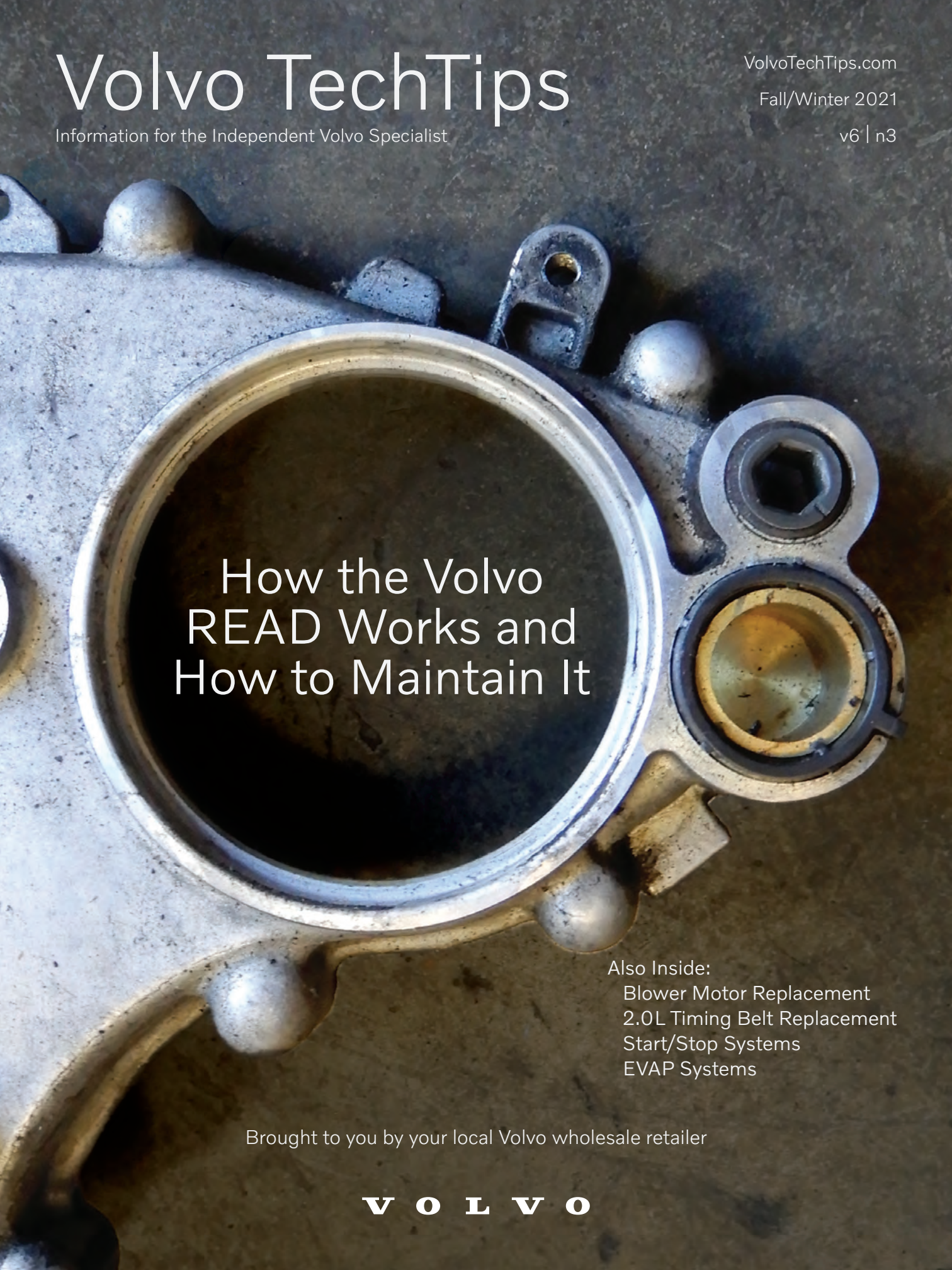
Volvo TechTips

Information for the Independent Volvo Specialist

VolvoTechTips.com
Fall/Winter 2021
v6 | n3



How the Volvo READ Works and How to Maintain It

Also Inside:

- Blower Motor Replacement
- 2.0L Timing Belt Replacement
- Start/Stop Systems
- EVAP Systems

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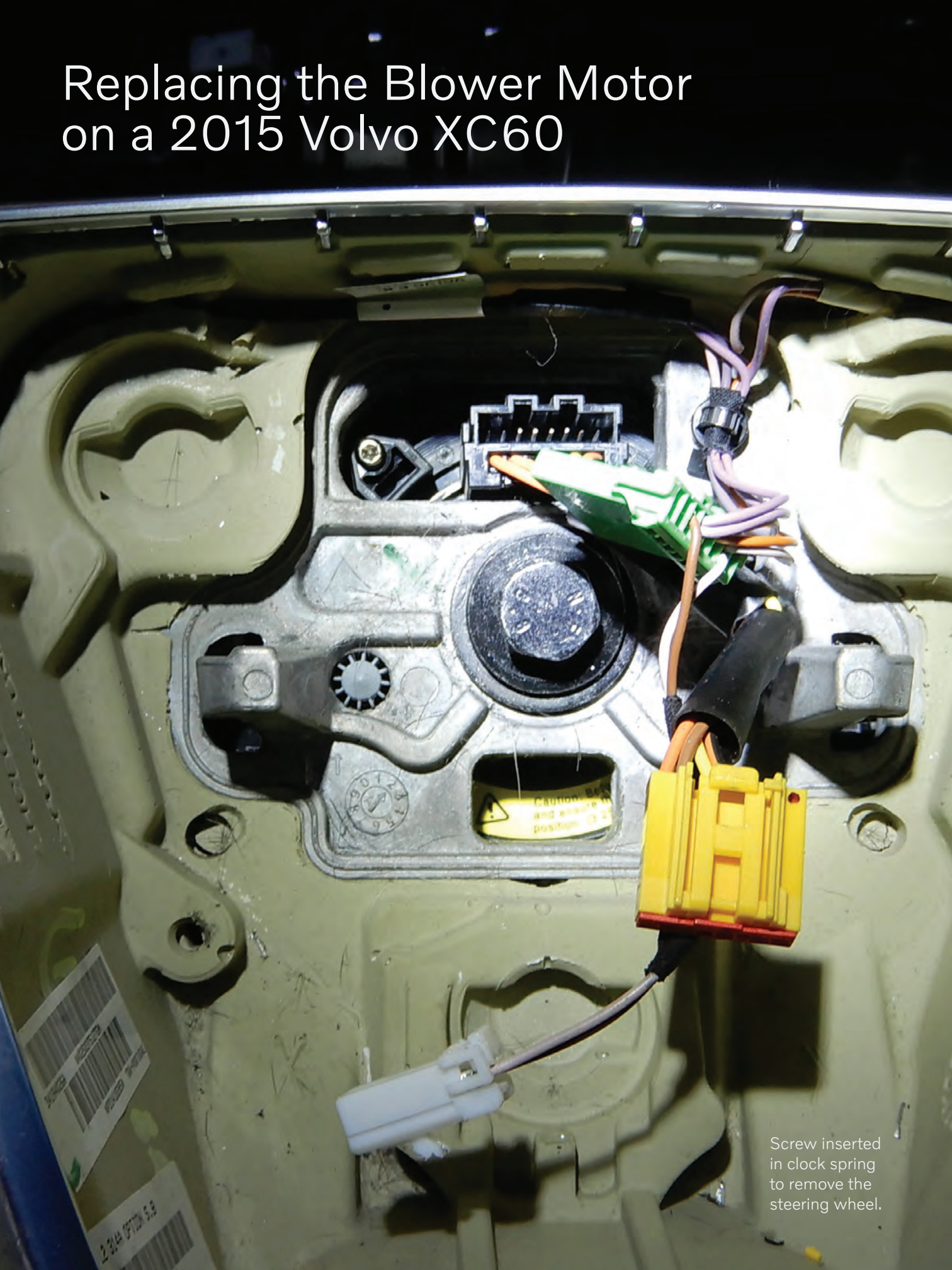
Features

Replacing the Blower Motor on a 2015 Volvo XC60



Screw inserted in clock spring to remove the steering wheel.

Remember the old 240s when you had to take half the dash apart to replace the blower motor? Well this job isn't quite the same, but the dash still has to come out.

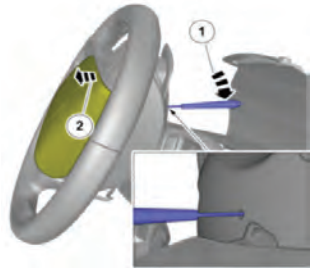
Let's look at one example

The blower motor on a 2015 Volvo XC60 is up underneath the dash, and the dash will have to come out in order to replace the blower motor. Although this job can be very daunting, with the right tools and the right instructions, it just becomes time consuming.

First, start by moving both front seats as far back as you possibly can. This will give you room to work on the dash and all of its components.

Open up the tailgate so you can put all the trim pieces and dash pieces in the back seat. Turn the ignition on and push the button at the climate control for recirculation. This will help to remove the blower motor. Roll down the windows and disconnect the battery negative terminal.

Remove driver's air bag assembly first. You will need to use a small screwdriver to pop the air bag loose. Turn the steering wheel so you can insert the screwdriver in the hole at the back of the steering wheel. Insert the screwdriver in the small hole on the back of the steering wheel at an angle and release each side of the air bag.



Screwdriver inserted in the back of the steering wheel to release the air bag, making sure to turn the steering wheel to the position with the access hole at the top.

Disconnect the air bag electrical connectors, and set the air bag in the back seat out of the way. Set the steering wheel to straight ahead, and insert a screw at the clock spring so the clock spring will not move.

Two T25 screws that need to come out when removing the trim around the DIM.

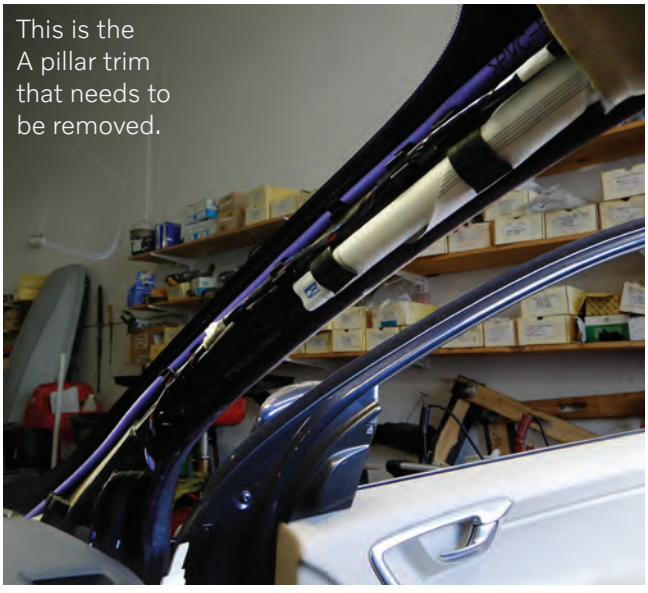
Remove the center nut at the steering wheel, being sure to mark the position of the steering wheel. Set the steering wheel out of the way. Remove the trim around the steering column. Pull up on the top trim, being careful where the trim is connected to the plastic trim around the DIM (Drivers Information Module). You will have to remove two Torx T25 screws and pop the trim loose, after which you can remove the trim components.

Remove the trim panel underneath the steering column to expose all connections at the column. This requires the removal of three T25 screws. Now remove four screws at the clock spring and electrical connection, and pull the clock spring straight up, making sure not to bend or damage the little pin connectors. Remove both the turn signal switch and the windshield wiper switch.

Remove four screws to remove the DIM and disconnect the electrical connector. Remove the parking brake switch from the dash (two screws hold it in place), and then disconnect the electrical connector. Set these aside with the other switches. Pop out the headlight switch assembly and disconnect the electrical connector. Remove the sensor at the front of the dash, pop it up with a bone tool and disconnect it.

Remove the driver's kick panel. Be careful and disconnect the electrical connector for the light. Slide

At the bottom trim at the steering column, remove three screws.


This is the A pillar trim that needs to be removed.

the OBD II connector out of its dash position, and let it hang out of the way. If the dash is equipped with speakers, remove them. Pull up on each grille carefully so as to not break it and remove the speaker from the dash. Remove the A pillar trim pieces on both sides.

Move to the passenger's side and remove the kick panel after removing two T25 screws. Empty and remove the glove compartment. To remove the glove compartment, remove the trim panel on the side of the dash to expose the dash bolts.

