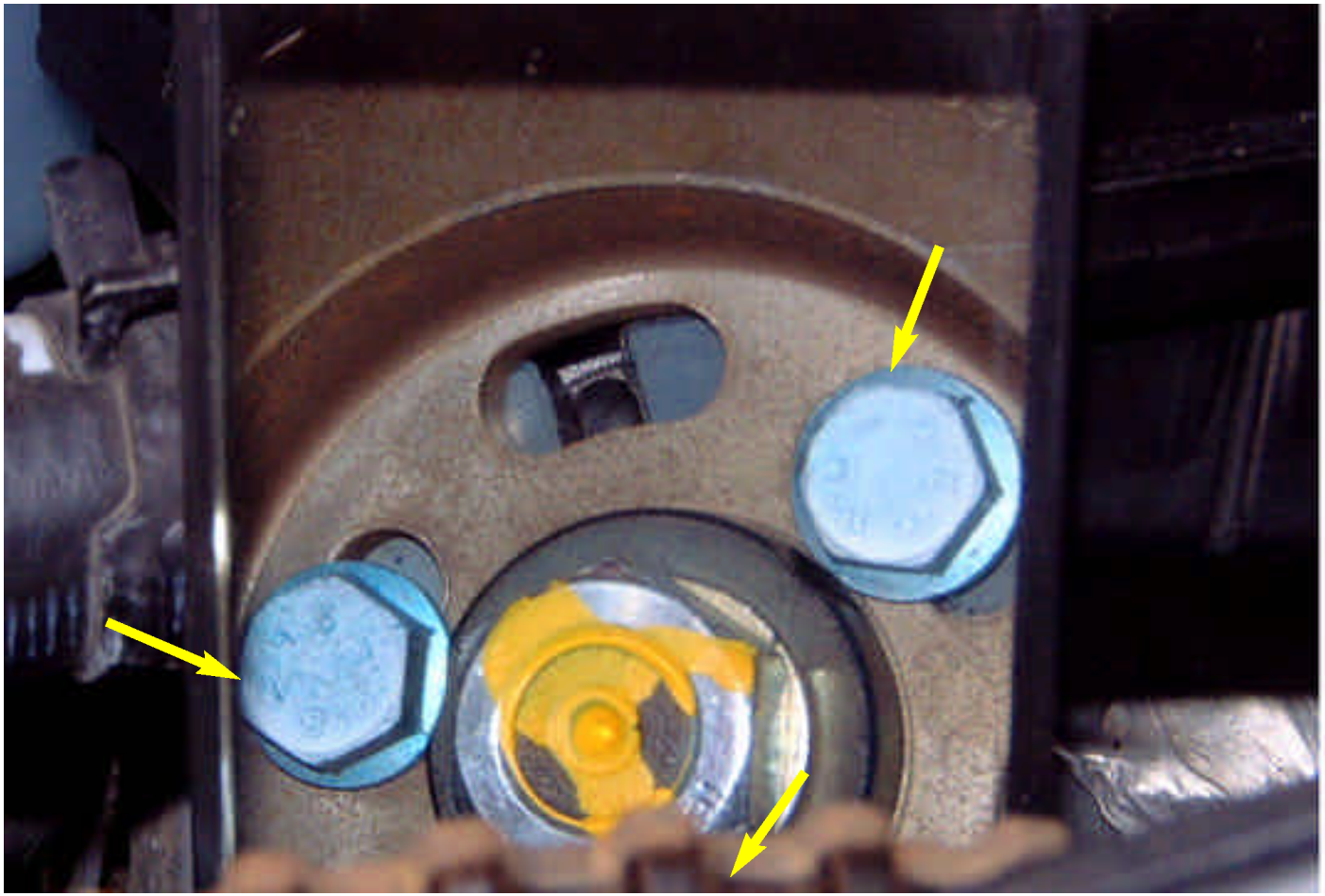
Notes



Once you get the cam pulley on, install the cam bolt but DO NOT TIGHTEN.Make sure it is only finger tight!.

