

Fall/Winter 2016

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VOLVO TECHTIPS



Information for the Independent Volvo Specialist

「EVERYDAY
SERVICE」



**MISFIRE DIAGNOSTIC STRATEGIES AND REPAIRS
PATTERN FAILURES, PART 2
SHIFTLESS?**

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VOLVO TECHTIPS



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Have a content idea, suggestion, or comment? Contact us: feedback@VolvoTechTips.com

Volvo Senior Project Director
Phil Cabot
Senior Manager, Business Strategy and Analytics

Volvo Project Team
Mattia Janigro
Business Strategy and Analytics Specialist

Chad Walker
Wholesale Program Manager

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

Editor
G. Quagmire
gquagmire@AutomotiveDataMedia.com

Contributing Writers
Sean Stephens, Wayne Riley, Frank Walker

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

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

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

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FEATURES

MISFIRE
DIAGNOSTIC
STRATEGIES AND
REPAIRS WITH
OR WITHOUT ECM
CODES



EVERYDAY SERVICE
Careful attention to routine maintenance can greatly extend the life of your customer's Volvo.



PATTERN FAILURES,
PART 2
Here are some service issues that turn up frequently.



SHIFTLESS?
Transmission problems may or may not actually be transmission problems.

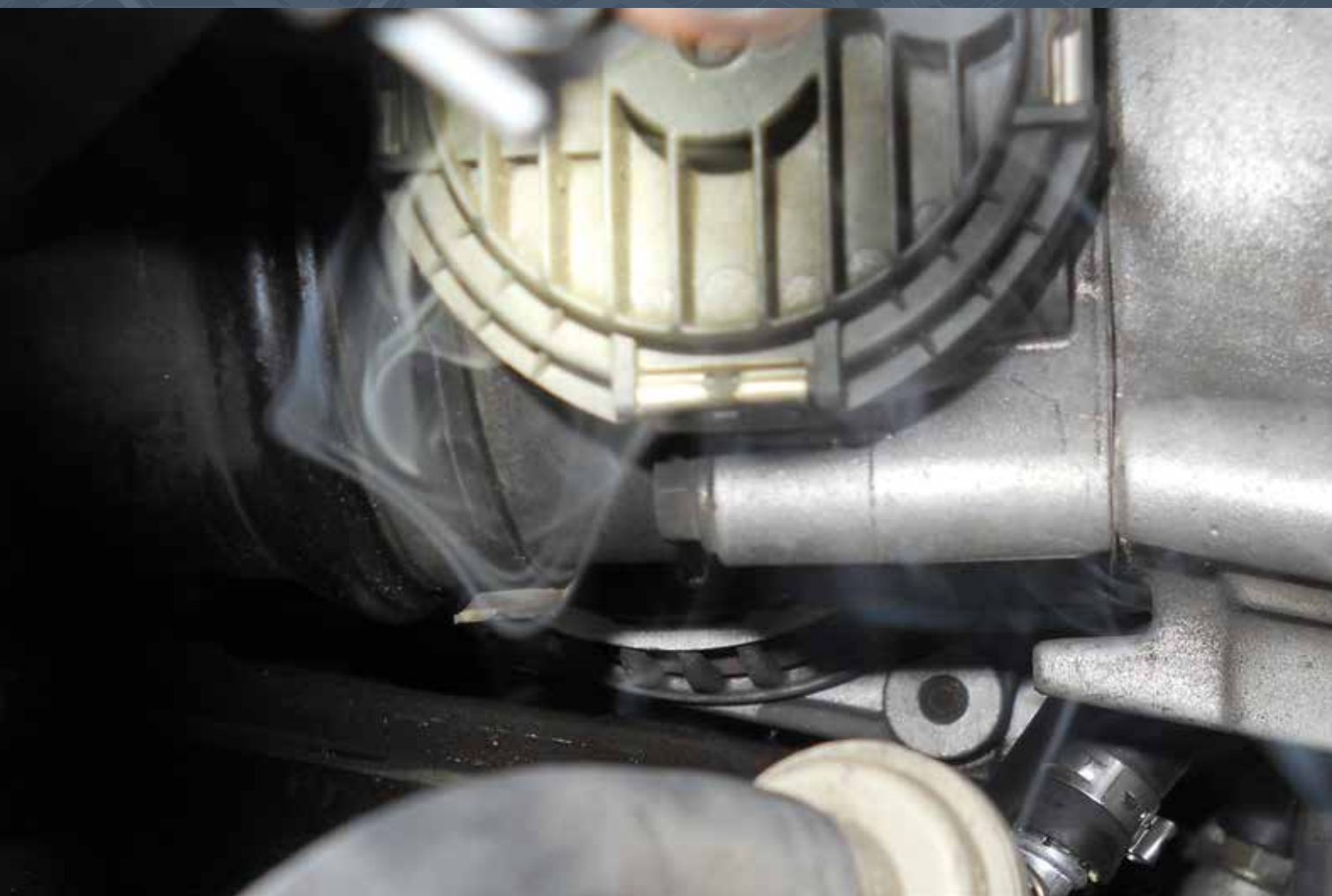


DEPARTMENTS

THE SIDEBAR: WINDSHIELD 32



VOLVO MISFIRE DIAGNOSTIC STRATEGIES AND REPAIRS WITH OR WITHOUT ECM CODES



In the independent Volvo repair world, a lot of shops are starting to see more older Volvos coming in with complaints of misfire and poor running. The independents see more of these cases than dealer techs who mainly work with the newer Volvos and cars still under the factory warranty.

Most technicians will agree that overall, Volvos tend to be more reliable than other makes when it comes to breakdowns. Most Volvos will still limp into the shop, except in the case of major problems such as a broken timing belt.

Diagnosing Volvo misfires is not much different from the way you diagnose other cars, you just have to know what to look for. The most important thing you need when diagnosing a Volvo or any other car is the right information. When the customer brings his Volvo into your shop, the person checking them in needs to be able to ask the right questions about the symptoms, to give the technician a place to start the diagnosis.



You should make checking the PCV system for pressure one of the first steps in diagnosing any engine performance problem on a Volvo.

Customers are not technicians, so you have to guide them to provide full information. If it's practical in your shop, the tech that will be working on the car should interview the customer about their symptoms. This can save a lot of time and confusion.

When starting any diagnostics, begin with the basics! Volvo has been using OBD II on all its models since 1995 and, as early as 1989 240 models, had the ability to store some malfunction data in the ECM.

So after getting as much information as possible from the customer about the symptoms and a test-drive, check to see if there are any stored codes. If the car has stored a code or codes, check to see if there is any freeze data to go with it. Freeze frame data is a gift; in a lot of cases the answer to the problem is right there.

Now if you happen to have codes, ask yourself, do these codes have anything to do with the symptom or problem? In many cases, especially on 1999 and newer Volvos, there may be a lot of stored codes in multiple models that have nothing to do with the customer's current problem.

A common mistake made on late model Volvos is replacement of perfectly good air mass sensors, based only on the fact that the ECM has stored a code for one. This is one of those codes that can be generated for many reasons. You need to check the live data if the air mass sensor numbers

look out of range. There are a few basic checks you should do before recommending replacement.

Number one, check for air leaks. If the car has a post air mass sensor air leak, the ECM will try to compensate for it and the data numbers for the AMM, O₂ sensors, MAP and Throttle unit will be all over the place. On 1999 and newer Volvos it's always important to know if the crankcase ventilation system is functioning correctly and is not plugged. If the PCV system is blocked in these late model Volvos it can cause all kinds of problems. The excess crankcase pressure can actually reduce engine vacuum, causing the ECM to think the air mass sensor is out of range.

Checking the PVC system pressure should be part of your everyday inspection program; this system was covered extensively in the first issue of *Volvo TechTips*. It cannot be overstressed how important a functioning PCV system is to late model Volvos. If left unchecked, the unvented pressure can cause the engine to consume engine oil at a rapid rate, and can cause engine seals like the crank and cam seals to pop out, causing massive oil leaks. Checking for PCV pressure is easy; just run the engine until it reaches normal operating temperature. While the car is at idle remove the dipstick and insert a combination vacuum/pressure gauge like Volvo special tool number 999-7226.

You should see negative vacuum, not positive pressure. The most common Volvo misfire problem related to a plugged PCV system occurs when engine oil is forced out through the

oil filler cap seal. This oil accumulates under the spark plug cover and begins to seep into the spark plug wells. As the plug wells fill with oil, the ignition coils start to short to ground and misfire. This is also common in 850 series cars that use standard ignition wires.

If the misfire symptom is intermittent and there are no codes stored that are related to the problem, start by checking the live data numbers for irregularities. If the symptom only happens when the car is cold, you should keep the car overnight to try to replicate the symptoms.

When performing diagnostics on 1999 and newer Volvos, the best tool for the job is a laptop with Volvo's VIDA and DICE Tool installed. VIDA can monitor and record 10 Data PIDs at once, even in a graphing format. This is great when you're looking for that needle in the haystack. Volvos can have a lot of codes and data that a generic scan tool may not even detect and, if they do, it's usually a generic P code. VIDA can tell you if the fault is intermittent or permanent and if the sensor signals were high, low or missing. The difference is very important in figuring out the car's problem and verifying the fix.



If you have a misfire code on one or two cylinders, the best way to confirm or eliminate a coil as the problem is to number them, clear the codes and switch the suspected coil to another cylinder and test drive the car and see if miss moves to that cylinder.

For example, suppose a 2002 Volvo XC70 stores a fault code for #5 injector. Most generic scan tools would read P0223 Injector #5 signal fault. If you use VIDA to scan this Volvo you will get ECM 2350 followed by signal missing, high, low, intermittent or permanent. The testing for each one of these conditions can be very different.

When performing your initial check out on the Volvo in question, part of checking the basics is battery voltage and condition; a weak battery can wreak havoc on Volvos with CAN networks. A good rule of thumb is, if the customer's battery is older than five years it may be time to replace it.

Most people who buy Volvos buy them for one main reason and it's not the fact that they have the most comfortable seats in the industry; it's safety. If your customer's Volvo is randomly misfiring or stalling, it's not safe to drive. The modern day auto tech has to think like a detective and use the clues and information available to find out "who done it" or, more accurately, what caused it. Of course, instead of DNA and fingerprints we have DTCs and live data.