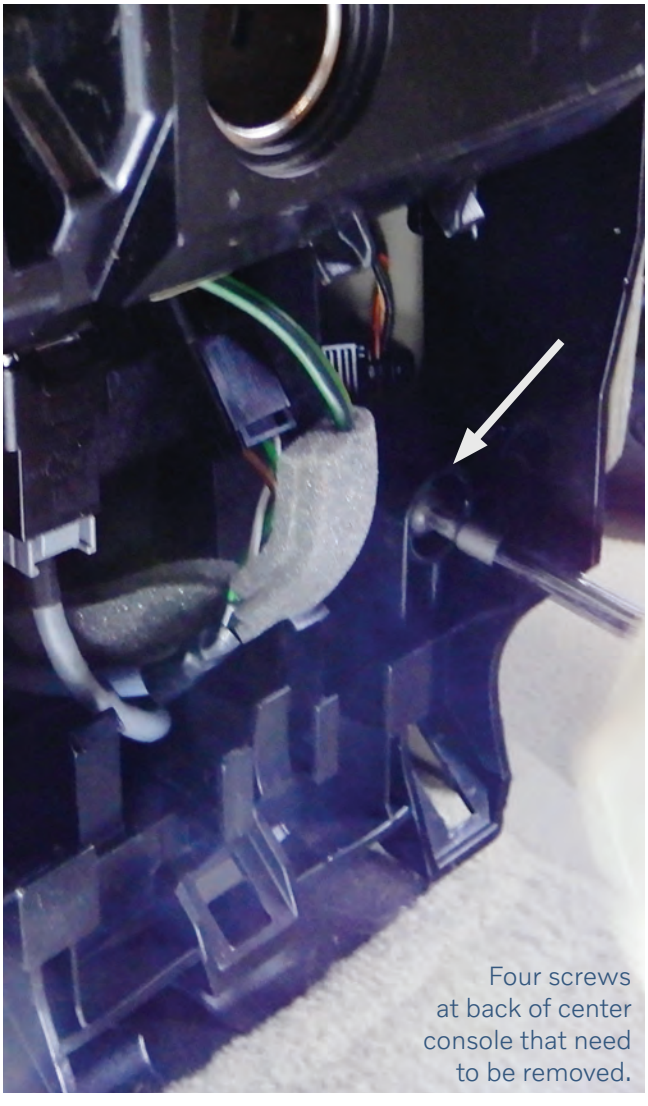
At the bottom of the glove compartment remove two screws, open the compartment and remove the light. Four screws hold the inner compartment; remove it and set it aside. Two more screws at back of glove compartment need to be removed. Now you will be able to remove the complete glove compartment.

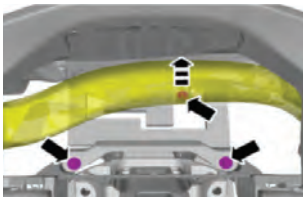
Now it's time to remove the center console. Remove the trim around the infotainment screen. Use a bone tool to pop the clips out, and disconnect the hazard warning switch.

Pop out the trim around the CD entrance. Remove six screws that hold the console controls, disconnect the electric connector and remove.

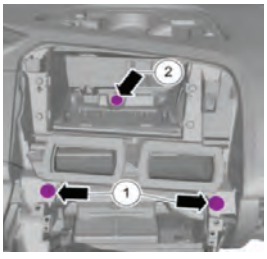
On both driver's and passenger's side remove the panels that are under the shifter console. Disconnect the shifter cable. Open up the top covers on the console and pull out the cup holder to expose screws. Remove five screws, one under the cup holder and the other four in the compartment behind the cup holder. Remove two screws at the top of the console at the back of the shifter. Then remove two more screws at the bottom of the console in front of the console near the front of the shifter.


Center trim around infotainment screen.


Four screws at back of center console that need to be removed.



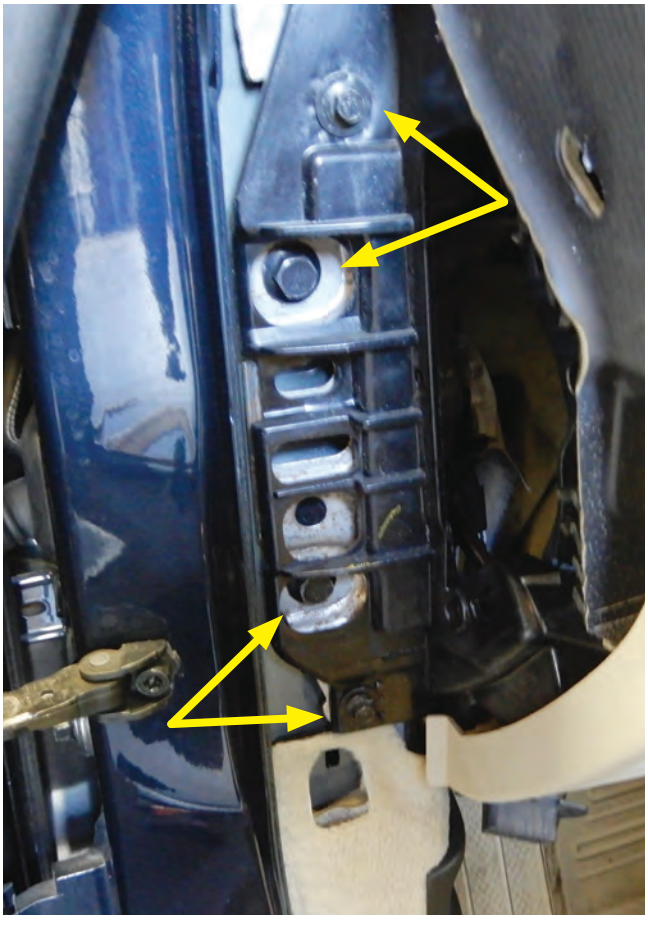
Three bolts behind the DIM need to come out to remove the dash.



Three bolts at center of dash need to be removed when removing the dash board.

On the back of the console, remove the trim by popping it out with a bone tool. Disconnect the 12 volt connector. Remove four top and bottom screws. Remove the back bracket from the console.

Remove the center console from the vehicle. The trim around the shifter and up around the infotainment system can now be removed.



Four bolts, two on each side of the dash, near the A pillar need to be removed.

Remove six screws that hold in the infotainment module and screen, disconnect the electrical connection and remove the units. Remove the trim around the ignition switch, remove the screws, and pull out the switch, disconnecting the electrical connector.

Remove the bolts at the shifter box and remove the shifter, making sure to disconnect the electrical connectors.

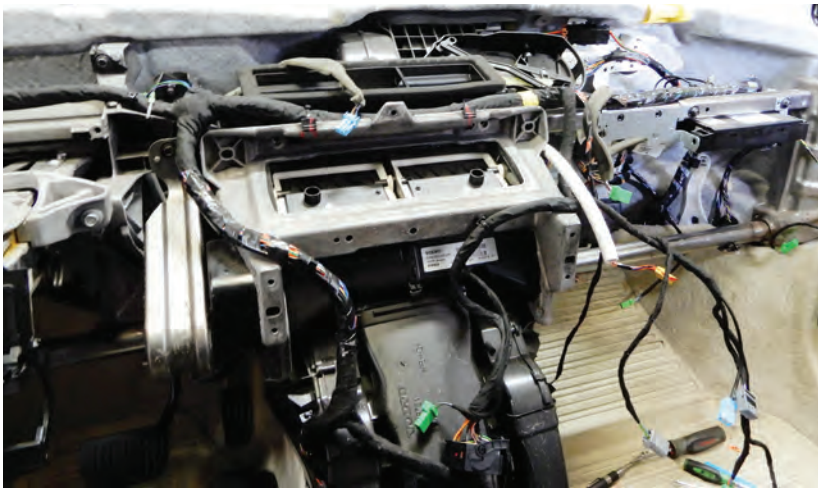
Now we can work on removing the complete dash. Behind the DIM there are fasteners that need to come out.

In the center of the dash, there are three bolts that must be removed: one right behind the navigation screen; the other two right below the climate control duct.

On each side of the dash there are two bolts that need to be removed, near the A pillar.

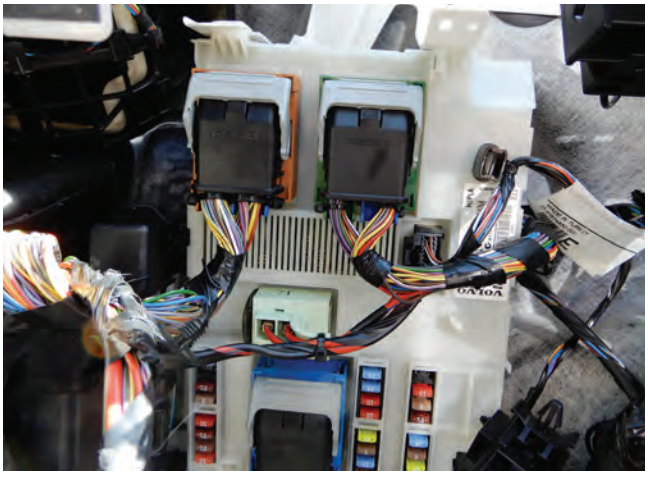
Remove the bracket that is behind the glove compartment and disconnect the electrical connector for the passenger air bag.

Now that all bolts and components have been removed, the dash can be lifted out. This will be a two-person job to remove the dash. With a technician on each side of dash, pull the dash straight out, making sure nothing is still connected. Remove the dash from the vehicle and set it aside, making sure not to damage it.



Left: Dash removed from vehicle in order to remove blower motor.

With the dash removed, now we can work on getting to the blower motor and removing it. Support the bar across the top of the dash; the passenger's side will need to come out. You might want to take a picture just to make sure that when putting it back together, you get the correct bolts in the correct positions. Also pay attention to how the wire harness is positioned.



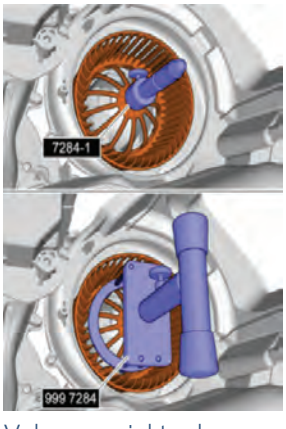
At the CEM on the passenger's side, the electrical connections need to be unplugged. Then remove the CEM from the vehicle.

On the passenger side, remove the plastic cover over the fuses on the CEM (Central Electronic Module). Disconnect all connectors at the CEM and pop out the CEM from the vehicle. Remove the bracket that supports the CEM and the three bolts that hold it in place.

Remove the air quality sensor and disconnect the electrical connection; undo the harness for the sensor and move it out of the way.

In the middle of the dash near the windshield, you will be able to see the blower motor. You need to remove three T25 Torx screws from the cover to expose the blower motor. Place Volvo special tool number 999 7284 onto the shaft at the end of the squirrel cage connected to the blower motor. Make sure that the tool adjustment is pointing up.

On the back side of the blower motor, disconnect the electrical connector, and if there is a screw on the backside above the connector, remove the screw. On the back side of the blower motor is a tab lock at the top of the motor. Pushing that tab down, turn the tool 15 degrees counterclockwise and remove the blower motor from the vehicle. Remove the tool from the old blower motor and install on the new blower motor.



Volvo special tool number 999-7284 connected to the blower motor for removal.

Set the new motor and tool in place and turn to lock in place. On the back side of the blower motor, insert a screw through the blower motor and into the housing. This will help keep the motor in the correct position.

Let's put it all back together

NOTE

P3 vehicles up to and including some 2015 should get a piece of weatherstrip tape added under the wiper cowl to prevent water from running down the windshield frame and dripping into the fan motor. See TJ 27558 for more information.

Connect the electrical connector at the blower motor. Install the bracket for the CEM, using the three 8 mm bolts. Install the support bar and secure into place.

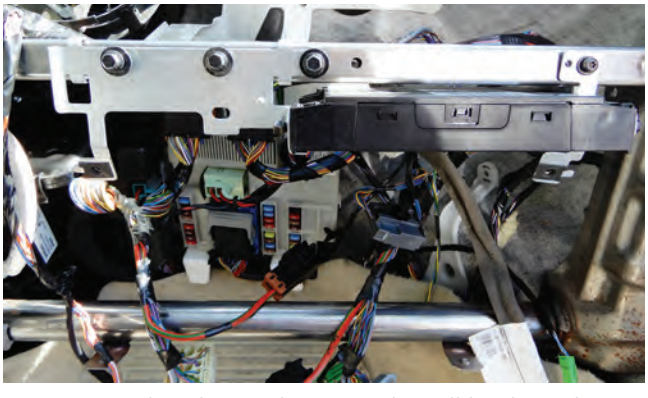
Set the CEM into the bracket and push into place. Attach all electrical connectors carefully, making sure not to bend any pins at the module.

Time to set the dash back into vehicle; you need some help to do this. Set the dash in, making sure all wire connectors are close to their hookups. Install the two bolts on each side of dash near the A pillar, but don't tighten them yet.

Install three bolts at the center of the dash, one behind the infotainment module and two below the center vents, one on each side. Now make sure the dash is in place and tighten the A pillar bolts on each side of the dash. Tighten the three center dash bolts.

Behind the DIM, install the three bolts and tighten them. Install the sensor at the top of the dash and pop into place. Install the ignition switch with bracket and set into place, securing the three screws that hold it into place. Set the infotainment screen into place and tighten the screws. Plug in the DIM and secure into place. Install the infotainment module making sure to connect the electrical plug.

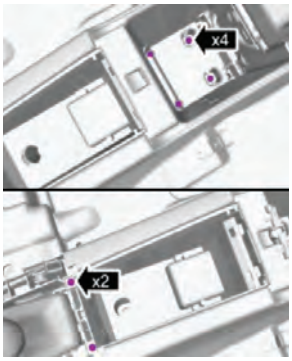
Put the shifter box into place and tighten down. Install the shifter cable and all electrical connections at the



CEM, CEM bracket and support bar all back in place.

shifter. Set the center console cup holder assembly into place. Connect the 12 volt electrical connectors both front and back. Install four screws at the back of the console and two on top in front on the console. The four screws inside the console compartment can now be installed and tightened.

Set the compartment cover and frame into place and snap in. Put the back console trim into place. Install the cup holder and secure. Now that the center console is in place, let's install the trim piece that has the climate control module. Connect the electrical connectors and tighten down. Install the trim around the vents, connecting the electrical connector at the flasher switch.



Install four screws inside the console compartment, and two screws at the front of the console and tighten.

Secure the DIM with the four T25 screws. Pop in the parking brake switch the headlight switch and the OBD II diagnostic socket. Install the steering wheel module, clock spring and both combination switches, making sure not to damage the electrical pins at the connections.

Add the trim at the bottom of the steering column and slide into place, securing with three T25 screws. Add the trim at the top of the column and around the DIM and secure. Install the steering wheel and make sure to remove the screw in the clock spring so not to damage it. Install the driver's air bag, connect and push into place. Install the kick panel at the driver's side and the panel at the console bottom.

