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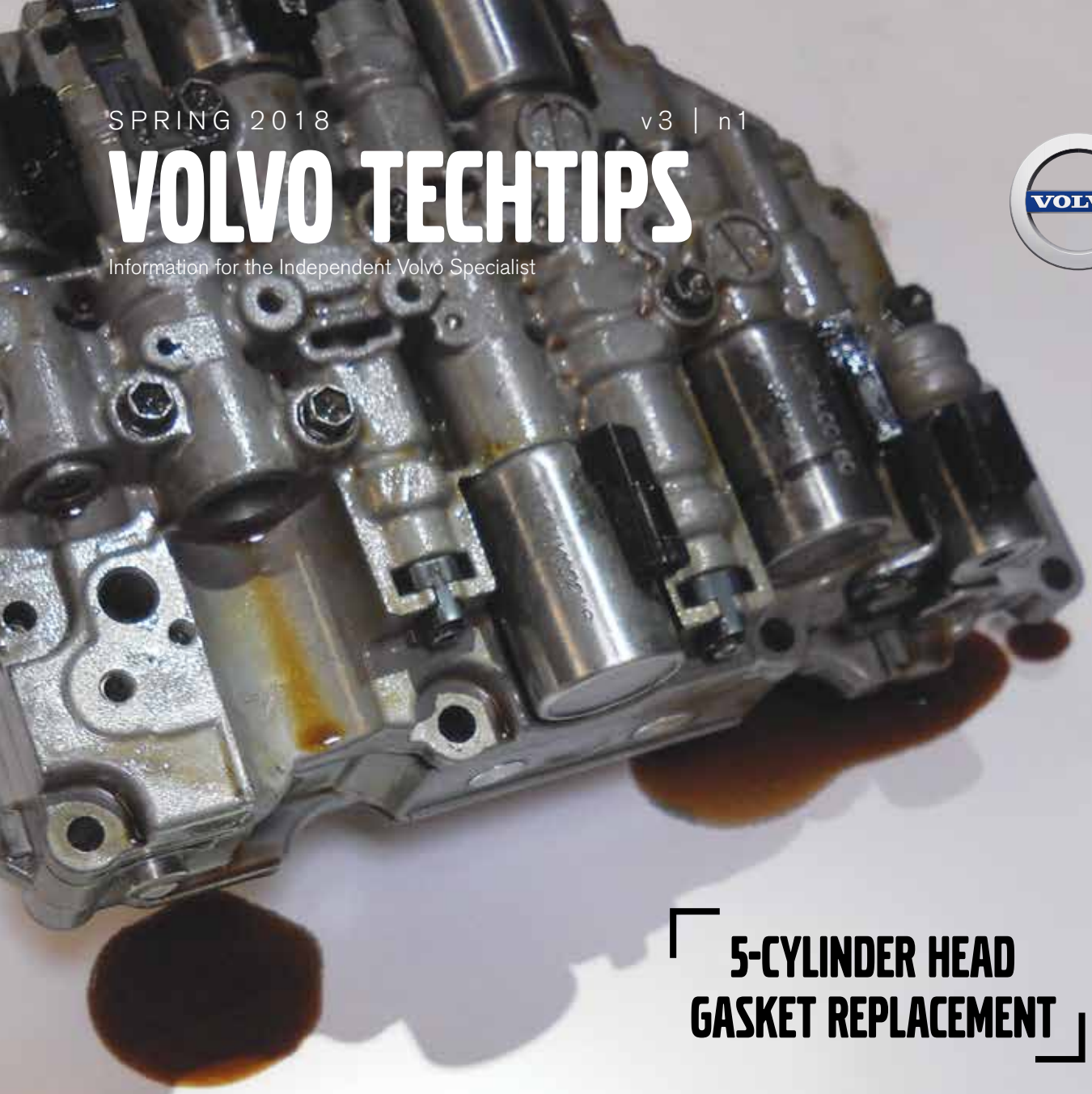
VOLVO TECHTIPS

Information for the Independent Volvo Specialist



5-CYLINDER HEAD GASKET REPLACEMENT

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VOLVO TECHTIPS

Have a content idea, suggestion, or comment? Contact us:
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Volvo Senior Project Director
Phil Cabot
Senior Manager, Business Strategy and Analytics

Volvo Project Lead
Rohit Mathew
Wholesale Program Manager

Group Publisher
Christopher M. Ayers, Jr.
cayers@AutomotiveDataMedia.com

Editor
G. Quagmire
gquagmire@AutomotiveDataMedia.com

Contributing Writers
Kevin Parkhurst, Sean Stephens, Wayne Riley, Frank Walker

Automotive Data Media Project Mgr.
Tamra Ayers Banz
tbanz@AutomotiveDataMedia.com

Art Director
Christopher M. Ayers III
ayersc3@AutomotiveDataMedia.com

Editorial and Circulation Offices:
134B River Rd., Montague, NJ 07827

FEATURES

5-CYLINDER HEAD GASKET REPLACEMENT

THE VOLVO FIVE CYLINDER ENGINE WAS INTRODUCED IN 1993 WITH THE 850 MODEL. IT CAME IN BOTH TURBOCHARGED AND NON-TURBO CONFIGURATIONS DEPENDING ON CUSTOMERS' PREFERENCES.

The five cylinder Volvo engine B5254T

The Volvo five cylinder engine was introduced in 1993 with the 850 model. This five cylinder engine has performed admirably for over twenty years, and has been Volvo's go-to powerplant for many years. The five cylinder engine came in both turbocharged and non-turbo configurations depending on customers' preferences.

Abuse and/or normal wear through the years can lead to head gaskets deteriorating and oil mixing with coolant. The cause is often overheating.

This is why it is so important to change the oil and filter regularly and changing coolant when needed. Oil should be changed at 5K mile intervals and coolant every 25K miles, although these intervals should be adjusted based on driving style and miles driven.

When a vehicle comes into your shop overheating or is towed in because the customer didn't pull over in time before the engine completely stopped running, the result is often a blown cylinder head gasket. Diagnosing to pinpoint the exact problem can be done different ways.

For instance, perhaps the vehicle is running but coolant in the reservoir keeps overflowing because of pressure build-up in the system. This typically results from combustion gases getting into the water jacket and pressurizing it, sending coolant out of the reservoir. This is a sign that the head gasket and/or cylinder head is damaged.

Here are some of the Volvo tools you will need to replace the cylinder head gasket.

A combustion leak tester can be used to check for a blown head gasket. The tester features a dual-chamber design for higher accuracy to eliminate false readings. The first chamber will filter out any alkaline particles that could result in a false indication of a combustion leak. Test results in the second chamber will provide a true indication of a combustion leak.

Another way to diagnose a suspected blown head gasket is to use an emissions gas tester and hold the sensor over the reservoir. Here we will see if any hydrocarbon gases are present in the cooling system. If hydrocarbons are present, then almost certainly the head gasket is leaking internally and will need to be replaced.

This five gas analyzer can help detect hydrocarbons in the coolant reservoir.

Removing the cylinder head will require a variety of tools, some of which you will need to purchase from Volvo. This can be done on the Volvo tech info website. You can find these tools under Resources and then click on Special Tools.

Once you have determined that the head gasket is blown, you can dig into cylinder head removal. Start by draining all coolant and oil in the vehicle. As is always recommended with major repairs, disconnect the battery negative cable.

After draining the fluids, raise the vehicle up and remove the splash pan. Remove the heat shield over the exhaust manifold. Remove the turbo drain tube if the vehicle you're working on is turbocharged and disconnect the exhaust flange pipe. The nuts for the exhaust might need to be sprayed with penetrating oil so they can loosen up without breaking studs.

Lower the vehicle back down and remove the coolant reservoir. Make sure there are no cracks in this plastic reservoir; if so replace it during reassembly. The engine stabilizer bracket will need to be removed, as will the turbocharger air pipe if so equipped. You'll also have to remove the cover over the injectors, the ground straps at the firewall, the cover over the spark plugs, all vacuum hoses, and the dipstick tube.

Fuel rail tool

Disconnect the electrical connectors at the air mass meter and injectors. Take the air cleaner box completely out. Make sure not to damage the heat air exchange hose if the car you're working on is a non-turbo vehicle. The air mass meter boot from the air cleaner to the turbocharger will need to be removed as well.

The clamp under the manifold at the throttle module will need to be undone. Depressurize the fuel rail and remove it; see the fuel rail tool pictured on the previous page.

Remove the top stabilizer brace between the strut mounts. Disconnect the heater hoses from the cylinder head.

Depending on the year and model of the vehicle, there could be cam sensors that need to be removed and a trigger wheel that is held in by an 8 mm bolt at the back of the head.

Taking pictures during disassembly can prove very helpful during reassembly if you're not familiar with this task.

Remove the coils from the spark plugs and lay them out of the way, towards the transmission. Take the spark plugs out; this will make it easier to spin the engine over when lining up the timing marks during reassembly.

Now it's time to remove the intake manifold. A ¼ inch drive 10 mm swivel socket with an extension is a good tool for this procedure. Some models have a bracket connected under the manifold. Raise the vehicle up and a 12 mm swivel socket should work fine. A 10 mm bolt connecting the harness may need to be disconnected also.

Using this tool, a 10 mm swivel socket with extension works ideally.

Unplug the electrical connection to the throttle unit. There is a banjo fitting under the manifold that connects to the oil trap for engine breathing. This fitting can be difficult to access. You'll find this task much easier if the power steering pump is removed. Once this is removed the manifold should come right off.

Now that the manifold is off, let's go to the timing belt area. Remove the cover and expose the timing belt. This is a good time to line up the timing marks and use a white marking pen. This will make it easier to reassemble.

Using Volvo tool 9995452 at the back of the camshafts will lock the cams in place. The timing belt tensioner will need to be removed and then the timing belt removed. Remove the water pump and replace it with a genuine Volvo pump.

Remove the front timing gear pulleys on each camshaft. If the vehicle is equipped with VVT put a rag under the sprocket and use a T55 Torx socket to remove the plug. Oil will drip out and the rag will collect it.

The exhaust manifold bolts will all need to be removed. Remove any heat deflector covers first. There is a coolant pipe that will need to be removed on the exhaust side towards the front of the engine. Remove all banjo fittings for coolant and oil at turbo and move out of the way.