If you work on a lot of Volvos, you know that the majority of misfire complaints can be traced to ignition coils that have lived past their useful life span. But of course when Volvo coils fail they almost always store a code in the ECM. The majority of high mileage coil failures that are being seen in the aftermarket are in Volvo models starting in 1998 with the S/V70 series cars. Volvo did use coil over plug systems as early as 1991 in the 900 series cars, but for some reason the early coils don't fail as much as the ones on later models. Verifying that a coil has failed is relatively easy. The preferred method is to mark each coil with the corresponding cylinder number and then switch the coil in question with a known good coil.

After that, all you have to do is start the car and watch the live misfire data and see if the bad coil has moved cylinders. If your scan tool does not monitor misfire data you can just clear codes, drive the car and see if you get a new code for the cylinder with the questionable coil.



Deep cracks are a sign of a coil that is old and may start to create performance problems. If you have one or two coils that are failing, it's best to recommend that all the coils be replaced at the same time. The coils are the same age and have the same mileage on them.



THERE'S NO SECOND CHANCE

VOLVO GENUINE BRAKES

Volvo Genuine Brakes are more than simply replacement discs and pads. They are essential components that interact with sophisticated systems and software to help ensure the safety and performance of Volvo cars.

Installing Volvo Genuine Brakes is an investment in reliability and quality – the best option in the marketplace for keeping your customers safe.

They are critical in Volvo Active Safety Systems including:

- Antilock Braking System (ABS) with Electronic Brake Distribution (EBD) and Electronic Brake Assistance (EBA)
- Automatic Braking
- City Safety
- Collision Warning with Auto Brake
- Pedestrian Detection

Get the replacement brake parts designed and engineered by Volvo. Contact your local Volvo dealer for a complete selection of Volvo Genuine Parts.



That being said if you have to replace the coils you should recommend that all of them be replaced at once, unless you like the customer having to come back every few months with another failed coil. Use only high quality replacement coils for the same reasons. OE Volvo coils have a 2-year unlimited mile warranty. Volvo misfires can be caused by multiple things and, yes, most of the time it's the coils and plugs.

But this article is also going to help you with the not so everyday misfire causes.

Here is a case study of a Volvo that should have been easy to figure out but was not. A new customer brought in a 2005 Volvo S60 with a 2.4L non-turbo engine. The car was well maintained and only had 68K miles on the odometer. The customer stated that the car would intermittently shake and run rough at idle. Sometimes it would happen once a day and sometimes it would only happen once every two weeks.

The customer stated that the car had been to two other shops that could not fix the problem. The first shop replaced the coils and spark plugs with OE Volvo parts. The shop that replaced the coils and plugs was a Volvo specialist with a good reputation, so we had no cause to question their work.

After interviewing the customer and examining the repair orders from the other shops we noticed that all of the shops that worked on this problem had checked the car for stored codes and had come up with none.

When we plugged the car into our VIDA we got the same result — no stored codes in the ECM or any modules that could cause similar symptoms. We went to vehicle communication and checked the live data.

The car was at operating temp and all the data was normal. We watched the misfire counters and nothing happened. We decided to have a technician drive it home for a few days with the VIDA laptop until the symptom happened. The first day nothing happened. The next day when the car was cold, the symptom occurred for about 10 seconds! It was definitely a misfire on more than one cylinder, and it happened so fast no codes were stored.

When he got to the shop we were lucky enough to see it happen again with the VIDA misfire counters monitoring data on all five cylinders. At idle 2 and 5 were missing just for a second — not enough for this Volvo to store codes but there it was. We decided it may be a mechanical problem like a broken valve spring, so we decided to do a compression check.

The technician removed the brand new coils and then removed the first spark plug. This is when we saw the first problem; the plugs were brand new, high quality OE Volvo spark plugs, but they were not for this engine. These plugs were designed for the R version of the S60, the S60R and the V70R. The main difference is the length of the threaded portion of the plug. As you can see in the picture, the spark plug

PARAMETER	VALUE
ECM-Coolant temperature	63°C
ECM-Engine speed	654.5
ECM-Mass air flow	13 kg/h
ECM-Misfire counter	0
ECM-Misfire counter 1 (5 cyl)	0
ECM-Misfire counter 2 (5 cyl)	0
ECM-Misfire counter 3 (5 cyl)	0
ECM-Misfire counter 4 (5 cyl)	0
ECM-Misfire counter 5 (5 cyl)	0
ECM-Throttle angle	3.92%

VIDA is the best tool for diagnosing Volvo problems. You can view up to 10 data PIDs from multiple control units at once.



You can see the obvious difference in the plug from the S60R. Even though it's a good 5mm longer, it did not come in contact with the top of the piston. Always make sure to use only OE Volvo plug sets and to double check your part numbers.

for the R version of this Volvo is 5mm longer than the correct plug for this engine. The longer plugs did not come in contact with the tops of the pistons and the gaps were normal.

Upon closer inspection of the plugs we found the problem. The plugs that were installed on cylinders 2 and 5 had broken electrodes that would move up and down when

cold. So on the intake stroke the electrode would slide down, shorting the plug. Then on the compression stroke the pressure would push the electrode back into place so it would fire somewhat normally. As the plug got hot it would expand, fixing the electrode in the correct position. This S60 would never display its symptom for long enough to set a misfire code.

This example shows why it's important not to assume anything and why you should always start with the basics. It's good practice to read the data on all the cars you diagnose before and after the repairs, not only to confirm the fix but to get used to what the normal data numbers look like. The more experience you have reading scan tool data, the better you will become at recognizing when the data numbers are out of normal range.

If you have a hard time remembering scan tool data numbers, a good tip is to use your phone to take screen shots of the data before and after repairs or make a journal. It's also a good idea to check for TSB and recall information on the car you're working on. This simple step can save you a lot of time and money. Volvo engineers will often develop software or service procedures to fix common problems or improve the performance and reliability of their cars. Here is just one example: TSB-No: 28-71.

When checking a Volvo with a no-code misfire, start by checking the live data. Is the temperature correct for the ECT? Volvo temp senders can fail at higher mileage and don't always set a code. It's always best to check ECT readings from a cold start all the way to normal operating temperature. On the live data you will see two ECT readings — one for the gauge and one for the ECM even though the signals come out of the same sensor.

Watch to see if the temperatures deviate from each other. This is a sure sign of a worn ECT sensor. A malfunctioning ECT sensor can cause a misfire after a cold or hot start, usually by telling the car's ECM that the coolant temp is full cold (-32°C). This can cause the injectors to flood the engine and foul the spark plugs.

As Volvos age, the vacuum hoses on the engine can start to deteriorate

DATE: 6-1-2006

MODEL YEAR: All New S40 T5, 2004.5-2006, V50 T5, 2005-2006, All new C70, 2006

CHASSIS: All new S40 000001-249999, V50 000001-269999, All new C70 0000030-005374

SUBJECT: Long Crank and or Stumble at Cold Start.

REFERENCE: VIDA

DESCRIPTION: The customer may experience a long crank or stumbling idle when making a cold start at ambient temperature's between 15°-35°C (59°-95°F). This is due to low tolerance of wide variations in fuel volatility. The cold start has been enhanced to improve the feeling for the customer and make it tolerant of variations in the gasoline.

Downloading the latest engine management software will improve the cold starting for customers experiencing this fuel sensitivity.

SERVICE: Download SW part # 30668282 (ECM Upgrade) using VIDA.

WARRANTY CLAIM INFORMATION

LABOR OP	LABOR DESCRIPTION	LABOR TIME
36004-2	SOFTWARE DOWNLOAD	0.3 HR

Claims may be submitted under the new car warranty when there is a documented customer complaint using claim type: 01

PARAMETER	VALUE
DSA-Engine speed	773 rpm
ECM-Battery voltage	13.22 V
ECM-Boost pressure (BOP)	1043.79 mbar
ECM-Coolant temperature	91.5 OC
ECM-Engine Coolant Temper...	84 OC
ECM-Mass air flow, real	10.75 kg/h
ECM-Oxygen sensor front si...	0.74 V

When monitoring ECM live data with VIDA, you can see that the ECT sensor is failing. The two temperature readings should stay within 2 to 3 degrees of each other. Volvos won't always store a code for this condition, since most of the time it's intermittent.

and develop cracks. Usually an unmetered air leak won't be bad enough to cause a misfire, but it will affect a lot of sensor data as the car's ECM tries to compensate for the air leak. These readings can often store a code in the ECM. It's common that functioning parts like air mass sensors are replaced just because of a stored code and the car's real problem is not addressed. To avoid this kind of thing make sure you always check the data. Check electrical connectors and grounds. Resistance caused by corrosion can affect the sensor readings a great deal.

When performing any engine performance diagnostics on a Volvo, it's always a good idea to make checking for post air mass sensor air leaks part of checking the basics. The best tool for this is a smoke machine. This tool will pay for itself over and over again.

Make sure your smoke machine is for emissions testing so you can regulate the pressure. Most techs only use their smoke machine to find intake and emission system leaks.

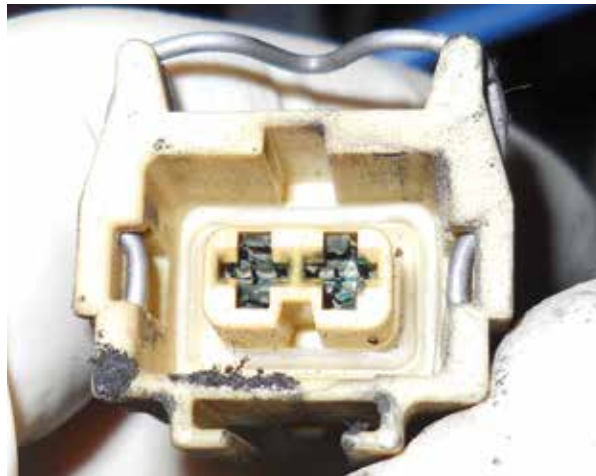
One of the cool things you can do with it is to check for leaking valves. Just put the cylinder you want to check in the top dead center position and blow smoke through the hose for your compression gauge. If you see smoke coming out of the exhaust, you probably have a burnt exhaust valve and if smoke is coming out of the intake, you may have a worn intake valve. Sometimes you can also see a leaking head gasket by removing the coolant reservoir

cap while blowing smoke into each cylinder and watching for smoke and bubbles coming up in the coolant.