Now over to the passenger's side to finish this job up. Install the bracket by the passenger's air bag and connect the air bag. Install the glove compartment, connect the electrical connector for the light. Install the screws inside the compartment and two at the bottom of the compartment. Secure the kick panel and console trim on the passenger's side. Install the trim pieces on both sides of the dash and trim at the A pillars on both sides.

Connect the battery in the vehicle and check to make sure everything is working correctly.

As with previous models, replacement of the blower motor on newer vehicles is not a simple job. Attention to detail and patience will assure a satisfying outcome. ●

Volvo 2.0L Timing Belt Replacement

There is not a lot of aftermarket information out there about the procedure of replacing this timing belt yet. With VIDA, you can get complete, step-by-step instructions.

Independent shops that work on Volvos are working on more and more newer Volvos that are equipped with the relatively new 2.0L B4204 engines in their various configurations.

If you have been working on Volvos for a while, you know that they have had a lot of engine variations over the years, but now they are going back to their roots by using the same displacement engine in all their models, even the hybrids.

Volvo has used a 2.0L engine before, in Volvos made in 1968 trough 1975, that had the B20. Of course the early Volvo 2.0L engine and the new one are galaxies apart in so many ways.

Since these cars are relatively new, most independent technicians have not had the opportunity to replace a timing belt on one of these cars, since the service interval for the timing belt is 150,000 miles or 12 years, whichever comes first.

Of course that service interval is for cars that are driven under the rare and mysterious “normal driving conditions.”

There is not yet a lot of aftermarket information out there about the procedure of replacing this timing belt.

On platforms like Alldata or Mitchell there is very little information, at least that was the case at the time this article was written.

But there is hope. If you have Volvo’s Service, Parts and Diagnostic Application VIDA (Vehicle Information and Diagnostics for Aftersales), you can get complete, step-by-step instructions in the Information tab. You will have to have an active subscription and have the car that you are working on connected or selected.

If you do not already have VIDA, you can learn more about it, including pricing and how to get a VIDA subscription, by visiting volvotechinfo.com and selecting the "VIDA" tab.

Since these cars will soon be out of warranty and getting higher mileage on their odometers, you will have more Volvos come into your shop that will be due for a timing belt replacement, so get ready for them.

The special tools for this job are pretty inexpensive, and when you need them you don’t want to have to put off the job until they come in the mail or from your dealership parts department, just get them now.

Remember Volvo is using this 2.0L engine in all their late models now; that’s a lot of Volvos with basically the same timing belt setup.

The relatively new Volvo 2.0L engine has several improvements that lessen stresses on the parts as compared to any previous Volvo engine.

One thing is the huge harmonic balancer and the design of the crank gear and timing belt; the belt teeth are a 1 mm oval shape.

The slight oval shape of the timing belt helps counteract the kind of tight-loose cycling that comes from the power stroke followed by the crankshaft slowing down from the next compression stroke on the next cylinder in the engine's firing order.

This is a relatively easy job for a skilled technician that has done a few timing belt jobs on other cars.

The tools that are needed to perform this job are pretty standard, but you will need some special tools to do the job right.

Volvo 2.0L engine

You will need a special tool Volvo calls a Counter Hold Tool (Volvo part # 999 7497) to align and hold the camshaft gears in place when the belt is removed.

You will also need tool # 999 7495, another Counter Hold Tool, which is actually two tools under the same number. They are

There are basically two Volvo special tools needed when you replace the timing belt on a 2.0L Volvo engine, parts #999 7497 and 999 7495. The first one is called a Counter Hold Tool and it is critical when you preform this job to keep the camshafts in time when the belt is off. The other one is also call a Counter Hold Tool, but it holds the crank pulley in place when removing and torquing the bolts.

used together to hold the vibration damper pulley in place while removing and torquing the five bolts that hold it together and mount it to the crankshaft.

Parts needed for this job

Since you only replace this timing belt at 150K miles, it's obvious that you should use the best parts available; don't try to save money here — it's just not worth the risk.

We all know that it's the timing belt tensioner and idler bearings that are usually the weak points in late style timing belt setups. Do yourself and your customers a favor and only use genuine Volvo factory parts to perform this job.

And there's good news: Volvo sells most of the parts you need for the timing belt job as a kit, part number 32213096. It comes with new bolts, idler bearing, tensioner with bearing, new mounting for bearings, new crank balancer washer and timing belt.

You will still need the special washer that goes between the vibration damper pulley and the end of the crankshaft. You'll also need to specify a new auxiliary belt.

The crank balancer washer is made with diamond dust and is designed to keep engine vibrations from

Volvo sells a parts kit that has all the parts that you will need to do this job properly, except for the auxiliary belt and washer for the vibration damper.

Harmonic balancedr removed

allowing the harmonic balancer from moving back and forth, which could loosen the bolts over the long service life of the timing belt.

This washer must be replaced any time the harmonic balancer is removed for any reason; the bolts and the washer can be purchased separately.

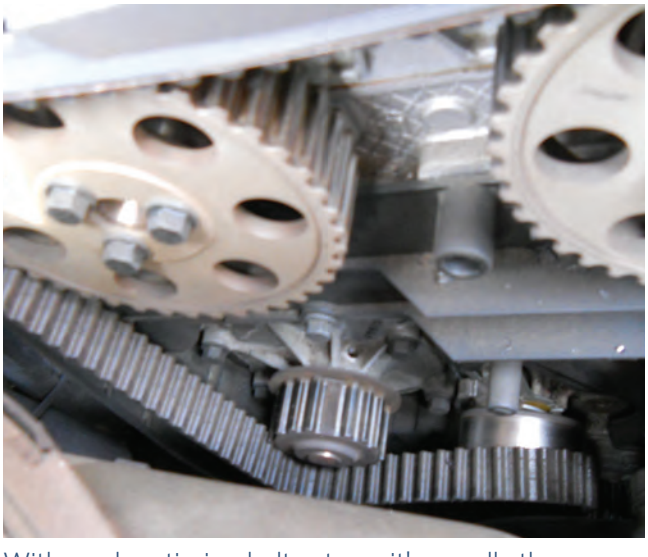
Torque specs are very important when doing this timing belt replacement. The 2.0L engine is a very complex design with very tight tolerances, so if the torque specs and procedures aren't followed exactly, you may be setting yourself up for trouble.

Torque specs for 2.0L timing belt replacement

Auxiliary belt tensioner and idler mounting bolts:	24 Nm
Timing belt tensioner bolt:	24 Nm
Timing upper cover:	10 Nm
Timing belt idler bearing bolt:	24 Nm

4 X M10 Damper Bolts	
Stage 1:	20 Nm
Stage 2:	90 degrees angle torque

Central Damper Bolt	
Stage 1:	110 Nm
Stage 2:	90 degrees angle torque



With modern timing belt setups, it's usually the bearings and tensioner that fail first. The timing belts in modern engines are made so tough that breakage is extremely rare.

Bearing failure is by far the number one cause of timing belt failure in most modern cars. The actual timing belt itself rarely breaks even if the customer goes well beyond the factory recommended replacement mileage interval.

This is because automotive engineers have over-designed these modern timing belts to handle almost anything the engine and driver can throw at them, even in extreme temperatures.

Timing Belt Replacement

Just like all timing belt replacement jobs, you will start by putting the car on a lift and disconnecting the negative battery post on the main battery. On Start/Stop cars, read up on battery disconnection procedure.

Remove the splash shield under the engine.

Remove splash pan

Outer fender liner pulled back

Remove the right front wheel.

Remove two screws and the plastic 10 mm nut and fold back the inner fender liner to expose the harmonic balancer pulley.

On some of the models there is a second plastic cover under the inner fender liner; remove the two clips and pull it down out of the way.

Be careful when working around the load level sensor bolted to the right inner frame rail; you should not have to remove it to do this job.

Next, you will have to remove the right motor mount assembly. (Volvo calls it an engine support insulator.)

You should support the engine from the bottom or the top when you remove any motor mounts.

You can use an engine support brace assembly and hold the engine up from the top. Or you can lower the car down and support the engine from the bottom while you do the job.

Volvo makes a tool for this or you can carefully use a jack and a block of wood.

Be careful if you use a jack to push up on the oil pan; you could damage or crack it. The thin aluminum casting on the bottom of the oil pan was not designed to handle the load of lifting the engine. You don't want to have to call your customer and tell them that you have to replace their oil pan as part of the service.

Remove two clips for second inner fender liner

The right motor mount design will differ slightly from model to model depending on the configuration.

You should inspect this mount for leaks and wear; it may need to be replaced, especially if the car has 150,000 miles on it and the mount is original.

Next remove the auxiliary belt (it should be replaced at this time).

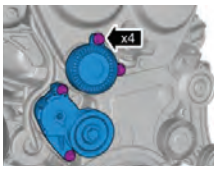
Second inner fender cover

Volvo engine support tool

Right torque mount

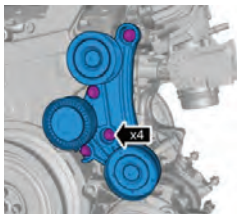
Next, remove the auxiliary belt bearing and tensioner assemblies on both left and right of the timing belt; they have four M8 mounting bolts each.

Left auxiliary belt mount



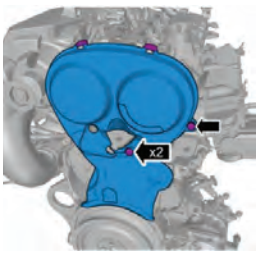
Remove the bolts from timing cover and remove the cover.

Right auxiliary belt mount



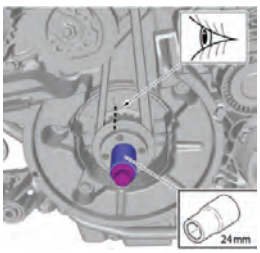
Now it's time to put the engine on top dead center, cylinder number 1.

Remove timing cover bolts



You can use the handle part of tool # 999 7495 to turn the crankshaft.

Position the crankshaft so marks line up on the gear and engine case.



Crank TDC Mark

Remove vibration damper

When removing the vibration damper, you will need Volvo special

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tool # 999 7495, which is actually in two parts that fit together to hold the crankshaft in place and can be used to turn the crankshaft as well.

Turn engine with special tool #999 7495

Don't try to hold the pulley with another tool like a chain wrench or some giant pliers because you will damage it.

Next, Install cam holder tool # 999 7497 and turn cams outward to take up any slack in the belt and tighten bolts to 25 Nm.

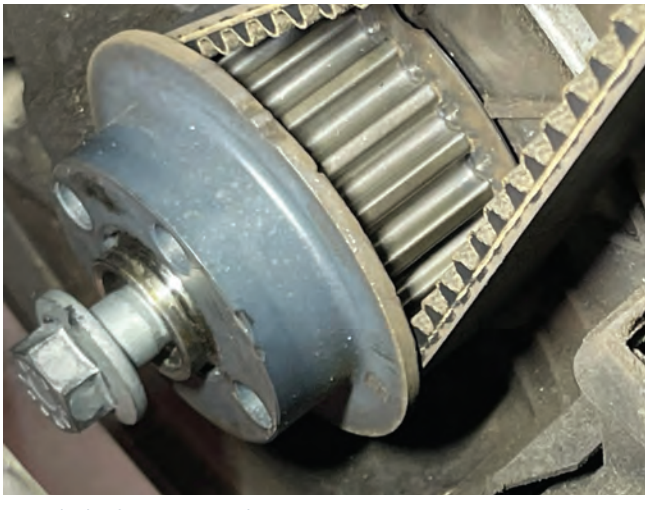
Next, loosen the bolt for the timing belt tensioner and turn the adjuster to let the tension off the timing belt and remove the belt.

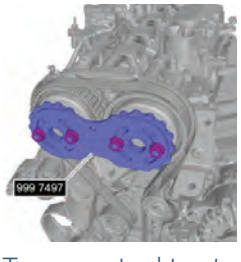
Remove the idler bearing bolt and bearing.

Now it's a good time to clean the timing belt area with a mild degreaser and air pressure.

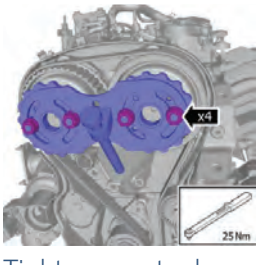
Inspect the cam sprockets and crank gear for leaks or wear and make sure they are still on TDC marks.

Install the new idler bearing and new bolt; then torque to 24 Nm.


Crankshaft TDC Mark



Turn cam tool to stop



Tighten cam tools to 25 Nm

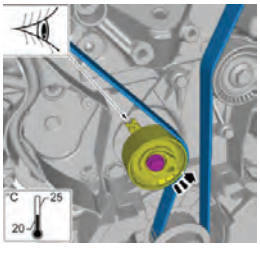

Tensioner alignment mark

Install the new tensioner bearing and new bolt, but don't tighten fully yet.

Install the new timing belt. Start from the crank sprocket, then run to the idler, and then to the right cam gear; install around the tensioner last.

Remove the cam holder tool and make sure all TDC marks are still on.

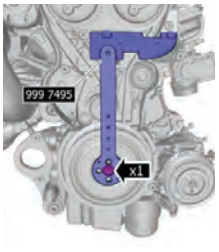
Use an allen key to adjust the tensioner so it is aligned to the notch in the belt tensioner bracket and tighten to 24 Nm.



Adjust depending on temperature

Next, verify that the belt is set up correctly by rotating the engine twice in a clockwise direction; then bring it back to TDC and recheck your marks and tensioner settings.

Install the vibration damper with new washer installed and set up the Counter Hold Tool (999 7495) and install new bolts.