Install tool 999 5454, one in spark plug hole number one, and one in number five, and tighten down. Remove all camshaft cover bolts. Slacken tool 999 5454 so there is room to pop up the cover.

Tool pliers 999 5670 are used to press up the cover. Once the cover is loose, remove tool 999 5454 and the tool at rear of camshafts. Now the camshaft cover should come off. Remove the camshafts and set aside.

Remove the cylinder head bolts and discard them, since these are single-use torque-to-yield bolts and new bolts will be used.

Now that the head bolts are removed, you will need someone to help you remove the cylinder head. Since we did not remove the exhaust manifold you need to slide the head towards the intake side in order to remove it. When setting the cylinder head down use two small 2x4s to set it on. Remove the head gasket and you should be able to see what part of the gasket failed.

Cylinder head removed

Remove the cam followers with a magnet and keep them in order so they can be returned to their respective camshaft lobes Make sure to have a local machine shop check for leakage past valves and check the surface for warpage. Both of these steps are crucial and need to be done so no problems occur after reassembly is complete. Overheating can sometimes cause cylinder heads to warp too much; in this case you may need to replace the cylinder head with a new unit.

Clean the cylinder block and chase all the head bolt threads in the block. Use carburetor cleaner and blow out all the holes for the head bolts in order to achieve proper torque during reassembly.

Make sure to buy quality Volvo parts when assembling. Aftermarket parts won't have the same integrity and could lead to more problems. It's not a good idea to take short cuts when doing this big of a job; it's not good for the customer and not good for your shop's integrity.

Make sure to clean all surfaces, including those on the intake and exhaust manifolds, thermostat housing, and cam solenoids.

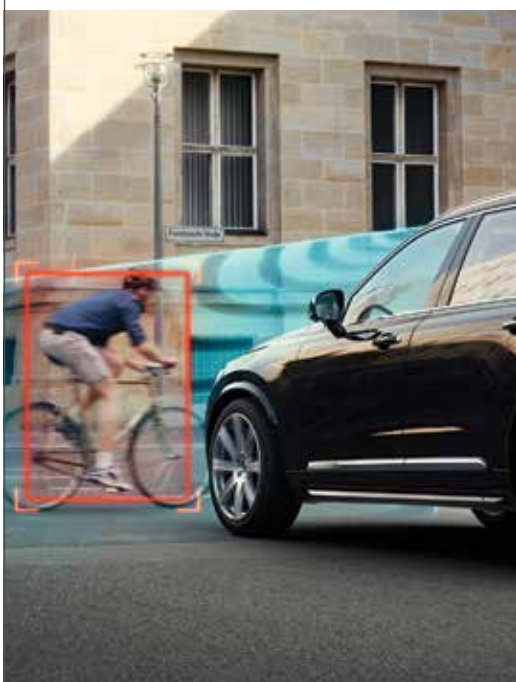
Clean the cam cover with a solvent and make sure not to damage any of these surfaces. A razor blade works well to scrape off gasket material.

Now that everything is clean and the cylinder head has been reconditioned we're ready to put it all back together.

Remove the starter and install tool 999 5451 in the plug on the block behind the starter. Make sure to

VOLVO GENUINE BRAKES

Did you know Volvo brake pads are actually 3mm thicker than generic brands? They fit perfectly and provide more stopping power. Combine them with Volvo brake discs, and you maintain the integrity and safety of the braking system.



replace the exhaust studs and tighten them in the head. Install the new cylinder head gasket. Install the cylinder head, being careful not to damage the head gasket. It would be a good idea to have someone help you when setting the cylinder head in place.

New head bolts should be purchased and lubricated and installed by hand. A torque wrench and protractor 951 2050 will be needed to tighten down the head bolts to the proper specification.

For torque specs VIDA will supply all of the information you need. Different years and models may have different specs, so make sure you have the right specifications for your application.

Once the cylinder head is tightened down, install the exhaust manifold and hard washers, use new 8 mm nuts and tighten down. Connect all banjo fittings at the turbocharger coolant and oil pipes. Raise the vehicle and install the turbocharger drain tube with a new gasket and oil ring. Be sure to glue the gasket to the pipe first to make this procedure easier. Connect the exhaust flange using a new gasket.

Lower the vehicle and glue the gasket onto the coolant pipe that connects to the front of the head, on the exhaust side, and tighten down. Install the heat shields and the bracket over the exhaust manifold.

Be sure to use the special tool behind the starter to make sure the crankshaft is aligned during reassembly.

Lubricate and install the cam followers in the same location they came from. Lubricate the camshaft lobes and bearing surfaces. Set the camshafts in place with tool 999 5452 at the back of the camshafts. Apply liquid gasket to the camshaft cover and install new o-rings around the spark plug holes. Make sure not to get liquid gasket on anything but the surface of the cam cover.

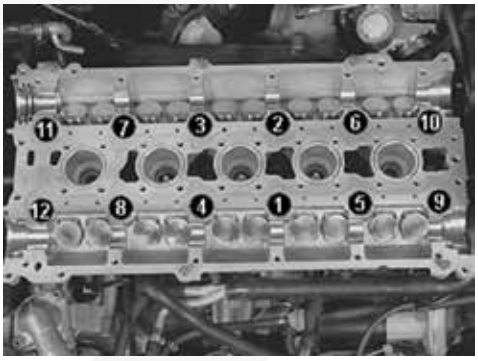


Illustration of head bolt tightening

Now install the cam cover and use press tool 999 5454. Tighten down, going back and forth, in order to keep the cover parallel to the head. Install the cam cover bolts. Start in the middle and work outward. Then torque to specs. Remove the hold down tool.

Install the thermostat housing and replace the thermostat and sensor. It's always a good idea to replace this sensor since it may be compromised due to previous wear and overheating.

Make sure to clean oil and particles from the variable valve timing (VVT) solenoid. Using a new gasket, install the unit onto the cam cover and tighten down.

The coolant temperature sensor is right in the thermostat housing as shown.

VOLVO GENUINE PARTS

NOTHING CAN REPLACE THEM

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

Don't let your Volvo customers leave your shop with less Volvo than they came in with. Contact your local Volvo dealer for a complete selection of Volvo Genuine Parts.

2-YEAR WARRANTY

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

When working on the front of the engine, remove the bolts from the bottom right side of the vehicle engine mount and jack up so it will be much easier to get to the timing belt assembly.

Now install the timing cam gears. Remember, the tool is on the back of the cams to hold them in position and the tool by the starter has aligned the crankshaft. Install the front cam seal using tool 999 5718. Now it's time to install the camshaft sprocket and VVT unit.

With the tool on the back side of the camshafts, install the front VVT units and sprocket. Depending on the year and model you're working on, non-turbo engines will have two VVT units and turbocharged engines have one unit on the exhaust side, and a sprocket on the intake side.

Install camshaft seals using special Volvo tools 999 5718 and 999 5719.

Tighten the VVT unit middle long bolt lightly. Turn the unit completely clockwise and line up the timing marks. If both sides are VVT you will need to do the same on both sides. If not, just align the marks. Some units are spring actuated and will need to be held in place when putting on the timing belt. Now snug down the sprocket bolts, three on each side per cam.

Torque down the middle bolt for the VVT unit. Make sure to clean the bolt so torque is accurate. Torque spec for the center bolt is 120 N-m and 35 N-m for the sprocket bolts.

When the crankshaft marks are aligned it's time to install the timing belt. Install a new belt, roller bearing, and tensioner. There is a kit that you can buy from your local Volvo dealer that includes the necessary parts.

It's always a good idea to replace the water pump and bolts at this time since the timing belt wraps around the pump.

Run the belt around the crankshaft and up to the roller bearing and then up to the intake camshaft. Then route it across to the exhaust cam, making sure that the VVT unit is completely positioned clockwise.

Run the belt down to the water pump and to the tensioner. Hold the spring loaded tensioner so it is easier to install the belt. Now that the belt is on use a 6 mm Allen wrench and adjust the tension of the timing belt, and tighten. Remove the tool from the back of the camshafts. Install the rear cam seal and plug. Install the cam sensor.

Install the intake manifold gasket and manifold. Make sure the oil trap is clean and all hoses are in good shape. If there is a question about the oil trap just replace it with all new hoses and seals.

Start all bolts for the intake manifold but don't tighten them. Start the bolt for the banjo fitting under the manifold for the oil trap and tighten. Now tighten down the manifold bolts. Install the plastic hose going to the throttle housing and tighten.

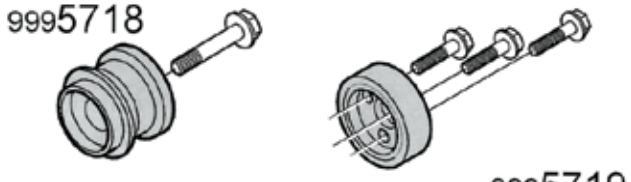
Install all vacuum lines and sensors that attach to the plastic intake hose. Re-seal the injectors and install. Secure the fuel rail hose and connect all electrical plugs at the injectors.

Install new factory spark plugs. Connect the spark plug wires and secure.

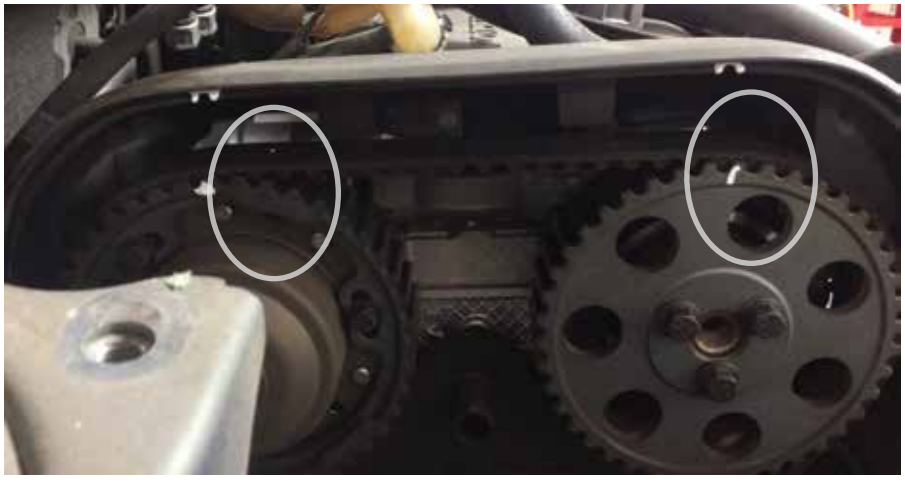
Install the turbo air hose that runs to the air mass meter. Install the air cleaner and connect the hose. Fill coolant with factory coolant. Replace oil and filter.