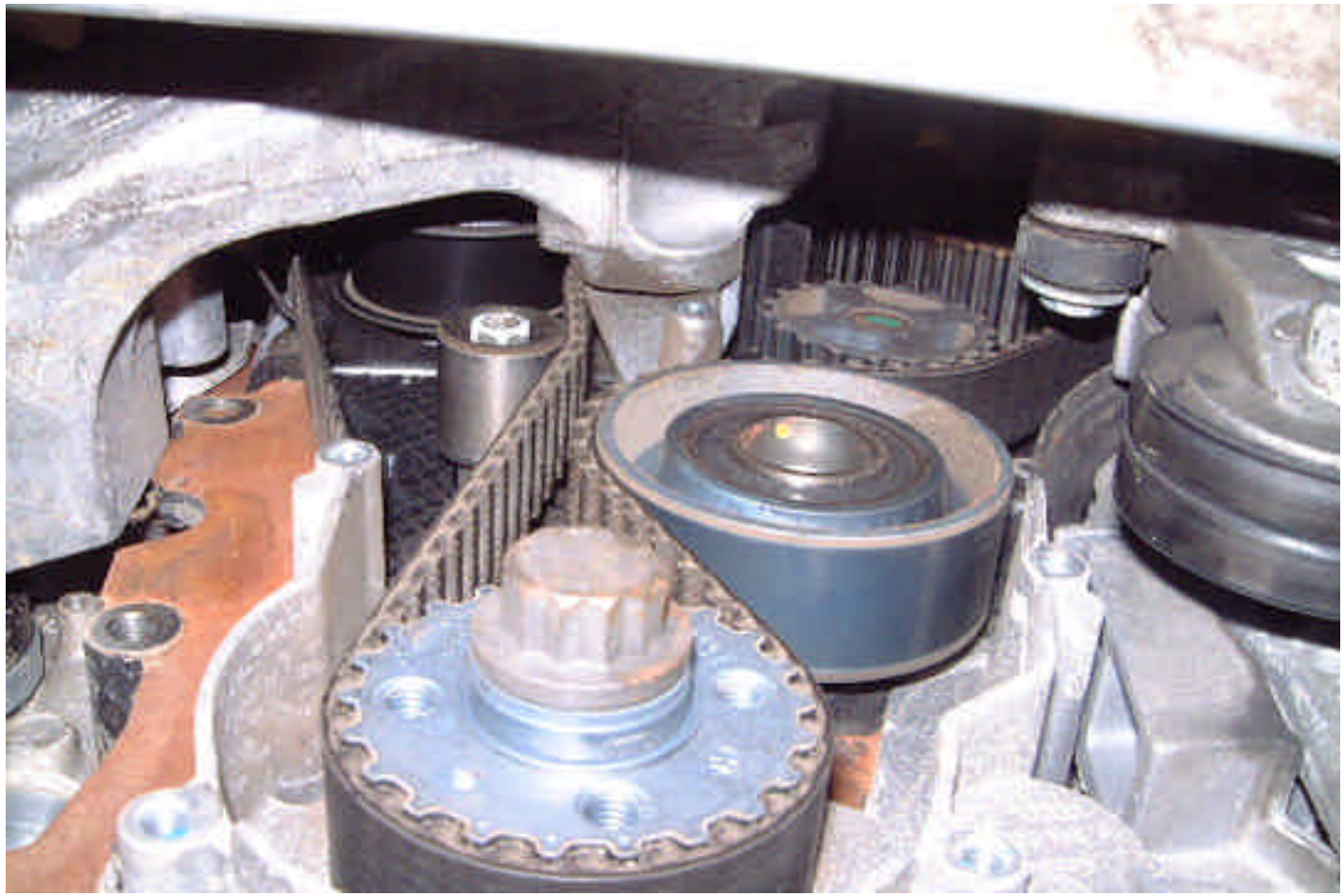
Injection pump bolts (3)