Most Volvo misfires can be traced to ignition or fuel problems, but if all those systems check out OK, it may be time to check for a mechanical problem in the engine. Although rare in Volvos, engine problems like leaking head gaskets, burnt valves or seats and broken valve springs are possible.

Volvo fuel injector failures are very rare but can happen. Faulty Volvo injectors will almost always store a code, except in the case of clogged or leaking injectors. However Volvo injectors are very tough, even at high mileage, so you won't see many that need replacement.

When diagnosing a Volvo or any other modern car, your best tools are information and data. Volvo tends to use similar data PIDs on most of their systems, so the more you read live data, the better you will be at spotting the numbers that are out of range. ●



Always check your connectors and grounds. The resistance caused by this corroded connector caused the sensor signal to be way off.



When performing any engine diagnostics on a Volvo, it's a good idea to check for unmetered air leaks with a smoke machine. A post air mass sensor leak can cause all your sensor readings to be off, as the ECM tries to compensate for the extra air.



Make sure your smoke machine is suitable for emissions testing. Too much pressure can cause damage to sensors and possibly blow out seals.



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Contact your local Volvo dealer to learn more.

collisionlink®



VOLVO EVERYDAY SERVICE

EVEN LATE-MODEL
VOLVOS NEED ROUTINE
MAINTENANCE, BUT
ONLY THE RIGHT KIND
AT THE RIGHT TIME.



Volvo maintenance and service sure have changed over the years. In the old days a 122 or 240 would come into the shop every three thousand miles to get the oil and filter changed, and once in a while you would do what historians call a “tune up” (you young guys can Google what that means). These days auto service has become very complex and the service intervals can be confusing.

Take the engine oil change for example. Every 3K is not the rule any more, it's the exception to the rule. Advanced synthetic oils that have sophisticated additive packages have been proven to perform well past 20K miles before the oil starts to break down.

With auto manufacturers having to comply with stricter EPA standards and wanting to sell cars that require less maintenance, most modern cars have adopted 5,000, 7,500, 10,000, and even 15,000 mile oil change intervals.



A lot has changed in Volvo service over the years. In the old days an everyday service would usually include things like adjusting the carburetors, points, and valves.

A lot of you are reading this, rolling your eyes and saying “yeah right.” Yes it's hard to believe but if the customer follows the service guidelines and drives a normal driving pattern, they can conceivably use these oil change intervals. Of course this so-called “normal” customer is checking and topping off their engine oil with an approved product between services, right?

How many of your customers fall into the category of the normal service schedule? Not many. Depending on their age, the “average” Americans drive just over 13K miles a year. Most manufacturers' service intervals are based on the “normal” service schedule which is based on the “average” motorist. Here is a great definition of normal vs. severe service.

The maintenance intervals that are listed under Normal Service are designed by the vehicle manufacturer to meet the needs of the “average” motorist.

Since maintenance intervals are affected by climate and operating conditions, customers who operate their vehicles under more arduous conditions, or whose driving habits are markedly different from the “average” motorist should have a more personalized service program developed for them. This will ensure the continued safe and reliable operation of their vehicle.

Because Volvo does not specify a Severe Service interval, the determination of the proper maintenance interval should be left to the good judgment of the vehicle owner and the advice of an authorized service center.

Conditions that will affect the frequency and composition of Normal Service:

- Operating in dusty, wet or muddy terrain
- Frequent driving in dense city stop-and-go traffic
- Repeated short trip operation without sufficient engine warm up
- Ambient temperature extremes
- Operating in mountainous/high altitude areas
- Trailer towing

NOTE: Low mileage vehicles should be serviced at least once a year.

Well, do any of your “average” customers fit into the “normal” service category? If so, your shop is not “average.” So what do we do? Go back to the old days and sell everyone an oil and filter change at 3,000 mile intervals? No.

It's important to educate your customers on the benefits of preventive maintenance.

The oil change intervals that Volvo recommends are 7,500 miles for Volvos up to 2012 and 10K miles for 2013-up models, with approved synthetic oils. Use Volvo factory recommendations when possible and customize service programs for customers that drive a lot more or fewer miles than average.

Make sure to educate your customers on the benefits of preventive

maintenance and the steps they should take if they are going to use these longer oil change intervals.

Some drivers under the age of 35 need a lot of education when it comes to servicing their Volvo. Baby boomers were taught at an early age to do things like check the engine oil and get the car serviced regularly. A lot of younger Volvo drivers wait until they see a warning light or two before they bring the car in. How many times has a younger driver come into your shop asking for an oil change because the oil light came on?

But it's not always their fault. They were raised in an age where the media has built a lot of distrust in the automotive service industry. The media tells the public things like "you only need to change your oil every 10 to 15K miles," but neglect to mention that this only applies to some newer cars using fully synthetic oil.

The fact that drivers have to check and top off the engine oil between services is always left out of the stories too, because we all know no matter how tight and new that engine is, it will use some oil in 10K or 15K miles.

Any service these days should include a safety inspection, especially if the car only comes in once a year, because a lot can happen between services. All Volvo models have specific pattern failures to look for as the cars get older, which are covered in all editions of this magazine.

All service inspections should include a test drive, wheels-off brake inspection (when possible), checking the brake hydraulic hoses for cracks and bubbles (common problem on older Volvos), checking suspension for play, wear and damage, tire tread depth, pressure and wear check and, of course, check for oil and fluid leaks. You should also check exterior lights for function. When checking under the hood, check the fluids for level and fluid condition.

Check the car's odometer for the mileage and consult VIDA or your repair information program to see what Volvo recommends for that year and model at that mileage.

VOLVO FLUID SERVICE

BRAKE FLUID

On most Volvo models, brake fluid should be changed at 37.5K miles or every two years, whichever comes first. In areas where there's a lot of rain or humidity it may be necessary to

change fluid more often. Brake fluid is hygroscopic, meaning it adsorbs water out of the atmosphere, so the best way to check the condition of the fluid is to use a brake fluid test strip or an electronic brake fluid hydrometer. Brake fluid should be flushed and refilled if it has moisture content of over two percent.

COOLANT

When checking coolant condition, the color of the coolant is not the best indicator of whether it's good or needs to be changed as stated



The carbon and oil sludge buildup on this Volvo's oil filler cap is a sure sign that this car has not seen regular service.



As Volvos and all other makes age, the brake hydraulic hoses will start to develop cracks. If left to continue to deteriorate they can become a serious safety hazard. The hoses for front calipers wear faster than those for the rear because of the constant flexing when the wheels turn.



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Only one thing lasts longer than our coatings.
Our commitment to you.



in Volvo TSB TJ-29751. However there are a few coolant colors that are indicators of other problems. Coolant that looks like a strawberry milk shake is a sign of transmission fluid leaking through the transmission cooler tubes in the radiator. This is a serious condition; it damages the coolant hoses from the inside and is difficult to flush out completely.

The bigger problem is the coolant that's in the transmission oil. Often the transmission oil will look OK visually, but don't let that fool you. The only proven way to tell if there is glycol in the transmission fluid is to have it tested. Volvo has a test kit and procedure for this condition, check out TSB JT-16724 for details.

If the Volvo you are checking out has this problem, you should start by inspecting the coolant hoses closely and check the TCM to see if any codes are stored. If no codes are stored and the hoses are OK, you need to tell the customer that, at a minimum, the radiator or the transmission cooler (if it's separate like the one on the XC90) needs to be replaced and the transmission and cooling systems need to be flushed. Of course the customer should be advised that this may have damaged the transmission and may have shortened the life of the coolant hoses.

If the coolant looks more like a chocolate milk shake, then there may be engine oil contamination. Be careful what you recommend here because this can be caused by multiple problems. On most other cars this would be a sure sign of a blown head gasket, but this is not always the case with Volvos. The more common cause is an internally leaking oil cooler. The car could have a blown head gasket, but if the engine oil looks normal, the oil cooler is most likely the cause.

When coolant replacement is called for use only OE Volvo coolant mixed 50/50 with water. Don't mix coolant types or colors. When refilling Volvo

cooling systems that have hoses that are part hard plastic bonded to rubber, it's best not to use a vacuum airlift filling system. A lot of shops report these types of hoses failing after using this tool; the vacuum can pull the bonds apart on older hoses.

TRANSMISSION FLUID

On most Volvo models 1999–present there is no specified transmission fluid change interval. Most shops in the independent world recommend a 3 year/30K mile change interval for non-synthetic transmission fluids and 6 year/60K mile interval for synthetic transmission fluids.

Make sure you are using the correct fluid type for the year and model Volvo you're working on. Volvo is very specific when it comes to transmission fluid recommendations. There are very few aftermarket fluids that meet all of the correct specifications for Volvo transmissions, so don't take any chances, use only OE Volvo transmission fluids. You can consult the chart on page 18 to find the correct fluid and part number for the Volvo you're servicing.

A word of caution when changing transmission fluid to try to “fix a problem.” If on your initial pre-service test-drive you experience some shifting or transmission issues it's time to ask the customer if they have been experiencing any problems themselves. And if your customer comes in and requests that you change or “flush” the transmission fluid you should proceed with caution.

Ask the customer why? In a lot of cases they will tell you that someone recommended that they change the fluid and in some cases they will tell you it has shifting problems or slams into gear. You should manage the expectations of the customer by explaining that changing the fluid may not help their transmission problems and in some cases may make them even worse.

A lot of Volvo dealers are requiring customers to sign a waiver before changing the transmission fluid on higher mileage cars. Not a bad idea, it's better than having to buy the customer a transmission.



Brake fluid color is not always a good indicator of fluid condition. Brake fluid should be tested for moisture content, and should be replaced if fluid exceeds two percent water content.



Volvo has used a few different colors of coolant, so before recommending replacement based on color, test it and check to see what type of coolant Volvo recommends for the car.

In some cases a transmission fluid change and TCM software can fix some shifting issues. Of course you should get the customer to authorize some testing and diagnosis, to make sure there are no mechanical faults in the transmission before trying this first step.