Double check all hoses to make sure they're tight, including the radiator and heater hoses. Check to make sure all vacuum hoses and electrical connectors are secure. Connect the battery and start the vehicle. Warm the vehicle up to operating temperature and make sure there are no leaks and that all fluids are topped off.

Test drive the vehicle to make sure all is well. Let the vehicle cool down and check again. ●



Tools for installing cam seals


Here are the marks when lined up correctly.

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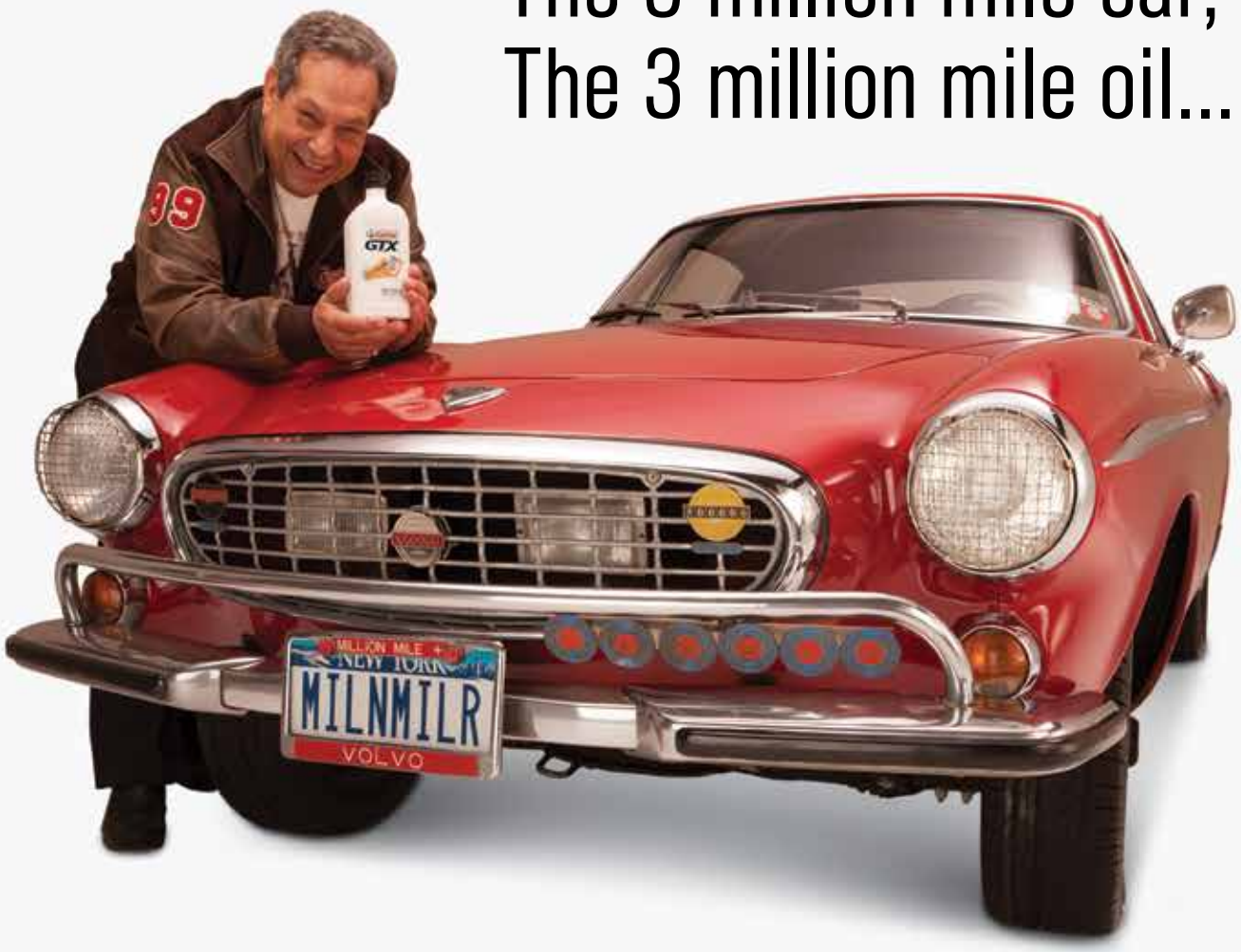

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HIGH MILEAGE VOLVOS

A LOOK AT SOME OF THE ISSUES THAT DEVELOP IN HIGH MILEAGE VOLVOS

850 AND S70/V70 SERIES (1993-2000) DOOR STAY REPAIRS

"SNAP CRACKLE POP!"

If you still see some of the good old 850 and early S70/V70 series cars in your shop, you have probably opened a door or two to the sound of a loud crack or popping noise. In most cases the cause of the noise is damage to the part of the door sill that the door stay is bolted to.

Over time stress and metal fatigue take their toll on door sills and can crack. If you catch this problem in time it is relatively easy to repair, but if left unattended for too long the damage may become a larger issue that a body shop will have to attend to.

You should always replace the door stay mechanism with a new one at the same time you repair the cracked mounting area. It's believed that a weak or worn door stay can lead to the cracks in the steel around the mounting bracket.

A lot of shops will just grind down the paint around the door stay mounting and mig weld the cracks. This method usually only lasts for a couple of years at best because the area is already weakened and needs to be reinforced. Volvo's recommended repair procedure is to replace the mounting and weld the cracks around the door stay mounting.

If you work on a lot of older Volvos, you have probably opened a door or two to the sound of a loud 'POP' or 'CRACK' noise, caused by cracks in the body where the door stay is attached. In most cases, this is a repair that can be done in house and, if done properly, can last for years to come.

You will have to start this repair by removing the affected door from the vehicle. Luckily on these early Volvos, the engineers had mercy on the technicians and made the removal of the entire door assembly VERY easy to do.

Volvo's service bulletin (TP 32395/2) covers the repair of both front and rear door stay mounts, even though finding one of these Volvos that needs this repair in one of the rear doors is extremely rare.

REPAIRING LOOSE DOOR STOPS IN A- AND B-POSTS

This service bulletin [TP 32395/2, Section 8 (81, 84) Body and Glass; 850 1992-] describes how to repair damaged door stop welds.

Door stop mountings are available as replacement parts if a mounting needs replacing.

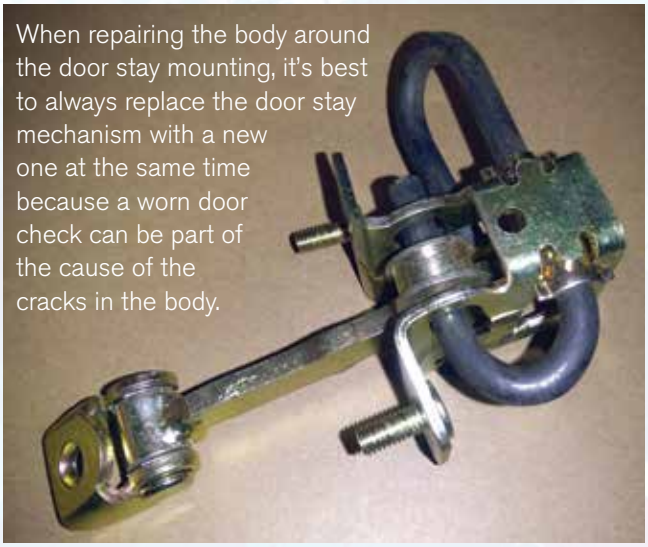
Door stop mounting A-post is p/n 6817408-5.

Door stop mounting B-post is p/n 6817409-3.

WARNING! The use of protective equipment such as safety goggles is recommended.

Procedures for preventing electronic component damage while arc welding:

1. To avoid closed circuits remove the negative battery lead.
2. To avoid ground potentials for different control units, place the welding ground lead as close as possible to the welding spot.
3. If welding is to take place close to any control unit, you should remove the unit just to avoid the risk of heat damage.



When repairing the body around the door stay mounting, it's best to always replace the door stay mechanism with a new one at the same time because a worn door check can be part of the cause of the cracks in the body.

METHOD, REPAIRING DOOR STOP MOUNTING IN A-POST

Preparations:

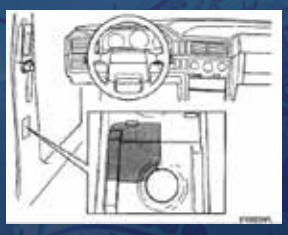
1. Disconnect negative battery lead.
2. Remove front door.
3. Mask the A-post to protect it from welding and grinding damage.
4. Protect the interior of the car with a fireproof cover.
5. Cut a section corresponding to the section of the mounting still on the car, from the new mounting. Grind the mounting clean and even so that the new mounting can be welded into place.

   Warning! The use of protective equipment such as safety goggles is recommended when welding.
6. Copy, cut out, and use the template in this service bulletin to ensure the correct alignment. Enlarge the image to actual size if possible.
7. Hold the template against the A-post, below the position of the mounting. Align the mounting above the illustration on the template.
8. Tack weld, check measurements, and adjust if necessary.
9. Weld any cracks in the A-post.
10. Steel brush and clean the surfaces to be sprayed. Sand with fine emery paper.
11. Spray on primer, treat repaired, unpainted surfaces with rustproofing agent, apply color coat and varnish.
12. Remove masking and protective cover.
13. Reinstall front door.
14. Check and if necessary adjust its function.

REPAIRING DOOR STOP MOUNTING IN B-POST

Preparations:

1. Move the front seat as far forward as it will go and cover it with a fireproof cover.
2. Protect carpets and upholstery on the rear seat with a fireproof cover.
3. Remove B-post panels.
4. Disconnect battery negative lead.
5. Disconnect connectors and remove wiring from the B-post.
6. Remove rear door.
7. Mask the B-post to protect it from welding and grinding damage.
8. Mark the shaded section in the illustration using the template in this service bulletin. Enlarge the image to actual size if possible.