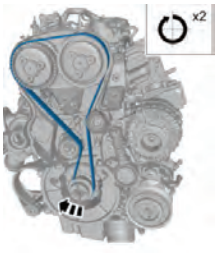
Tighten damper bolts with tool #999 7495

Tighten bolts to specs as seen in the diagram above.

Reinstall the timing cover and auxiliary belt bearing assemblies with new auxiliary belt.

Reinstall mounts and the rest of the parts in reverse order.

Test drive and you're done! ●



Turn crank two times clockwise

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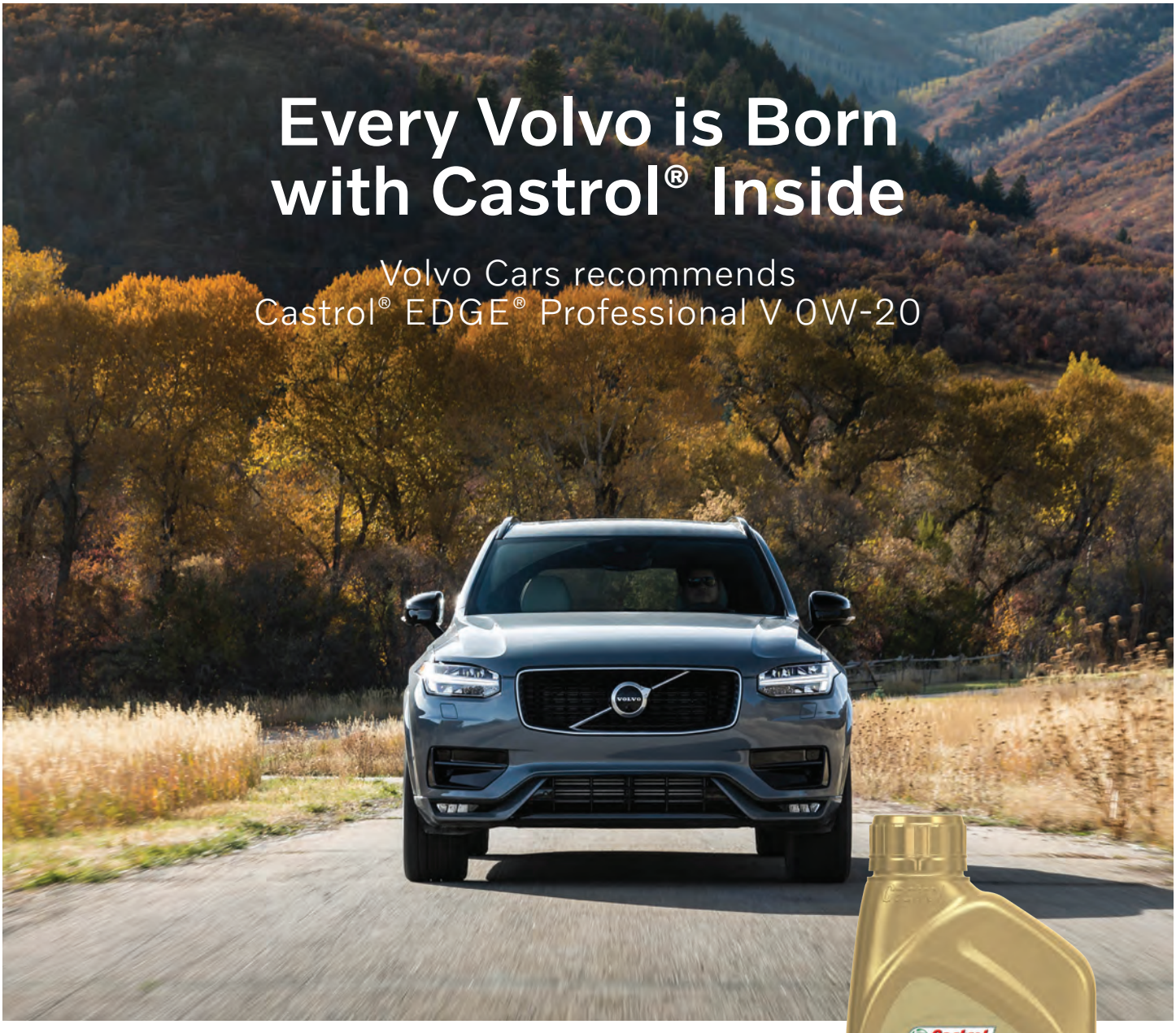

Castrol EDGE Professional V 0W-20 is exclusively engineered in collaboration with Volvo Cars for use in Volvo Drive-E engines. Every litre is certified CO_2 neutral according to the highest global standard.

Engineered with patented **FLUID TITANIUM**, Castrol EDGE Professional transforms to be stronger under pressure and reduces metal-to-metal contact to unlock the true performance of the engine.

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Understanding Volvo Start/Stop Systems and How They Work

A lot of customer complaints about the Start/Stop function can be traced to lack of knowledge about how the system works.

Whether you like the Start/Stop feature or not, you should get to know these systems because the automatic start and stop systems will be part of the way car makers are meeting the tighter emission standards for the foreseeable future.

These systems were first introduced in some hybrid cars as a way to switch from the combustion engine to the electric motor/generator systems.

Volvo first introduced their version of Start/Stop technology in 2009 in cars with their Drive-E branding.

Start/Stop systems were developed as a way for auto makers to help reduce emissions and increase overall fuel efficiency.

A lot of unnecessary hydrocarbons and other ozone depleting emissions are generated all over the world by cars idling in traffic every day.

And then there's the wasted fuel. A study that was done in 2012 stated that in the United States alone, idling wastes approximately 3.9 billion gallons of gasoline per year.

Some states have passed laws pertaining to idling, setting time limits on excessive idling, especially in places like loading zones and places where the vehicle will be parked or stationary for more than a few minutes.

Cars that are equipped with Start/Stop systems have different support components and electrical systems than cars with conventional drivetrains.

Modified electrical demands in cars with Start/Stop systems

During the Start/Stop or Auto Stop function, the standby battery supplies power to all the electrical accessory demands, including the air conditioning, radio (infotainment system), interior cooling fan, electric water pump, wipers, lighting, etc.

During a Start/Stop event, the battery can be drained to a predetermined level before the battery monitoring module would command the starter to engage and restart the engine.

Vehicle system modifications

Many vehicle alterations had to be made to standard engine parts to make Start/Stop systems practical; we could never achieve the same desired effect by turning off the engine manually.

First off, the starter motor has to be a lot more robust so it will stay reliable, despite being used far more often than a conventional starter motor.

The batteries for these cars have to be the deep cycle type, that can endure more frequent draws from the starter. They also have to maintain power to the accessories like the electric water pump for the engine coolant when the engine is in the Stop mode.

Electric pumps are also necessary to maintain hydraulic pressure to the transmission when the engine is in Stop mode, so there is no felt power loss when the driver steps on the accelerator and the engine restarts and the car starts to move forward.

Most problems that technicians are seeing with Volvo Start/Stop systems stem from the batteries or, in rare cases, the starter motor.

These systems would not work with some standard engine components because of the extra load being put on, not just the starter motor, but many other drivetrain components as well.

Auto makers had to redesign many of the existing internal combustion engine components and come up with a few new ones to handle these systems. For example, cooling systems had to include electric water pumps so the coolant would still be flowing when the engine was in the stop part of the cycle.

Customer education

A lot of customer complaints with the Start/Stop system will end up being lack of knowledge of how these systems work.

Your customers will come to you with all kinds of perceived problems with the Start/Stop function and insist that it was not working right.

The customer may not even know what “working right” means.

This happens a lot, especially when two people share one car. That’s because most people have totally different driving styles.

One person may have the habit of switching off the Start/Stop function every time they drive the car, while the other driver may not even know there is an option to do this.

Pandemic problems

The pandemic has brought about a lot of challenges in our world, in all areas of our lives.

The work-from-home culture has changed the way your customers drive and maintain their cars. Your shop has probably seen a large number of cars being towed in with battery problems due to customers letting their cars sit idle for days and weeks at a time.

This is fine if your customer has an old pre-CAN bus network car, but this is not the case with any car made after the year 2000.

The CAN bus network communication can continue even when the car is dormant for days. Not all nodes will go to sleep and stay asleep, and this can cause the battery to drain.

Volvo vehicles are no exception. Even if the main battery is able to start the engine, the Start/Stop may not function due to the small standby battery being discharged.

Volvo vehicles like to be driven.

How the Start/Stop system works on Volvo vehicles

Driving with Start/Stop function

The Start/Stop function temporarily switches off the engine when stationary and then restarts it automatically when the journey is resumed.

The Start/Stop function is available when the car is started and can be activated if certain conditions have been met.

The driver display indicates when the function is:

- Available
- Active
- Not available

All of the car's normal systems such as lighting, radio, etc. work normally, even when the engine is auto-stopped. However, some equipment may have its output temporarily reduced, such as the climate control system's fan speed or extremely high volume on the audio system.

Auto-stop

The following is required for the engine to auto-stop:

- Stop the car with the foot brake and then keep your foot on the brake pedal - the engine stops automatically.
- In drive mode Comfort or Eco, the engine may auto-stop before the car is completely stationary.
- With adaptive cruise control or Pilot Assist activated, the engine will auto-stop after approximately three seconds.

Auto-start

The following is required for the engine to auto-start:

- Release the brake pedal - the engine will auto-start and you can continue driving.
- On an uphill gradient Hill Start Assist (HSA) engages, which prevents the car from rolling backwards.
- When the Auto Hold function is activated, auto-start is delayed until the accelerator pedal is depressed.
- When adaptive cruise control or Pilot Assist is activated, the engine will auto-start when the accelerator pedal is depressed, or by pressing the button on the left keypad of the steering wheel.
- Maintain foot pressure on the brake pedal and depress the accelerator pedal — the engine auto-starts.
- On a downhill gradient: Release pressure on the brake pedal slightly so that the car begins to roll — the engine will auto-start after a slight speed increase.

Symbols in the instrument panel

White: Displayed in the tachometer when the function is available.

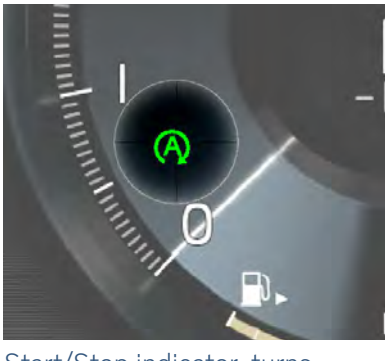
Green: Shown in the tachometer when the function is active and the engine is auto-stopped.

Gray: When the symbol is grayed out with a line through it, the function is not available.

If no symbol is shown, the function is switched off.

With 12-inch driver display

- A pointer in the tachometer points to READY when the function is active and the engine is auto-stopped.
- No text is shown when the function is deactivated.



Start/Stop indicator turns green when system is active. (Courtesy Volvo Cars.)

READY is grayed out when the function is not available.

Conditions for the Start/Stop function

For the Start/Stop function to work, a number of conditions must be met.

If any condition is not met, this will be indicated in the driver display.

The engine does not auto-stop

The engine does not auto-stop in the following cases:

- The car has not reached approximately 6 mph after starting.
- After a number of repeated auto stops, speed must again exceed approximately 6 mph before the next auto-.
- The driver has unfastened the seat belt.
- The capacity of the starter battery is below the minimum permissible level.
- The engine is not at normal operating temperature.
- The ambient temperature is below approximately 23°F (-5°C) or above approximately 86°F (30°C).
- The windscreen's electric heating is activated.
- The environment in the passenger compartment deviates from the set values.
- The car is reversed.
- The starter battery's temperature is below or above the permitted limit values.
- The driver makes sweeping steering wheel movements.
- The road is very steep.
- The hood is opened.
- When driving at high altitudes when the engine has not reached operating temperature.
- The ABS system has been activated.
- In the event of heavy braking (even without the ABS system having been activated).
- Many starts during a short period of time have activated the starter motor's thermal protection.
- The exhaust system's particulate filter is full.
- A trailer is connected to the car's electrical system.
- The gearbox is not at normal operating temperature.
- The gear selector is in M (±) position.

The engine does not auto-start

In the following cases the engine does not auto-start after having auto-stopped:

- The driver is unbelted, the gear selector is in P position and the driver's door is open. A normal start must take place.

The engine auto-starts without the brake pedal having been released

In the following cases, the engine auto-starts even if the driver does not take his/her foot off the brake pedal:

- High humidity in the passenger compartment forms misting on the windows.
- The environment in the passenger compartment deviates from the set values.
- There is a temporarily high current take-off, or starter battery capacity drops below the lowest permissible level.
- Repeated pumping of the brake pedal.
- The hood is opened.
- The car starts to roll or increase speed slightly if the car auto-stopped without being completely stationary.
- The driver's seat belt buckle is opened with the gear selector in D or N position.
- The gear selector is moved from D to R or M (±) position.
- The driver's door is opened with the gear selector in D position — a "ping" sound and text message indicate that the ignition is on.

Warning

Do not open the hood when the engine has auto-stopped. Switch off the engine normally before lifting up the hood.