Notes

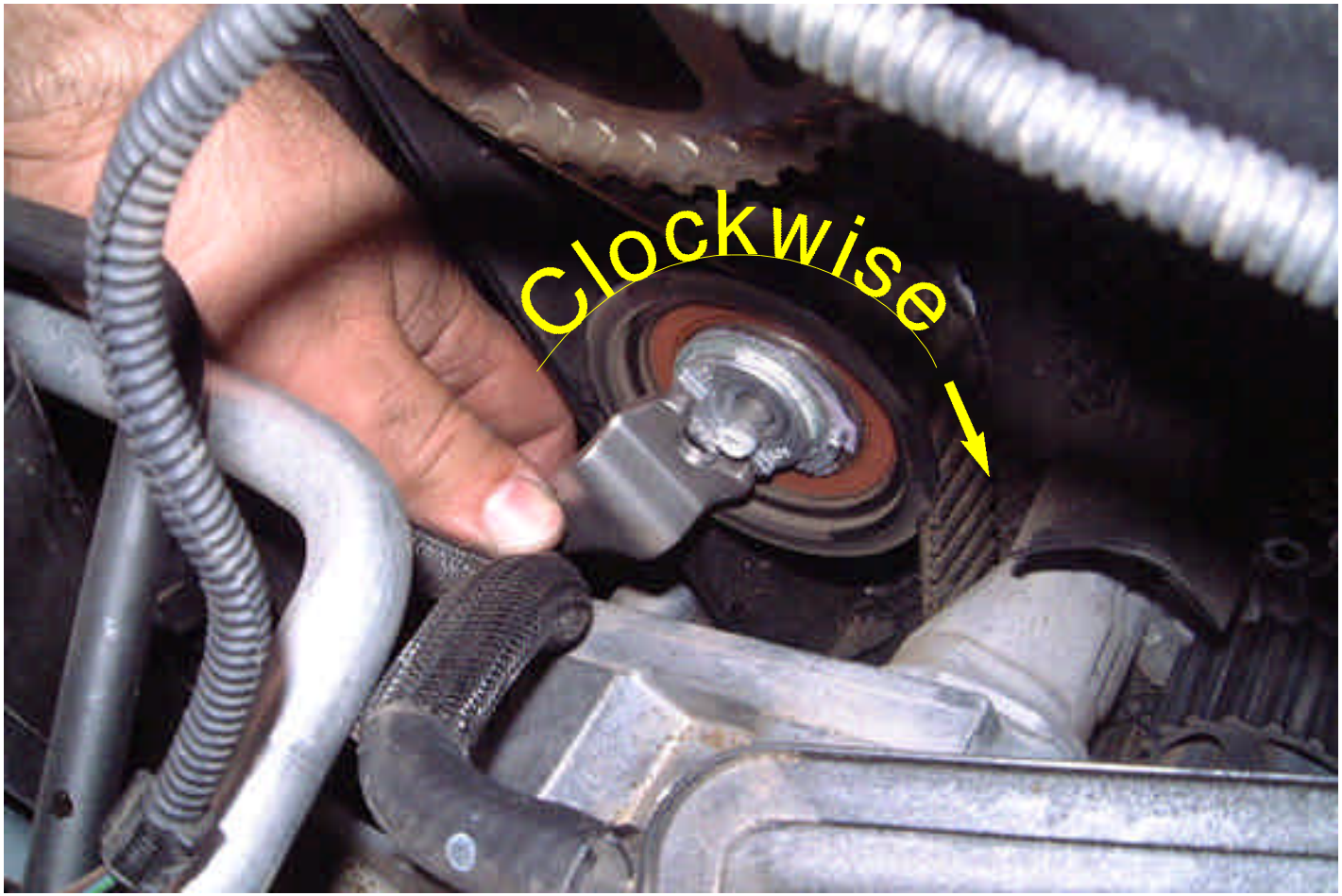


Here is the earlier photo of the injection pump.Once the cam pulley is on, loosen, but do not remove the three blue bolts on the injection pump.This will relieve the stress on the belt between the injection pump and the camp pulley as well as the lock pin.
I suggest getting the new style non-stretch bolts, the older style stretch type were depicted by an "x" in the part number Avoid these if possible.The new style non-stretch are suitable for use on ALL A4 TDI's.You can visually determine the non stretch style bolt by looking to see if the bolts have threads all the way up the shaft to the integrated washer head, the stretch type threads stop half-way up the shaft.Anyway when you loosen the injection pump bolts remove one to inspect it for the type of bolt installed.
With the 3 pump bolts loosened and the injection pump lock pin installed this will assure you that the injection pump is set within the ignition window.I call the setting "basic" pump timing as it pertains