9. Copy and cut out template.
10. Cut out the marked section using an electric saw with a short blade.
11. Stuff the hole in the B-post with a damp rag to protect against welding drops and residue. The rag should be large enough to be secured just under the round hole.
12. Clean around the damaged weld on the door stop mounting.
13. Use a rotary wire brush.
14. Replace the door stop mounting if it is damaged.
15. Use the template in this service bulletin. Position the template as illustrated. The door stop mounting should be above the marked section on the template. Enlarge the image to actual size if possible.
16. Weld the door stop mounting.

17. Seam weld the door stop mounting.
18. Clean the weld and the surrounding area. Use a rotary wire brush.
19. Remove the damp rag from the B-post.
20. If necessary dry the damp area with compressed air.
21. Check that the fireproof cover is protecting the floor and interior trim.
22. Tack weld, align if necessary (use the template) and, when the panel section is correctly positioned, seam weld the entire joint.
23. Grind the welds even.
24. Take care not to damage interior trim.
25. Re-spray repaired surface. Spray on primer, color coat and varnish. Dry with a heat lamp.
26. See Service Manual Section 8 (80) for Paintwork Repairs
27. Spray the repaired inside and outside of the B-post with rustproofing agent.
28. Remove masking and protective cover.
29. Reinstall wiring and panels.
30. Reinstall rear door.
31. Reconnect battery negative lead.
32. Check door stop function and adjust if necessary.

When servicing these older Volvos it's always a good idea to lubricate the door hinges with a spray lubricant. Your customer will notice if that old squeak is gone when they get in their car.

VALVE BODY TF80-SC, 6 SPEED AUTOMATIC TRANSMISSION

VEHICLES AFFECTED:
2005- XC90 V8, 2006- S60R/V70R, 2007- XC90 3.2 & S80

There are a lot of Volvos and other makes of cars using the Asian Warner designed TF80 series transmissions on the road today. So whether you are working on a Volvo or any other make with one of these in it, knowing how to service and diagnose problems in the TF80 transmission will serve you well into the future.

A lot of these TF80 transmissions have had the valve body replaced already with an updated version as covered in Volvo technical journal TJ30547, but you will still get some of these Volvos in your shop with the original valve body or ones that are malfunctioning.

But don't just throw a valve body at every Volvo that comes into your shop with a shifting problem, start with the basics.

When dealing with any Volvo with a transmission issue there are a few things you should check early in your diagnostics. Of course the first step is a thorough interview with the customer. Have the service writer get as much information as possible about the symptoms and, if possible, go on a test drive with the customer. Have them drive so you can see their driving style. How your customer drives the car can give you clues on where to start your testing. In many cases it can be difficult to replicate the symptoms if the car is not driven in a particular way.

If your shop has Volvo's VIDA (and you should if you work on Volvos), after you check for stored data and codes, click on the Software tab and see if the customer's car has the latest versions of the TCM and DEM software already installed.

Fluid condition is not easy to check as there is no dipstick on this transmission, but you can get a sample of the fluid by disconnecting the transmission cooling line on the top left of the radiator and pouring some fluid out into a clear container.

If you are going to change the fluid on one of these TF80 series transmissions you need to use the specific Volvo fluid type and follow the changing procedure outlined in Volvo TJ16673.

A word on changing transmission fluid on Volvos that have existing shifting problems. We all know the old story of shops changing the transmission fluid on weak transmissions and having the transmission fail shortly afterwards. But the real story is that the fluid is not the cause, the worn out transmission parts are the cause.

Many shops are protecting themselves by educating the customer and in some cases having the customer sign a waiver before they change the fluid.

Even if the codes are not in the TCM they could be related to the customer's symptoms. Codes stored in other modules can give you clues on what's going on in the transmission or maybe not in the transmission!

An example of this is described in Volvo's TJ27713. If the Volvo you are working on has not had the DEM software updated it can cause vibrations and noises in the driveline in some cases.

After any transmission repairs it's a good idea to try to re-learn the TCM. There should be no codes stored in the TCM or ECM, the transmission should be at operating temperature. Drive the vehicle at 20 – 25 percent throttle angle through all of the gears and then allow 20 – 40 seconds to slowly come to a stop so that the TCM can re-learn the coasting downshifts. The re-learn can take about 20 to 30 minutes on most Volvos with the TF80 Transmission.

Refer to TJ32546.2.0 for applicable TCM software upgrades for certain drivability complaints and/or DTCs. Not all drivability complaints and/or DTCs can be fixed by TCM software so VIDA should be used to properly fault trace DTCs. Other TJs can be used to remedy certain drivability complaints and/or DTCs. In the case that the complaint is not directly addressed by software and once the cause of the complaint is corrected, TCM and ECM software upgrades should then be attempted to be sure the ECM/TCM have the latest software.

SHIFTER BUTTON CRACKED — MOST VOLVO YEARS AND MODELS EQUIPPED WITH AUTOMATIC TRANSMISSIONS

As Volvos age, some of the plastic components will become brittle and start to crack. In a lot of cases, this kind of wear is mostly cosmetic, but in the case of the plastic shifter button on Volvos with automatic transmissions, a cracked or broken shift button can turn into a problem.

If you are test driving a customer's car and feel that the bottom of the shift release button is rough and jagged, you should recommended that the customer replaces the shifter knob assembly before it becomes a real problem.

What the customer will usually notice first in most cases, is that the shifter button starts to stick in, when the driver tries to shift into park and turn off the ignition.

If the shift release button is stuck in the release position, the cable that connects the shifter Interlock to the ignition lock cylinder will not allow the ignition lock to fully go to the (0) position and will not allow the customer to remove the key from the ignition.

Some customers can figure this out and pop out the sticking shifter button, but if the damaged shifter is not replaced it may become a safety issue over time.

If you are test driving a customer's Volvo and you feel a jagged edge on the lower part of the shift button, you should recommend replacement of the shift knob assembly before a sticking button causes a real problem for the customer.

(Continued on next page.)

(Shifter Button Cracked cont.)

Replacement of the shift knob assembly on most of the affected Volvo models is relatively easy. To remove the old knob, start by applying the parking brake so the car won't roll and turn the key to the first position so you can put the car in neutral. This is so the shifter is pointing straight up towards the roof of the car.

Now take a panel tool and loosen the boot at the bottom of the shift knob, grab the shift knob with both hands and pull straight up. This can take some force, so make sure you don't hit yourself in the face when the shifter comes off the stalk.

To install the new shifter assembly you got from your local Volvo dealership parts department, just slip the new knob onto the shifter stalk and press down until it clicks into place. This can also take some force. If necessary you can use some shop towels to protect the top of the knob and tap it into place with a rubber mallet. Test the function of the new shifter and re-install the boot into the bottom of the shift knob.

Don't let your customers find out the hard way about this problem!

ENGINE TORQUE ROD MOUNT CAUSING RATTLE AND GRINDING SOUND FROM TRANSMISSION AREA (XC90 2006- WITH SI6 3.2L SIX CYLINDER ENGINES)

You may get one of these later XC90s in your shop equipped with the SI6 3.2L short six cylinder engine, with a customer complaint of an intermittent grinding or rattling noise coming from the engine area under light loads. The symptom usually happens more when the car is cold and can sound like there are rocks being ground up in the transmission or bevel gear.

When you replace the upper engine torque mount tighten the bolts to 80 N-m.

It is difficult to replicate the noise if the car is on the rack with no load on the tires, so you will have to drive it until you observe the symptom.

(Continued on next page.)

VOLVO

VIDA

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This sound is usually intermittent and can sound like the drivetrain is ready for the scrap pile, but before you break the bad news to the customer, you should remove the upper engine torque mount and test drive the car again.

The torque mount is on the right side of the engine and is bolted to the right strut tower and the top of the engine block. Like most torque mounts this one has two rubber bushings to isolate engine vibrations from the body.

The bushing that is bolted to the engine is covered by a large cast aluminum cover so it's difficult to see the condition of the bushings without removing the entire torque rod from the engine.

If the torque rod is worn out, it will rattle around when you grab it from the bottom to check for play. When you remove the torque mount you will usually see the front bushing is cracked and shrunken.

Several shops have mistakenly replaced transmissions and bevel gears to "fix" the noise that can be caused by this torque rod mount when it is worn out. So don't jump to conclusions when you hear a grinding or rattle noise coming from the drivetrain on one of these Volvo XC90s that is equipped with the 3.2L SI 6 engine. ●

When you are checking out a Volvo equipped with the SI6 3.2L engine, make sure you check the upper engine torque rod mount by grabbing it from the bottom and shaking it. If it rattles, replace it. These mounts can cause very strange noises while driving at low speeds, sometimes the noise sounds like a grinding transmission or angle gear.

DON'T LET YOUR CUSTOMERS GET STRANDED. TEST THE BATTERY.

