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VOLVO TECHTIPS

Information for the Independent Volvo Specialist



AUTOMATIC TRANSMISSIONS THROUGH THE YEARS

**MORE VOLVO BRAKES
VOLVO SUSPENSION 2
T6 TIMING BELT REPLACEMENT**

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VOLVO TECHTIPS



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FEATURES

AUTOMATIC TRANSMISSIONS THROUGH THE YEARS

The Volvo automatic transmission has evolved through the years to provide a much smoother shift, a longer life, and a better ride.



MORE VOLVO BRAKES

We all know that Volvo's mantra has always been safety; that's why Volvo has always been on the cutting edge of brake system technology, even in the early years.



VOLVO SUSPENSION, PART 2

Buzz, rattle, ping, squeak, snap, crackle, pop! Customers come into your shop every day making sound effects to try to imitate and explain the noise that their Volvo is currently making.



T6 TIMING BELT REPLACEMENT

Timing belt replacement can sometimes be a daunting job, but with the right tools and help from Volvo VIDA this job can be made a lot less stressful.



DEPARTMENTS

Squeaking Noise from Subframe Bushings / Reinforcement Plate 26



VOLVO AUTOMATIC TRANSMISSIONS THROUGH THE YEARS

THE VOLVO AUTOMATIC TRANSMISSION HAS EVOLVED THROUGH THE YEARS TO PROVIDE A MUCH SMOOTHER SHIFT, A LONGER LIFE, AND A BETTER RIDE.





Volvo transmission fluid drain plug



Volvo tool No. 9995475



Tool installed and aligned properly on the transmission.

Transmissions were developed in order to permit the gear ratio that exists between the vehicle engine and wheels to change when slowing down or speeding up. Gears have to be shifted in order to avoid not only overworking the engine but also to maintain it running at optimal rpm for performance.

The 850 Volvo had a transmission that was developed for front wheel drive. It was used in 1993 to 1997 L5 2.3L and 2.4L applications, and is a four-speed, front-wheel drive transmission model 50-40 (AW50-40) Aisin Warner.

This transmission is a solid and reliable automatic transmission. It has just a few problems, but most problems are due to not maintaining them properly. Fluid needs to be changed every 20,000 miles.

To check the fluid, make sure the vehicle is level. Apply the parking brake and make sure the shifter is in the Park position. Start the engine and idle. With your foot on the brake, move through all positions from Park to Drive a couple of times, now back to Park. Wait a minute and check the fluid at the yellow dipstick. The level should be between Min and Max. If not, fill with genuine Volvo fluid.

When changing fluid on these transmissions and the car is on the rack, remove the drain plug from the bottom side of the transmission. If the drain fluid is black or dark, recommend that the customer should change the fluid more frequently. Draining here doesn't remove all the fluid. There is still some in the torque converter. Draining and filling the fluid a few times will get you back to clean red fluid. To fill fluid, use a funnel and fill at the transmission dipstick. Fluid should be checked while the engine is running and the transmission is in Park.

REPLACING OR ADJUSTING THE GEAR SELECTOR SWITCH, OR NEUTRAL SAFETY SWITCH. VOLVO CALLS IT A PNP SWITCH.

Remove the air cleaner assembly from the vehicle. Also remove the battery and battery tray. Now that the switch is accessible, removing or adjusting will be less of a challenge.

To remove the switch, remove the two bolts that secure the switch. Unplug and remove. Install the new one and leave the bolts loose for adjustment. Install tool number 9995475 at the linkage for the shifter cable.

Move the linkage until the tool has lined up the mark.

Once the tool is aligned, tighten and secure the bolts. Remove the tool and secure the linkage. Install the electrical connection, air filter box and the hose for the air mass meter. Make sure to check to assure that the vehicle starts in Park and Neutral and not in any other gear.

The 1998 to 2000 Volvo S70 and V70 used transmission AW55-50SN five speed, and the all wheel drive model was either the AW55-50 five speed or the AW50-42LE four speed.

The 2001 Volvo used this same transmission, the AW 55-50 and the AW55-50SN, with a new feature. These five speed transmissions came standard with a Geartronic transmission, meaning you could shift the vehicle manually if desired. By pulling the shifter back to first gear and slightly pushing the shifter forward, you could shift through the gears. The position or gear will show on the instrument cluster.

The Geartronic transmission is a specific transmission brand that is commonly found in Volvo vehicles. It was designed to provide performance and flexibility. Geartronic has manufactured both a five-speed and a six-speed transmission for Volvo.

To replace the transmission in a 2002 Volvo XC70 you will need these tools:

VOLVO PART NUMBER		
9985972	9995460	9995463
9995681	9995716	9995972
9995562	9997076	9997077

Disconnect the battery negative cable. The battery is in the rear of the vehicle. Now that the battery is disconnected, remove the air filter housing and fresh air intake hose. Remove the top torque rod which is attached between both strut towers.

Use tool 9997077 to remove the gear selector cable. Remove the bracket for the cable and set it aside. Disconnect both hoses going to the radiator. Drain the coolant and remove the bottom radiator hose. This will give room to get to the transmission-to-engine bolts. Disconnect the bracket for the oxygen sensor and move it out of the way.

Remove the two bolts from the starter and the other three bolts that hold the transmission to the engine. Disconnect the hoses at the firewall that lead to the heater core. This will help when lowering the engine. The quick connect hose release needs to turn counterclockwise and pull directly out of the coolant pipe.

Install tools 9995716 and 9995460 and tighten so no tension is allowed.

Raise the vehicle on the hoist and remove the front tires, splash shield and air baffle.

On the front of the cross member remove the screws that hold the negative battery cable and the screw that holds the wire loom near the air conditioning compressor.

Geartronic shifter as seen on S60/V70



Remove both cross member brackets near the exhaust, along with the front bracket disconnect clips that hold the brake lines. Try not to bend them much. Remove the bolt from the steering gear at the knuckle and separate the gear from the shaft. Remove both engine mount bolts at the cross member. Remove the torque rod mount from the transmission to cross member.

Remove the outer tie rod nuts and separate on both sides. Remove the lower sway bar link nut and let the bar hang. Remove the ABS sensor from both front hub assemblies. The outside axle bolts need to be removed, along with the ball joint bottom nuts. Use tool 9997076 to pull down the control arm and release it from ball joint on both sides.

Remove two nuts on each side of the inner fender, bend it over out of the way and secure. Now that the control arms are separated from the ball joints this should give enough room to remove the axles from the vehicle. Next remove the right front axle bearing cap. Now the axle should pull directly out. On the left side use tool 9995681 to pry out the axle from the transmission.

The driveshaft will need to be removed. Mark both ends of the shaft so it can be put back in the same position, remove the bolts and center support and set the driveshaft aside.

Under the subframe on the left side, position a jack to support the frame. Remove the subframe bolts from the left side. Now lower the frame, making sure all hoses and cables are not getting stretched too far. Remove the jack and let the subframe hang.



Volvo 2002 transmission in vehicle and on transmission jack



Tools 9995716 and 9995460 connected to engine

Time now to remove the angle gear. Remove the five bolts connecting the angle gear to the transmission. The angle gear should now be removed and set aside. This is also a good time to repair any leaks at the angle gear and change the fluid. Remove three bolts and remove the bracket and engine mount near the firewall.

The torque converter bolts can be removed now. Turn the crankshaft so that each bolt head is visible and remove with a Torx T50 tool. Spin the crankshaft around until all bolts are removed. Drain the transmission of fluid and re-install the plug.

Lower the vehicle and lower the transmission by turning the left lifting hook until you can see the stop point, or until the transmission is clear of the body. Raise the vehicle back up and remove the rest of the bolts holding the transmission in. Leave one bolt in until the transmission jack and head fixture are in place. Set the head fixture onto the transmission jack. Lift the jack until the fixture aligns with the transmission and tighten the head fixture tool 9995463 to the transmission.

Removing the left control arm will give room for the jack head to slip around the subframe. Remove the last bolt and pull the transmission out, making sure to keep it even with the engine. Push the torque converter, with a screwdriver, back away from the flywheel. Lower the jack and make sure nothing is in the way and everything is disconnected.

Before installing the transmission be sure to check to assure that the flywheel teeth are not ground down at all. If so replace the flywheel. Replace the rear main seal after the flywheel is removed. Install the transmission in reverse order. Let's go over this order.

Secure the transmission to the jack. Try to line up the torque converter with the holes at the flywheel, this will make it easier to insert the bolts and tighten. Be careful not to break the speed sensor fitting.

Secure the transmission to the engine making sure they fit together evenly; adjust the height and angle with a transmission jack. Install a bolt or two just to keep everything in place. Use a small screwdriver to line up the torque converter holes. Tighten all bolts on the bottom that hold the transmission to the engine. Install the bolts for the torque

converter and tighten. Spin the engine around a couple of times to make sure all torque converter bolts are in and tight. Secure the rest of the transmission bolts on the bottom.

Remove the transmission jack and head fixture. Lower the vehicle and lift the engine and transmission so that they are level. Raise the vehicle back up on the lift. Install the engine mount bracket and mount next to the firewall.