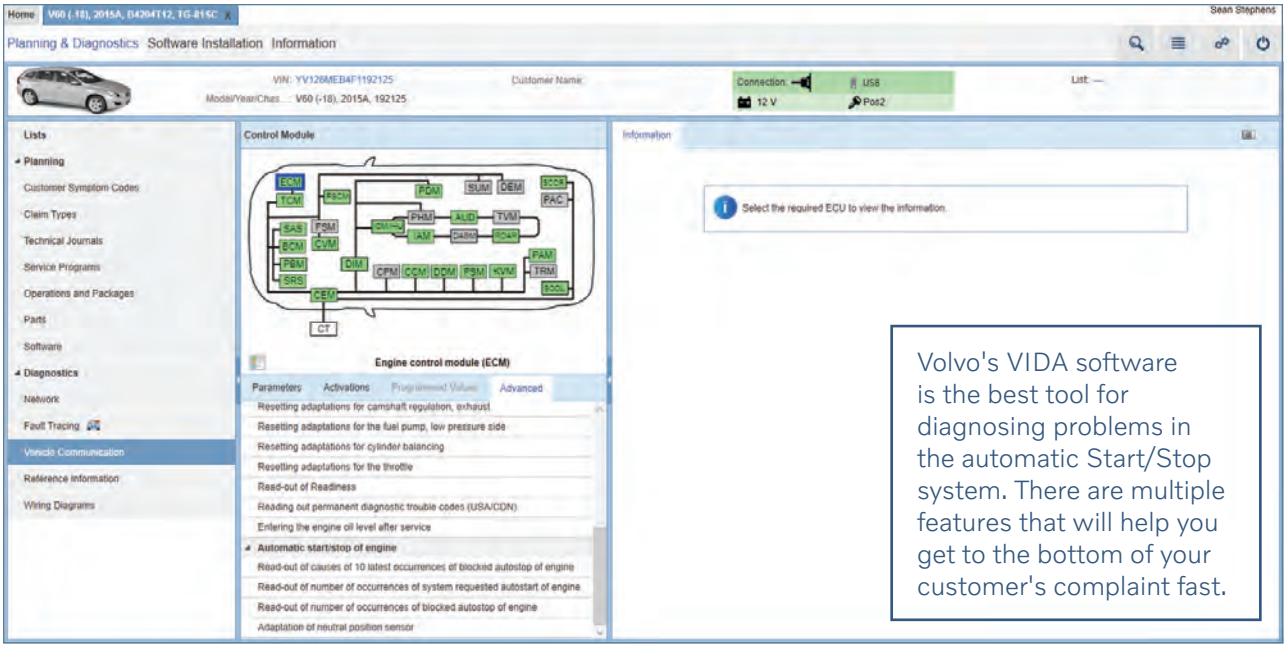
The Start/Stop function is disabled if the support battery is weak or the voltage is out of range.

Using VIDA to diagnose Start/Stop problems

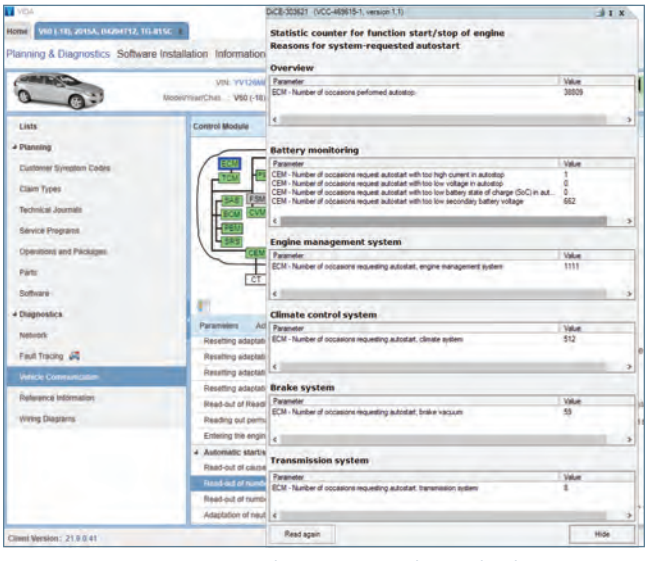
Volvo's Service, Parts and Diagnostic Application VIDA (Vehicle Information and Diagnostics for Aftersales) is one of the best tools to diagnose issues with the Volvo auto-Start/Stop system.

You can use VIDA to see all kinds of useful data and run active testing on the system.

Even if there are no codes stored at the time you check the car, the CEM will record and store a lot of data PIDs.



Volvo's VIDA software is the best tool for diagnosing problems in the automatic Start/Stop system. There are multiple features that will help you get to the bottom of your customer's complaint fast.

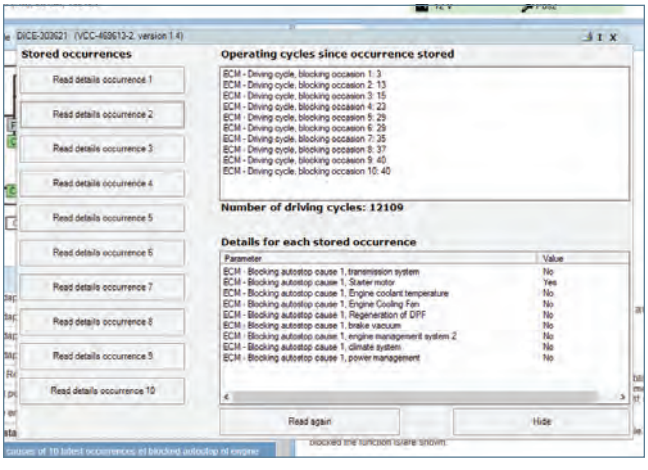


Using VIDA to access the CEM in the Vehicle Communication tab, you can select Advanced and see that there are multiple tools available to check data. On this screen you can see how many times the Start/Stop function was called for and for what reasons.

One of the most common causes of problems with the Volvo automatic Start/Stop system stems from problems with the batteries. Yes, batteries, plural.

All Volvo vehicles that come equipped with the automatic Start/Stop system have two batteries — a main battery and a small standby battery. The standby battery's main purpose in life is to run the car's functions when the engine is off and in standby mode.

The support battery is located in different locations depending on model and year. Be sure to reference VIDA to find locations.



The last ten occurrences that the Start/Stop function was blocked and the last ten causes. This will help you greatly when trying to pinpoint a common cause.

Volvo battery testing

Volvo states that checking the status of the batteries on SPA/CMA and P3 models should be done by the onboard battery monitoring sensor and related battery systems.

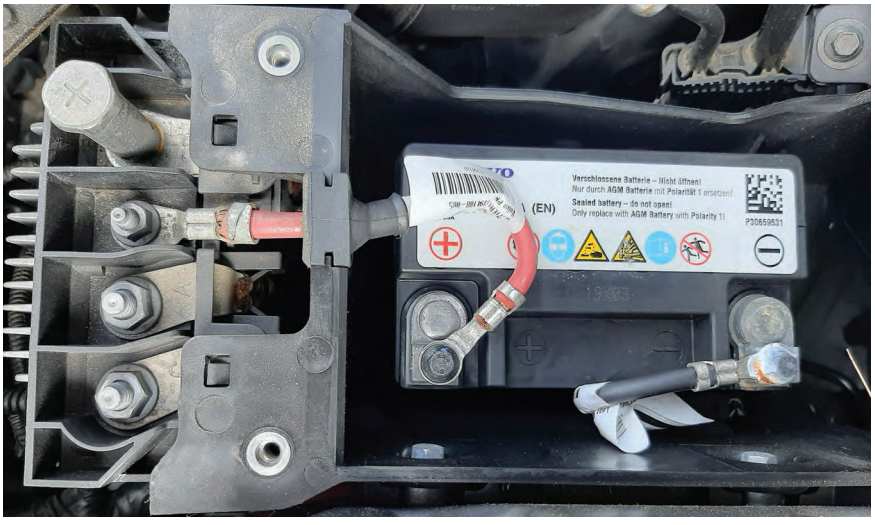
That's unless the driver sees a battery warning displayed in the DIM screen.

The standby battery is an AGM battery that is specifically designed by Volvo engineers for this purpose.

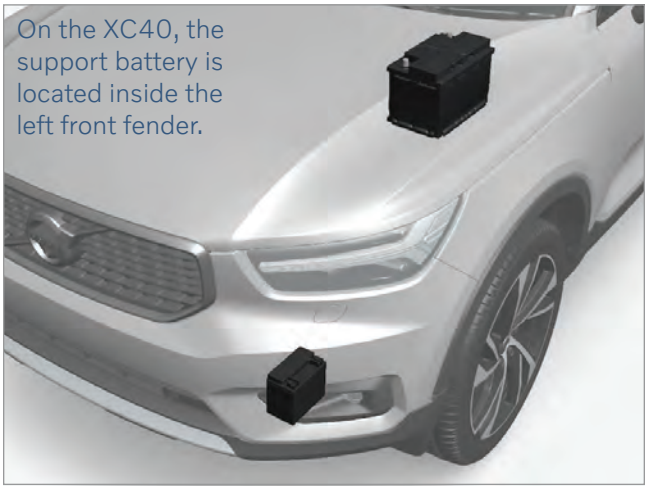
Follow these steps as outlined in Volvo TJ26745.13.9.

AGM-type batteries are very sensitive to charging conditions:

- A charging voltage of 13.6 volts is preferred.
- Charging voltage MUST NOT exceed 14.4 volts.



All Volvo vehicles that have a Start/Stop function have a small second battery, called a standby battery. It's used to maintain electronic functions when the engine is not running and in standby mode.



On the XC40, the support battery is located inside the left front fender.

- Charge current into battery should not exceed 25 amps.
- Midtronics MSP-070 should never be set to 14.4 volts with AGM batteries.
- Exceeding the recommended charging voltage or current can permanently damage the battery.

Main Battery Testing: SPA/CMA vehicles only

A new battery diagnostic sequence has been implemented in VIDA that can be used for any situation where the vehicle battery needs to be checked. This includes situations with a customer complaint and general maintenance checkups. The sequence can be found by following CSC fault tracing for "Electrical distribution: 12V System."

This new sequence will evaluate the battery condition based on long-term data measured by the vehicle's on-board battery diagnostics.

If a deeper analysis of the battery is needed or if the battery is suspected to be faulty, VIDA will guide the technician through the testing procedure and provide a warranty authorization code if the battery needs to be replaced.

NOTE

The VIDA diagnostic tool is the only acceptable test on SPA/CMA vehicles without a customer complaint or for Multi-Point Inspections (MPI).

Main Battery Testing: All other vehicles + Support Battery Testing, ALL Vehicles

The hand-held battery tester (9513030/BT3300) should be used for testing main batteries on all non-SPA/CMA vehicles and for testing support batteries on ALL vehicles. Before testing battery, read out the vehicle with VIDA to ensure that there are no current issues causing battery drain. Please follow normal CSC-based fault tracing to determine if battery testing is needed.

NOTE

The hand-held battery tester must be set to test the appropriate type of battery: If the Volvo label on top of the battery indicates "AGM," then the "AGM Flat-Plate" setting should be selected. All others should use the "Regular Liquid" setting.

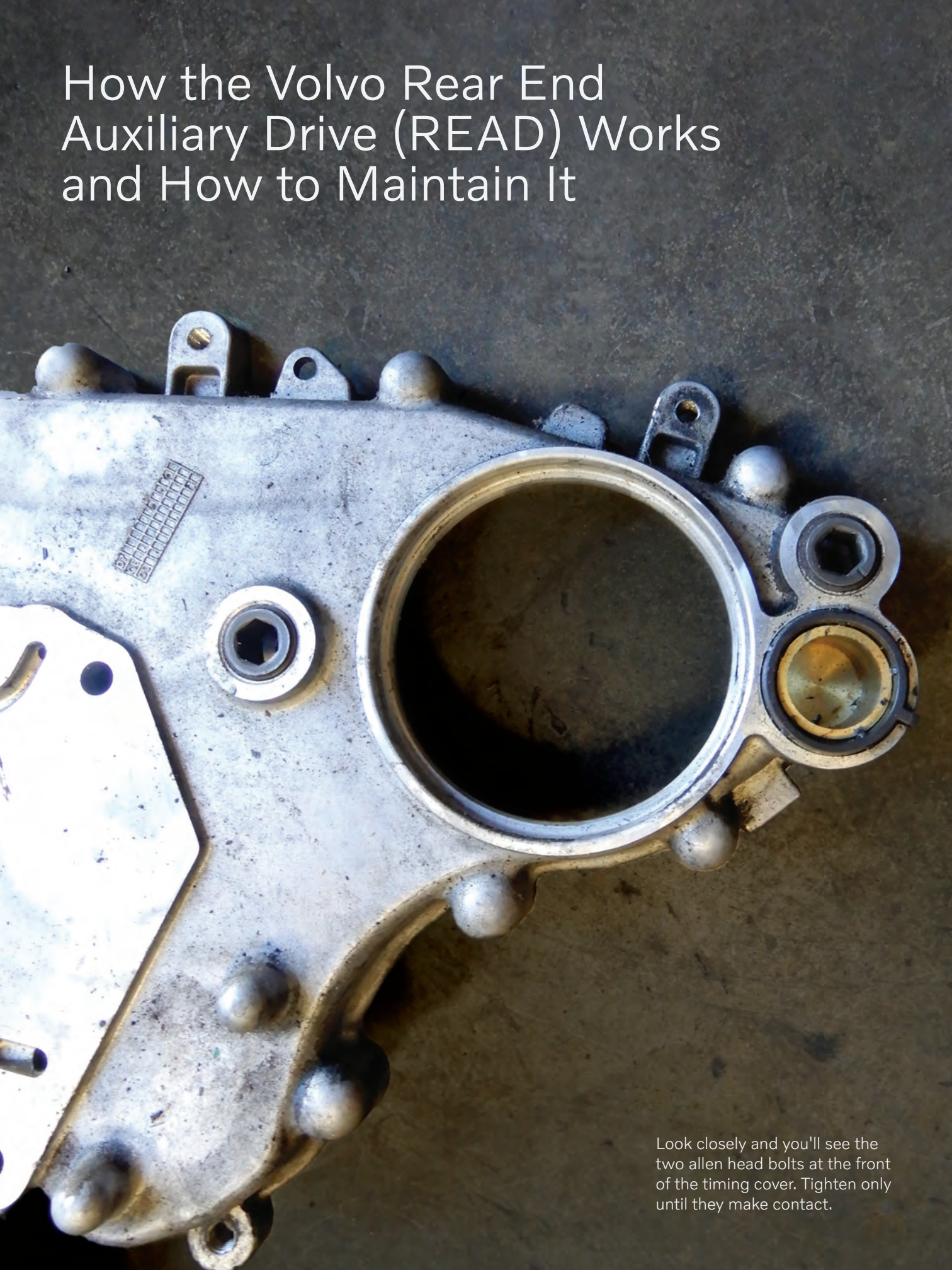
The tester should also be set to the "EN" (European Normal) rating scale as indicated on the Volvo label.