AWD DIFFERENTIAL & ANGLE GEAR FLUIDS

Volvo does not specify a service interval for these fluids. Most shops replace these fluids when performing repairs on these components. Make

sure to use the correct OE Volvo fluids for the model and drive train you're working on.

TIMING BELTS

Volvo used timing belts on most of their models from 1975–present. 1999–2015 service intervals can be found in service bulletin (group 21 #044). Depending on the year and engine type, timing belt replacement mileage ranges from 105K or 10 years, to 150K or 10 to 15 years on the newer models.

A lot of the Volvos that come into independent shops are getting their second timing belt. Since these Volvos are at higher mileages, the tensioner bearing, idler bearing and water pump should be changed at the same time.

Most shops recommend this combination of repairs on every timing belt job. Replacing just the belt is not worth the risk. Always install a timing belt service sticker so the other shops can tell when it was changed last, because it's very hard to determine the

age or mileage of the belt visually. Most timing belt failures on 1998–present Volvos can be linked to bearing or water pump failures, not the belt breaking.

SPARK PLUGS

Volvo spark plug replacement mileage intervals vary depending on the year and model. Make sure you consult VIDA or your automotive information system before recommending replacement. Volvos are very sensitive to spark plug configuration. A lot of shops have reported problems with aftermarket plugs, like premature failures and poor performance. The best way to ensure problem-free spark plug performance is to install only OE Volvo plug sets. The spark plugs should be torqued to 18 lb-ft or 25 Nm on most models with aluminum heads.

CABIN FILTERS

Starting in 1994 with the 850 series, Volvo offered an interior climate control filter as an option. Later, in 1999, it became standard equipment on all models. Replacement intervals vary but the average replacement mileage is every 15K miles (more often in dusty areas). The first cabin filters used on 1994–2000 850, S, V, and C70 models are very easy to check and change — just open the hood, remove the three T25 Torx screws on the passenger side of the wiper cowl and carefully lift up the plastic panel and change the filter. On all later Volvo models starting with the 1999 S80, S/V40, the cabin filters have to be accessed from under the dash. On later Volvos the filter is mounted under the passenger's side dash. This example is the filter housing used in the 2004 S80.

Most Volvo cabin filters are relatively easy to service, but there is an exception. The cabin filter for the P1 cars (S40 2005) can be challenging for some techs.



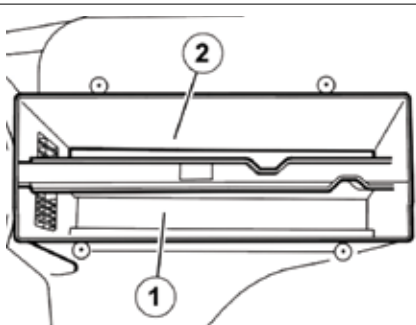
When refilling the coolant on P1 Volvos (2005–present S40/V50/C30/C70) or any Volvos with rubber and bonded plastic radiator hoses, don't use airlift or vacuum filling tools. On older hoses the vacuum can cause the hose to crack and fail prematurely.

Note the notches in the housing and the position of the filter element you are removing. Make sure to use the correct side for the application as described below. Use only one filter; do not use both filters as this will greatly restrict air flow.

Install the air cleaner (ACL). There are two alternative positions for the air cleaner (ACL). See the illustration.

The pollen filter (standard) must be installed in the smaller compartment (1).

The multi filter (cars with an air quality sensor) must be installed in the wider compartment (2).



You access these filters from the driver's side of the car. Start by carefully removing the three M6 (10mm) nuts. The best tool setup for this is a ¼ inch drive ratchet with a long wobble extension and a deep 10mm socket. Carefully disconnect the pedal sensor connector, remove the pedal assembly and pull back the carpet. To access the filter remove the cover. Early versions had three 7mm screws; later versions have one white plastic wing nut holding the cover on.

Remove the cabin filter by pulling it out behind the brake pedal. When installing the new filter, compress it slightly to fit into the opening and make sure the arrow for the air flow direction is pointing to the rear of the vehicle. Reinstall the three screws (torque to 10 Nm) or the wing nut, fold the carpet back, reinstall the accelerator pedal assembly and tighten the three nuts to 10 Nm.

VOLVO FUEL FILTERS

Volvo fuel filters are so well designed they rarely have problems and last

a long time. On most models, Volvo recommends replacement at 105K miles. Make sure to use only factory Volvo fuel filters. This filter only gets changed about every 10 years so it's important to use a filter that was tested and designed by Volvo for Volvo fuel systems.

VOLVO AIR FILTERS

Volvo's recommendations on air filter replacement intervals vary from year to year and model to model, but the average replacement interval is every 15K miles (more often if the Volvo is driven in dusty areas like the desert or the beach).

A lot of shops will use a cheaper aftermarket air filter because they think there's not much difference. The main reasons to use an OE Volvo air filter instead of a cheap copy are:

1. They right fit the first time and take less time to install. How many times have you had to fight one of those cheap filters into the air box? What's your time worth?
2. Volvo tests and designs these filters to maximize engine

efficiency while protecting your customers' engines from all kinds of damaging dust, debris and contamination, in some cases down to the sub-micron level.

3. Compare the cost to value and you will see that installing genuine Volvo air filters provides the best value for your customers.

Regular service and preventive maintenance are key to keeping your customers' Volvos running safely and efficiently for many miles and years.

Using factory Volvo service parts and fluids is far better than using aftermarket copies. The difference in fit, function, and service life makes them the best value and the best choice.

When your customers know that you use only OE Volvo parts and fluids to service their cars, they will know that you care and that your shop performs top quality service. And when you educate your customers on the difference they'll welcome the peace of mind. ●

APPLICATION	NOTE	PART NUMBER
<ul style="list-style-type: none"> • 5- and 6-Speed Automatic Transmissions - AW55 - TF80-SC <p>This fluid is also recommended to address two complaints on the AW 50-42:</p> <ul style="list-style-type: none"> • Harsh Lock-Up engagement/disengagement (SB 43-0029) • Squeaking noise during low speed turns (TNN 43-11) 	<p>JWS 3309</p> <p>The only oil approved for the 5- and 6-Speed automatic transmission is JWS 3309. None of the other fluids available on the market have been evaluated by Volvo to meet the requirements of these specific transmissions regarding:</p> <ul style="list-style-type: none"> • Shift quality • Slipping lock-up functionality • Transmission durability 	<ul style="list-style-type: none"> • 1161540 (1 liter) • 1161640 (4 liter)
<ul style="list-style-type: none"> • 4-Speed Automatic Transmissions - GM4T65EV - AW50-42 - AW30-40/43 - AW70/71/72 - ZF22 	Dexron IIIIG or IIIH	• 1161621 (4 liter)
<ul style="list-style-type: none"> • 5- and 6-Speed Manual Transmissions - M56 - M66 • Chain Housing - XC90 T6 	API GL4, Synthetic	• 1161745 (1 liter)
<ul style="list-style-type: none"> • Angle Gears (All) 	API GL5, BOT	• 1161648 (1 liter)
<ul style="list-style-type: none"> • AOC (Active On-Demand Coupling) 	Specific oil for the AWD clutch	• 1161641 (300 ml)
<ul style="list-style-type: none"> • Rear Differential (200/700/900 with optional limited slip) 	API GL5, with limited slip additive	• 1161619 (1 liter)
<ul style="list-style-type: none"> • Rear Differential (All Others) 	API GL5, low friction	• 1161620 (1 liter)
<ul style="list-style-type: none"> • Cleaning Manual Transmission Input Shafts 	Sprayable mineral based grease	• 1161657 (200 ml)
<ul style="list-style-type: none"> • Lubricating Manual Transmission Input Shafts 	Sprayable PFPE grease	• 30759651 (150 ml)
<ul style="list-style-type: none"> • Lubricating AWD spline interface - Splines between transmission and angle gear 	Lithium grease with PAO base	• 1161748 (10 ml)



VOLVO GENUINE PARTS

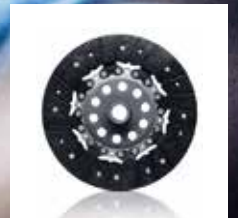
NOTHING CAN REPLACE THEM

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.*

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.



VOLVO PATTERN FAILURES, PART 2

As the Odometer Turns

AS THE ODOMETER
TURNS SOME SERVICE
ISSUES SHOW UP MORE
OFTEN THAN OTHERS.



Like fine wine, Volvos can get better with age (if they get the proper care and feeding). Volvos, over the years, have proven to be among the longest lasting cars on the road. It's very common to see Volvos coming into a shop with well over 150K on them. Most other cars are ready for the retirement home at 150K miles. A Volvo P1800 reportedly holds the

world record for the most miles on a passenger car, with over three million miles recorded. The cars you work on probably will not have this kind of mileage on them, but with your help your customers' well-aged Volvos can continue to be safe and reliable for many more miles.

As these cars age, we see common issues coming into the shop, and if you know what to look for, you can spot them and fix them before they become a bigger problem for your customer. Here are just a few of the pattern failures, seen on Volvos with higher mileage or lack of maintenance.



This is the standard test procedure for checking the control arm bushings on a Volvo. When they are really bad you can feel the wheels jerking back when stabbing the brake pedal at low speeds.



You can really see and feel the difference between the Volvo OE bushing and the aftermarket ones. Make sure you use only Volvo factory replacement bushings. Volvo now has a 2-year unlimited mileage warranty on replacement parts.

Opposite page: Here is the a front lower control arm bushing on a 2003 S60. You can see the separation inside the bushing. This kind of wear can have a negative effect on handling, braking and tire wear.

CONTROL ARM BUSHINGS

More and more Volvos are appearing with cracked or broken control arm bushings.

The driver of the car won't always notice that there is a problem with the bushings, but they will notice the difference after the bushings are replaced.

On a Volvo, worn control arm bushings can cause reduced control on sharp turns, pulling, clunking noise on braking, reduced

stopping performance and uneven tire wear. You should make inspecting these bushings part of your regular inspection procedure.

There are several ways to check these bushings for wear. One way is to put the car in gear with your foot on the brake and have someone watch the front wheels while you release and apply the brakes while moving forward. If the bushings are badly worn, the wheel will jerk back and forth quite a bit. On XC70 and XC90 models the movement can be as much as a few inches. This is also a great way to show the customer how much worn bushings can affect braking performance and steering control.