CONSUMER BATTERY MINDSET

77% of consumers wait until the battery fails to replace

74% choose another outlet for batteries

PROACTIVE BATTERY TESTING

95% of your current customers are willing to have a battery test

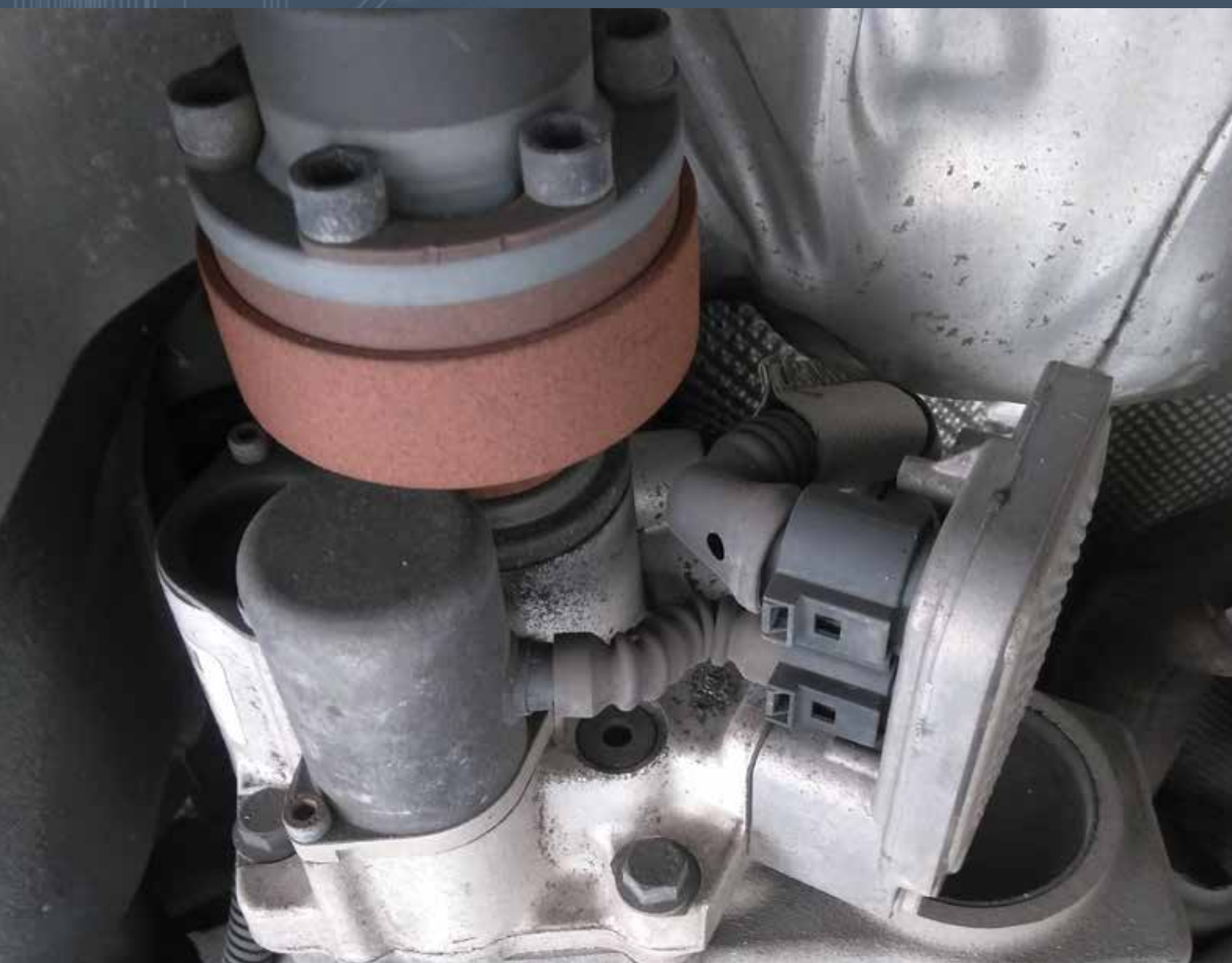
84% will proactively replace a battery if the test shows it will fail soon

The best opportunity to sell batteries is to the customer who's already in your shop

TEST EVERY BATTERY. IT'S THE HIGHWAY TO SATISFIED CUSTOMERS AND GREATER PROFITS.

VOLVO (DEM) AND HALDEX

HISTORY, FUNCTION, DIAGNOSIS AND REPAIRS



Volvo started using an electronically controlled rear differential on all their all wheel drive models in 2003 with the adoption of the second generation of the Haldex system on the XC70 and XC90 models. Before that they used a viscous coupler type of rear end with a series of plates bathed in a special type of synthetic hydraulic fluid.

After the early all wheel drive systems were on the road for a while, Volvo realized they could do better, so they started using an electronically controlled rear differential, that was driven with an electric pump controlled by the car's Control Area Network (CAN).

Every year these systems get better and better with a lot more control and improved safety on and off the road. If you want to see how these systems really work and you have an opportunity you can hook up a laptop equipped with Volvo's VIDA and, under the vehicle communication tab, select DEM and select 10 data pids to monitor. Then have someone else drive the car down an icy road and watch the magic.

Of course it's best to do this test with the written permission of the owner of the car or your own Volvo, for obvious reasons.

Selected Parameters | **Information**

Parameters	Value
DEM-DEM-status	OK
DEM-Oil pressure	0.31 MPa
DEM-DEM voltage	13.6 V
DEM-Pump current	1377 mA
DEM-Solenoid current	938 mA
DEM-Velocity rear right	0 km/h
DEM-Velocity rear left	0 km/h
DEM-Velocity front left	0 km/h
DEM-Velocity front right	0 km/h
DEM-AOC-status	Normal operator

Volvo's all wheel drive systems are getting better every year with more control and improved safety on and off the road. If you want a peek into how responsive these systems really are, hook up your VIDA laptop and have someone drive you down an icy road while watching the DEM's live data.

Opposite page: Most of the Volvos you will be servicing in your shop will be equipped with a Haldex rear differential controlled by the car's Differential Electronic Module (DEM).

Over the years Volvo has used updated versions of the Haldex rear end, with each new version having more responsive traction control features. Depending on the year and model of the Volvo you're working on it may have an older or newer version of the Haldex system.

Here are a few examples:

- S60R AWD (Second Gen Haldex 2004-2005, Third Gen Haldex 2006-2007)
    - Volvo XC60 AWD (Fourth Gen)
    - Volvo XC90 AWD (Third Gen 2008-2009, Fourth Gen 2010-2012, Fifth Gen 2013 -)
    - Volvo V70R AWD (Second Gen 2004-2005, Third Gen 2006-2007)
    - Volvo XC70 (Second Gen 2003-2005, Third Gen 2006+)
    - Volvo S80 AWD
    - Volvo XC90 AWD (Second Gen up to 2005, Third Gen 2006-)

Here are some of the features of the different versions of the Haldex systems used by Volvo and others over the years.

PRE-HALDEX VISCOUS COULPLER

Volvo uses Haldex's AWD system for nearly all of their models since the introduction of their FWD/AWD platform. However, before the switch over to the Haldex system in 2003, Volvo used a viscous coupling to transfer torque to the rear axles. A viscous coupling is an assembly of closely spaced plates bathed in a dilatant type fluid – a lot like the fluid used in the old radiator fan clutches. This viscous coupling links the front and rear drivetrains.

When the vehicle is traveling with relatively equal traction on the front and rear axles, the two halves of the coupler will be rotating at nearly the same speed. When the car loses traction and the front wheels begin to spin, the side of the coupler attached to the front axles will begin to spin faster than the side attached to the rear axles. This difference in speed causes a shearing effect on the dilatant fluid that the coupling is immersed in. However, in practice these early AWD systems did not go far enough in providing traction for all driving conditions. The engineers at Volvo and Haldex knew these systems could do better and over the years developed systems that could handle almost any condition the average driver could throw at them.

HALDEX FIRST GENERATION

The first generation Haldex AWD system is the first reactive hydraulic AWD system produced by Haldex Traction. This means the AWD system relies on wheel slip to activate the torque transfer from front to rear wheels.

It uses a mechanical pump connected to the input and output shafts of the Haldex clutch assembly. Normal driving with ample traction means the car is nearly entirely front wheel drive.

When wheel slip occurs, the difference in rotational speed between the input and output shafts drives the hydraulic pump. Operation of the clutch pack is almost entirely mechanical - a mechanically driven pump and a mechanical linear throttle valve were used to determine wheel slip and lockup of the clutch pack, converting the system from 90 percent front/10 percent rear torque distribution to 50/50 torque distribution within 90 degrees of wheel slip.

HALDEX SECOND GENERATION

Haldex second generation is also a reactive AWD system. Second generation Haldex AWD is different from first generation systems with the addition of computer-controlled solenoids to control the clutch plates. This system reacts within 90 degrees of wheel slip. When wheel slip occurs, the difference in rotational speed from front to rear axles activates a mechanically driven hydraulic pump. The pump forces hydraulic fluid through a computer-controlled solenoid, which then engages a set of clutch plates to transfer torque to the rear axles.

HALDEX THIRD GENERATION

The chief complaint about performance on the first and second generation systems was the reaction time required to trigger the torque transfer to the rear axles. Haldex third generation is the first proactive AWD system by Volvo. As soon as the engine is started, an electric pump pre-pressurizes the AWD transfer clutch. When the traction control computer senses wheel slip, the pre-pressurized clutch pack is engaged instantaneously and torque is transferred to the rear axles.

Once engine torque is transmitted through the Haldex unit, the mechanical oil pump takes over from the electric pump and continues to supply pressure to the hydraulic clutch pack. Haldex claims a reaction time of 15 degrees of wheel slip. This AWD system is marketed as “Instant Traction” by Volvo.

HALDEX FOURTH GENERATION

Haldex fourth generation is virtually identical to the third generation system, but does away with the mechanical hydraulic pump. Instead of relying on the electronic pump to just pre-charge the AWD system, the fourth iteration of Haldex's AWD coupler uses the electric pump to supply hydraulic pressure for the entire operation of the torque transfer from the front to rear axles. Haldex fourth generation is also a “proactive” AWD system. Volvo continues to market the fourth generation system as “Instant Traction.”

HALDEX FIFTH GENERATION

The fifth generation of Haldex's AWD system focused on tighter integration of components and simplified construction. Previous versions of Haldex's AWD system used a set of pumps (mechanical and electronic), accumulators, and solenoids to precisely control hydraulic pressure applied to the clutch pack. The fifth generation system simplified the design and uses only a computer-controlled high pressure hydraulic pump to replace the accumulators and solenoids used in previous versions. Volvo also markets the fifth generation system as “Instant Traction.” The typical problems you will encounter with the Volvo DEM are electrical, but in rare cases you will have a Volvo come into your shop with a mechanical problem in the rear differential.

When a customer comes into the shop with one of these Volvo XC series cars they won't always have four wheel drive; in a lot of cases they won't even realize they have no all wheel drive unless they have recently driven in snow or other slippery conditions. The DEM will disengage if it registers a fault to try to protect itself from further damage. And in most cases there will be no check engine light or traction control message on.

The most common DEM fault, seen in most Volvo shops, tends to be problems with the oil temperature sensor in the DEM control module.

VOLVO REAR DIFF SERVICE

Volvo's recommended service interval for rear differential fluid replacement varies from model to model and year to year, so check VIDA or your service information website

When performing a fluid change for any reason on a Volvo Haldex type of rear end, it's a good idea to replace the pump's fluid filter. On most models, Volvo offers a filter service kit, but on gen five Haldex units the filter is part of the pump and should be cleaned.