When installing the angle gear make sure the spline joint is clean of debris and greased before installing. Insert all bolts and tighten. Secure the drive shaft to the angle gear and tighten the bolts. Secure the negative battery cable.

Install a new rubber o-ring at the transmission cooler line at the bottom of the transmission.

The right axle can now be installed, making sure to clean and lubricate both ends of the axle, and assuring that the seal is in place at the front hub assembly. Secure the bearing cap and fit the bolt at the bearing hub and tighten. Install the left side axle and secure.

Fit a jack under the subframe on the left side and raise into position. Install the subframe bolts and leave loose. Secure the wire harness screw at right front, along with the bracket for the negative battery cable at the front of the subframe. Secure the steering rack to the steering column and tighten the bolt. Tighten all bolts for the subframe.

Install the bracket at the exhaust, making sure to secure the brake lines in position so they don't rub against anything. Install the torque rod mount. Install the left control arm and tighten; pull down with tool number 9997076 and fit into the ball joint and tighten. Tighten the sway bar links both sides. Tighten down the tie rod-to-hub assembly.

Lower the vehicle and remove the lifting beams and hooks from engine, and tighten the bolts for the transmission and starter. Secure the shifter cable onto the bracket and transmission. Install the radiator hose and small bracket for the oxygen sensor. Fit heater hoses to pipes with quick connects.

Fit the air cleaner box into place and secure. Secure the hose to the air mass meter and tighten the clamp. Attach the electrical connector to the air mass meter. Install the air charge pipe to the turbo across the engine and tighten clamps. Install the upper torque rod between the strut towers and tighten.

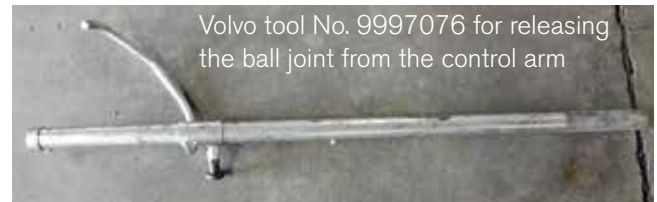
Add coolant and top off. Fill the transmission with fluid, three quarts. Start the vehicle and let warm up to operating temperature. With your foot on the brake pedal, run the transmission through the gear selection, then back into Park. Re-check the fluid level and adjust as needed.

Raise the vehicle back up and check to make sure everything is tight and secure. Install the air guide and splash pan. Tighten the wheels and test drive the vehicle. Check the transmission fluid level again just to make sure the fluid is full.

VALVE BODY INSIDE TRANSMISSION

The AW55-50SN transmission is controlled by a computer and actuated by hydraulics. Replacing the valve body can eliminate hydraulic problems in this transmission.

Customers may describe shifting problems such as harsh engagement after prolonged coasting and occasional



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awkward shifts between 3rd and 4th gear. Having VIDA diagnose transmission problems while activating components can be a real help. Reading codes setting counters for fluid change and resetting adaption is needed after any work to the valve body.

Shift solenoids can sometimes be a problem in this transmission. Having VIDA hooked up to the vehicle and the key in number two position, activate the solenoids and you will be able to hear them click if they are working correctly. If no click is heard, replacing the solenoid will be necessary.

To remove the valve body or replace a solenoid, lowering the transmission to gain access to the valve body cover is necessary. Volvo special tools 9995716, 9995460, and 9995477 are needed to lift and lower the engine. After disconnecting the battery negative cable, put the engine lift bars and threaded hooks across the top of the engine and secure. Raise the vehicle and drain the fluid. Remove the front air duct. Add a new seal ring to the drain plug and tighten. Lower the vehicle and remove the air cleaner housing, disconnect the air mass meter plug and clamp holding the hose to the air mass meter. Pop up the air cleaner box from the three plastic clips that hold the box in.

Disconnect the top transmission line at the transmission and at the radiator. Using a 22 mm crow's foot flare wrench works well for this job. Put the special Volvo lift tools across the top of the engine. Secure the threaded hooks to the engine and tighten until no play is left. Raise the vehicle back up and remove the bottom transmission cooler line. Be sure to catch escaping fluid at the bottom of the transmission. Remove the bolt on the bottom for the front engine mount. Remove the torque rod mount.

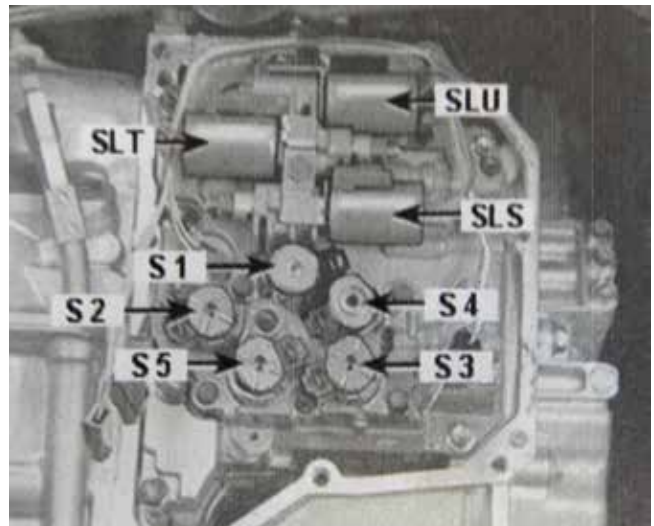
Remove the front left subframe bolt. Disconnect the negative cable bracket and cable from the transmission. Remove the screw at the harness on right front. Loosen the front right subframe bolt but leave a few threads engaged. Loosen the rear subframe bolt on the left side



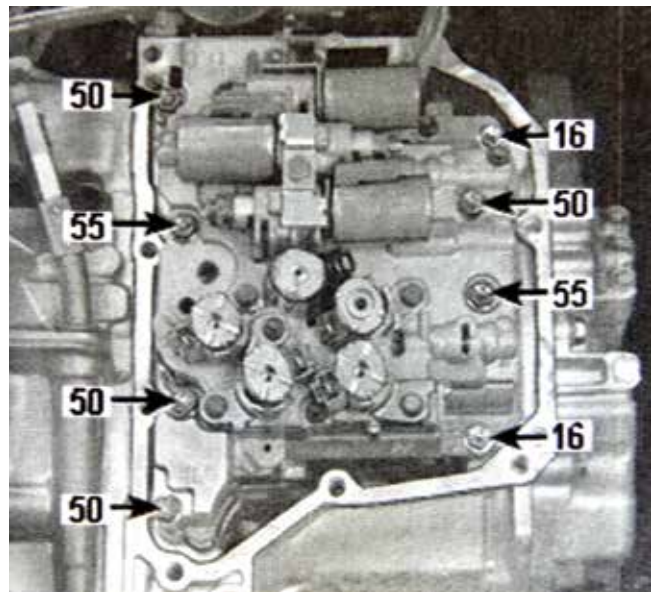
Torque rod mount at bottom of transmission



Valve body from inside transmission



Valve body solenoids at each location



Control system valve body screws and their lengths

two to four turns without removing the bolt. Use a spacer of some sort to put between the subframe and the body of vehicle at the front left. This will give room to get to the transmission pan. Remove the dipstick tube.

Clean the area around transmission pan so that dirt and debris do not get inside the transmission. Remove the nine bolts, Torx T40, from pan and remove the pan. Now the valve body will be exposed.

To check all solenoids, disconnect all of them and check resistance with a multimeter between the pins at the solenoids.

- Solenoid S1: Correct value 12-16 ohms.
- Solenoids S2-S5: Correct value 11-15 ohms.

If any of these solenoids are out of range, replace them.

Solenoids SLT, SLS and SLU:
Correct value is 5.0-5.6 ohms.

If these solenoids are bad, replace control system.

When replacing a solenoid, remove the screw and pull out. Lubricate the new solenoid seal with transmission fluid and insert and tighten screw to 7 Nm.

If replacing the control system, make sure the valve body and all connectors are disconnected and push the harness to the side out of the way. Remove eight screws from the control system and remove from the transmission. These screws are different in length, so be sure to note. After the unit is removed, replace two seals in the transmission and clean all debris. Hold seals in with grease.

Check gear selector slider, making sure it's correctly positioned. Position the control system with new gasket in place, making sure that the lever for the gear selector is in Neutral. Install screws and tighten to 10 Nm. Connect the harness to all solenoids and secure the oil temperature sensor and connect.

Clean the pan surface and make sure it is flat. Use a thin layer of sealing compound and re-install to the transmission. Tighten all screws to the pan and reassemble the vehicle in reverse order. Make sure to replace the subframe bolts and tighten and reconnect the battery negative cable.

Add three quarts of transmission oil and start the vehicle. Run until the temperature is warm, check fluid again and top off and test drive the vehicle. After your test drive check again and make sure there are no leaks.

Install the air guide and splash pan. ●

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MORE VOLVO BRAKES

IN THIS DAY OF EVER ADVANCING AUTOMOTIVE TECHNOLOGY, MOST TECHNICIANS LOOK FORWARD TO GETTING A REPAIR ORDER THAT SAYS SOMETHING LIKE "CHECK BRAKES" INSTEAD OF SOMETHING LIKE "CHECK INTERMITTENT (FILL IN THE BLANK) ON TUESDAYS GOING DOWN THE FREEWAY BACKWARDS AT 86.2 MILES PER HOUR."