The more common way of checking is to put the car on the rack and use a pry bar to move the control arm back and forth while observing the bushings with a flashlight.

Some play is normal, even with new bushings. If the cracks in the bushings are small, there is probably not cause for concern. Just make the customer aware that they may be looking at replacing the control arm bushings in the future and you can re-check them on their next visit.

In the photo you can see the front lower control arm bushing is completely separated and torn. In this case, it's time to advise the customer that their Volvo needs to have them replaced. As with all suspension components, you should always advise to replace the bushings on both the left and right sides. This will help prevent alignment and pulling issues.

On this job it is very important to use only OE Volvo bushings. Aftermarket bushings often become torn or

badly cracked in less than a year of driving. If installing new bushings in your shop, make sure you mark the position and depth of the old bushings before you press them out. This is critical for installation on the car and proper suspension performance. You may choose to farm out the press work to a local machine shop, or you may opt for simply replacing the control arm with bushings already installed.

The job of removing the control arms from the car is pretty straightforward on early Volvos like 1994 850 through 2000 S/V and C70 series. The majority of Volvos showing cracked or worn lower control arm bushings are 2001–present V70/XC70, 2003–present S60, and 2003–present XC90. Bushing wear typically begins to appear after 60K miles, unless the car has been driven repeatedly on rough pavement or has impacted something like a large pot hole.

The problem most techs have is prying down the control arms enough to clear the ball joint during removal and installation. The trick to safely and easily lower the arm under tension is to use the Volvo special tool (999 7076).

SOUNDING THE ALARM

Late-model Volvos have a lot of bells and whistles and sometimes, as they age, some components start making noise when they're not supposed to. If your customer brings in one of these Volvos complaining about the alarm going off randomly or the lights flashing in the middle of the night, in most cases the car is having an issue with the alarm module, or as Volvo calls it, the SCM (Siren Control Module).

In some cases the car will display a message of Alarm System Service Required. But before you start throwing parts at the car, let's check a few things and do some testing. Start by checking for codes in the

UEM and CEM. The most common code is code UEM 0004, Siren Communication Fault.

Volvo uses a siren module with an internal non-serviceable but rechargeable battery. The battery in

these units is designed to provide power to the security system in the event that the car's 12V main battery is disconnected or discharged. When troubleshooting these systems, make sure you load test the battery as part of preliminary testing.



The safest and easiest way to pull down Volvo control arms is by using Volvo special tool #999 7076. Once you use this tool you will wonder why you did it any other way.



In the image you can see the alarm module removed from a 2001 Volvo V70XC. The internal rechargeable battery has failed causing intermittent alarm malfunctions.

There are many reasons why the car's alarm could be falsely activated, from a weak 12V main battery to a broken tailgate harness to someone sitting on their keys and activating the panic button on the remote. So with this in mind, the first step in any alarm system diagnosis is to ask the customer the right questions. When and where does the car display the problem? How often does the problem occur? And is there a message in the dash display, like "Alarm Triggered Check Car?"

The right information can help you avoid a wild goose chase. Start by checking the alarm system for function by arming the system with the remote with the driver's window open. After 25 seconds the alarm indicator light should start flashing.



The coolant tanks on the P1 cars tend to crack along the gap in hood where sunlight can expose it to UV rays.



Make sure you order the PCV valve and hoses when you perform the valve cover job. The hoses always crack, and replacing the valve is always a good idea when repairing oil leaks.

Reach inside and open the door with the inside door handle and the alarm should sound.

If the alarm goes off and the lights flash, you know the system is functioning. However this does not mean the system is free from faults, especially if the problem is intermittent false alarms.

If the alarm does not go off when you trigger it, you should start by checking the siren fuse inside the fuse box on the driver's side of the dash. In most cases the siren module's internal battery has deteriorated to the point that it can no longer hold a charge for long periods of time, causing the alarm system to perform erratically. The module is located inside the right front fender. To replace it you will need to remove the right front wheel and inner fender liner.

The siren module is held on by one security bolt that will have to be drilled or cut off. You will need to get new fender rivets from your Volvo parts department in order to reinstall the fender liner correctly.

The siren module does not need software to work, but if you have VIDA and the car needs the update software for the UEM or CEM it's a good idea to include it in the job. Make sure you check all the functions of the alarm system, including the remote and locks, after the repair is complete. And always reset the system by using one of the main keys to lock and unlock the driver's door twice. If you fail to do this last step the car may come back with the same UEM 004 code and intermittent false alarms.

CHECK THE COOLANT

When a Volvo is in for service, check for cracks or leakage on top of the coolant reservoir. After about 90K miles some tanks become brittle and develop cracks and leaks on top. When you replace the tank you should also recommend a new reservoir cap and a coolant change. Make sure you use only Volvo factory coolant in these cars. Using a vacuum lift system for filling the system on these engines is not recommended because of the lower radiator hose; its hard plastic and rubber construction can separate under vacuum. The customer won't always notice that they are losing coolant until the low coolant light comes on. If the tank's weakness results in one of the nipples breaking off at the wrong time, like on a long driving trip, an overheating condition can occur.

LEAKING VALVE COVER GASKETS

The Yamaha-designed 4.4L V-8 is a great motor, it has lots of power, provides decent mileage, and is very reliable. One of the pattern problems we see a lot on the V-8 is leaking valve cover gaskets. They usually start leaking after 90K miles, and when they do you will see oil all over the sides of the engine block. Sometimes the oil leak can look like it's coming from the oil pan or head gasket, but in most cases it's the valve cover gaskets leaking.

To confirm this, remove the plastic covers on the intake and valve cover gaskets and with a mirror and a flashlight, look around the edges of the valve covers. The one near the firewall usually starts leaking first. Doing this repair is not that difficult but it does take more time than on most cars with similar engine configurations. When you perform this repair you should replace all the seals in the valve covers as well as the PCV valve and hoses located under the intake manifold.

The two hoses replaced during this repair are often rock hard and crack during removal, so include them in every V-8 valve cover job. It's also a good time to replace the spark plugs if needed.

You can clean the throttle plate while the intake is apart but try not to push on or move the throttle plate by hand, since this can damage it. If the throttle plate is really filthy, you can wait until the intake is reassembled and, with the intake hose off, put the ignition key in position 2, and then use a prop rod to push the accelerator pedal to the floor. This will put the ETM at full open. With a clean rag and some throttle cleaner, gently clean the opening, again trying not to touch the throttle plate.

You should be careful with the wire harness for the ignition coils, especially the ground wires on the valve cover bolts. They tend to break if you are rough with them. Use a 10mm wrench to hold the bolt while you remove the ground connector. Here is a list of the Volvo part numbers you will need to order to do the complete job:

- 30720095 Valve cover gasket bank 1
- 30720096 Valve cover gasket bank 2
- 30720335 Intake gasket (two needed)

- 30720101 PCV valve hose
- 30720126 Throttle body gasket (optional)
- 925063 Oil filler cap O-ring
- 30720097 VVT solenoid seal (four needed)
- PCV Valve
- Breather Hose
- 30731383 Spark Plug Set B8444S (optional)
- Ignition Coils 1992–present (most Volvo models)

Like most cars that use a coil over plug ignition system, the coils on Volvos can fail with age and mileage. Volvo first started using the coil over plug type of ignition on the 1992 960 series cars, and by 1998 it was used on all Volvo models. In the majority of cases, problems with the coils start to develop after the car has gone over 90K miles, but some fail sooner. It depends on the climate, how the car was serviced and how it was driven.

For instance we have seen coils fail prematurely because the car's PCV system is clogged, causing engine oil to be pushed out of the oil filler cap and into the spark plug tubes. This can cause the coils to short. Or if the spark plugs are worn out, they can cause the coils to have to ramp up the voltage to get through the extra resistance, causing the coils to overheat.

When you are checking out a Volvo that has a misfire problem, make sure you inspect the coils closely. The coils can develop tiny cracks around the plastic housing on top. This is a sure sign of a bad coil. If you pull the rubber insulator boot down on a weak coil, sometimes you will see carbon tracks from voltage leakage. If your diagnosis shows that a car has a defective coil and the car has over 60K miles, it's best to replace all the coils.

Some technicians may disagree with changing all the coils at once and only sell the one or two coils that happen to be failing at this time. This can be a slippery slope, because the original coils are the same age and have the same mileage on them. So if you replace only one or two, you're most likely going to get a call from the customer in a few weeks or a few months, saying something like, "My car is doing the same thing it was before you fixed it last time," and when they bring it back in and you find out that one or two of the old coils has now failed, you will be the one holding the bag. The moral of the story is, replace the coils as a set with only high quality OE Volvo coils and a set of new Volvo spark plugs, to keep your customer's Volvo running the way it was designed. ●



When replacing the valve cover gaskets on Volvo V-8s, take care not to damage the ignition ground wires. They are delicate and can break easily.



As the coils age they start to develop cracks in the plastic housings, which can let moisture in and leak secondary voltage out.



GENUINE ORIGINAL EQUIPMENT VOLVO BATTERIES

YOUR LOCAL VOLVO RETAILER
HAS A FULL LINE OF MODEL
SPECIFIC REPLACEMENT
BATTERIES WITH A FULL
RANGE OF POWER RATINGS.




- Built to Volvo OEM specifications to help optimize vehicle performance, battery life and vehicle fit.
- Backed by a Volvo Car USA LLC limited warranty. See retailer for details.
- Very price competitive.



SHIFTLESS?

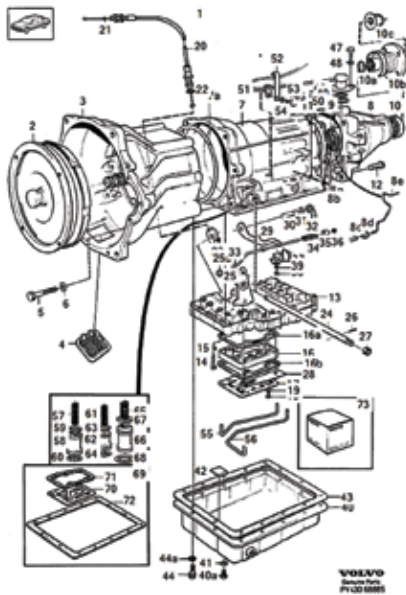
Volvo Automatic Transmission Service,
Diagnosis and Repair

CAREFUL DIAGNOSIS CAN HELP
YOU GET TO THE BOTTOM OF
TRANSMISSION COMPLAINTS.