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for the specific service information you need for the Volvo you are working on. Volvo TJ16773 includes information on the correct Volvo fluid to use.

Of course it's difficult to know if the Volvo you are you working on has ever had its rear differential fluid changed, and in many cases you will find it has never been serviced.

As a rule of thumb, it's a good idea to change the rear diff fluid about every 3 years or 30K miles, more often if the customer uses the car for a lot of off road driving or uses the car for towing.

But if you have a Volvo that has high mileage or a Volvo that is having problems with the rear differential, you should replace the Haldex's filter screen along with new fluid.

Volvo offers a filter kit for earlier models that comes with a new o-ring and an updated filter cover and new bolts.

Gen five Haldex units used in the latest Volvos don't have a replaceable filter, just a screen on the pump inlet.

REPLACING THE AOC CLUTCH FILTER

NOTE! As the illustrations in this service information are used for different model years and/or models, some variation may occur. However, the essential information is always correct.

REMOVAL

CAUTION! The oil filter must be replaced every four years. In the service schedule this corresponds to a normal mileage of 50K miles. However it is the period of four years that is the key factor, not the mileage.

REMOVING THE OIL FILTER

NOTE! Thoroughly clean around the oil pump before beginning removal.

1. Position a container underneath the Active on Demand Coupling.
2. Remove the two screws from the cover for the oil filter.
3. Remove the loose o-ring furthest into the filter seat.

INSTALLATION

INSTALLING THE OIL FILTER

1. Clean the filter area thoroughly. There must not be any lint from any paper or cloths.
2. Position a new o-ring furthest into the seat for the filter.
3. Install the new o-rings on the cover. Lubricate the o-rings with a little Active on Demand Coupling oil, P/N 116 1641 (1 liter packs).
4. Install the filter and the cover. Tighten to 5.5 N-m.

To fill and check the oil in the Active on Demand Coupling, see Active on Demand Coupling (AOC).

COMMON HALDEX REPAIR PROCEDURE FOR REPLACING (AOC) OIL PUMP

OIL PUMP ACTIVE ON DEMAND COUPLING (AOC), REPLACEMENT

NOTE! As the illustrations in this service information are used for different model years and/or models, some variation may occur. However, the essential information is always correct.

PREPARATORY WORK

REMOVE:

The rear section of the exhaust system and the propeller shaft from the flange for the Active on Demand Coupling, the flange from the Active on Demand Coupling, and the pinion seal coupling.

REMOVAL

REMOVING THE OIL PUMP

NOTE! Thoroughly clean around the oil pump before beginning removal.

1. Position a container underneath the Active on Demand Coupling.
2. Disconnect the connector for the oil pump. Remove the tie strap.
3. Remove the bracket and the connector for the (DEM) control module. Be gentle with the connector clips because you don't want to send one of these cars down the road with a loose connector because the (DEM) is always exposed to the elements.
4. Remove the two screws for the oil pump. Pull the pump straight out of the coupling.

NOTE! Later versions of the oil pump have the socket for the cable harness on the side of the oil pump housing. The cable harness is shorter. This version supersedes all previous versions, including as a replacement part.

INSTALLATION

INSTALLING THE OIL PUMP

1. Check that the seat for the oil pump is clean. There must not be any lint from paper or cloths.
2. Check that the new o-rings are in position. Lubricate the o-rings using oil for the Active on Demand Coupling, P/N 116 1641 (1 liter container).
3. Install the oil pump. Press the pump in as far as possible. Lightly tighten the two M5 screws alternately. Tighten. See the relevant specifications.
4. Connect the connector.

FINISHING

Fill the AOC (Active on Demand Coupling) with oil. Check the oil level. Install the propeller shaft and the exhaust system.

NOTE! Later versions of the oil pump have the socket for the cable harness on the side of the oil pump housing. The cable harness is shorter. This version supersedes all previous versions, including as a replacement part.

DEM SOFTWARE AND TESTING

The following DEM DTCs could be caused by a faulty Temperature/Pressure sensor in the AOC (Active on Demand Coupling) on the vehicles listed above: P093211, P093215, P093711, P093715, P093827, P096162, P188973, P188974, P188A68, 0001, 0002, 0007, 000B, 000B.

SERVICE:

Check if the Temperature/Pressure sensor indicates a malfunction by using the procedure described below.

The following test can be performed using VIDA/ Diagnostics/Vehicle Communications to indicate if a malfunction with the Temperature/Pressure sensor function can be detected. To test the function, DTC information and freeze frames have to be saved before DTCs are erased and then the DTCs can be erased. If the DTCs are not erased, the AOC functionality will be limited.

TESTING FOR PRESSURE SENSOR FUNCTION:

1. Ignition in position II, engine not running. Read out pressure to confirm function. Correct pressure 0.00 +/- 0.08 MPa (0.00 +/- 11.60 psi).
2. Engine idling. Check that the AOC oil pump is running. Read out pressure info to confirm function. Correct pressure 0.38 +/- 0.08 MPa (55.11 +/- 11.60 psi)

TESTING FOR TEMPERATURE SENSOR FUNCTION:

1. Ignition in position II. Read out temperature information. Normal value is ambient temperature when the vehicle is cold and 20 - 50 degrees C (36 - 90 degrees F) more than ambient temperature when the vehicle is driven.

If the Temperature/Pressure sensor indicates a malfunction when checked as described above, replace the sensor according to the Removal, Replacement, and Installation procedure in VIDA, erase DTCs, re-check the pressure & temperature using VIDA/Diagnostics/Vehicle Communications, and then test drive the vehicle.

There are two different Temperature/Pressure sensors available; an 80 bar sensor and a 40 bar sensor. The color of the sensor cannot be trusted to distinguish between the two sensors. As a guideline, chassis numbers that are found in VIDA parts catalog (once updated) can be used to distinguish between the two sensors as long as the AOC or DEM has never been replaced previously in the vehicle.

If a 40 bar AOC or DEM has been replaced, the vehicle now has an 80 bar sensor. If it has been replaced, the diagnostic hardware (HW) part number (P/N) must be read off in VIDA/Diagnostics/Network to distinguish between the two sensors.

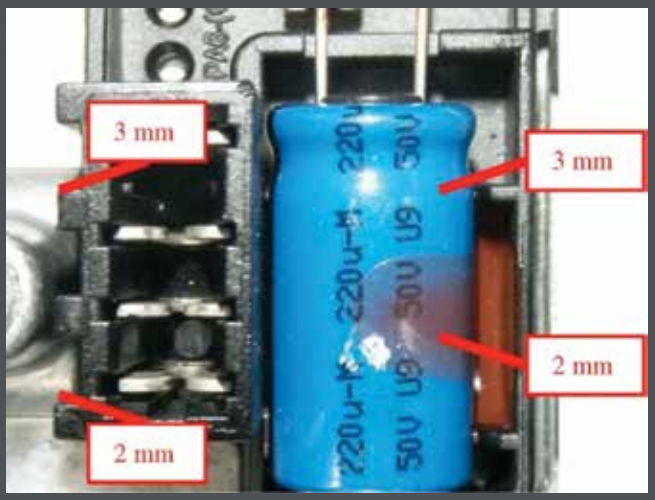
If a 40 bar sensor is installed where it should be an 80 bar sensor, the sensor will indicate too high of a pressure. If an 80 bar sensor is installed where it should be a 40 bar sensor, the sensor will indicate too low of a pressure. To be absolutely sure that the correct pressure sensor is installed in the vehicle, use VIDA to read off the HW P/N.

If the vehicle is set up for an 80 bar sensor P/N 30759668, one of the following DEM HW P/Ns should be read out: 30759701, 30785483, 30759682, 30783198, 30735844, or 30783018.

If none of the above DEM HW P/Ns show up, the vehicle is set up for a 40 bar sensor P/N 30651694.

Care should be taken when removing the connectors from the DEM. Very little force is required to separate the connectors from the DEM without breaking the connector. When releasing the connector, press down on the connector, towards the DEM, to relieve pressure on the connector tab. Insert a small flat-blade screwdriver under the connector tab and gently rotate the screwdriver until the tab is unlocked. Then, gently push up on the connector.

It is important to note the orientation of the Temperature/ Pressure sensor in the DEM upon replacement. It is



possible to forcefully install the sensor into the DEM in the incorrect orientation. Incorrectly installing the sensor will inhibit AWD function and can damage the DEM. See the photo (previous page) of the approximate dimensions of the connector and the female terminals in the DEM.

See the photo of a sample DEM that had an incorrectly installed Temperature/Pressure sensor. The center two female terminals are now spread apart due to the incorrect installation and the sensor will not make constant electrical contact with the DEM.

The photos below show the correct and incorrect orientation of the Temperature/Pressure sensor in the DEM connector.

The fault tracing and parts catalog information in VIDA are currently being updated to include this information.

REPLACING THE OIL FILTER FOR THE CLUTCH (AOC)

Note! As the illustrations in this service information are used for different model years and/or models, some variation may occur. However, the essential information is always correct.

REMOVAL

CAUTION! The oil filter must be replaced every four years. In the Service Schedule this corresponds to a normal mileage of 50K miles. However it is the period of 4 years that is the key factor, not the mileage.

REMOVING THE OIL FILTER

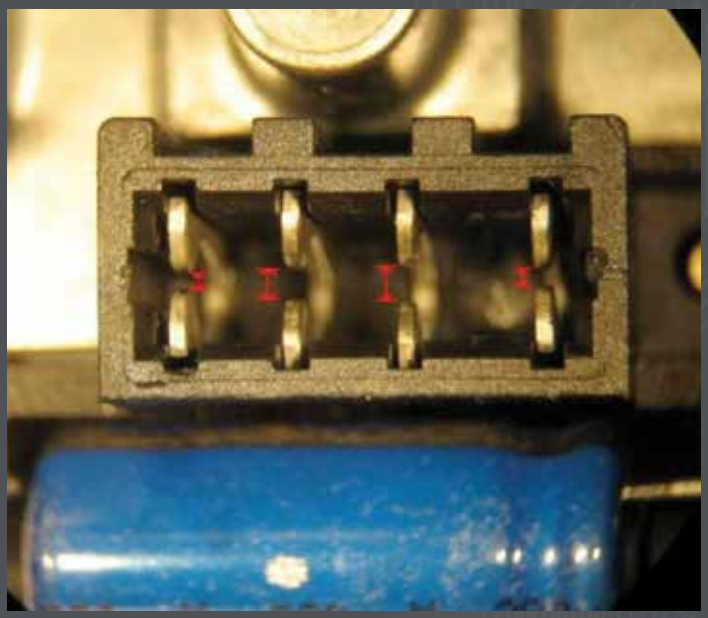
NOTE! Thoroughly clean around the oil pump before beginning removal.