to a mechanical setting rather than anything to do with the ECU or "Basic Settings" as recognized by the VAG-COM. Keep in mind having the pump set with the pin will only assure you the engine will start and run, however it will not give you an optimum setting for efficiency or power.At the end of the procedure I will explain how to adjust the timing using the VAG-COM to get the best power and economy from your TDI.

Notes



What it should look like from below.



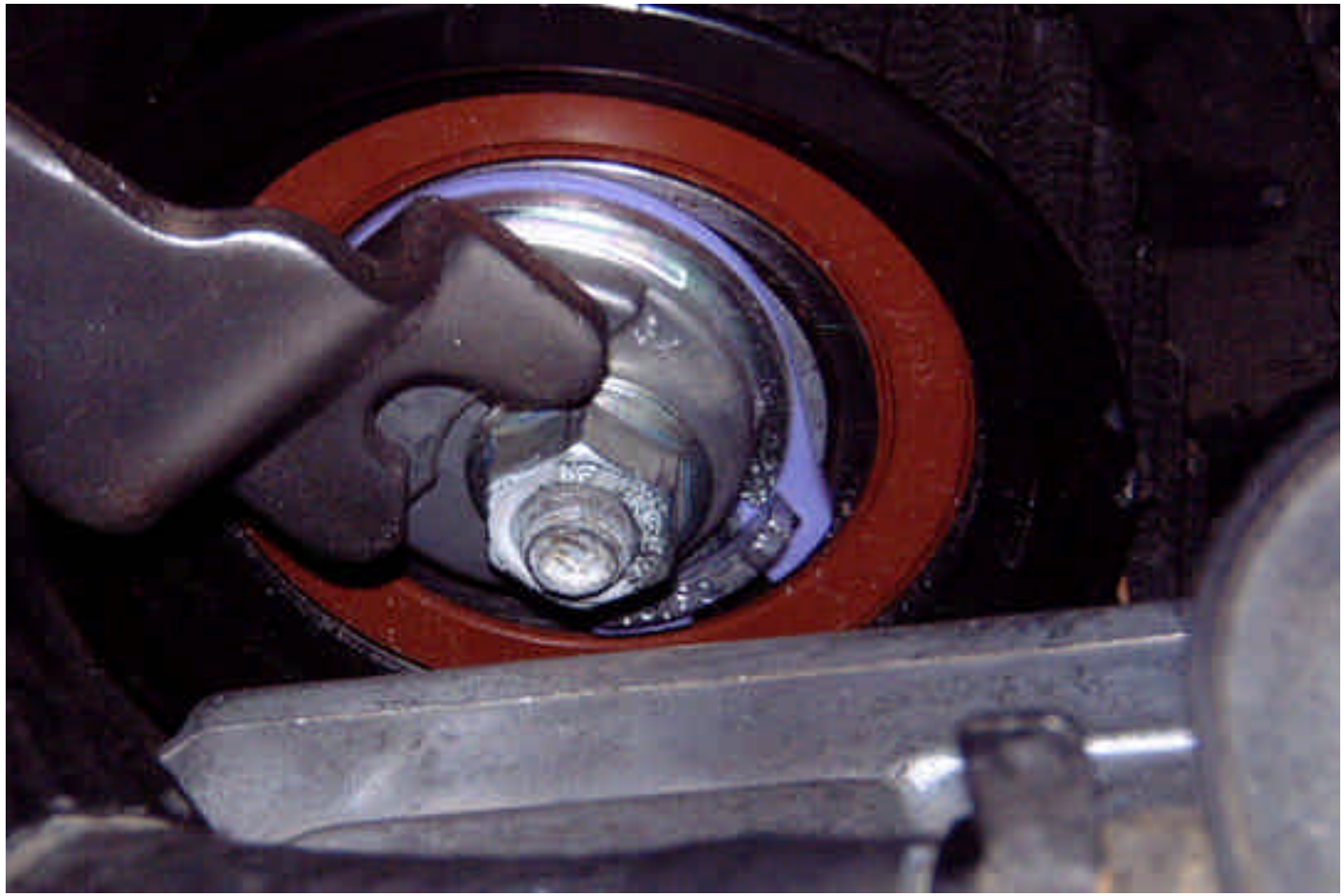
Snug up the 13mm nut just enough and insert the 2587 Two Pin spanner and rotate the tensioner "CLOCKWISE" until the marks (a tooth and a groove) are lined up as depicted in the last picture. You will notice that when you set the tension the cam pulley and the injection pump pulley will move as you take up the slack, this is the whole idea of doing it this way. The magic is even though the pulleys move the pump, cam and crank all remain in perfect time! Now lock down the bolt "Good'n Tight" is a good torque setting.