A close-up photograph of a worn control arm bushing. The bushing is a dark, cylindrical metal component with a circular opening in the center. It is surrounded by other metal parts of the suspension system, all of which appear heavily rusted and worn. The lighting is dramatic, highlighting the textures and imperfections of the metal.

Worn control arm
bushings can
make shifting and
transmission problems
feel a lot worse than
they actually are.

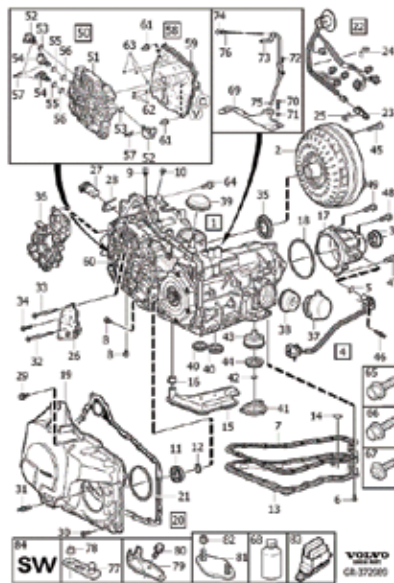
Over the years Volvo has used a large variety of transmissions and driveline systems in their cars. In the early days Volvo transmissions were simple and, like current Volvo transmissions, very reliable. Transmissions like the legendary AW70 and 71 used in most of the 240, 740, and 940 series cars were almost impossible to kill. Many shops have seen cases where a Volvo equipped with one of these beefy Swedish transmissions came into the shop with no fluid, or fluid contaminated with coolant from a bad



The AW 70/71 was one of the toughest transmissions that Volvo has used. It was simple and hard to kill.

radiator, just keep going after the leaks were fixed and new fluid was added.

Of course some of you older Volvo techs remember that a few 740 series cars came with a ZF-made transmission that was prone to failure if the engine was revved up when the car was in park, which happened quite a bit in the early days of emissions testing.



The GM4T65EV transmission was a real pain in the neck for Volvo even though it worked well in some GM cars. Volvo has gone to great lengths to fix the problems with this transmission.

If you have been working on Volvos for a while, you know that Volvo has had some challenges with a few of their transmissions including the GM4T65EV used in S80 and XC90 models from 1999–2005.

There are still a lot of these XC90 and S80 Volvos on the road and many of them have had at least one transmission overhaul or replacement. Volvo has gone to great lengths to correct the problems in this transmission variant. Volvo was able to fix most of the weak points in the GMT65EV and updated the software so that the transmission worked better with the rest of the power train.

You will occasionally encounter one of these cars with the original transmission. If you get one of these XC90 or S80s in your shop with transmission problems make sure you advise the customer that a flush and fill with filter replacement is not likely to cure many transmission problems.

Since the GM4T65EV uses non-synthetic Dexron 3 transmission fluid, it's critical to educate the drivers of these Volvos on the importance of regular fluid servicing at intervals specified in VIDA. If the customer drives in a high heat area or uses their Volvo for towing they should change the fluid more often.



When the transmission fluid is very dark or burnt, you should make sure that the customer understands the possibility of making an already worn transmission worse by changing the fluid. Total transmission failure is rare after a fluid change, but in the event that this should happen you don't want to be left holding the bag.

With any transmission with higher mileage, if the transmission fluid is very dark or burnt, you should make sure the customer understands that there is a small possibility that changing the transmission fluid can make a weak transmission fail completely.

The magic words when it comes to transmission diagnosis or any repairs that you're not 100% sure will fix the customer's complaint are: "This is the first step..." or "we need to try this first."

But the real golden rule is manage customer expectations. Even though most technicians who are reading this are miracle workers (see *Wizard* in the dictionary), don't promise miracles. The best way to sell diagnosis and repairs is to be honest and educate the customer on how the system works, the steps needed to properly diagnose the problem and the steps needed to repair it.

When you are diagnosing this transmission or any Volvo transmission issues, it's important to get as much information as possible from the customer about the symptoms, such as frequency, noises, cold or hot, etc. The average customer is not a technician and will have to be asked leading questions, like, "When the problem occurred did it seem like the engine was revving but the car was not moving?" A good service writer knows how to elicit this valuable information from the customer.

Check for stored TCM and ECM codes. A lot of customers will mistake engine performance problems, such as a random misfire, for a transmission problem. And remember, just because there are no stored codes, this does not mean the transmission is OK. Always check for TSBs and Technical Journals. Volvo has several for transmission issues.

A lot of shift problems can be helped with a TCM software update, but of course software can't fix mechanical damage.

When performing the initial test-drive, it is critical to use VIDA or a scan tool that has a data recording feature to accurately diagnose the transmission. Make a note of the time when you start your road test, so if or when a symptom occurs you can see how many minutes into the test drive the problem occurred. When you play back the data stream you should be able to see what numbers are out of range at that specific moment.

You're going to have to use Volvo's VIDA tool to find out if the car you're working on has the latest version of the TCM software installed. One of the cool new features of VIDA 2015 is that when you connect to a Volvo and go to the software tab, you will see the software updates that are available for the Volvo you're working on. If you don't see a TCM update under the available software update tab, it means that it is already installed with the latest version.

This is a lot better than earlier versions of VIDA, where you would just have to buy the software package and try to upload it, because the only way to find out if the car had the latest software was if the software loaded or failed and you got an error message that said, "The latest version of software already installed." This was, of course, after you went through the whole software purchasing and download procedure.

With the newest version of VIDA a lot of things have improved compared to earlier versions. If you have used VIDA before but have not installed the online only version, VIDA 2015, you can read complete setup and purchasing instructions at volvotechinfo.com

If you have never used VIDA to diagnose Volvos in your shop, you are doing it the hard way. For 1999-

PARAMETER	VALUE
TCM-Battery Voltage	13.40V
TCM-Engine coolant temper...	104°C
TCM-Engine Speed	654 rpm
TCM-Gear ratio	No value
TCM-In Rpm speed NC sensor	639 rpm
TCM-Oil temperature	95°C
TCM-Solenoid S1 status	Off
TCM-Solenoid S2 status	Off
TCM-Solenoid S3 status	Off
TCM-Solenoid S4 status	Off



Worn or broken engine torque mounts can make shifting feel unduly harsh.

present Volvos there is no better tool. Most generic scan tools will only talk to one module at a time. VIDA will let you look at the car's entire network on one screen. With most generic scan tools, you will only see generic trouble codes. With VIDA you will get specific codes and their conditions, like intermittent, permanent, signal high, signal low and so on.

VIDA will pay for itself over and over. If you work on late model Volvos, it's a must. For more info about ordering VIDA go to volvotechinfo.com.

To get the most out of a road test for transmission problems, you should hook up your VIDA or other scan tool with a data recording function, so you can replay the data from the



If transmission fluid is very burnt you may have burned or damaged clutch packs.

If the Volvo you're working on has this much metal in the pan, you will have to replace the radiator, trans cooler, and possibly the trans cooler hoses. If you don't remove all the metal from the cooler system it can damage the new transmission.

test drive to see what is out of range. The test-drive should be at least 20 minutes long and be both on city streets and at freeway speeds.

around and feel generally unsafe. But if you have worn suspension, worn torque mounts and a slipping transmission, it will feel like the drive train is going to jump out of the car.

When checking live data from the TCM, the main data PIDs you should be checking are:

If you have shift solenoid codes, don't automatically assume that a solenoid is defective. Watch the live data. If a solenoid is bad you will often see it not respond when the shift command is given.

- Engine rpm
- Transmission main shaft rpm
- Output shaft rpm
- Gear ratio
- Shift solenoid status
- Transmission fluid temp
- Engine coolant temp
- TCM and ECM battery voltage

After the initial test drive, the car should be put on a lift for a visual inspection. Customers will often mistake suspension problems for a transmission issue. If the lower control arm bushings are worn out, the drive train can shift back and forth during heavy acceleration, braking and when the car upshifts.

If the transmission fluid is very dark, the 2nd gear clutches can be badly burned and damaged as well as 3rd gear clutches. When they are burned and glazed they will not hold as long as they should when applied, and slippage occurs. With excessive slippage you will experience long shifts that slide into each gear and seem delayed, and you may even feel the transmission slip out of gear as you slightly accelerate.

Another problem that feels like harsh shifting can occur when the engine's upper and/or lower torque mounts are broken.

When the TCM detects that the commanded gear ratio did not occur, then it blames the shift solenoid for mechanically not doing its job, even though it likely is. The TCM doesn't know any better and will set a fault code to best suit the condition; it knows nothing about the actual physical condition of the transmission.

If you get a Volvo in your shop that is experiencing both worn control arm bushings and engine torque mount failure, the car will clunk and bang

COOLANT CONTAMINATION

A lot of transmissions have failed because of coolant from the radiator mixing with the transmission fluid. This can be caused by the transmission cooler inside the radiator cracking or leaking. (Or is it?)

Which came first? The chicken or the egg?

This is a classic example of this saying. Most technicians believe that the radiator fails and causes the damage to the transmission, but the fact is, it's usually the transmission that takes out the radiator cooler pipe first. What happens in most cases is that metal debris from a failing torque converter or other worn internal transmission part is carried by the transmission fluid through the cooler pipe in the radiator.

So when the car is running, the metal contaminating the fluid acts like sandpaper and as this "sanding fluid" is forced through the transmission cooler pipe, the pipe develops holes and then you know what happens next. In any event, the radiator must be replaced and we suggest almost all Volvo models have the radiator replaced due to heavy contamination.

Unlike some other car makes, when a Volvo has coolant contamination in the transmission fluid, it's not always easy to see. Later Volvos rarely will have visible cross contamination. Most of the Volvos that come into shops with this condition don't show any sign of transmission fluid in the coolant, and the transmission fluid is almost never milky like you see on other cars with this problem.

SO HOW CAN YOU TELL?