The hand-held tester must ALWAYS be connected directly to the battery terminals for testing. Connecting the negative clamp to a grounding point is not acceptable.

Don't take a chance by replacing this very important battery with an inexpensive replacement or one that "looks close enough." Make sure you replace it with an OE Volvo replacement battery from your local dealership parts department.

When replacing the standby battery, it is important to make sure the main battery is in good shape too. It is more common to replace both batteries as a pair. ●

How the Volvo Rear End Auxiliary Drive (READ) Works and How to Maintain It

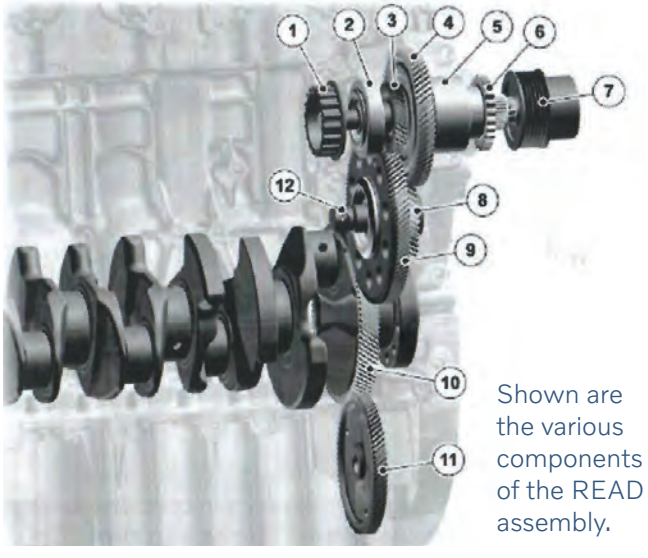


Look closely and you'll see the two allen head bolts at the front of the timing cover. Tighten only until they make contact.

In this article, we will go over the Volvo Rear End Auxiliary Drive (READ) assembly, how it works and how to maintain it. The READ assemblies on these six-cylinder engines are unique to Volvo.

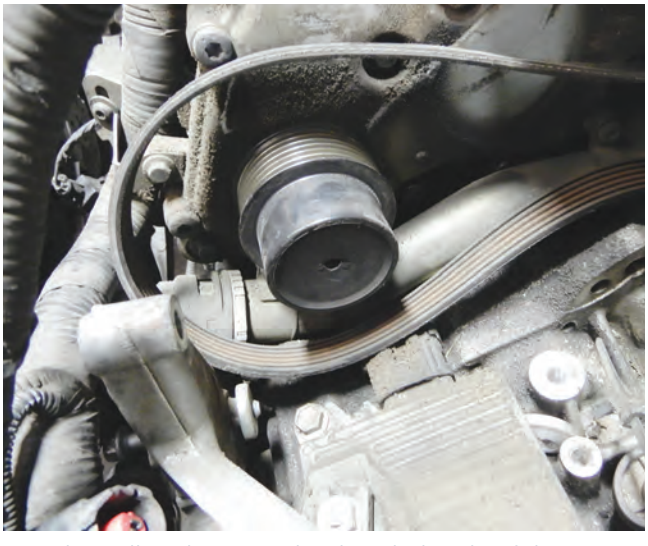
We go through inspecting the READ assembly, and how to deal with a potentially expensive repair for the customer. The READ assembly is the gearbox on the side of the engine, closest to the radiator.

The gears in this assembly are all driven by the crankshaft. The READ assembly diagram shows each gear wheel and its function.



Shown are the various components of the READ assembly.

1. Sleeve Connection, Alternator
2. Front Bearing
3. Gear Wheel, Auxiliary Unit Shaft (Inner shaft)
4. Gear Wheel, Cam Driving Shaft (Outer Shaft)
5. Rear Bearing
6. Gear, Cam Chain
7. Pulley
8. Gear Wheel, Drives the Cam Driving Shaft (47T)
9. Gear Wheel, Drives the Auxiliary Unit Shaft (94T)
10. Gear wheel, Crankshaft (99T)
11. Gear Wheel Oil Pump (76T)
12. Intermediate Shaft



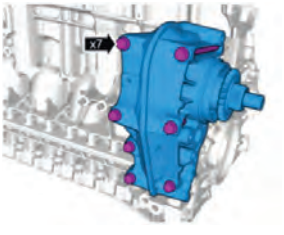
Coupler pulley shown at the drive belt side of the engine

The gear housing is machined to the engine block. The unit contains a shaft inside a shaft. The intermediate shaft (12), which is joined to the crankshaft gear wheel (10), drives the two shafts. The intermediate shaft has a small and large gear wheel. The small gear wheel drives the outer gear wheel on the cam drive shaft (4). The large gear wheel drives the inner gear wheel on the auxiliary unit shaft (3).

Being of different sizes, the shafts will rotate at different speeds. The oil pump connected to the gear wheel (11) is driven from crankshaft gear wheel (10). The gearbox READ assembly links the timing chain and drives the alternator and the serpentine belt that runs the A/C compressor, water pump, and power steering pump.

When the bearing in the coupler pulley becomes noisy (7), and/or the pulley won't turn freely in one direction, it must be replaced before internal engine problems occur to the complete READ assembly or even worse, engine timing chain problems.

When maintaining customers' vehicles, it is always a good idea to check to see if the drive belt will spin freely in one direction; if not, or it feels tight, you might want to tell your customer it's time to replace the coupler pulley, drive belt, tensioner, and idler pulley.



The READ assembly is shown mounted to the side of the engine.

The READ assembly should be checked periodically to prevent damage to the engine. The coupler pulley on the drive belt side should turn one way free; if this pulley becomes locked up, this can damage the engine.

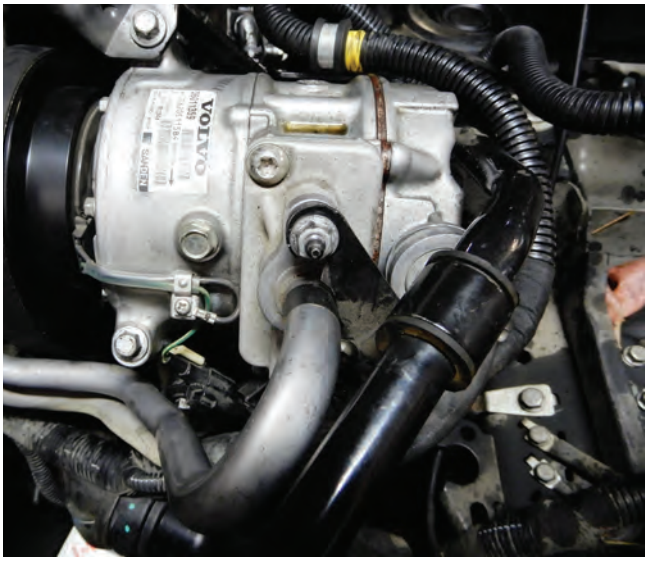
To check this, try to spin the belt on the engine. If the belt spins one direction with less friction, the coupler is OK; when the belt will not spin, it's time to replace the coupler and any other parts that are damaged or need to be replaced.

Replacing coupler pulley, belt, tensioner, and idler pulley at READ assembly

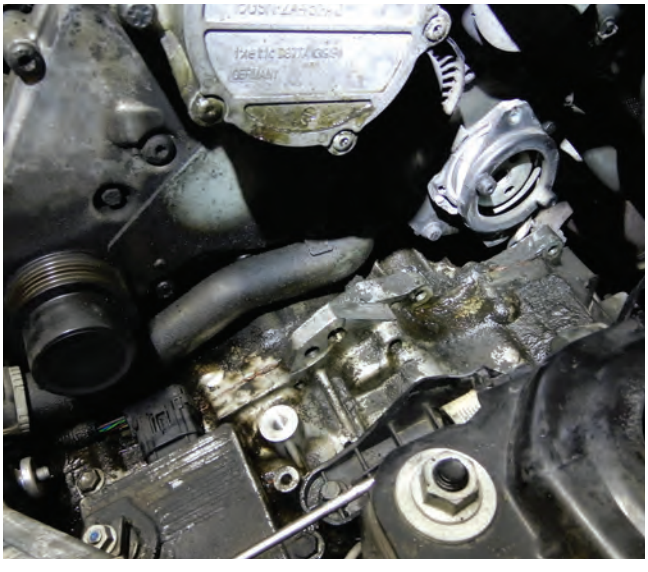
Remove the air filter housing, disconnecting the air mass meter. Disconnect the battery; always disconnect the negative cable first. Disconnect the electrical connector from the computer that sits on top of air filter housing. Pull up on the housing and remove it. Remove the plastic hose down to the throttle housing from the air filter assembly. Remove the battery tray and its three 8 mm bolts and set aside.

You will need to evacuate the air conditioning system. Remove the bracket that holds the power steering reservoir from the back side of the compressor. There are two 13 mm nuts and one bolt. Disconnect the hard lines going to the air conditioning compressor. Disconnect the electrical connectors at the compressor. Remove the T25 Torx screw at the bracket that holds the air conditioning line. Now you can move the air conditioning lines out of the way.

Remove the brackets at the air conditioning compressor. Remove the power steering hose at the pump if so equipped. Depending on the model and year you might have a pump or not. In this case remove the power steering hose and set it out of the way.



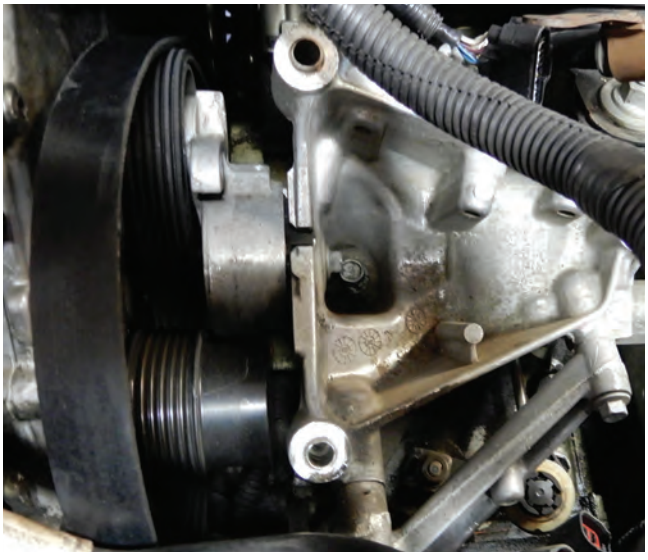
You'll need to disconnect the air conditioning lines at the compressor after removing and capturing the refrigerant.



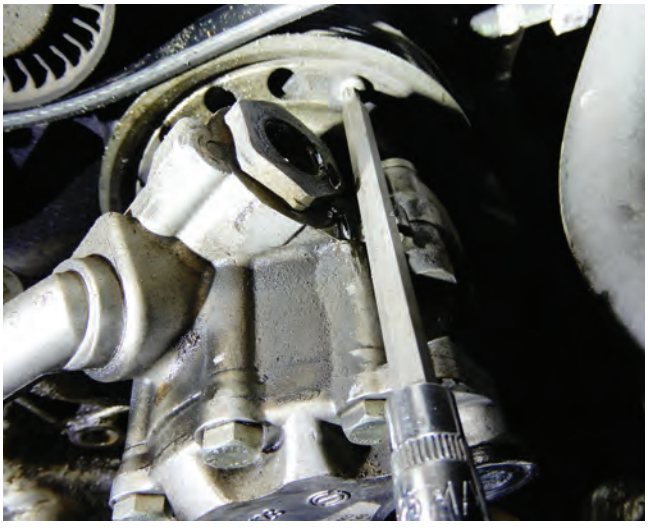
You'll have to disconnect the power steering hose in order to move it out of the way.

At the drive belt tensioner, using a 19 mm wrench, release the tension. Use a 3 mm pin and insert it at the tensioner to lock the tensioner into position. The belt will now be free. Now that the brackets to the air conditioning are removed, remove the three bolts that hold on the air conditioning compressor and wiggle the compressor out of the engine bracket. Tape up the compressor line connections so dirt and moisture don't get into the compressor.

After the air conditioning compressor is out of the way, there is a bolt that holds the drive belt tensioner into place. Remove this bolt and remove the tensioner. Now the bracket that holds the air conditioning compressor needs to be removed. Four bolts will need to be removed and set the bracket out of the way.



After you remove the air conditioning compressor, you'll be able to see the bolt that must be removed in order to remove the tensioner.



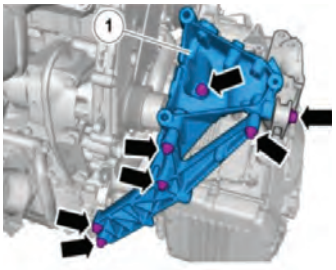
Here you can see the T25 Torx screws that need to be removed at the power steering pump pulley.

After the lines have been disconnected, use a T25 Torx bit, quarter-inch drive, on a long extension to remove the screws at the pump pulley.

Once the screws are removed, remove the bracket at the back of the pump and two bolts that hold the pump in place. Push in on the spring behind the power steering pump and remove from the vehicle. Engines with no power steering pump will be a little bit easier to deal with.