Of course that's an extreme example, but a good old brake job can be a relief for some technicians, especially those that do a lot of diagnostics.

We all know that Volvo's mantra has always been safety. That's why Volvo has always been on the cutting edge of brake system technology.

In August of 1966 Volvo introduced a new car model to the world. It was called the Volvo 144. In terms of safety, this car was extremely advanced. It had disc brakes all round, a safety steering column and a new lock on the three-point safety belts. The body had energy-absorbing crumple zones at the front and rear. Even the door locks had a safety design.

With Volvo's introduction of the 144 they also introduced a new brake system — the triangle-split dual-circuit brake system. The car had two brake circuits and, if one of them failed, 80 percent of braking effect was still available.

The Volvo 144 was a huge success in Sweden and also abroad. In the USA, the Volvo 144 complied with the new safety regulations before they had even been made public.

In the automotive world, everything changes. So whether you have been working on Volvos for 30 years or 3 months, you need to pay attention and keep up with the changes. The fact that you are reading this is a good sign.

With systems like Advanced Driver Assistance Systems (ADAS) and semi-autonomous braking systems becoming standard equipment on a lot of newer cars and trucks on the road, you will need to learn how these new systems work and, when they don't work, how to go about repairing them.

Having the right tools and training is critical to the diagnosis, repair and service of these modern braking systems.

A lot of this training you can source for free. Online videos and trade publications (like this one!) are out there for you to access whenever you want.

VOLVO BRAKE TECHNICAL JOURNALS (TJs)

When you talk about repair information, among the most valuable resources are the Technical Journals (TJs) issued by the auto manufacturers.

Volvo periodically issues new Technical Journals to fix problems that come up on Volvos that are already on the road. There are several dealing with brake issues on all different years and models.

The most up to date Technical Journals can be found on Volvotechinfo.com and if you have an active subscription to VIDA you can find them there.

DO I NEED THE FACTORY VOLVO SOFTWARE (VIDA) TO WORK ON VOLVO BRAKE SYSTEMS?

The answer is YES in a lot of cases, especially on newer Volvo models 2010 and up.

Let's face it, these days your shop needs to have access to the OEM scan tools. The generic all in one scanner just won't cut it in a lot of cases, especially when dealing with newer cars with integrated driver assist capabilities.

Systems like Advanced Driver Assistance Systems (ADAS) or, in the case of Volvo, City Safe, are becoming standard equipment on most cars these days and when it comes to testing and calibrating these systems you will need the factory tool to do it right.

Yes there are some aftermarket scan tools that can get codes and some live data, even some that have bi-directional command abilities.

But Volvo's VIDA is the only system that has it all in one place and the only system that can download software to Volvos' network modules.

A lot of shops think that they can't afford VIDA, but they are wrong. Your shop can have VIDA for the cost of a laptop and Volvo's DICE tool.

Once you have that your shop can purchase use of the VIDA software for as little as \$64 for a three day subscription (price subject to change without notice).

Compared to the price of some generic scan tools, VIDA is a real bargain.

Here are a few examples of brake work where you would have to use VIDA software.

On Volvos equipped with electronic parking brakes you will need VIDA to put the rear calipers into "SERVICE MODE." This retracts the screw type caliper pistons so you can replace the rear pads.

Conditions:	
<ul style="list-style-type: none"> • The vehicle must be stationary. • Ignition switch position II. • The engine must be switched off. 	
Parameter	Value
PBM - Neutral	Yes
PBM - Maintenance Mode	No
PBM - Left brake pad applied	No
PBM - Right brake pad applied	No
PBM - Left brake pad released	Yes
PBM - Right brake pad released	Yes

Parameter	Value
PBM - Left brake pad extended release, service mode	No
PBM - Right brake pad extended release, service mode	No

If you install a Brake Control Module (BCM) in a 1999 or newer Volvo you will need to load a software package in order for the car's network to recognize the new part.

There are software updates for all modules on Volvos, including the BCM, and only VIDA can load these important software updates.

Software updates include this one which is covered in Technical Journal TJ21247:

Retailer Technical Journal 21247
 Electrically operated Parking Brake (EPB)
 Drive away function delayed
 Date 06-24-2009
 Reference: VIDA, VSTG

Model	Type	Model year	Chasis range
S80	124	2007 - 2010	000850 - 113001
V70	135	2008 - 2010	000395 - 118001
XC70	136	2008 - 2010	000400 - 074001
XC60	156	2010 - 2010	000212 - 050001

The drive away function which releases the EPB upon take off may be delayed if the customer enters the car and drives away within 1 - 1.5 seconds.

The Parking Brake Module (PBM) needs to receive data from other control modules before it will release the EPB.

Service software has been developed to prevent this delay.

SERVICE:
 Download PBM Upgrade software using VIDA.

BRAKE SYSTEM REPLACEMENT PARTS

THEY ARE ALL THE SAME, RIGHT?

Have you ever had a customer think or say that? Not very often. That's because, unless your customer is 16 and just got their license and is that rare species of teenager that has to pay for the repairs themselves, they have probably had a brake job done on their car before.

If your customer has had a cheap brake job done before, they probably know that there is a vast difference in the quality of replacement parts out there.

Most technicians that have been doing this for a while have seen the effects of poor quality brake parts.

There are high quality replacement brake parts available to you these days and some are made right alongside the factory replacement parts, so what's the difference?

Well there are a few.

FIT

Even though a replacement brake pad may be a copy of the OE Volvo pad, it's just that, a copy. Due to patent laws the part won't necessarily be the exact same size or design and may not perform as well as the OE part.

WARRANTY

Volvo offers a 2-year warranty on its brake pads and rotors (U.S. only).

Most aftermarket brake manufacturers only give you a one year limited warranty, or none at all.



Volvo routinely issues Technical Journals to deal with problems that arise in the field. In this case TJ 51-09 helps fix squealing noises on V70/S60R cars by installing noise dampers on the backs of the calipers.

PRICE

Have you compared the prices of OE Volvo brake parts to some aftermarket parts? You may be surprised. Yes you might save a couple of bucks in some cases, but if you have a comeback there goes any profit and your reputation.

VALUE

Most customers will appreciate that your shop installs Volvo OE parts on their car, even if it costs a bit more.



These brake pads are both quality parts and are made to fit the same car, but the OE Volvo pad set has been updated to address issues that appeared in the field. With these cars the aftermarket pads can stop the car, but may cause other issues.

Here is a real world example of why OE Volvo brake pads are the best fit for your customers' cars.

CASE STUDY 2005 V70 R

This car came into the shop with a customer complaint of squealing from the front brakes at low speeds. The customer stated that they had just been to another local Volvo shop and had the front brake pads and rotors replaced only about 2,000 miles ago.

When the service writer interviewed the customer about why they had not taken the car back to the original shop for a possible warranty repair on the brakes, they stated that they did and the other shop told them that they needed to drive the car more to "break in" the new parts.

This customer was not satisfied with this and decided to bring the car in for a second opinion.

The technician was able to readily reproduce the customer's noise complaint on a short test drive.

The car was put up on a lift and the wheels were removed to inspect the brakes. The shop that had performed the brake job had a good reputation and was known for good work and using quality parts.

The tech noted that everything looked correctly installed and there was no missing or damaged hardware. The tech removed the brake pads from one of the calipers and noticed that the pads that were installed were a high quality aftermarket brand and looked to have no visible defects. The new brake discs were also very high quality aftermarket parts.

So why were these brakes making noise?

Since the service writer at this shop knew the service writer at the shop that first performed the brake job, he was able to call them and inquire about the work done on the car.

The other shop told the service writer that they had already replaced this customer's brake parts under warranty and did not understand how they could still be squealing.

Volvo's fix for the squeal is to install vibration dampers on the inside of the caliper, bolted on with the caliper mounting bolts. These dampers would counteract the vibration caused by the light weight caliper design that came on the S60/V70 R cars from 2004-2005.

The service writer decided to call their local Volvo dealership's parts department and order an OE brake pad set for this car. When the parts arrived, the technician and service writer compared the OE Volvo pads to the high quality aftermarket pad set.

Right off the bat you could see the differences.

The aftermarket pads wear surfaces were all the same shape and size with bevels on both ends being cut at the same angle. However the factory Volvo set had friction material that was cut at different angles at each end and had arrows that indicated installation direction. This updated pad design was developed to help fix the R's tendency to squeal at low speed braking, while the aftermarket pad set was just designed to stop the vehicle.

In many cases Volvo engineers have re-designed parts to fix problems that have arisen on cars that have been on the road for a few years. They base the need for a re-design on feedback from technicians in the field.

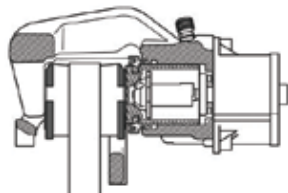
VOLVO ELECTRONIC PARKING BRAKE SYSTEMS (EPB)

Volvo started using an electronic parking brake system in some of its cars in 2007. This system is very reliable, but it pays to understand how these systems work in order to avoid misdiagnosis of EPB issues.

