

# Volvo TechTips

Information for the Independent Volvo Specialist

VolvoTechTips.com

Spring 2023

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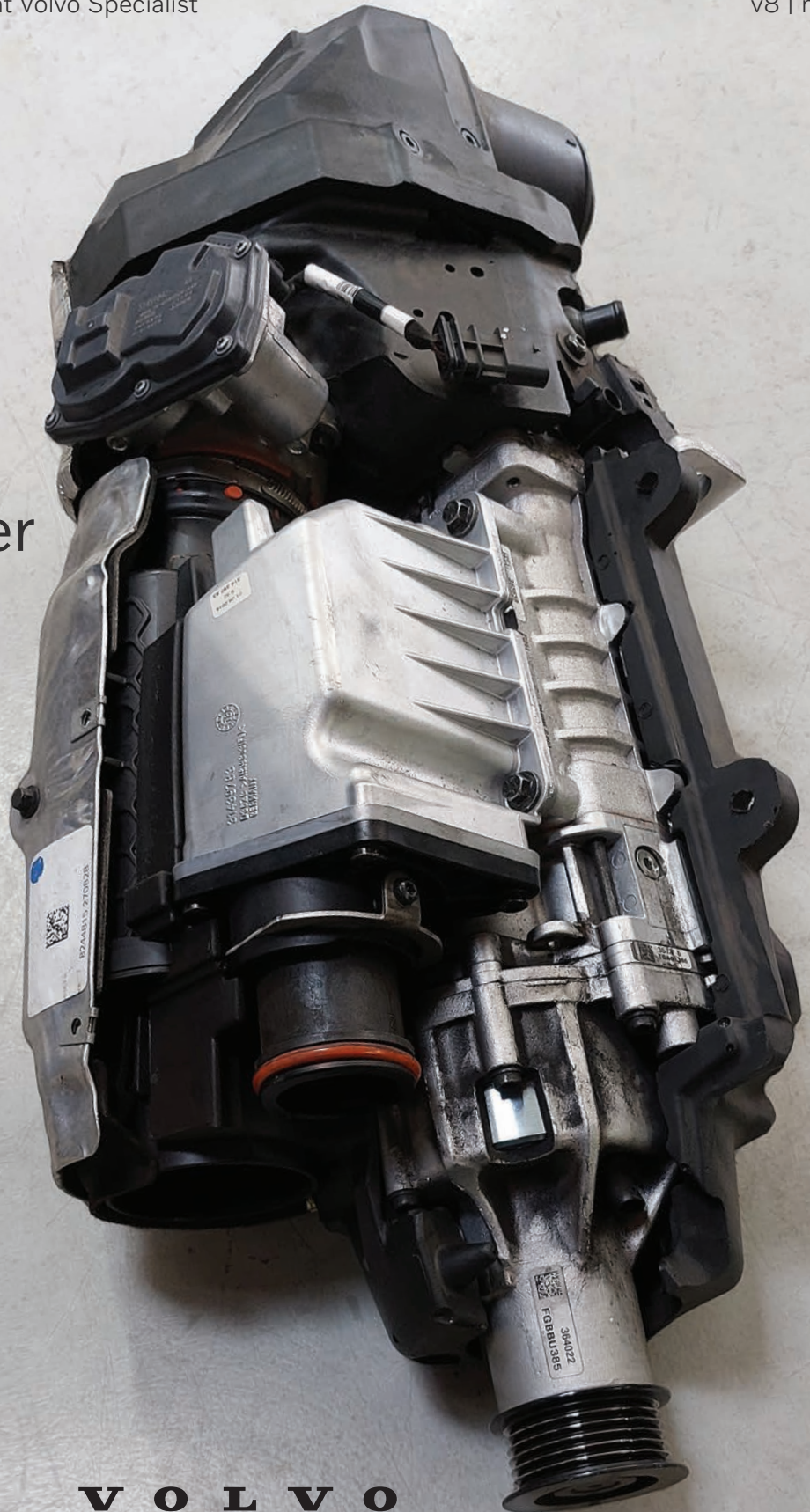
## Supercharger Service

Also Inside:  
3.2L Engine Timing  
Chain Replacement

Volvo Seats and  
Seat Belts

Interior Repairs

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**V O L V O**

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Properly trained technicians have the equipment, tools, safety instructions and know-how to perform repairs correctly and safely. If a condition is described, DO NOT assume that a topic covered in these pages automatically applies to your vehicle or that your vehicle has that condition. Volvo Car USA LLC, the Volvo name and Volvo logo are registered trademarks of Volvo Corporation.

## Features

### Timing Chain Replacement on a Volvo 3.2L Engine

The 3.2 liter engine is a six cylinder non-turbo engine. In this article, we will cover the replacement of the engine timing chain and related components.