Notes

Adjusting new tensioner

25.2

Notes



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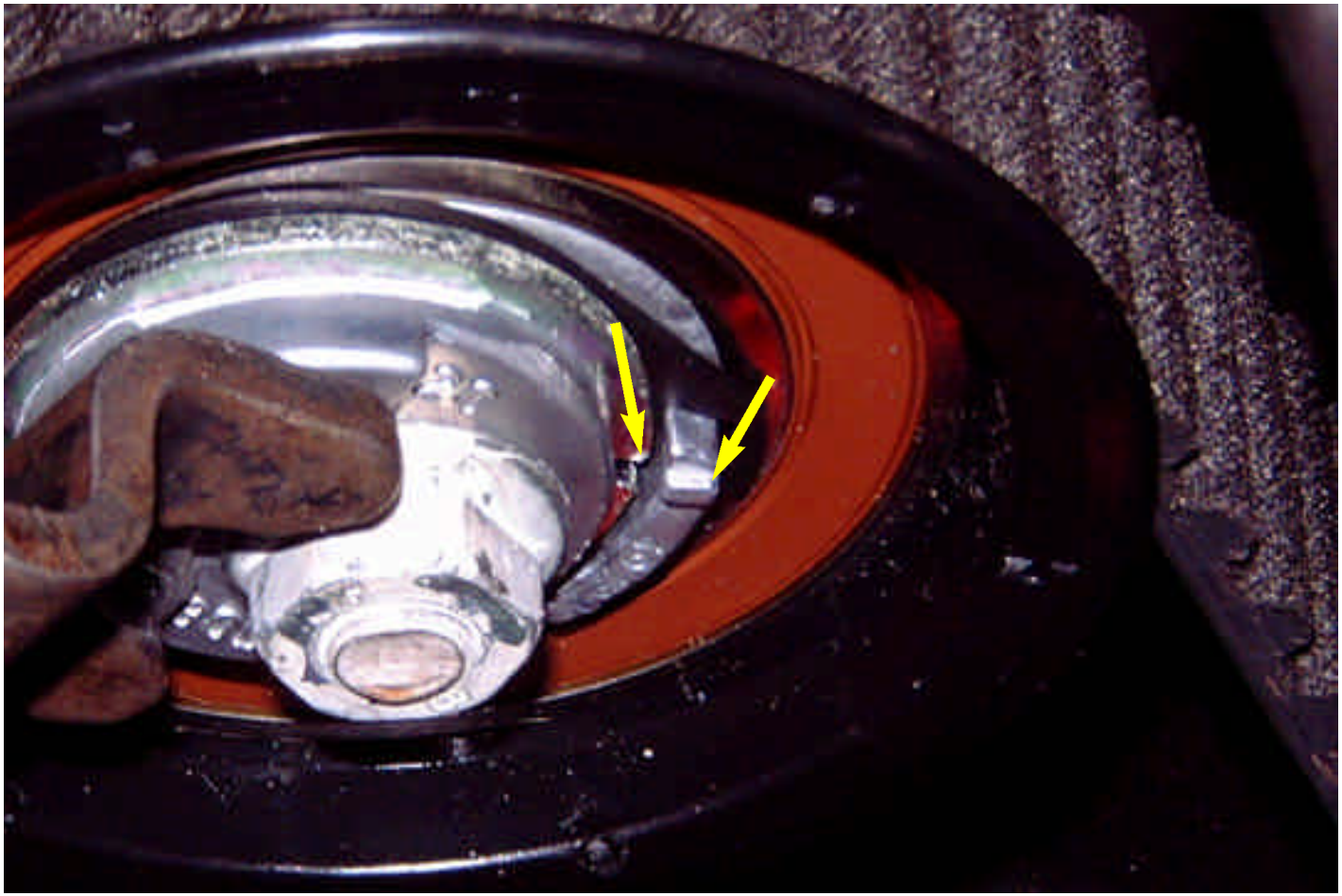
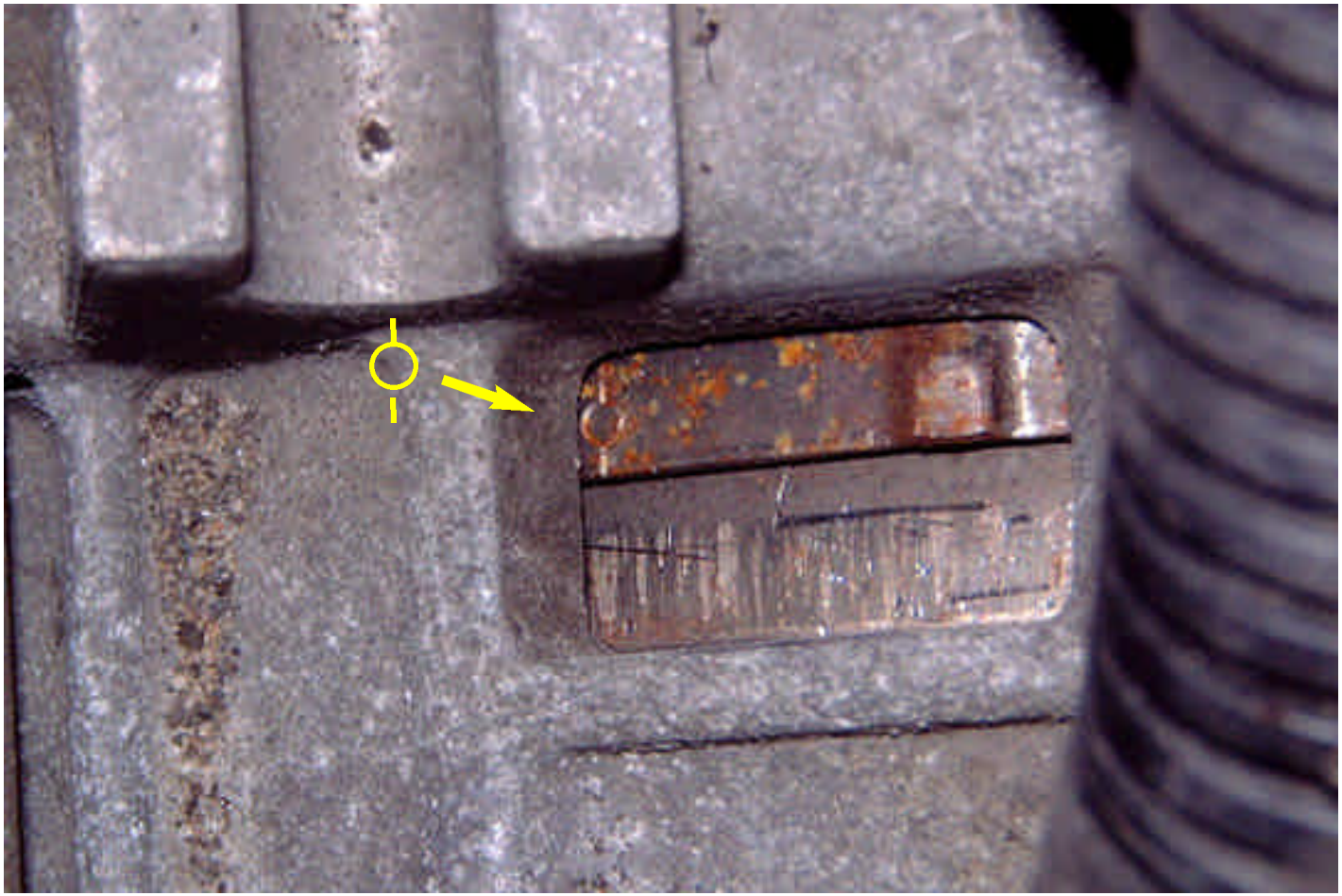