This is how they work:

The parking brake switch has three positions, of which two are counter sprung and the third is in the neutral position.

The parking switch consists of a number of smaller switches. The switch has six terminal pins. When the switch is activated the smaller switches open and close inside the switch. This creates a pattern for the six terminal pins. The Parking Brake Module (PBM)



Active Parking Brake

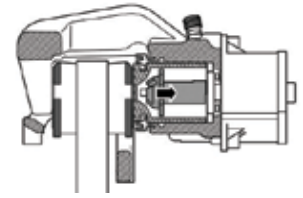
recognizes certain approved patterns for activating and deactivating the parking brake. If a faulty pattern occurs, the Parking Brake Module (PBM) indicates this by a diagnostic trouble code being set.

Background lighting/instrument lighting for the parking brake switches is supplied with voltage via the Central Electronic Module (CEM).

The brake caliper which is used together with the Parking Brake Module is a special design. The brake caliper consists of the normal components of a brake caliper, along with an electric motor, a gearbox and a shaft/spindle which presses on the brake pads. The electric motor is connected directly to the Parking Brake Module.

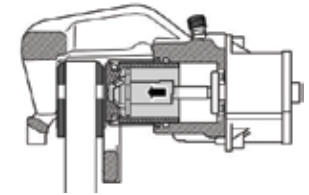
For vehicles equipped with Parking Brake Module there are brake calipers of this type located on the rear wheels.

These brake calipers replace the normal brake calipers. The brake caliper has a connection for the hydraulics and functions as a normal brake caliper when the parking brake is not used.



Released Parking Brake

When the parking brake is activated, the electric motor provides torque which is transferred to pressure via a spindle. The spindle is located in the brake piston and presses on it so that the brake pads are applied.



Spin Wear

When the current to the electric motor is broken (the vehicle is parked), the self-locking thread on the shaft retains the brake pressure.

When the parking brake is released the spindle is wound back and the piston releases the pressure. The shaft remains in position.

The spindle follows the wear on the brake pads

The spindle on the shaft is screwed out continuously with the piston in order to follow the wear in the brake pads. The spindle applies the pressure in the same way each time. ●





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NOTHING CAN REPLACE THEM

When a part needs replacement, a Volvo Genuine Part is the right choice. Manufactured to Volvo's exact specifications, they deliver the safety, quality and reliability your customers expect from the Volvo brand.

Volvo Genuine Parts fit perfectly and come with a 2-year limited warranty.*

Contact your local Volvo dealer for a complete selection of Volvo Genuine Parts.



* U.S. only. Warranty excludes consumable "wear item" parts, labor and Volvo accessories.



VOLVO SUSPENSION, PART 2

BUZZ, RATTLE, PING, SQUEAK,
SNAP, CRACKLE, POPI!
CUSTOMERS COME INTO YOUR
SHOP EVERY DAY MAKING
SOUND EFFECTS TO TRY TO
IMITATE AND EXPLAIN THE
NOISE THEIR VOLVO IS MAKING.



With any customer complaint, the more information the service adviser can get out of the customer the better, especially in the case of an intermittent or hard to duplicate noise.

It's important to be on the same page with your customer about their complaint, because when most technicians test drive the vehicle, they may hear multiple noises, many of which the customer may not even hear.

That's because, over the years and miles that the customer has been acquainted with their Volvo, the parts wear and slowly start making subtle noises that the customer may just get used to.

But then the day comes when a new not so subtle noise rears its ugly head and now it's your problem.

The most common wear issue that is usually not noticed by the average Volvo driver is when their struts or shock absorbers are worn out.

That's because in most cases, under normal driving conditions, shocks and struts degrade slowly, and the effects of worn shocks and struts on everyday driving can be very subtle.

And just like your some parts of your body, you don't know the parts are worn out until your doctor tells you or you start feeling pain.



The way that different shops and technicians evaluate the condition and wear of shocks and struts is as varied as the number of shades of blue.

In this case, you are the doctor and, let's face it, if you are an auto technician in this day and age you are a doctor!

SO WHEN DO YOU RECOMMEND REPLACEMENT OF YOUR CUSTOMERS' STRUTS AND SHOCKS?

Good question. A lot of suspension parts manufacturers recommend strut and shock replacement at 50,000 miles under normal driving conditions. But of course they can be biased because they sell these parts. But there is evidence to support this replacement schedule.

Here is their data behind this theory:

Even on well paved roads the shocks can move up or down 1,500 to 1,900 times every mile. In 50,000 miles that can exceed 75 million cycles. Over time, performance tends to decrease gradually and the motorist usually doesn't realize how much handling and control is lost. Replacing shocks and struts after 50,000 miles can keep the vehicle performing as well as it was designed and extend its life expectancy.

Well paved roads, is there such a place? Not in most US cities.

So is mileage alone a good enough reason to replace your shocks or struts?

Not always. It depends on how your customer uses their Volvo and, of course, where they drive it.

So how do you feel good about selling shocks and struts that don't have any

outward signs of failure and are just worn and have over 50K miles on them?

You need to interview the customer and ask them about their driving style.

Do they drive in a lot of stop and go traffic?

Worn shocks can increase stopping distance in a panic stop.

Do they drive on the freeway at high speeds?

Worn shocks can greatly reduce the control and handling when changing lanes or swerving to avoid other drivers.

Of course we all know these things, but remember that most of your customers do not know these things and don't notice the difference in their car's driving performance until the shocks or struts are replaced.

REMEMBER TO CHECK THE BASICS

A lot of Volvo suspension noise complaints can be simple to fix, you just have to look for them.

Most Volvo models you encounter at your shop have steering stops (or bump stop limiters) on the lower control arms. Some have replaceable parts that should be changed when they are broken or worn out.

When the front wheels are fully locked to one side, especially when the car is going up a driveway, these steering stops will rub on the corresponding bracket on the lower part of the spindle.

These steering stops need to be lubricated. If they are dry it's common for them to create a squeaking or rubbing noise that can easily be mistaken for something more serious.

So check that the bump stops are intact and lubricated, especially when trying to pinpoint suspension noises that occur when the wheels are turned.

The best lubricant for the steering stops is a heavy waterproof marine grease, but if you don't have that you can just use regular wheel bearing grease.

You should make lubing the steering stops part of your regular service procedure on Volvos that have them.

And remember, when you are trying to find an elusive suspension gremlin, don't count out the possibility of loose suspension mounting hardware. It's rare on later

Volvos but a slightly loosened nut or bolt can make a lot of strange noises, so check that hardware.

And as always don't forget to check those Technical Journals (TJs).

Volvo has issued several suspension-related TJs over the years on almost all their models.

You can get access to the latest TJs and other Volvo OE information at volvotechinfo.com

You can purchase a three day subscription to access TJs and other Volvo specific technical data.

COMMON VOLVO SUSPENSION FIXES

As your customers' Volvos age you will start to see some of the not so common parts wear and cause suspension noises and reduced road handling characteristics.

Here is one example:

XC90/ S80/ S60 /V70 / XC 70 2001-2013



Make sure to check the steering stop limiters for wear or lack of lubrication. If these stops are dry or damaged they can cause suspension noises, especially when the wheels are turned to the full lock position.



CABIN FILTER

CLEAN AIR FOR EVERYONE

All Volvos are equipped with a cabin filter that cleans the incoming air to ensure a healthy in-car environment.

Replace the cabin filter every other maintenance visit, or more frequently if driving in high traffic areas or on dusty roads.

Contact your local Volvo dealer for a complete selection of Volvo Genuine Parts.



DON'T TRY THIS ONE AT HOME, KIDS

As these mounts wear and crack they can make all kind of noises. They can even affect the alignment and the overall handling of the vehicle.

If the Volvo you are working on has over 100K or has been driven on rough roads these bushings should be replaced.

Volvo has recently issued a Technical Journal (TJ 17644) for some later Volvos that has a "fix" for squeaks caused by worn subframe bushings contacting the rear subframe reinforcement plates.

The fix is to replace the left and right reinforcement plates with updated versions that don't allow the old bushings to rub and cause noise.

Of course this will only help the noise, not necessarily the movement of the worn bushings

If you do have a Volvo that has subframe bushings that are very worn or cracked and the customer is willing, go ahead and replace them. The new bushings will improve the car's overall handling.

You will need four new bushings and four new subframe bolts with washers.

One of the bushings, the right rear one, will be different from the other three with an elongated hole to aid in alignment of the subframe when it is installed in the vehicle.

Of course to replace these bushings you will have to remove the subframe and support the engine and transmission.

This is a big job and requires a lift and an engine support system to hold the engine and transmission in the car when you remove the subframe.

Use the lift points that correspond to the engine configuration of the Volvo that you are working on.

The engine needs to be supported in more than one place, so don't just use a 4x4 and a chain like in the old days.

You can purchase the factory Volvo lifting beam set or use your own, just be safe and smart about it.

The part numbers for the factory engine support set are: 999 7070; 999 5716; two of the 999 5460; and 999 5185. You can order these tools from your local Volvo dealer or use the Tool link on volvotechinfo.com.