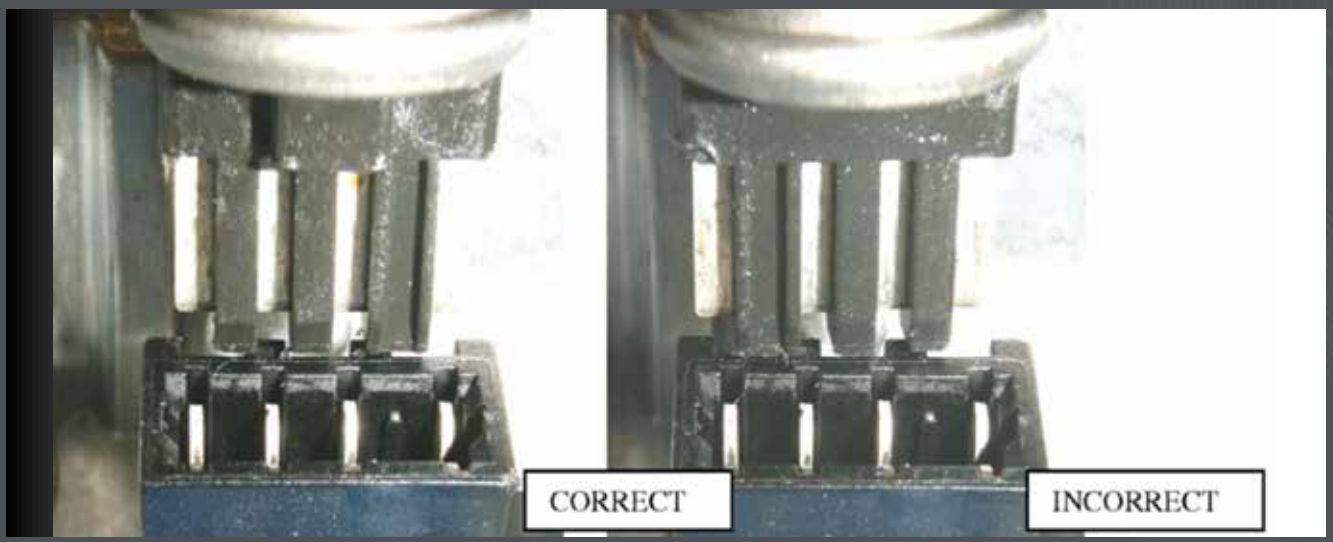
1. Position a container underneath the Active on Demand Coupling.
2. Remove the two screws from the cover for the oil filter.
3. Remove the loose o-ring furthest into the filter seat.

INSTALLATION

INSTALLING THE OIL FILTER

1. Clean the filter area thoroughly. There must not be any lint from any paper or cloths.
2. Position a new o-ring furthest in the seat for the filter.
3. Install the new o-rings on the cover. Lubricate the o-rings with a little Active on Demand Coupling oil, P/N 116 1641 (1 liter packs).
4. Install the filter and the cover. Tighten to 5.5 N-m.
5. Now fill the AOC through the fill plug hole until the fluid runs out, replace fill plug test drive to operating temp and then re-check fluid level and top off if needed. ●





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.

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VOLVO HEATER CORES

HEATER CORE REPLACEMENT HAS COME A LONG WAY FROM THE EARLY 1970S AND 1980S. THE DAYS OF REMOVING THE COMPLETE DASH BOARD HAVE GONE AWAY. THROUGH THE YEARS VOLVO ENGINEERS HAVE MADE IT EASIER TO INSTALL A HEATER CORE IN NEWER VOLVOS.

By easier we mean that the right qualified technician with the right Volvo tools and certified Volvo parts makes this job professionally done. The shop and your customers will feel at ease and satisfied.

The heater box or HVAC system, (Heating, Ventilation and Air Conditioning) that is inside the vehicle dash is the collection of parts, including the vents and temperature control, that gives heat or cool air depending on your desire.

Heater cores are the source of heat inside the cabin. A heater core is like a radiator but inside the cabin. Hoses are routed from the engine to the connection at the core itself. So when the vehicle is started and the cooling system heats up, circulation of the liquid is controlled by the amount of heat you want inside the vehicle.

Older 240 style

Newer style

Examples of different heater cores

Heater core box from 240 modules

How often do heater cores need to be replaced?

Heater core issues are most commonly associated with lack of engine cooling system maintenance, as corrosion inside the heater core is the cause of most failures. As engine coolant sits in the engine, anti-corrosive agents help prevent corrosion and rust. Though these protective chemicals are present, corrosion and rust will occur over time. The majority of vehicles will never need a heater core replacement, but without the factory scheduled coolant flushes the heater core may not make it to 100K miles.

Let's not go back too far, but for the Volvo 240s still on the road, replacing heater cores can be quite challenging, with an extensive degree of difficulty to remove the complete heater box. Once the heater box was removed, the heater core could be replaced.

Replacing the heater cores on 740 and 940 Volvos was time consuming also. These types of heater cores lasted many years and were very reliable.

The start of the 850 models featured a new heater box and a different type of heater core. The old traditional copper and brass heater core had gone away, replaced by new aluminum units with plastic ends. These heater cores were introduced in the late 1990s in the 850 models and then later in the S70s and V70s. Today's models all use the same style of heater cores.

Heat in the cabin makes for comfort in the chilly winter seasons. Once the vehicle is warmed up, the coolant circulates through the engine and into the heater system in the cabin to make heat. Climate controls can adjust heat to certain temperatures to make the cabin comfortable.

You might be wondering what a heater core is, what it does, and how it can affect your customer's vehicle. These are all great questions, and we're going to get you some quick and easy answers so you can get this car fixed ASAP.

In fact, the heater core is simply a small radiator itself, with a grid of little tubes and a waffled appearance from the fins that disperse the heat. The heater core allows the heater and defroster to function. Volvo calls this the heat exchanger.

Here are some clues that will help you decide if heater core replacement is needed. Diagnosing a bad or blown heater core is pretty easy. Replacing a heater core may not be so easy.

Fogging up inside the vehicle on windows is a sign that the heater core has developed a hole in the core and is leaking into the heater box, causing condensation on the inside windows.

A sweet smell is also an indication that the heater core is leaking inside the cabin. Peel back the floor carpet and look for coolant under the mats. Sometimes the coolant will come out through the A/C condensation drain and you will see coolant on the ground under the vehicle.

Turning the heat on and finding that only cold air blows is an indication that the heater core is plugged and coolant can't circulate to make warm air.

Having to frequently add coolant to the cooling system and finding no leaks under the hood or on the ground could mean coolant is leaking in the cabin and there may be a puddle under the carpets. Pressurizing the cooling system and checking for leaks can sometimes make diagnosis less difficult.

When replacing the heater core on a Volvo 240, start by draining the complete cooling system and disconnecting the battery ground cable. Removal of the complete heater box is necessary. In order to do this you will need to remove; steering wheel, glove compartment, and both side kick panels. Remove the front panel, radio, climate controls and the duct tubing for heater vents. Disconnect wires and vacuum connections and set aside. Taking a picture or two will help during reassembly. Disconnect heater hoses coming into the cabin and set aside.

If equipped with air conditioning, connect your A/C machine and remove all of the refrigerant in the system. Remove A/C hoses going into cabin and put caps or tape on the ends so moisture will not get into system.

Remove all vent tubing that goes to the heater box. The two heater hoses going inside the vehicle and connecting to the heater core must be removed. There are four bolts at the top of the heater box; two on each side need to be removed. Once this is done you will need to wiggle out the heater box on the passenger's side with the seat adjusted completely back.

Now that the heater box is completely removed from the vehicle you can split the heater box, which is held together by clips, and the heater core can be removed. Clean inside the heater box with water and bleach so all coolant leaking inside will be removed, as well as any mold that may be growing there.

You can re-install the heater core and assemble in reverse order. Be careful when installing the heater box not to damage the hose connections for the heater core. Having someone help can save time and make it easier to secure.

The 740 and 940 Volvos were quite similar to the 240s, meaning you had to remove many things to remove and install a replacement heater core. But it is possible to split the heater box in the vehicle and expose the heater core

Here is a 2006 Volvo S40 heater core in dash, exposed.

Heater core in 850 Volvo

Example of heater hose connector under the hood at the firewall

Removing heater core from S70 and V70

without removing the complete heater box. Still, these jobs could take eight hours and more depending on the person doing the job.

In the early 1990s the 850 model was introduced by Volvo with many changes made to make heater core replacement much easier.

When replacing the heater core in 850 models, first drain all coolant from system. Just like with all heater cores this is the first step. You can do so by disconnecting the bottom radiator hose and draining into a pan. Once the coolant is drained you can re-connect the hose.

Inside the cabin of the vehicle remove both under-dash kick panels and inner kick panels. The passenger's side inner glove compartment might also have to be removed. After the kick panels are removed, the heater box will be exposed as will be the metal pipes connecting to the unit.

Solid pipes inside the vehicle are connected one end to the firewall of the vehicle, and the other end is connected to the heater core with o-rings to seal coolant from escaping. When installing new o-rings make sure not to cut or slice the rubber because coolant will escape. A plastic coupling at the firewall will sometimes need to be replaced due to cracks caused by the heating and cooling of the plastic.

Under the hood of the vehicle disconnect the heater hoses at the firewall. You'll need to replace the o-rings and connectors when reconnecting the heater hoses.

Inside the vehicle at the heater box remove the T25 Torx fasteners that connect the pipes to the core and disconnect. Some coolant will escape, so have shop rags or something to catch this coolant. Using a shop vacuum cleaner works well.