Now that the power steering pump is out of the way and the tensioner is removed from the engine, you can now remove the bracket that the air conditioning compressor sat in.

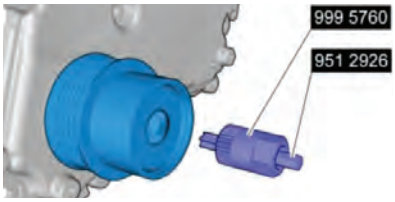
Now remove the auxiliary bracket under the air conditioning compressor, depending which model will determine the number of bolts that need to be removed. After removal of the bolts, you can now remove the bracket and set aside.



There are seven bolts securing the auxiliary bracket that must be removed.

Now that the bracket is out of the way, we can see the coupler pulley. To remove the cap that covers the release bolt, drill a small hole into the cap, insert a small screwdriver and pop out the cover. This cover will be replaced when installing the new coupler pulley.

To remove the coupler pulley, you will need special tools 9995760 and 9512926. Remove the coupler pulley and pop out the seal with a screwdriver or an awl. Install a new seal using special tool 9997265. Install the new coupler pulley and using special tools 9995760 and 9512926 to tighten down to 60 Nm.



You will need these two Volvo special tools in order to install the coupler pulley.

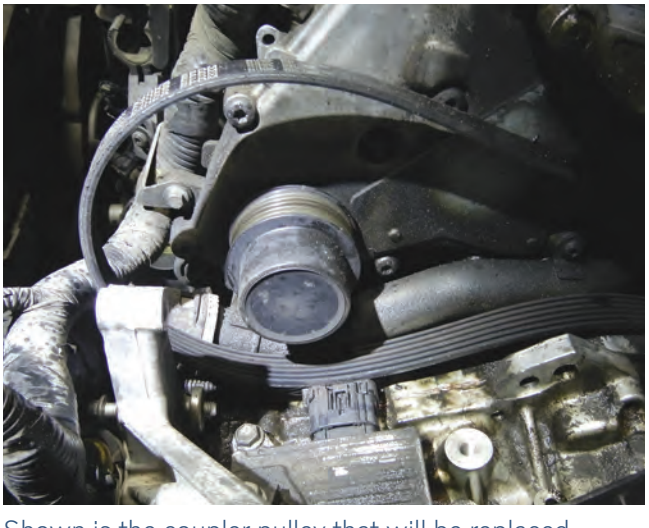
Install the cap over the end of the pulley. Now you can start putting everything back together. Set the new drive belt into place around the coupler pulley. Install the auxiliary bracket and tighten all bolts.

Install the power steering pump back into place, making sure to wrap the drive belt around pulley for the power steering pump. Set the pump into place and adjust the spring assembly into power steering pulley. If you don't install the drive belt at this time, the pump will have to come back off, so don’t forget.

Once the pump is into place, secure the two bolts that hold the pump on. Install the T25 Torx bolts at the pump pulley to spring assembly for the water pump and tighten.

Install new idler pulley, and slide the tensioner into place at the auxiliary bracket for the air conditioning compressor. Leave the pin in the tensioner until the A/C compressor is secure.

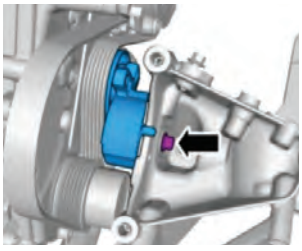
Install the air conditioning compressor and secure the bolts. Install the brackets at the top of the compressor. Connect the A/C hard lines, making sure to replace the A/C o-rings. Tighten down. Secure the A/C hoses at the bracket with the T25 Torx fasteners. Connect



Shown is the coupler pulley that will be replaced during this repair.

Be sure to install the drive belt when reinstalling the power steering pump. Otherwise, you'll have to pull it back apart.

the electrical connectors at the A/C compressor. Install the power steering hoses and tighten. Remove the pin from the tensioner. The drive belt should be tight and spin freely in one direction, counterclockwise.



This how the tensioner and securing bolt are to be installed.

Evacuate the A/C system, vacuum and charge the system with the correct amount of refrigerant.

Install the battery box, then install the battery. Set the air filter box into place, connecting the hose at the throttle housing. If equipped with an ECM on top of the air filter housing, secure and connect the electrical connectors.

Tighten down the battery terminals, starting with positive first, then negative. Start the vehicle and make sure everything is operating correctly. Test drive the vehicle making sure the air conditioning is nice and cold.

Doing this job ensures there will be no premature problems with the READ assembly.

The Rear End Auxiliary Drive (READ)

Let's talk about how to rebuild or repair this component. Let's say you have a major noise, possibly a grinding sound from the READ assembly, and you know it will need to come apart. First thing is to make sure you have all the tools to do this job. Second, this is a time-consuming repair and needs to done by an experienced technician.

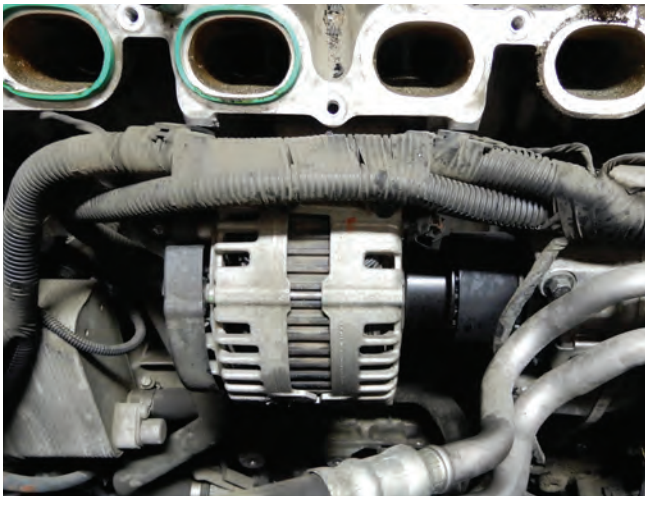
To do this job, you will need to remove the intake manifold, which is not too hard to do. Remove the air cleaner box assembly and disconnect the hose at the throttle body, and remove together.

Remove the two bolts at the bottom by the throttle housing that holds the intake to the block. Disconnect all electrical connectors and hoses. At the top, remove the electrical connector for the fuel pressure sensor and the coolant hose at the middle of the manifold.

Remove the seven bolts that hold the manifold to the block and remove the intake manifold from the vehicle.

Now the alternator will need to be removed. Take out the four bolts and two electrical connectors and remove the alternator with the small belt that connects alternator to the READ assembly.

Now let's go back to other side - the timing chain side. Remove the battery, battery box, and the



The alternator mounts to the READ assembly and will have to come off.

air conditioning compressor and brackets, as we previously explained. Once everything is out of the way, remove the coupler pulley at the drive belt side.

You will need to remove the timing chain to remove the READ assembly for rebuilding. First, use tool 9997257 at the front of the engine at the crankshaft; turn the tool to lock in position.

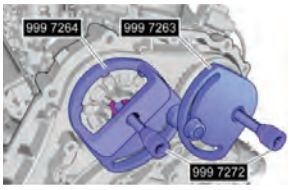
Volvo special tool 9997257 mounts on the front of the engine.

Use tool number 9997261 to lock the camshafts into position at the front of the engine.

Remove the coolant pipe at the bottom of the timing cover. Remove the twenty bolts around the timing cover and the two in the center and pop off the timing cover and set it aside.

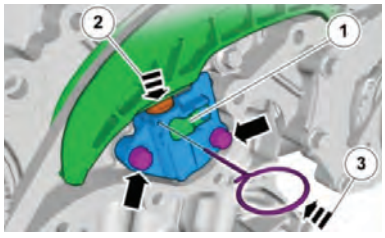
You need to lock the two camshafts into position using special tool 9997261.

Now we need to remove the inner timing cover. First we need to remove the timing chain tensioner. Raise the tensioner's lock plate (1) and press the tensioner together (2). Use a 2 mm drill bit and insert it into the tensioner hole to hold the tensioner in position for removal (3).



Three special tools are needed for removing the timing gear sprockets.

Remove the timing chain from the gear sprockets. Use tools 9997264, 9997263, and 9997272 to remove the gear sprockets — both intake and exhaust.



How to set up the timing chain tensioner for removal: Raise the tensioner's lock plate (1) slightly and press the tensioner together (2). Secure with a steel wire, drill bit, or similar of 0.2 mm in the tensioner hole (3).

Remove the two bolts that hold on the inner timing cover and remove the cover. Now that everything is removed, we can remove the READ assembly from the engine. Seven bolts hold this unit in place. Use tool 9995670 to release the unit from the engine block.

The READ assembly unit is unique to each engine; when removing it, if either the READ unit or the block is damaged, both will need to be replaced.

To remove the gear still installed at the block, you will need to use tool 9997315 to press out of the block; you will need to replace the set pin when installing back into the block.

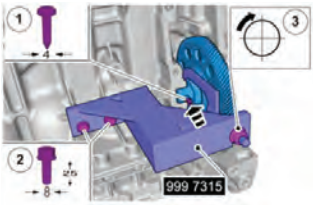
After the READ assembly has been rebuilt, now we can install the unit to the block. Install the gear back into the block, and install the new set pin with punch, tool 9997316. Use liquid gasket part number 1161771 on the surface of the READ assembly and install on the block.

Install six bolts finger tight, the bottom left bolt, and thread sealant, and install finger tight. Tighten down the bolts using this sequence.

Now that the unit is secured to the block, we can install the timing inner cover. Use a new gasket and set the inner timing cover into place with two bolts and tighten down to 17 Nm. Install the timing gear pulleys. This would be a good time to replace the timing chain, guides, and tensioner.

Once the new guides and chain are in place, install the tensioner and remove the pin so the tensioner expands. Remove the tool at the camshaft and crankshaft and spin the engine around a couple of times to make sure everything is smooth and in time correctly.

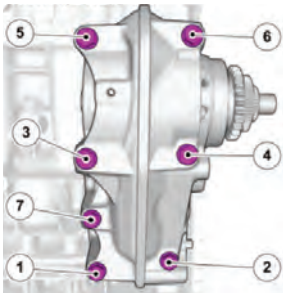
Remove the seal from the outer timing cover. Turn the two 9 mm allen screws at the front of the cover a couple of turns. Install the cover using tools 9997267 and 9997266 to align the cover to the engine. Install three bolts, one at the top, one at bottom, and one to the right of the cover and adjust finger tight; with tools in place, align the gasket and cover.



Use tool 9997315 to remove the gear remaining in the block.

Install three bolts at the middle of the cover, and then install the rest of the bolts. Torque down to 17 Nm. Turn the two 9 mm studs in until they make contact.

Install the bottom coolant pipe and vacuum pump. Install the idler pulley for the drive belt, install the bracket for the air conditioning compressor, and install all components on the timing chain side as discussed earlier in article.



This is the proper tightening sequence for the seven bolts securing the READ assembly.

Position the alternator side install pulley at the READ assembly and, using tool 9997258 to hold the pulley, tighten the center bolt and torque to 44 Nm. Install the coupler belt. Slide the alternator into the belt, and make sure the two dowels between the block and the alternator are aligned properly.

Install the four bolts and tighten down. Install the electrical connectors to the alternator. Set the intake manifold back into place, using a new gasket and install the bolts and tighten down. Install the two bolts at the bottom of the manifold, and attach all electrical connectors and hoses.

Set the air filter assembly into place securing the hose at the throttle housing.

Servicing the READ assembly is not a simple task. But it's good to know what's involved when the occasion arises. ●

How the Volvo EVAP System Works and Diagnosing Problems

The EVAP System in different Volvo models, how it works and how to diagnose the system when a Check Engine light is present.

Canister and filter located under the right rear inner fender.

The EVAP system (EVAPorative emission system) is an emission system that prevents hydrocarbons from entering the atmosphere. Fuel vapors are collected and stored In the EVAP canister. The canister contains carbon that adsorbs the fuel vapors.

In this article, we will talk about the EVAP system in different Volvo models, how it works, and how to diagnose the system when a Check Engine light is present.

The EVAP system vapors must be stored in the system's canister and can be redirected into the induction system of the engine, after which they're burned off, harmlessly and unnoticed.

The EVAP system consists of the following components:

- Fuel tanks
- Canister purge valve
- EVAP canister
- Leak diagnostic unit
- Air filter
- Rollover valve
- Float limit vent valve
- Fuel filler pipe
- All the lines connecting all components

The EVAP system has its own leak diagnostics that check pressure in the fuel tank EVAP system; an opening larger than 1.0 mm would be considered a large leak and should be much easier to diagnose.

If a certain pressure during the EVAP system on board test is not achieved, the Check Engine light will be illuminated, and you will need to diagnose the system problem.

The engine control module, and the leak detection pump, control and monitor pressure and flow in the system. If a Check Engine light appears in the EVAP system, the system has detected a pressure or flow problem which must be remedied using Vehicle Information and Diagnostics for Aftersales (VIDA) Volvo's Service, Parts and Diagnostic Application.

Common problems could be fuel smell caused by escaping fuel vapors, or maybe the vehicle is stalling, hesitating, or is running rough. Most of the time you won't notice driveability problems, but you might have an increase in fuel consumption.