Any time you remove the subframe from a Volvo, the car should get a four wheel alignment performed before delivering it to the customer.

When the subframe is removed and reinstalled it will almost always affect the alignment because there will be subtle differences in the angle of the subframe when it is reinstalled.

The instructions for replacing these bushing are about the same on most Volvo models from 2001 to 2013. There are some extra steps depending on the engine, transmission and the year and model of the Volvo you are working on.

OK, let's start with a test drive before we start the work. Make note of any noises in the front end and go down a flat straight road to see if the steering wheel is straight and make note of any pulling or drifting.

It's also a good idea to run a scan on the car to make sure that there are no codes stored for things like a



Volvo makes the best engine support setup and you can order these and all other Volvo factory tools from your local dealership's parts department or from the Tool link on volvotechinfo.com.

bad Steering Angle Sensor (SAS). It's better to tell the customer before you start the job because you don't want to get the car back from alignment with a nice shiny new traction control light on. Never happened to you, right?

When your customer is going to have you perform this job, do them and yourself a favor and get them to authorize any other parts that are worn in the front end.

When the subframe is out it is very easy to replace parts like the motor mounts, control arm bushings, C-V boots and axles, etc. So if they're going to do it, now is the time.

OK, LET'S DO THIS!

Put the car up on a lift and, as always, start by disconnecting the battery.

If the car has an upper engine torque mount, remove the crossbar before you install the engine support brackets and hardware.

Make sure the hood is securely open. Worn hood shocks can let the hood fall down onto the engine support and may cause damage to the hood and hood liner. Use a hood prop or a hood clamp tool to make sure there are no surprises when lifting and lowering the car.

The best setup is the Volvo factory one, so if your shop works on a lot of Volvos it's worth the investment.

You will have to lower and raise the engine slightly, so an adjustable multi-point engine support is needed.

After installing the engine support system the next steps are:

Remove the front tires, and then remove the splash shield.

If this is an XC90, remove the six bolts from the skid plate and lift it up and out to remove it.

The lower control arms can stay attached to the subframe when you remove it.

Remove the anti-roll bar links from the anti-roll bar on both sides. Counter hold the shaft of the sway bar link using a Torx or Allen wrench so that the joint boot is not damaged.

You can remove the bolts at the ends of the C-V axles to make it easier to remove and line up the ball joint during disassembly and reassembly, but it's up to you. In a lot of cases it's not a necessary step.

Remove the screw (or nut in some cases) for the drive shaft.

Use a brass drift to knock the end of the drive shaft through the hub.

Next remove the nuts from the lower ball joint and separate them with Volvo special tool number 999 7062 or equivalent.



Ball joint tool

Remove the bolt from the bottom of the front engine mount.

Remove the ground strap that's bolted to the top of the subframe on the left front side.

Remove the two screws holding the lower torque rod assembly at the transmission.

Remove the power steering oil pipe from the snap fasteners along the right inner side subframe.

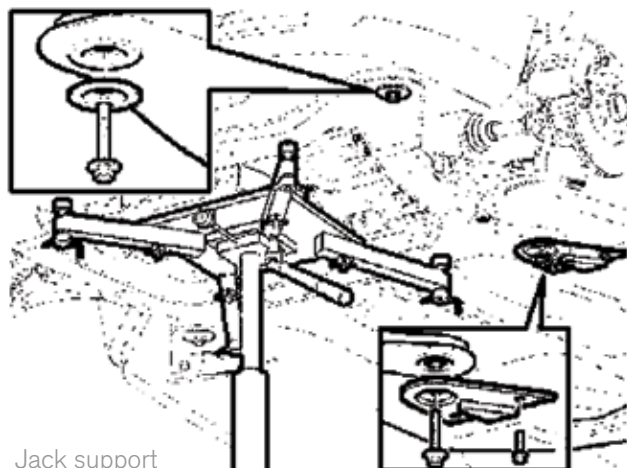
Remove the screw clip for the power steering oil return line.

You don't need to disconnect the steering coupler and oil lines from the steering rack because it can stay in place when you remove the nuts and bolts that attach it to the subframe. You should use a bungee cord or some rope to support it up in the car while the subframe is removed to keep it from hanging all its weight from the steering shaft. Otherwise this can cause damage to parts in the steering column assembly.

Remove the four nuts and screws holding the steering rack to the subframe.

On some models the EVAP canister tube that runs from the canister purge valve to the canister in the rear of the car runs through the right side of the subframe and under the sway bar. You can disconnect this line by finding the small silicone hose coupler that is located just a few inches behind the subframe.

Next remove the rubber hangers that support the header pipe in the rear of the subframe.



Jack support

Remove the four bolts that hold the exhaust bracket to the subframe.

Next remove the screws that hold the clips for the oxygen sensor wires.

There is a brake line that runs along the back of the subframe. You need to take care not to damage it when removing and installing the subframe.

OK, you're just about ready to drop that subframe out of the car, but remember it's heavy and awkward, so don't just try to lift it out by yourself.

There are a few ways that shops have come up with to support and remove the subframe.

You can just use a transmission jack with extra long brackets that can support the subframe from all four corners.

If you don't have this type of transmission jack you can use blocks of wood and lower the car down on the lift before you remove the last four large bolts that hold the subframe in the car.

Once the subframe is out of the car you can start working on removing the old bushings and pressing in the new ones.

Start by cleaning the area around the old subframe bushing and locating the bushing alignment marks. Use a marker to draw a reference line through all four bushings.

To remove the old bushings you can use Volvo's press tools if you have them.

If you don't have the Volvo setup you can use a similar bushing and bearing press tool set; just make sure that the tools don't damage the bushings when they are pressed in.

After you have all the new bushings pressed in, install the subframe in reverse order.

Lift the subframe up completely, at the same time locating the mounting screws for the steering gear on the subframe and, on right hand drive cars, the screw for the collision protection system.

Loosely install the subframe brackets together with the washers.

Install the four screws for the subframe. Always use new bolts but don't tighten them yet.

First tighten the screws on the left side of the subframe.

Tighten the bolts to 105 Nm. Angle tighten to 120 degrees.

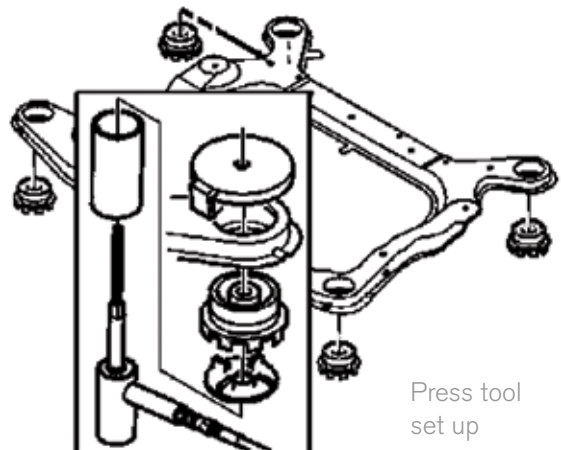
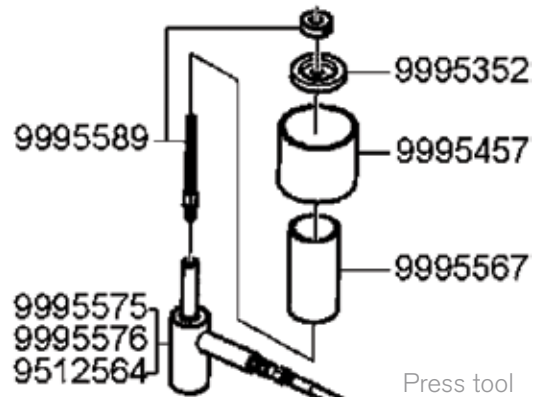
Then tighten the right hand side to the same values as the left hand side.

Finally tighten the bracket screws. Tighten to 50 Nm.

CAUTION: Tighten the left-hand side first. The subframe guides are on the left hand side.

Always use new mounting bolts and washers when reinstalling.

And folks, use OE Volvo bushings and hardware; this job is too big to take chances with low quality aftermarket parts. ●





Collision Advantage

In support of the collision repair market, Volvo Car USA has introduced Volvo Collision Advantage, powered by CollisionLink®. Volvo Collision Advantage supports body shops with faster estimates and cycle times, and also offers price matching on a select group of parts. Volvo wants to help repair shops get the Volvo Genuine Parts they need to help ensure the vehicle will be repaired properly.

Contact your local Volvo dealer to learn more.

collisionlink®

SQUEAKING NOISE FROM SUBFRAME BUSHINGS / REINFORCEMENT PLATE

NO: TJ 17644

FUNC GROUP: 2182

FUNC DESC.: RUBBER CUSHION

PARTNER: 3 US 7510 VOLVO CARS
NORTH AMERICA

ISSUE DATE: JULY, 15, 2013

Type	Eng	Eng Desc	Sales	Body	Gear	Steer	Model Year	Plant	Chassis range	Struc Week Range
124							2007-2014		0000001-0177939	200620-201326
134							2011-2014		0000001-0276466	201020-201326
135							2008-2014		0000001-0285952	200720-201326
136							2008-2014		0000001-0177780	200720-201326
156							2010-2014		0000001-0510437	200835-201326

Code	Description
WV	Suspension/Clicking/clonking noise/At start/stop
WY	Suspension/Clicking/clonking noise/Unsure when/at all times
X1	Suspension/Unusual noise

*NOTE! THIS DOCUMENT SUPERSEDES THE PREVIOUS RETAILER TECHNICAL JOURNAL 17644 DATED 08-22-2012.