The scientific approach is to get the customer to authorize a glycol test. Volvo has a test kit and procedure that is outlined in a TSB (RTJ-16724). The kits are available from Volvo or you can order them direct from Nelco:

Nelco Company LLC, Glyt-Tek Test Kit
1047 McKnight Rd. S.
Saint Paul, MN 55119
Phone: 651.738.2014
Fax: 651.738.9447
E-mail: Cvnelco@aol.com
intergarten.com/nelco/testkit.htm

The not-so-scientific approach is to drain the fluid through a coffee filter and check for metal shavings. If you have excessive metal in the fluid, the next step is to remove the transmission pan and check for excessive metal debris in the pan and on the magnets.

If the pan has so much silver and gold in it that you yell, "Eureka!" you can pretty much assume that this Volvo is going to need it all.

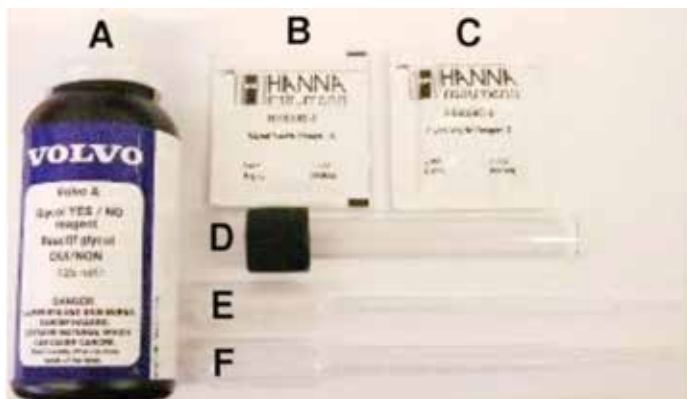
If your customer's transmission fluid tests positive for coolant contamination or if there are a lot of metal shavings in the pan, you're going to have to tell the customer that they need to replace their transmission, radiator and transmission oil cooler (if equipped with one).

Also to be able to guarantee the transmission, you will need to flush out

all the cooler lines and hoses. If there are a lot of metal shavings in the fluid you should recommend that the cooler hoses be replaced. And, of course, after the radiator is replaced, you will have to flush the coolant system for any lingering transmission fluid.

If you have a Volvo with intermittent symptoms, and no TCM codes, you can try changing the transmission fluid and updating the TCM software as a first step.

To test the transmission fluid for glycol contamination you can use Volvo's test kit, part number 30783760.



A. Volvo A reagent (clear liquid)
B. Reagent B (white powder)
C. Reagent C (purple powder)
D. Glass test tube with cap
E. Small pipette
F. Large pipette



To check or replace the fluid on the AW-80SC or TF-80SC you will need VIDA or a scan tool to read transmission fluid temperature. You will also need T40 and T55 Torx sockets.

NOTE: The TCM software and fluid change is not an instant fix. Most times the car has to be driven a few hundred miles to see if it worked.

When changing the transmission fluid on a Volvo it's critical to use the correct fluid type. Using the wrong fluid can cause performance problems and may eventually damage the transmission. Refer to VIDA for the correct fluid for the Volvo you're working on.

Checking the level and changing the transmission fluid on most Volvos is pretty straightforward. Drain and fill or use one of the cooler lines and a hose to drain while you fill through the dipstick tube. When you have to check or change the fluid on the newer AW-80SC and TF-80SC transmissions, the process is a bit more involved.

The AW-80SC and TF-80SC have no dipstick so when you check or replace the fluid use the following procedure:

1. Beginning with a cold transmission (below 50°C/120°F oil temperature), remove the lower engine cover, the air snorkel, and the air cleaner with the MAF (Mass Airflow Sensor) and ECM.
2. Remove filler plug (Torx 55) and place a clean funnel in the filler hole.
3. Temporarily install the air cleaner with the MAF and ECM so that the engine can be started.
4. Start the engine and leave it running for steps 5-9.
5. Move the shifter from P to D. Stop at each position for at least two seconds. Do this twice.
6. With the shift lever in P, raise the vehicle and place a receptacle under the transmission.
7. Remove the level plug (Torx 40). Lower the vehicle and add oil to the transmission until it starts to run out of the level plug hole beneath the vehicle.
8. Allow the transmission to warm up by letting the engine idle in P. During this time, some oil will be running out.
9. When the oil temperature reaches 50°C/120°F, reinstall the level plug and turn off the engine.
10. Reinstall the filler plug (Torx 55). Install the lower engine cover, the air cleaner correctly and the air snorkel.

A full version of the oil level checking procedure, can be found in VIDA. Note that it is not necessary to remove the air cleaner and ECM on S60R/V70R.

A word about installing used transmissions in a Volvo: DON'T! Transmission replacement is a major investment for your customer. Don't take chances with your customer's safety or your shop's reputation by installing a possibly faulty used transmission. If it doesn't work properly, you'll have to replace it yet again. How much profit do you make when this happens? How much is your customer's safety worth? Do yourself and your customer a big favor by doing the job right the first time. Use only OE Volvo factory rebuilt transmissions. ●

They didn't compromise.
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<http://marketing.oconnection.com/Volvo>

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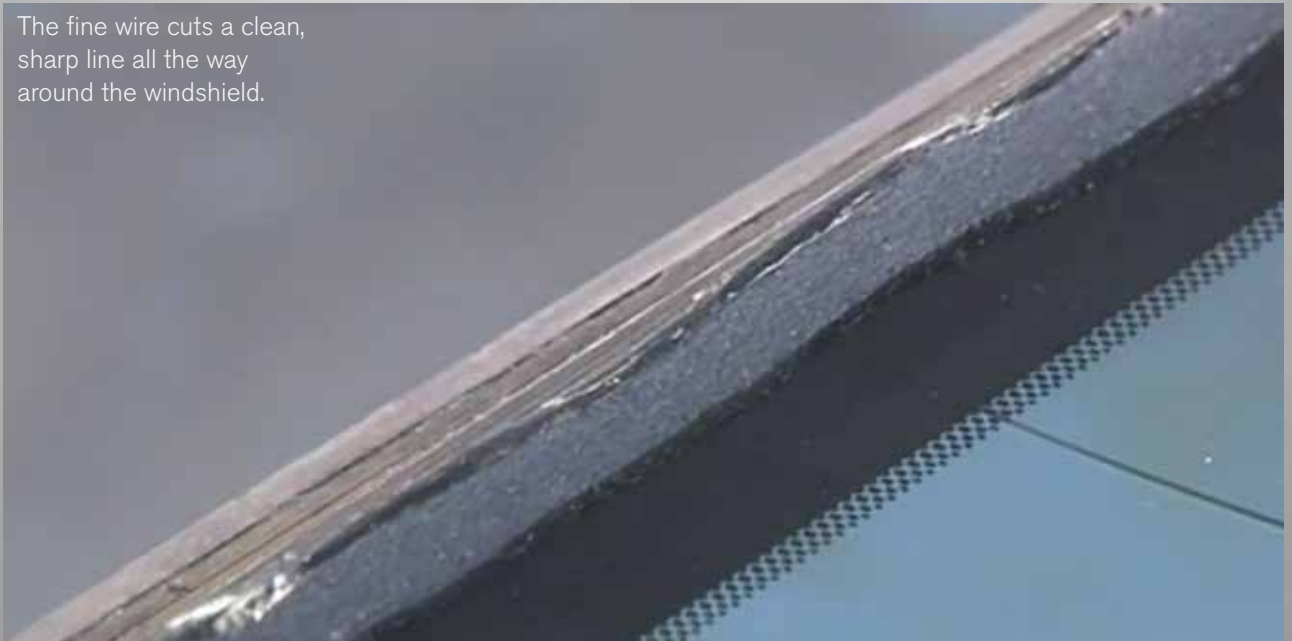
www.OEConnection.com



DO IT RIGHT WHEN REPLACING THE WINDSHIELD!

PROPER WINDSHIELD
REPLACEMENT CALLS FOR THE
RIGHT TOOLS, TECHNIQUES,
AND REPLACEMENT GLASS

The fine wire cuts a clean,
sharp line all the way
around the windshield.



The windshield, needless to say, is a vital component in every vehicle, and if a Volvo's windshield has been damaged in a collision or is cracked and needs replacement, today's techniques and equipment make the job faster than ever and ensure a safe, trouble-free windshield replacement. The trick is — do it right!



Removal tool uses pulleys and fine nylon wire, cranking the wire around the edge of the windshield and cutting the adhesive.

The windshield glass obviously provides a clear view of the road ahead, protects vehicle occupants from the weather, and can add strength to the vehicle structure when properly installed with the correct materials and procedures.

Replacing a Volvo windshield in the shop? Start with becoming aware of Volvo recommended or mandated windshield procedures, available on VIDA, and keep in mind that because of laser technology in newer vehicles it is best to use OE Volvo parts. Aftermarket products may be incorrect in fit, form, function, angle of glass and recalibration requirements.

OE WINDSHIELD WORKS BEST, PROVIDES STRONG CUSTOMER SATISFACTION

Volvo recommends that the replacement windshield itself be an original Volvo part — manufactured for a specific vehicle model — which is normally superior to aftermarket parts in reflectivity, transparency, distortion, and is readily available from your Volvo dealer parts department. This generates excellent long term customer satisfaction, and will avoid possible incompatibility with operation of the rain sensor.

Here are the major steps:

- Remove the windshield wiper assembly and lay it aside if it is in the way.
- Protect the front seats with a cover to avoid possible damage from the glass removal, and cover the instrument panel to protect it from possible damage from the high tension nylon wire cutting tool.
- Disconnect the vehicle's rain sensor.
- Get to know the Rollout 2000 removal tool that Volvo specifies, which uses a fine nylon wire to cut the windshield out of the old adhesive. No power is needed for this tool, which winds the wire and cuts the adhesive by simply "cranking" the tool with a ratcheting "winding handle" similar to a socket wrench. The Rollout 2000 is available through Volvo parts, #T9512925, with an acceptable optional tool, the Kong Tool from GT Glass, available in the aftermarket, although Volvo supports and offers the Rollout.
- The Rollout is basically two sets of pulleys that are attached to the inside of the windshield with large suction cups. Nylon wire is placed to surround the edges of the windshield and gently pressed into the adhesive and attached to the Rollout pulleys after insertion through a tiny opening in the adhesive at the bottom left corner of the windshield.
- After piercing the fine hole in bottom corner of the windshield adhesive, insert both ends of the wire and pull several feet of nylon wire into the interior reaching up to about the visor.
- Outside the windshield, carefully press the nylon wire from where it is inserted into the interior



Windshield repair tools are readily available from aftermarket suppliers and typically found in collision repair shops.

into the adhesive up against the outside edge of the windshield all the way around the windshield to the insertion point for both ends of the wire. Take care to ensure that the wire is tucked into position at the corners. Applying sticky tape over the wire at the top will keep it from slipping out of position.