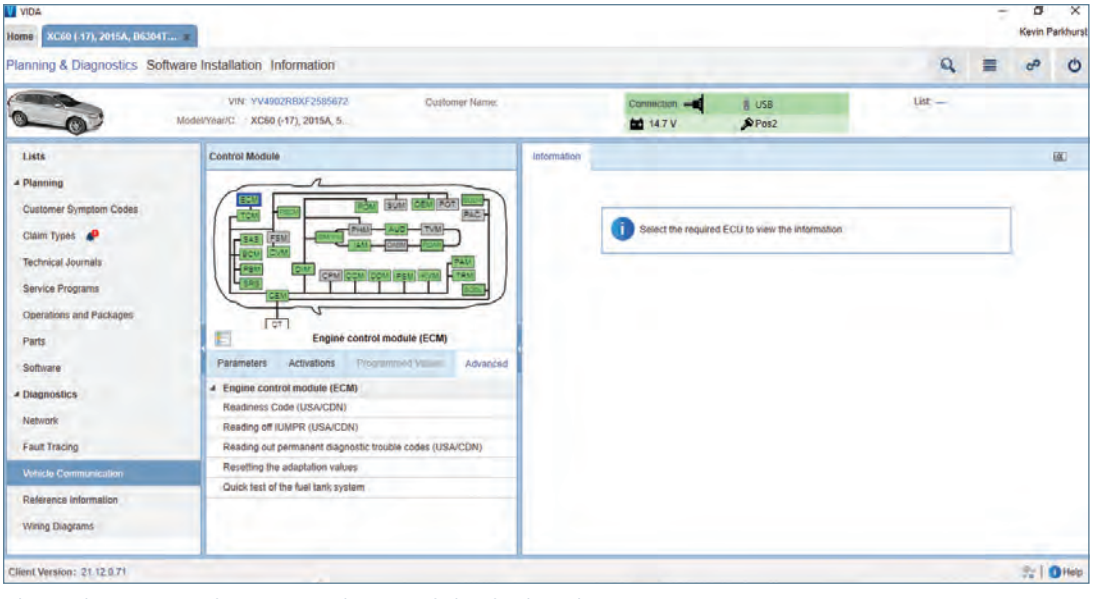
There are many factors that cause error codes, and some of the most common are:

- A cracked or disconnected hose
- Disconnected or loose wiring at components
- Open circuit in purge valve
- Detection pump not working correctly

Look over the EVAP system and try to identify problems. If the system has a small or large leak, using a smoke machine can inject smoke into the system to find any kind of vapor leak at a hose or component. If smoke is escaping from a hose after repair, it is important to run a fuel tank pressure test on VIDA to make sure all is well with the system.

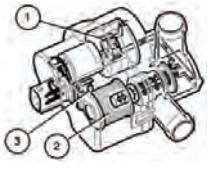
The leak detection pump pressurizes the fuel tank system and checks to make sure the system has no leaks and all components are functioning correctly. The pump has an electric pump, a solenoid that adjusts air flow in the component, and a heater element that warms up the pump.

The pump is controlled through the ECM and checks the pressure and monitors parameters in the EVAP system.

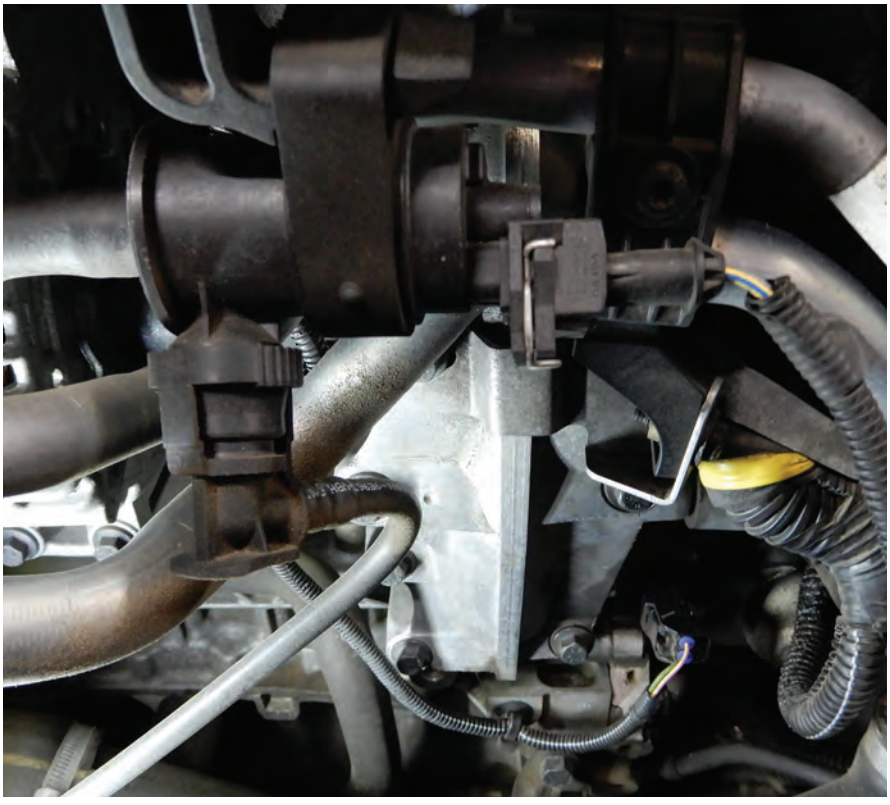


This is how to perform a quick test of the fuel tank system using VIDA.

The EVAP valve in the system is used to open



Here are the internal components of the detection pump.



This is the EVAP valve on a 2015 XC60 3.2L engine.

and close the connection between the intake manifold and the EVAP canister. The vacuum from the engine intake manifold controls the hydrocarbon flow through the EVAP valve to the canister and makes sure the hydrocarbons are stored, to be burned off in the combustion chamber.

When running EVAP tests in VIDA, there are a few conditions that need to be met.

No Diagnostic Trouble Codes (DTCs) for the EVAP valve or atmospheric pressure sensor can be stored.

Engine must be warmed up to operating temperature, and then switched off until engine temperature is a few degrees above the outside temperature.

Engine is off and stationary.

Engine temperature is between 38 to 95 degrees F.

Maximum altitude of about 8,000 feet above sea level.

Battery voltage must stay between 11 to 15 volts and stable.

Fuel tank volume should be between 0 and 85%. If there is a trouble code in the system for the fuel level sensor, the ECM (Engine Control Module) ignores this trouble code and continues.

EVAP canister purge valve must be closed.

Low volume in the canister.

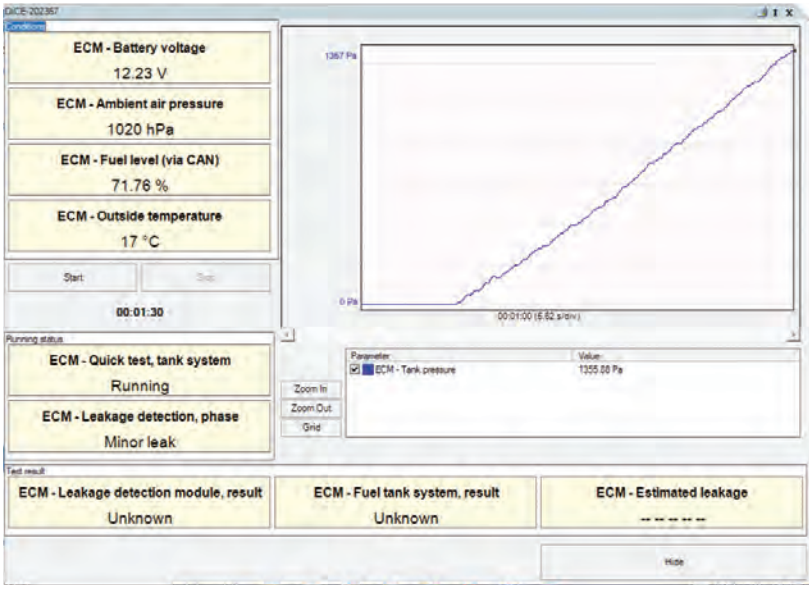
Tank cap must be tight and sealed. The diagnostic procedure has three different phases — reference phase, function test, and check tank system pressure.

Reference Phase

The ECM runs a reference phase for leakage before the test begins. The detection pump forces air through a 0.5 mm hole back into the outside air. During that time the system monitors the leakage diagnostic unit and stores the values which are used later to check fuel tank sealing. During this test, if values for the pump are too high or low, a trouble code will be generated and the test will abort.

Function test

During the function test, the fuel tank is pressurized. Through the detection pump, air is generated into the



VIDA is a very useful tool for running an EVAP test to locate small leaks in the system.

system and monitored. The EVAP system will monitor pressure; the pressure should drop briefly before building up in the fuel tank system. If for some reason this test is not done within a reasonable time, the diagnostics will abort and a Check Engine light will set.

Checking major leak (leakage through an opening larger than 1.0 mm) in the fuel tank system

The leak detection pump pressurizes the fuel tank system using calculated pressure, which is controlled by the detection pump. If pressure in the fuel tank system stabilizes and/or if the pressure does not go above 1500 Pa within 450 seconds, there is a problem in the system for large leak.

Checking small leak (leakage through an opening larger than 0.5 mm but smaller than 1.0 mm) in the fuel tank system

The small leakage test is performed after the large leak test. The leak detection pump continues to pressurize the fuel tank system. The ECM checks the sealing of the fuel tank system by measuring the difference between the reached pressure and flow from the leak detection pump. If readings are outside the reached relationship, a minor leak trouble code will be generated.

Let's say the customer comes to your shop with a Check Engine light on and you find the fuel cap to be loose and a large leak is detected. After tightening the fuel cap, the system will run the EVAP test and find that the cap problem is corrected and no code will appear in system.

It is important for the fuel filler cap to have a good seal at the neck in order to maintain the integrity of the EVAP system.

Sometimes the fuel neck can be stripped or distorted and the fuel cap will not seal correctly, thus making a Check Engine light appear. A smoke testing system can help to find this problem.

Suppose a customer comes in with a Check Engine light on. You hook up to VIDA and check codes in the system, and you find code ECM - EVAP Emission System Incorrect Purge Flow on a 2013 Volvo S60 B5254T12.

The ECM has detected a problem with the function of the EVAP valve by analyzing the signal from the pressure sensor in the induction pipe.

Possible Problems

The hose between the induction pipe and EVAP valve is broken, pinched, or clogged.

The hose between the EVAP valve and canister is broken, pinched, or clogged.

The EVAP valve is stuck in the open position.

The EVAP valve is stuck in the closed position.

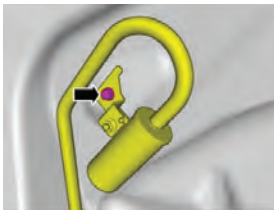
Check all hoses for these possible problems. Use VIDA and go into Activation and see if the purge valve is working. Click on purge valve and listen for a click sound; try a couple of times to make sure the valve is working. If no sound is heard, you will need to check for a possible loose connection or maybe no power to the connector. If power and ground are present, it's more than likely that the purge valve is bad and needs to be replaced.

Replacing the valve is fairly simple to do. Disconnect the electrical connector, remove the hose on each end and remove the valve from the rubber holder. Replace the valve with a Volvo genuine part.

Communicate again using VIDA, go into Activation and see if the valve is working now. If so, you have located the problem. Reset the codes in the EVAP system and run the fuel tank test to make sure the code is no longer present.

In the EVAP canister, fuel vapors are collected and the ECM will determine when to burn these vapor fumes, so they don't escape into the atmosphere. Since the EVAP canister is subject to the weather elements, sometimes this canister can crack and release fuel vapors into the air and that’s what we don’t want to happen. There is also a filter for the canister that will need to be replaced periodically so not to let dirt into the EVAP system and contaminate other components in the system.

Remove the right rear tire, and remove the inner fender. Eight T25 Torx screws and three 10 mm plastic nuts need to be removed. Set the inner fender aside. Now you will see the filter in line to the fuel neck.



Shown is the filter for the charcoal canister on a 2015 XC60. The filter is located behind the inner fender at the right rear tire.

Remove the screw and cut the pipe and add rubber hose and new filter for charcoal canister. Screw down and install the inner the fender and tire.

Another problem with the EVAP system is the detection pump. This pump is located close to the charcoal canister, usually at the rear of vehicle depending on model.

The two-wheel drive Volvo detection pump is a little easier to replace than that on all-wheel drive models.

The 2013 XC90 two-wheel drive vehicle affords a pretty easy replacement of the detection pump. Open the rear hatch, locate the tool for spare tire removal, and crank down to release the spare tire from vehicle.

Now that the spare tire is out of the way, you will now be able to see the detection pump and hoses. Remove the hose clamps from both hoses, disconnect the electrical connector from the detection pump, and pull the pump out of the rubber mount.

For this model, the leak detection pump part number is Volvo 30774518, the two hoses, one from the canister to the pump is 30622231, and the other, depending on the emission code for the vehicle, could be part number 8653367 or 30713602.

Install the hoses on the detection pump before installing the pump just to make things a little less complicated. Install the pump into the rubber mount and secure the hoses with hose clamps. Connect the electrical connector to the detection pump.

It would be a good idea to warm up the vehicle and run a fuel tank test with VIDA to make sure the EVAP system is working properly before installing the spare tire back into place.

Now that you have run the EVAP test and the system is working correctly, you can install the spare tire back into place. Always test drive the vehicle after any repairs just to make sure there are no problems.

The following codes will sometimes appear when the Check Engine light is on (and this could have to do with the detection pump). The leak diagnostic unit preheating signal could be too high or maybe too low. Too high would set code ECM 432C, and too low would set code ECM 432D. If you encounter either code you will need to use VIDA to activate the pump to see if the code is permanent or intermittent. Intermittent codes are definitely harder to diagnose.

If the pump cannot be activated, more than likely the pump is the problem. Make sure to check for power and ground at the pump. An intermittent code could indicate that the pump is just working part of the time, but still might need to be replaced.

The EVAP system on Volvos is a pretty straightforward system, but sometimes can be difficult to diagnose. A permanent code is always less daunting to figure out. Always use VIDA to help diagnose the problem and an electrical diagram can come in handy when needed. Start with the basics and keep it simple. ●

This is where you will find the detection pump on a 2013 XC90.

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