*There is a new repair method for this concern. Replacement of the subframe bushings is no longer necessary.

DESCRIPTION:

A squeaking noise could be heard from the front suspension, especially when turning or driving over a speed bump.

The noise usually comes from the rear bushings in the front subframe due to axial travel resulting in a rubbing or squeaking noise between the reinforcement plate and the bushings' front and rear axial movement limiters.

Once the rubber material on the bushing is worn out, the underneath plastic material may cause a soft knocking noise instead. The contact points are illustrated in the attached pictures: TJ 17644 -1.jpg; TJ 17644 -2.jpg

PRODUCTION MODIFICATION

* New reinforcement plates were introduced in production from 2013 week 26.

PARTS

Reinforcement plate, Left side: PN 31391780
Reinforcement plate, Right side: PN 31391781

SERVICE*

Note: First check if the squeaking noise could be caused by other factors, such as the front anti-roll bar bushings (TJ 23109).

If necessary, use Chassis Ears to locate and/or verify the source of the noise.

If this customer's complaint is verified, replace both right and left side reinforcement plates, refer to image "TJ17644: Contact Points," on the next page.

Torque specifications can be found on the next page, "TJ17644: Torque Specifications."

MATERIAL RETURN

None

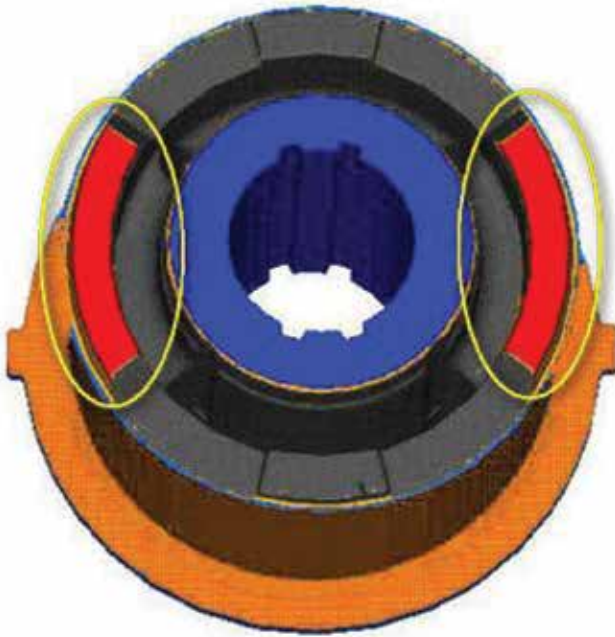
VEHICLE REPORT

* Yes, if the noise continues when using the new reinforcement plates.

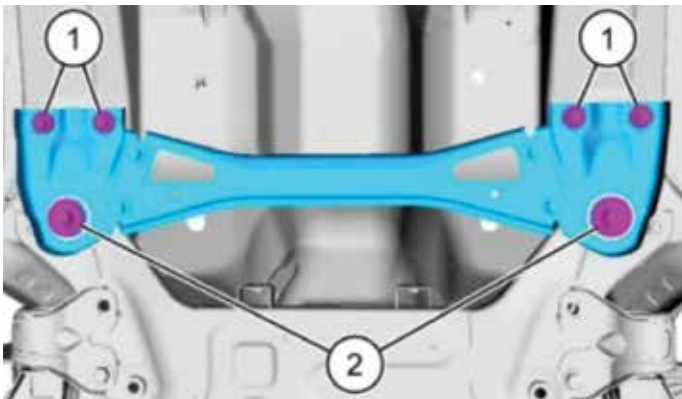
* Use concern area "Vehicle Report," sub concern area "Support not Needed" and Function group 2182