- Mount the Rollout 2000 with the suction cups strategically inside the windshield, and fasten the ends of the inserted wire into pulleys on each of the Rollout units. Place the units so that cranking the pulleys will pull the wire along the outer edge of the windshield and cut through the old adhesive. By carefully cranking the tools and moving them into different positions, the nylon wire is drawn under tension around the windshield, cleanly cutting the windshield glass out of the adhesive.
- As the wire reaches the windshield corners, crank slowly against strong resistance to make sure it is pulled around the corner. Move the Rollout tools to different positions on the windshield to gain needed leverage to pull the wire — this operation takes about 15 minutes. When the wire has completely cut the adhesive all around the windshield, the old windshield glass is free and can be lifted out.

REMOVE OLD ADHESIVE, CLEAN UP AREA

Once the old glass is out of the windshield opening, scrape or pull the remaining old adhesive out of the opening and clean the opening out with a solvent. Be sure to note rust in the opening if there is any, and touch up rust or bare metal with primer before putting fresh adhesive in place to make sure the rust patches or bare spots don't grow and become a problem.

It is now time to place a good bead of adhesive around the windshield opening.

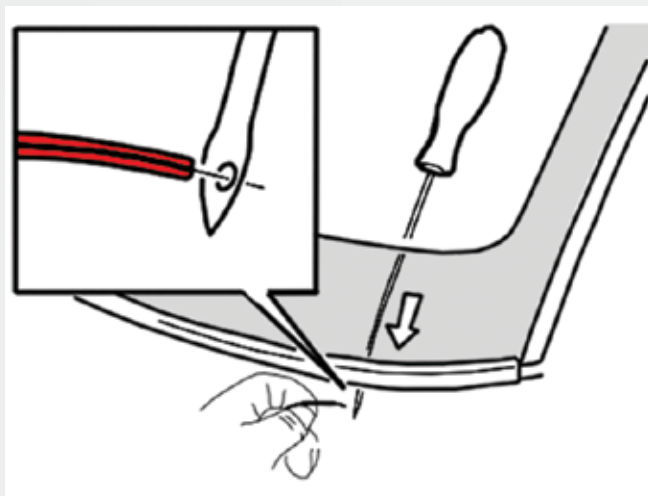
USE ONLY APPROVED SPECIAL EPOXY/URETHANE ADHESIVE

Volvo insists on the mandatory use of a special proprietary adhesive for any windshield replacement. This adhesive is unique to Volvo and available through Volvo dealers. This special adhesive is a two-part combination of epoxy and urethane, joined at the tip of the tube when dispensing, and bonds with an accelerator, and cures in three hours instead of eight hours. This nearly immediate bonding and rapid curing means the

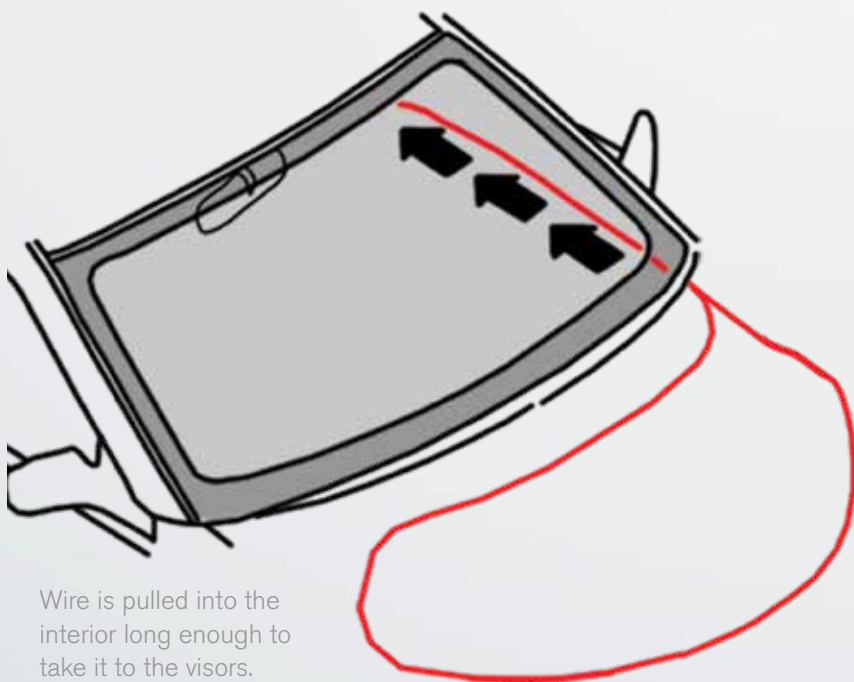
vehicle is ready to drive within a few hours of windshield installation.

With the opening clean, carefully apply a smooth, uniform bead of the special adhesive all the way around the windshield opening, after first making sure the new windshield edges are clean and ready for installation. To increase vehicle structural rigidity, Volvo's high shear strength adhesive is available in a glass adhesive and glass installation kit for repair work (Adhesive Kit #31298559) and includes:

- Adhesive cartridges



Both ends of the fine nylon wire are inserted through a hole pierced in the adhesive.



Wire is pulled into the interior long enough to take it to the visors.

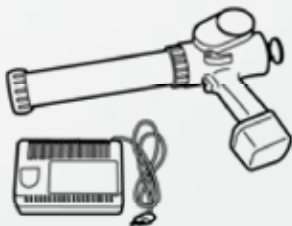
- Special adhesive applicator nozzle
- Glass cleaner
- Primer and instructions

PREPARE GLASS FOR INSTALLATION

Identify replacement glass part numbers to make sure you have the appropriate glass for the vehicle. This might include the last four digits of the part number under the Bar Code in glass identification information, usable when looking up the correct windshield for installation in the specific vehicle.

When replacing:

- Wear clean gloves to prevent fingerprints.
- Clean entire glass with glass cleaner and adhesive area with cleaner provided in kit.
- Attach any antennas or other connections, if appropriate.
- Depending on the age of the vehicle, apply the molding removed from the old windshield



Special dispensing tool combines the epoxy and urethane as the adhesive is applied around the windshield.

around the new windshield. Fit new molding if appropriate.

- Dry fit the new glass before the adhesive is applied, making sure the VIN plate aligns in the glass opening.
- Use tape to provide reference points.
- Apply the adhesive with an adhesive bead of 13-15mm, making sure that the adhesive bead is smooth and straight, there is no excess adhesive in one area with an uneven application, and there are no air bubbles which could result in an eventual leak. The glass should be installed soon after applying the adhesive, which will start to cure after 10 minutes.

INSTALL THE NEW WINDSHIELD

Keep door windows open when installing glass to prevent cabin pressure build-up. Install the new windshield, aligning the glass to reference points made previously using tape. Place the glass into the vehicle windshield opening, then press down firmly on the entire outer perimeter of the glass directly over the adhesive, which serves to anchor the glass to the vehicle frame.

The replacement is complete. Almost.

You must perform a water leak test after three hours and after the adhesive has cured. You should replace all removed clips and parts,

reconnect the rain sensor and make sure it is operative — and possibly recalibrate cameras that operate looking through the windshield using a scan tool. We say possibly recalibrate, because if a genuine Volvo replacement windshield is installed for a specific vehicle, recalibration will not be necessary. It should be checked to make sure calibration is on target, but probably unnecessary.

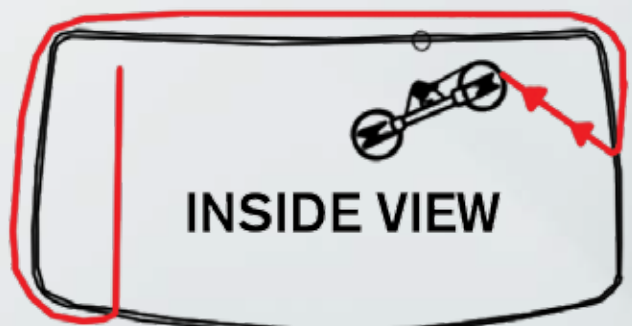
Non-OEM windshields will likely have slightly different optics that can render forward-looking cameras unable to provide accurate readings even if calibrated to the Lane Departure and Forward Collision warning camera, for instance, or other systems. These systems will not work correctly, may have aiming issues, the Lane Departure warning may activate too early while drifting to the right side of the lane and may not activate at all to the left until crossing the lane markings.

In addition to the driver annoyance factor and safety issues, such an installation will almost certainly bring an unhappy customer back breathing fire, and possibly invalidate insurance claims.

The idea is, if a system works by using the windshield, re-calibrate it to make sure it is within Volvo specifications. This may well use up the three hours needed for the windshield adhesive to cure before being able to turn the vehicle back to the owner for miles of safe driving — with a strong, sound, clear windshield. ●



Place the Rollout unit inside the windshield so the pulleys can begin to tighten the wire and pull it.



With wire tight and pulling, move Rollout unit to another position to continue bringing the wire around.



A PARTNERSHIP FOR SATISFIED VOLVO OWNERS

What's the most important thing that independent repair facilities and Volvo dealers have in common? We think it's our shared commitment to make Volvo drivers happy. One way to do that is to be sure everyone driving a Volvo car is always able to get Volvo Genuine Parts installed.

The advantages are clear. Today's sophisticated safety and performance features demand replacement parts that precisely replicate the originals. Volvo Genuine Parts also fit perfectly on the first try, which saves you time and money. Add to that a 2-year limited warranty* and you have a formula for satisfaction that's unmatched.

But there's more. Volvo can support your business on many levels. We cater to your needs with easy ordering, unrivaled availability, and you get access to technical information.

Satisfied Volvo customers –
the basis of a rewarding relationship.

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