Snug up the 13mm nut just enough and insert the 2587 Two Pin spanner and rotate the tensioner "CLOCKWISE" until the marks (a tooth and a groove) are lined up as depicted in the last picture. You will notice that when you set the tension, the cam pulley and the injection pump pulley will move as you take up the slack, this is the whole idea of doing it this way. The magic is even though the pulleys move the pump, cam and crank all remain in perfect time! Now lock down the bolt "Good'n Tight" is a good torque setting.



Double check that the engine mark is still at **TDC**, the injection pump lock pin is inserted all the way into the pump, and that the cam locking bar is fully seated. Now using the 3036 cam holding bar torque the cam pulley bolt to 33ft-lbs... I usually add just a hair but under no circumstance should this bolt be over torqued. If it is, it can snap the end of the camshaft off, now you have problems.Torque down the three injection pump bolts where they are at. Double check that the flywheel is still at TDC. At this point you have the cam locked down, a small screwdriver wedged in the bell housing holding the flywheel at TDC, the injection pump lock pin installed in the pump and all the bolts on the pulleys tightened.

The bolts you want tight at this point are the 3 bolts in the pump, the cam pulley bolt (33 ft-lbs..) and the tensioner nut.

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Rotation clearance check

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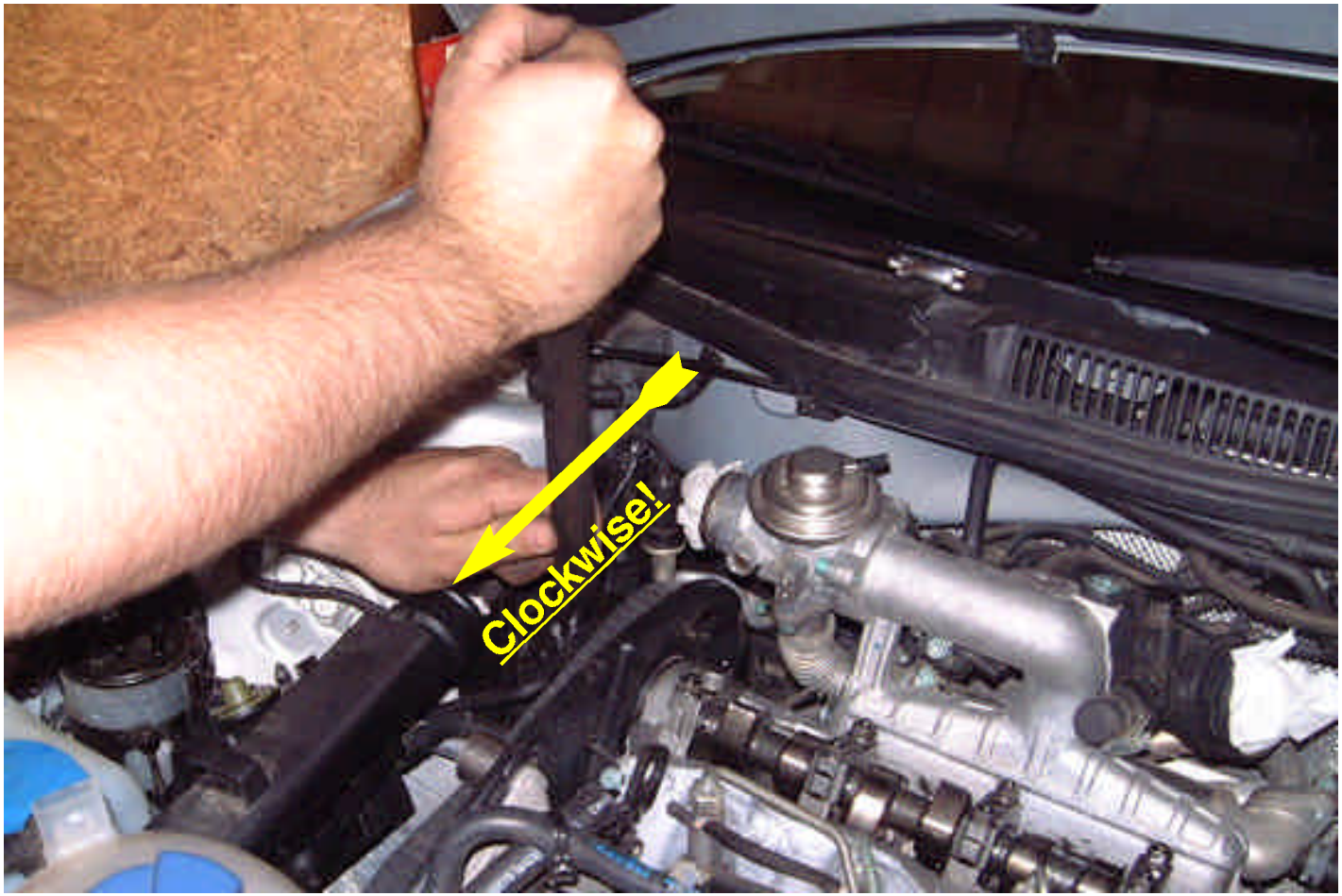
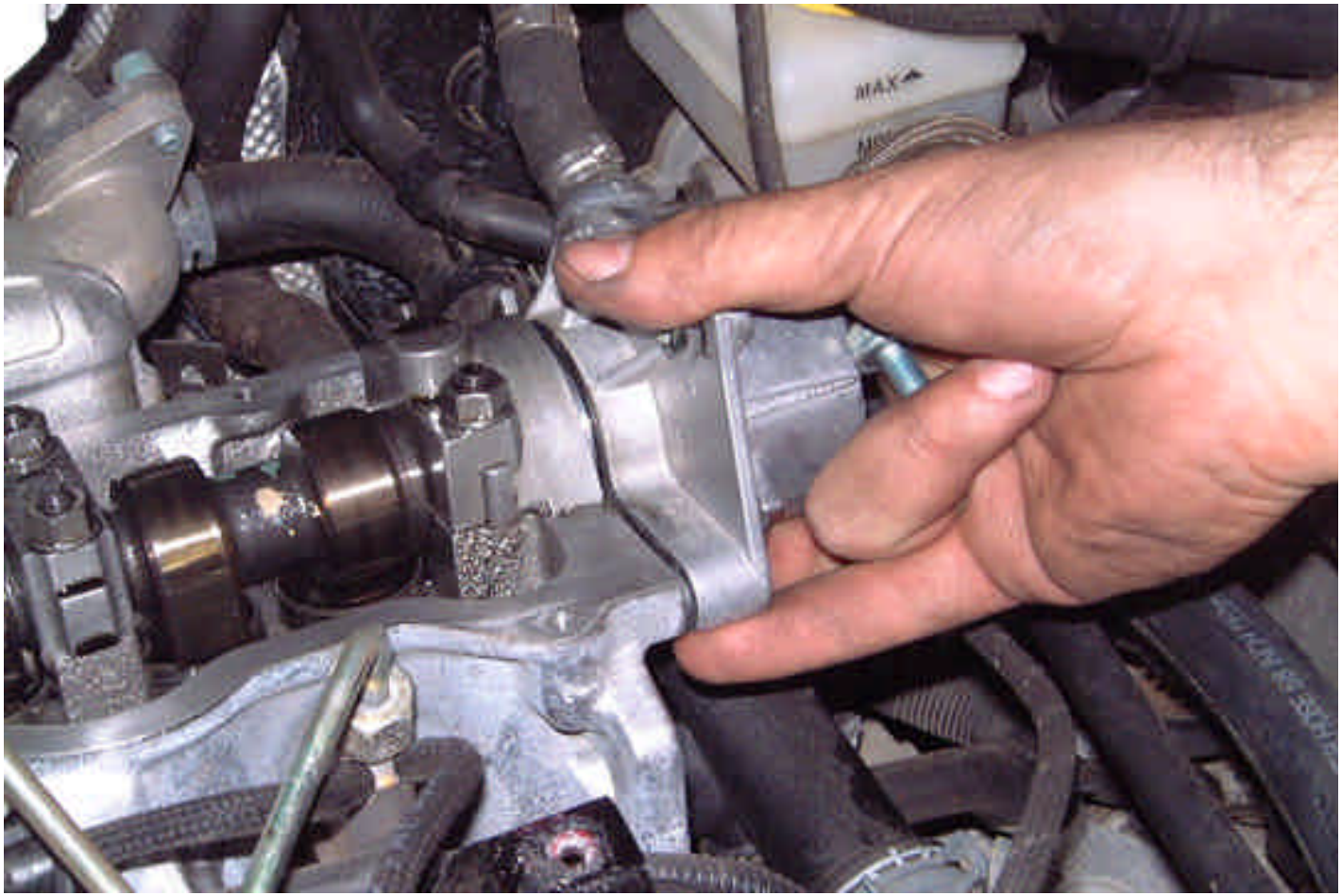