TJ17644: CONTACT POINTS

ORANGE BUSHING

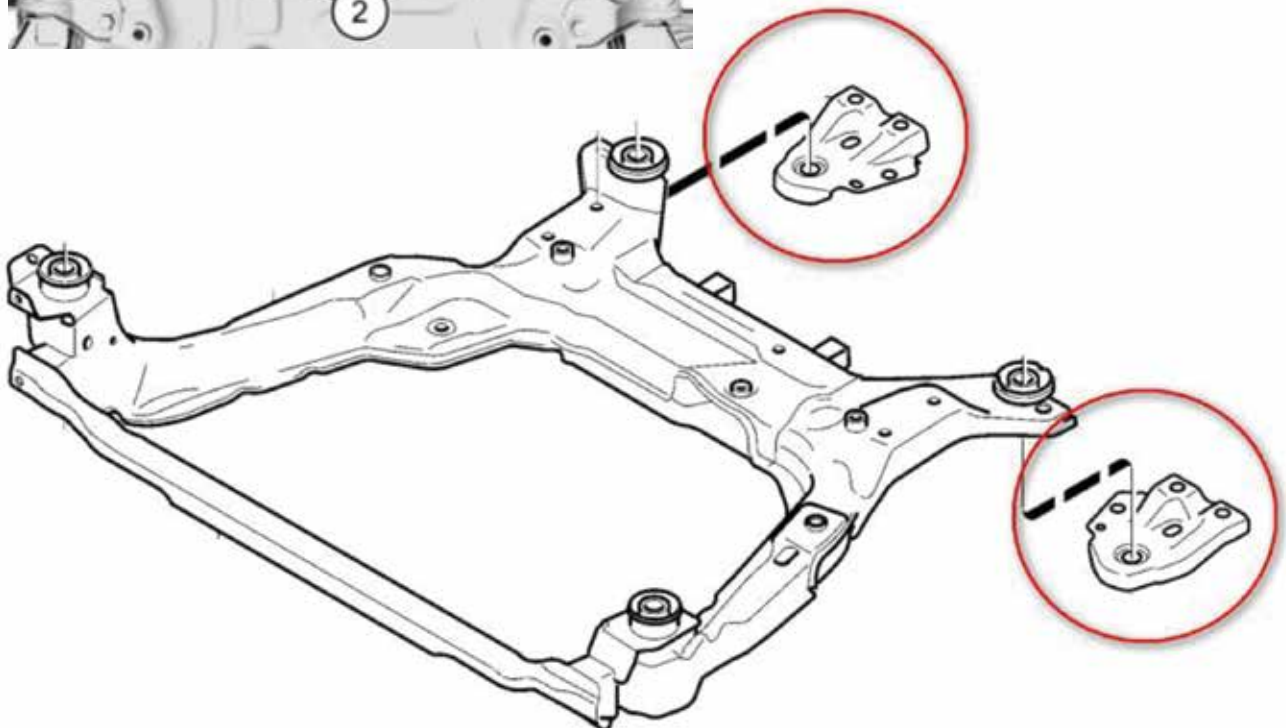


BLUE BUSHING



TJ17644: TORQUE SPECIFICATIONS

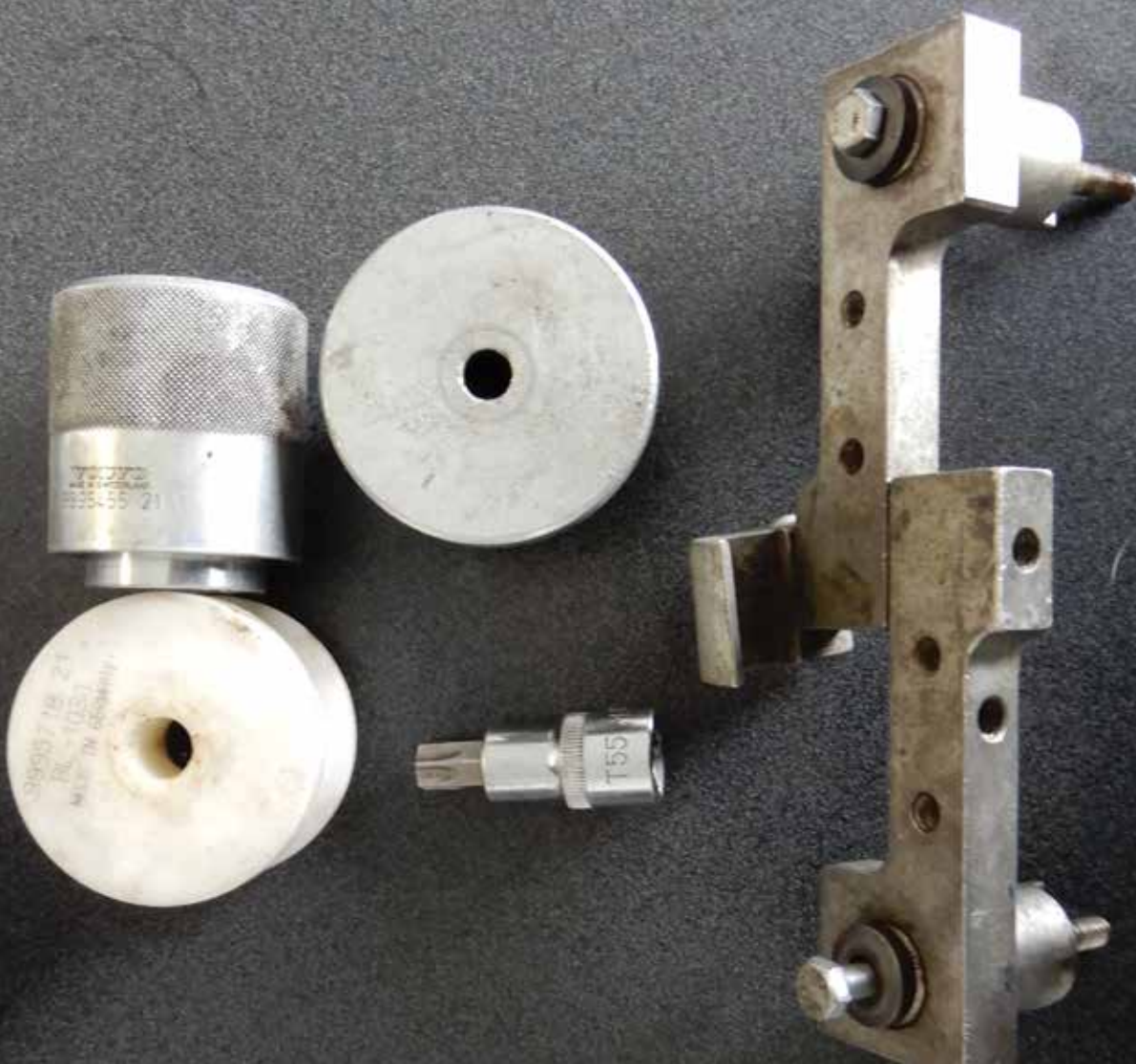
1. Torque: M8, 24 Nm
2. Torque: Subframe to chassis
(Rear screws)
 - Stage 1: 150 Nm
 - Stage 2: 90°





T6 TIMING BELT REPLACEMENT

TIMING BELT REPLACEMENT CAN SOMETIMES BE A DAUNTING JOB, BUT WITH THE RIGHT TOOLS AND HELP FROM VOLVO VIDA THIS JOB CAN BE MADE A LOT LESS STRESSFUL.



The Turbo 6 cylinder engine is somewhat like the 5 cylinder engine with a few different aspects. We will go over replacement steps, tools and parts needed to do this job correctly.

Volvo special tools needed for the job. Other tools will be needed also:

9995452	9995451	9995450
9995718	9995455	Torque wrench



Use the correct pliers and pull out to remove hose.



Tool installed on back on camshafts



Torque rod at top of engine and engine mount

When a customer's 2003 XC90 T6 enters the shop for its routine timing belt replacement, it's always a good idea to replace the water pump, timing belt, idler pulley and tensioner. The timing belt should be done for this vehicle at 120,000 miles or ten years, whichever is first. This is a very important job. This is an interference engine, so if a timing belt breaks it can bend the valves and make this job very expensive and a lot more work.

After disconnecting the battery negative cable, raise the vehicle up and remove the front guard under the bumper; four bolts hold this in place. Pulling downward and out will help to remove this guard. Remove the front air duct and drain coolant from the vehicle and dispose of it properly. A 6 mm Allen wrench will work to unscrew the petcock in the radiator. Remove the air charge pipe to the turbos. A 7 mm socket 1/4 in. drive should work fine or a flat blade screwdriver. Remove the hose at the bottom of the intercooler. If this hose is saturated in oil, replace it with a genuine Volvo part when reassembling. Remove the air cleaner box, remove the air mass sensor electrical plug. Remove the hose from the air mass to the turbo pipe. Remove the torque rod from across the top of the engine, and the engine mount.

Remove the top timing cover using a T30 Torx tool. Remove the top engine mount and remove the mount around the Camshaft Position sensor (CMP) on the exhaust side. Remove both intake and exhaust cam position sensor housings and sensors, disconnect the electrical connectors and set aside the sensors. Remove both pickup wheels on the backs of the camshafts.

Raise the vehicle up and remove the passenger side front wheel and the two nuts that hold the inner fender secure. Lower the vehicle and remove the coolant reservoir and power steering reservoir, plug hoses at the power steering so fluid will not escape. The hose going through the front timing cover will need to come off. This connector can sometimes be a problem to get off. The illustration shows the correct pliers and technique to pull it loose.

Remove the serpentine belt. Remove the front timing cover and set aside. Turn the crankshaft until the timing marks are aligned. Install tool 9995452 on the back of the camshafts. This will ensure that the camshafts are in the correct position, top dead center. Remove the bolt from the timing belt tensioner and remove the tensioner.

Check the variable timing units for play. If the variable timing units have excessive play they must be replaced. Remove the center plugs from the variable valve timing units. Set a rag under the plug to collect oil that will seep out. Remove the center bolts that hold down the variable timing units and remove, keeping track of exhaust and intake.

Remove the front crankshaft damper and use a puller to remove the crankshaft gear from the crank. Once the gear is off, remove the seal from the crankshaft using a seal removal tool. Clean the surfaces for the new seal.

Take out two engine mount bolts by the crankshaft and jack up the engine so that there is room to work on the front of the engine. Since the timing belt runs the water pump this is a good time to replace the water pump. Seven 10 mm headed bolts will need to come out and the water pump removed. Clean the surface at the block for the water pump making sure to get all the gasket off. This task can be hard to do because of the space between the body and the engine. Using a mirror you will be able to see if it is clean.

This is probably a good time to replace the thermostat assembly also since everything is apart.

Remove the front camshaft seals and the idler pulley. Clean the front of engine and all seal surfaces.

These are the new parts you will need to complete the job. Parts and part numbers:

PART NO.	PART
30758270	Timing belt kit: included, belt, tensioner and idler bearing
9440651	Camshaft seal front
9458309	Camshaft seal front
9497786	Exhaust variable camshaft unit
8642284	Intake variable camshaft unit
9443310	Rear camshaft seal
8694630	Water pump
6842273	Front crankshaft seal
985151	Water pump bolts
8636779	Thermostat assembly with gasket

Install the camshaft seal in the front using tool number 9995718. Make sure to clean the surfaces and lubricate the inside of the seal. Install both variable cam units,



Variable valve timing units on front of camshafts and timing marks lined up with top timing cover



Jack under front of oil pan holding engine up

intake and exhaust, they should be identified on the front of the units. Disregard the sprocket gear until later. Install the center bolt and leave loose.

Remove the starter bolts and pull the starter motor and set aside. Remove the plug behind the starter and install special Volvo tool 9995451. Turn the crankshaft slightly clockwise and the tool should bottom out. Turn the crankshaft counterclockwise until it stops against the crankshaft stop.

Raise the vehicle up and install the front crankshaft seal using special tool number 9995455. Once again make sure to clean the surfaces and lubricate the inside of the seal. The nut from the front of the crankshaft can be used in conjunction with the special tool to pull the seal into place. Remove the nut and tool and install the front crankshaft pulley. This pulley will only go on one way, so check the splines. Tap the pulley into place until flush with the engine block. Make sure to confirm that the timing marks are lined up with the marks on the pulley and the oil pump.



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We know quality repairs matter at your shop, and we're here to help.

Get all the benefits of Volvo Genuine Parts with one simple phone call.



Lower the vehicle and jack the front of engine back up to have more room to work.

Make sure the water pump surface is clean. Use a gasket sealer and seal the gasket to the water pump. This will make it easier to install the pump without the gasket moving around. Tighten the water pump bolts until the pump is secure. Same with thermostat assembly, clean the surface, install the gasket, and tighten down. Also tighten down the channel for the electrical connector for the ECT sensor.

Using genuine Volvo parts, install the idler bearing and tighten down. Install the timing belt tensioner but leave it loose for right now.

Install both timing gear pulleys on the intake and exhaust variable camshaft units but leave the three 8 mm headed bolts loose on both sides. Install the top timing cover to align the timing marks. Try to keep the alignment marks towards the top for both timing gear pulleys. Starting with the exhaust side make sure the bolt in middle of the variable unit is snug and the timing gear pulley is within limits of the marks for lining up the camshaft. Turn the variable timing unit exhaust side clockwise until it stops. Now move the timing gear pulley until the timing marks are aligned. Tighten three 8 mm bolts at the timing gear to 10 Nm. Tighten the center bolt for the variable unit to 120 Nm. Install and tighten the center plug to 35 Nm.

On the intake side, snug the bolt that holds down the variable timing unit in position. Turn the intake variable timing unit all the way clockwise until it stops. Try to keep the timing alignment marks at the top cover and timing gear within limits of the marks for lining up the camshaft. Move the timing gear until the marks line up and tighten down the 8 mm bolts to 10 Nm. Tighten the center bolt that holds the variable timing unit to 120 Nm. Install and tighten the center plug to 35 Nm.

Double check and make sure the variable timing units are all the way clockwise and that the timing marks at the gears are aligned properly.