If the heater core has been leaking into the cabin, sometimes it may be necessary to remove the seat and carpet to dry them out. Your shop vacuum cleaner can be used to clean out coolant from under the carpet if it's not too saturated.

Pull forward on the heater core box and remove. Remove the screws that hold the heater core in and replace with genuine Volvo parts. Clean the inside of the heater box with detergent and wipe down.

Install the new heater core back into the heater box and secure the screws. Connect the heater pipes with new o-rings and tighten. Before installing the kick panels, connect the heater hoses at the firewall. Install new coolant into the system and start the vehicle. Adjust the climate control to full heat coming out the floor area. Let the vehicle warm up and top off the coolant.

After the system is pressurized, check inside the cabin and all hoses to make sure there are no leaks in the system. If no leaks appear, install the kick panels and test drive. Make sure heat is working in every position.

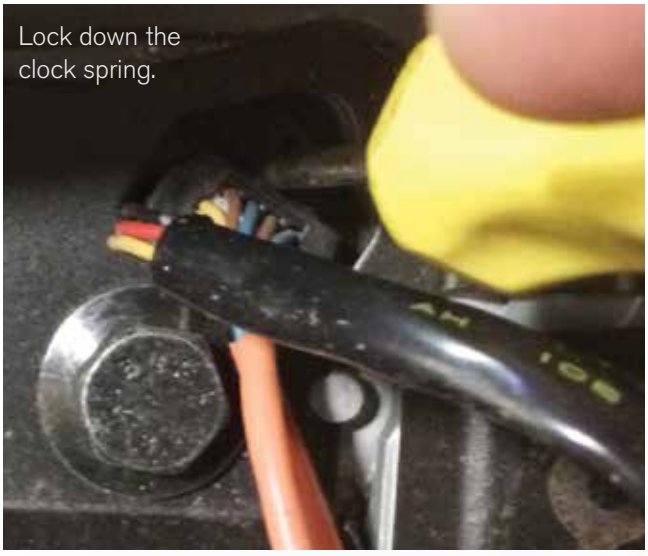
The heater cores in S70s and V70s in the early 2000s were similar to those in the 850 models, by removing the heater core that is centered in the heater box.

2001 came along and the Volvo XC70 heater core became a little more difficult to replace. Lets talk about it.

Begin by disconnecting the battery and make sure the steering wheel is straight. This will help for reassembly. Remove the steering wheel and disconnect the SRS wiring connections to the air bag. Lock down the clock spring with a screw to hold it in place.

Connectors at air bag, driver's side

Remove the bolt that holds the steering wheel on and mark the shaft and wheel so re-installation will be perfect. Remove the electrical connectors for turn signals and wipers, along with the ignition switch and antenna ring.



Lock down the clock spring.

Move the key to position one and remove the cable for the shifter. Now remove the bolt at the steering shaft universal joint towards brake pedal. Remove four bolts that hold the column in place and remove the steering column.

Heater hoses can now be removed after the coolant is drained. During re-assembly use new o-rings as needed.

Inside the vehicle remove the brake light switch so you have more room to remove the core. Adjust the heater controls so levers are out of the way of the core.

Remove the two lock inserts with pliers. Push in on the pipes going into the heater core and remove the clip. Move the pipes out of the way and remove the heater core.

Here are the control levers that need to be moved.

Install the new core, install new o-rings on pipes and secure them in the heater core. Push in on the pipes and install new clips. This process in limited space can be very difficult, so make sure to align the pipes correctly. Leave the kick panels off in order to check for leaks. Connect the heater hoses and replace if necessary with genuine Volvo parts. Fill the cooling system with the correct Volvo antifreeze/coolant and check for any leaks.

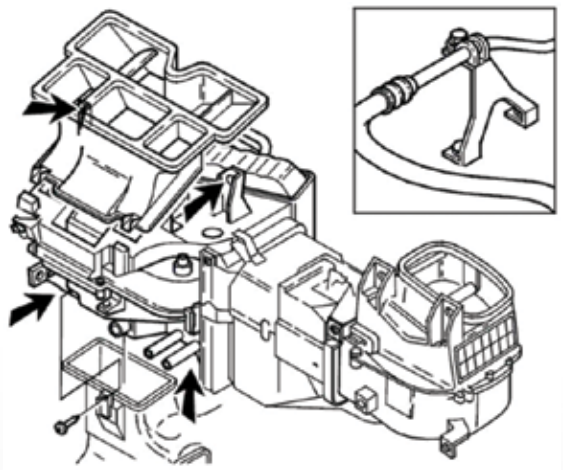
Install all parts in reverse order and remember to remove the screw that was used to hold down the clock spring. When installing the steering column be sure to line it up correctly.

Hard pipes going into the heater core

The S40 had a few different steps necessary in replacing the heater core. The older ones, from 1999 to 2004, were the first generation of the S40. Removing the complete dash is necessary on these vehicles, making it more difficult and time consuming.

After disconnecting the battery ground cable, remove all coolant from vehicle. Disconnect the heater hoses going to the heater core at the firewall. Use your air conditioning machine to remove all refrigerant from the A/C system. Remove the A/C pipe going into the vehicle firewall.

Remove the dash including the air bags. In the passenger compartment disconnect the cable harness and connectors located on the middle supports.



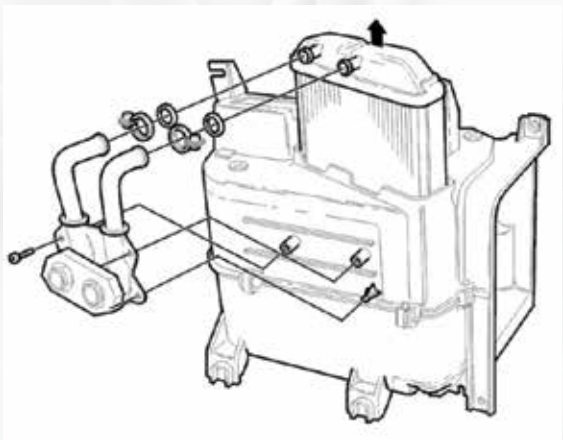
Heater box assembly

Remove the attaching screws from the middle supports and remove the supports. Remove the control panel. Disconnect all connectors and remove the power unit. Loosen the screws and the nut from the power unit and pull it backwards as far as possible. Remove the top part of the housing. Disconnect the connector for the floor heater. Press down on the pipes and remove the bottom piece. Remove four nuts and pull down on the unit and remove the core.

Make sure to replace all o-rings when installing the new unit from Volvo. Install all parts in reverse order.

The newer version of the S40, from 2005 onward, was a little different and the dash doesn't have to come off.

After disconnecting the battery, remove the center console and the glove compartment. Remove the CEM by disconnecting all connectors. Remove brackets and air ducts. Remove screws and remove cover to expose the heater core.



Heater core removal from heater box

Disconnect the heater pipe clamps, move pipes out of way and remove the heater core. Install new core and pipes. Replace o-rings and clamps to hold the pipes together.

Reassemble in reverse order.

Volvo vehicles have changed through the years and so have the heater cores -- from the old 240s to the newer XC70s; from all manual controls to the most recent Volvos with electronic controls to adjust heater temperature and venting to either side of the vehicle.

Lets take a look at the 2012 XC70, which has all electronic adjustments for comfort and convenience.

First of all disconnect the battery and remove the center console. Behind the climate control are a couple of screws that will need to be removed. Turn the key on and put the shifter into Drive to make room to remove.

Use an interior tool to remove the cover over the CD player. This tool is nice to use on all interior components.

Pop up the panel around the shifter and remove two screws that hold the bottom of the climate control panel and radio. The other two screws at the top of the CD player front panel were removed earlier.

Two screws behind the console compartment must be removed also. Remove the trim on both sides of the console using your bone tool. On the driver's side you will need to disconnect the electrical connector for the controls. Now it is possible to remove the climate control module by lifting it up and out.

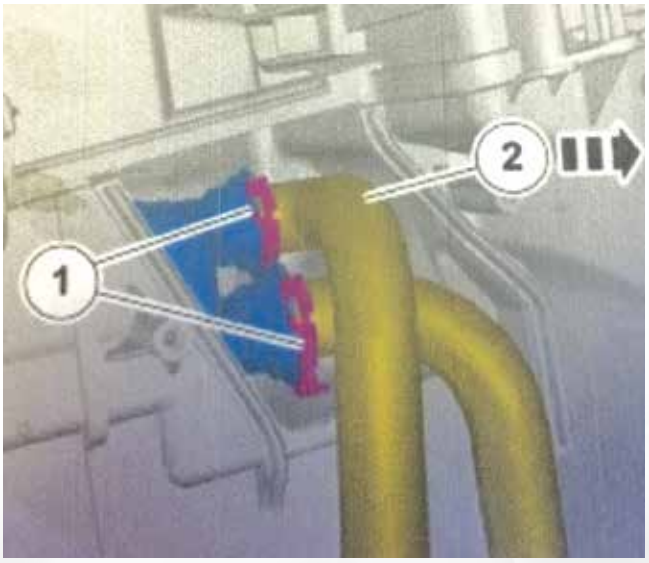
Remove the screws at the front of the console towards the floor board. Lift up the trim and remove two more screws. Disconnect the shifter cable and vent tubes for rear air and heat. Now remove the complete console out of the way.

Remove coolant from the vehicle. Remove all vent tubing by pulling downward and remove. Now you can see the cover over the heater core. Remove four screws and cover to expose the heater core.

On the passenger's side remove the plastic cover over the hard pipe lines into the heater core. Now push in on the clips and pull out on the pipes. Be prepared to collect escaping coolant. Even after draining the coolant there will still be some in the heater core. Remove the heater core and replace with a new Volvo core. Re-install all components and fill with coolant, making sure that all components are installed correctly and that there are no leaks.

Replacing heater cores can be a very trying job. With good technical skills and tools the right person should be comfortable with doing these jobs. Always remember to take pictures as you go in case something is forgotten. Using Volvo parts and tools will make the job less confusing and your customers very happy. ●

Heater core and pipes



Coolant pipes connected at heater core for removal

Tool for interior also called a bone tool

THERE'S NO SECOND CHANCE

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