Remove the cam lock bar, injection pump lock pin, screw driver in the bell housing. **REMOVE ALL THE PAPER TOWELS IN THE INLETS, INCLUDING THE AIR BOX, TURBO INLET, EGR INLET, AND ANYTHING ELSE THAT WAS PLUGGED.**

Using the 3036 holding bar rotate the camshaft clockwise **ONLY!!** or else you screw up the tension that is set on the tensioner!! Turn the camshaft/ engine one complete rotation until the the #1 cylinder is back to the "lobes up" position

(**FYI** you should feel really good compression when doing this however compression goes away but valves incorrectly timed do not! If you feel like the engine is hitting a valve, turn it back and recheck all your settings and bolts to make sure you torqued everything).

Notes



Install the front and rear bolt in the vacuum pump so that the oil feed does not shoot oil all over the engine bay. Be careful to make sure the o-ring is not pinched in when tightening it down.

CRC (camshaft revolution check)

The timing belt replacement procedure mandates that you MANUALLY rotate the eng/crank two full clockwise rotations PRIOR to starting the engine. If you do this step...This prevents you from starting the engine with the static timing out of alignment. If you have the static timing out of wack at this step... you'll feel it... the engine will not rotate through.
If you did everything correctly...then the only resistance you'll feel as you rotate the engine manually will be the normal compression.

Remove locking tools and rotate crankshaft forward two full rotations by hand, then check that the locking tools can be re-inserted with the flywheel mark is at the correct TDC position.

Correctly starting the engine

When you have successfully completed the CRC (camshaft revolution check) you are ready to bump the motor. With somebody in the car you are going to bump the engine using the starter. The reason is this will get the new timing belt properly centered on the pulleys and allow the tensioner to take up any slack in the timing belt. Try not to let the engine start and bump the engine as many times as required (3-4 times) until the belt stops moving and is centered on the "CAMSHAFT" pulley. The injection pump will be somewhat off center that's totally normal. You just want to make sure that the belt is not riding off the injection pump pulley. If it is, you will need to have the bracket either replaced or re-shimmed.

Now that you have bumped the motor, check once more that every every intake port is clear of any obstructions and start the motor. It should start immediately and run normally. If not, recheck all timing marks as you missed something.

When the engine starts shut it off to prevent oil from going everywhere.

Notes

Closing up

Notes

When your closing every thing up, here are a few things to remember:

- Timing belt covers: install the lower cover first, then the top cover, then the engine mount.
- When installing the pendulum mount, install the steel alignment bracket first then install the big mounting bolts.
- Use blue locktite on the 4 harmonic dampener bolts.

☐ 1. Start the engine and let it run.

☐ 2. Hook up the Vag-Com® and start the software and enter data block 000.

☐ 3. Enter "Basic Settings mode". Read data block 2 and data block 9. If block 9 (fuel temp) is reading 110 then block two should be reading 70. I doubt it is since the timing is only set to be in the ignition window.

☐ 4. Shut off engine.

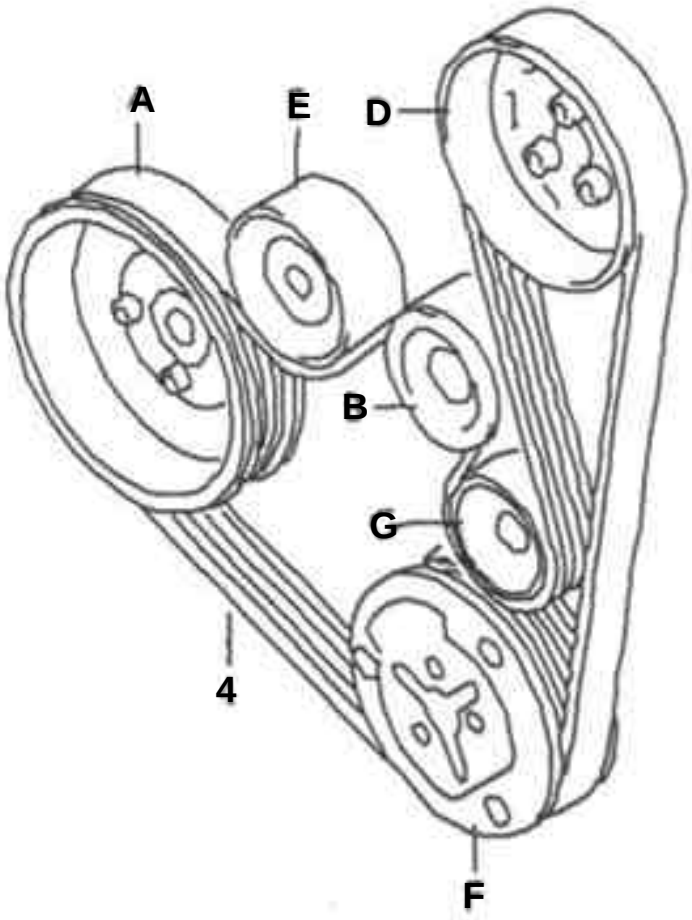
☐ 5. Loosen the three bolts (DO NOT REMOVE THEM!) on the injection pump. Using your trusty large crescent wrench (or some sort of a wedge) gently and very, very slowly rotate the pump counterclockwise to make the number in block 2 increase or clockwise to make it decrease. Increasing the value of the number in block two will effectively "Advance your timing".