Pushing the top of the tensioner or the needle on top of tensioner clockwise and holding it, tighten the center bolt for tensioner to 5 Nm. This will give room to install the timing belt. Install the timing belt starting with around the crankshaft, up to the idler bearing, and then to the intake camshaft, making sure the variable timing unit does not move. Now go over to the exhaust side, making sure the marks stay aligned, and down to the water pump and around the tensioner.

Adjusting the timing belt tensioner should be done with a cold engine. A suitable temperature would be 20 degrees Celsius or 68 degrees Fahrenheit.

With a warm engine or higher ambient temperature, the needle is further to the right. Below is an illustration of the tensioner compared to temperature and warmer engine.

Loosen the center bolt to the tensioner. Use a 6 mm Allen wrench to adjust the tensioner.

Turn the belt tensioner eccentric clockwise until the tensioner passes the marked position, determined by temperature. Turn the eccentric back so that the indicator reaches the correct marked position in the center of the opening on the tensioner. Be sure to hold the center bolt at same time so it won't tighten up on you. Hold the eccentric and tighten the center bolt to 25 Nm. After tightening make sure the needle indicator is in the correct position, determined by temperature.

Check and make sure all timing marks are aligned properly, and that the top cover to camshaft marks and crankshaft are still in position.

Remove the tool at starter, 9995452 and install the plug and re-install the starter motor and secure, making sure all is tight and the brackets are correctly installed.

Remove the tool at back of camshafts 9995451. Lower the engine back into the right side mount and rotate the engine a couple of times, making sure the timing marks, top cover to camshaft and bottom crankshaft pulley to the mark on oil pump, are aligned properly.

Install new rear camshaft seals using tool number 9995450. Lubricate the inside of the seal and push onto the tool. Press the seal in with the tool until it bottoms out. Install the impulse wheel on the intake side, back side of camshafts and tighten down. Install the camshaft sensor housing and secure. Install the impulse wheel on the exhaust side and tighten down. Install the Camshaft Position sensor (CMP) housing. Make sure to install the housing correctly; it should only fit one way. Install both sensors into their housing and connect the electrical connectors.

On the front of engine install the timing cover. It might be a good idea to jack up the front of engine again so that there is more room to work. Be careful not to break the water pipe from the thermostat, as it will stick through the timing cover.

Once the cover is in place push the top inward to snap into place with the rear cover. Install the center bolt and tighten.

This would be a good time to check the roller bearing at the serpentine belt adjuster. If any play or noise are



Adjustment of tensioner compared to temperature.



Coolant hose from thermostat pipe to reservoir



THERE'S NO SECOND CHANCE

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apparent from the bearing be sure to replace it. Install the serpentine belt. Use genuine Volvo part belt number 30731811. The belt goes around the crankshaft pulley to alternator, back down to the air conditioning compressor and up to the power steering. Now this is where it gets tricky. Using a T55 Torx socket and ratchet, hold the tensioner down and slide the belt around the pulley and release, making sure the belt doesn't move out of place on any of the pulleys.

Now that the serpentine belt is on correctly, lower the jack until the engine is in the engine mount, install the two bolts that hold the mount to the engine and tighten down securely. Fold back the inner fender into place and tighten. Install the right front wheel.

Install the top engine mount back into place and secure. Install the top covers over the spark plugs and secure. Install the air cleaner assembly making sure that all mounts are tight, and attach the air mass meter electrical connector. Secure the turbo boost valve at the side of air cleaner.

Install the turbo air charge pipes over top of the engine using a 7 mm socket and ratchet. Replace the lower hose to intercooler from the air charge pipe if it is saturated with oil, and tighten down the hose clamp. The replacement is hose number 9489968. When replacing this hose use a genuine Volvo part. Aftermarket hoses wear out too soon due to the rubber being too thin. Once the charge air pipe is in place, fit all vacuum hoses to their pipes and connect to the air mass meter.

Secure the coolant hose to the thermostat pipe coming out of the front timing cover. The coolant hose is part number 30680932.

Install the coolant reservoir and tighten down coolant hoses. Put the power steering reservoir back into place and connect the hoses and tighten. Make sure to check the fluid and top off. If a lot of fluid escaped, it's a good idea to fill up the power steering and turn the steering wheel back and forth without starting the vehicle so air will escape. Not doing this can sometimes damage the steering rack.

Tighten up the petcock at the bottom of the radiator. Add coolant to the reservoir until full, and reconnect the battery ground cable. After the vehicle is warmed up check the coolant again and fill to full level.

Start the vehicle and let it warm up to operating temperature. Test drive the vehicle to make sure there are no problems. Pull back onto the hoist, shut the vehicle off and let it cool down. Check the coolant again and make sure the reservoir is full.

Raise the vehicle back up and install the air guide. Install the guard under the bumper using the four 14 mm bolt heads and tighten. Install the splash shield under the engine.

Doing a job like replacing the timing belt can be very challenging and very rewarding at the same time. Timing belt replacement on a Volvo T6 is very crucial. Always make sure everything is lined up correctly, and that you check everything two and three times. If for some reason alignment is not done correctly, the vehicle could throw codes and possibly cause the Check Engine light to come on. Even worse, the valves could bend on this interference engine. Check and double check always. ●

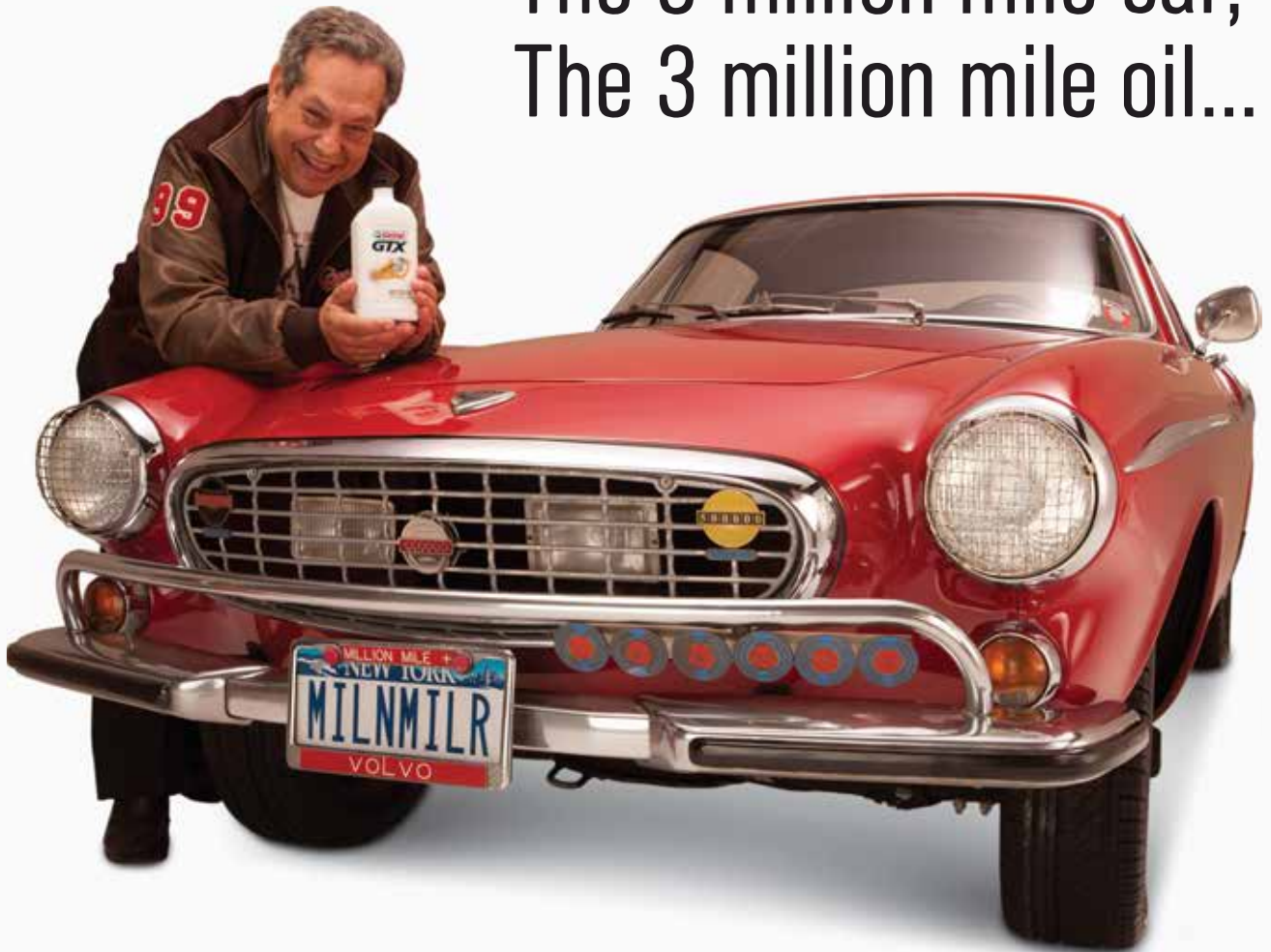
Front timing belt cover installed with the water pipe from the thermostat sticking through the cover





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