☐ 6. You will,of course, have to guess at how much you moved the pump. Retighten the 3 bolts , get in and start the engine and see where its at. If the number is not where you want it repeat the procedure 1-5 until the setting is where you want on the graph in the bentley manual (sometimes I am glad one of my cars is an A3....)

FYI: Advancing the timing (counterclockwise) will reduce smoke output, increase fuel economy, and make the engine more rev happy. It will not matter if you are running the .184, .205 or .216 injectors because the #3 injector tells the ECU when injection occurs so the ECU will have all that taken care of.

Notes

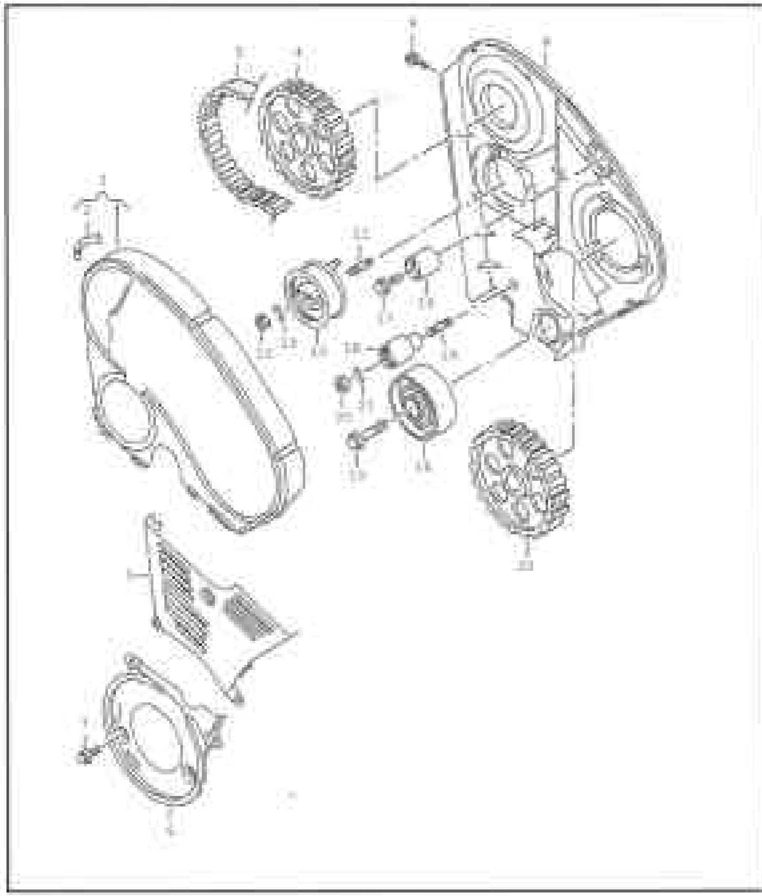
Serpentine belt layout



A- crankshaft
B- alternator
D- powersteering
E- belt tensioning damper
F- refrigerant compressor (A/C)
G- relay roller
4- belt part# 038 903 137J -- 21, 36 x 1660mm

Notes

Timing belt assembly



Pos	Part Number	Name	Remarks	Qty
		toothed belt toothed belt cover	[illegible]	
1	[illegible]	toothed belt cover	upper	1
2	[illegible]	spring clip		[illegible]
3	[illegible]	toothed belt cover	centre	1
4		toothed belt pulley see illustration	[illegible]	
(5)	[illegible]	toothed belt [illegible]	[illegible]	1
		[illegible]		[illegible]
5	[illegible]	toothed belt [illegible]	[illegible]	[illegible]
		[illegible]		[illegible]
(5)	[illegible]	toothed belt	[illegible]	1
6	[illegible]	toothed belt cover	lower	1
7	N [illegible]	bolt, hex. hd. with shoulder	[illegible]	[illegible]
8	[illegible]	cover plate		1
9	N [illegible]	bolt, hex. hd. (comb.)	[illegible]	[illegible]
10	[illegible]	tensioning roller		1
(10)	[illegible]	tensioning roller [illegible]		1
(10)	[illegible]	tensioning roller [illegible]		1
(10)	[illegible]	tensioning roller		1
11	N [illegible]	stud	[illegible]	1
12	N [illegible]	hex. nut, self-locking	M8	1
(12)	N [illegible]	washer	[illegible]	1
14	[illegible]	idler roller		1

Pos	Part Number	Name	Remarks	Qty	Model
15	N [illegible]	bolt, hex. hd. with shoulder, self-locking	[illegible]	1	
16	[illegible]	idler roller		1	
17	N [illegible]	bolt, hex. hd. with shoulder	[illegible]	1	
18	[illegible]	idler roller		1	[illegible]
19	N [illegible]	stud	[illegible]	1	[illegible]
20	N [illegible]	hex. nut, self-locking	M8	1	[illegible]
21	N [illegible]	washer	[illegible]	1	[illegible]
		--- [illegible] ---			

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