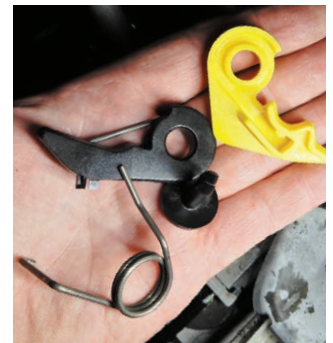
### Testing, Repairing, and Servicing Volvo Seats and Seat Belts

This article covers various repairs on seats and seat belts that you may find helpful, should they come through your shop.



### Three Common Interior Repairs on Volvo Vehicles

In this article, we will cover a few different repairs that don't take a lot of time, but knowing these situations can definitely help with repairing these vehicles.



### Supercharger Service on High Mileage Volvos

This is part of a continuing series of articles that cover some common issues that you may experience on Volvos with higher mileage and age.





# Supercharger Service on High Mileage Volvos

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## Supercharger Air Leaks, Late Style 2.0L Twin-Charged Engines (2015 and up)

In the new-to-most-of-us-in-the-aftermarket world, the 2.0L engines that Volvo is using across their entire line of cars these days have been around for more than a few years now.

The first Volvos to be offered with this new powerplant (in the U.S.) were the 2015 S60 and V60 models.

The 2.0L has become standard, as it is small but powerful—and with a variety of induction systems.

With the launch of XC90 T8 in 2016, Volvo introduced the first hybrid variant of a Volvo Engine Architecture (VEA)—with Electric Rear Axle Drive (ERAD) for electric propulsion and AWD capabilities.

The hybrid engine—or as Volvo calls it, the "twin-charged" engine—is equipped with a Crankshaft Integrated Starter Generator (CISG), which starts the engine, saves energy when slowing down, and, by acting as an additional supercharger, causes less lag.

The twin-charged versions of this engine are capable of producing a lot of power for such a small engine size due to the amount of air that can be moved through the intake manifold. It is boosted by the supercharger, and then the turbocharger after the engine has reached 3,000 rpm, and the induction is switched to the already spooled-up turbo.

These systems are put through a lot of heat and pressure, so over a lot of miles and years, these parts will wear. With such a complex air induction system, unmetered air leakage can be a real problem.

You will probably have one of these cars come into your shop with a Check Engine light complaint at first, but if you interview the customer, they will probably complain about poor fuel mileage and in some cases loss of power.

When you start your testing you will probably pull up a stored code from the ECM like PO171.

If your scan tool has the ability to display freeze frame data, take a look at the fuel trim numbers at the time the code was set. In most cases PO171 indicates a lean condition in the fuel mixture.

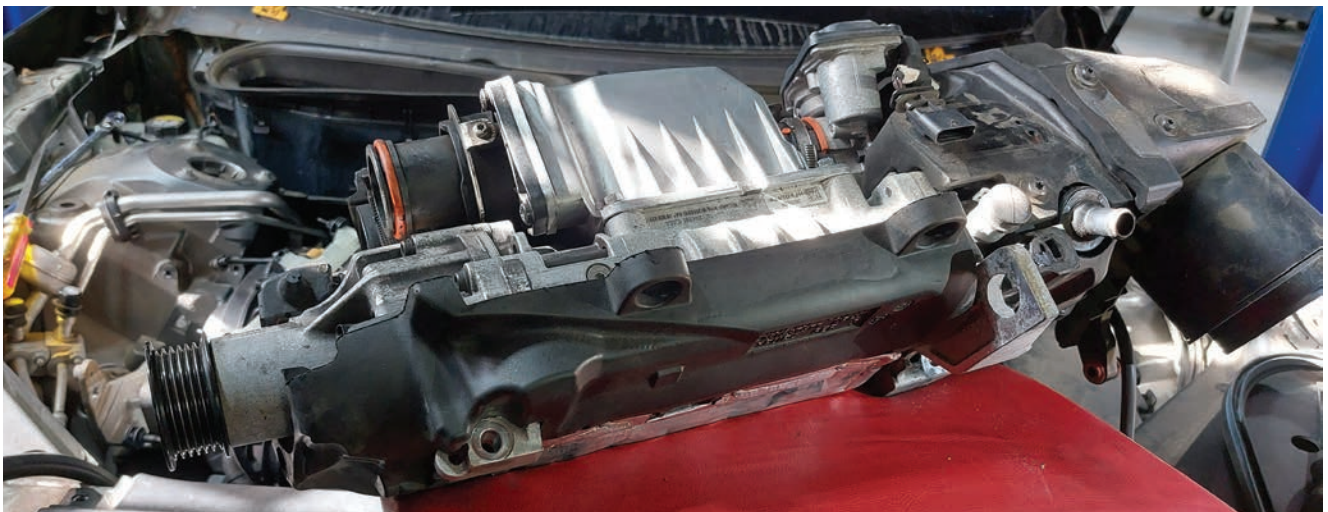
This code can be caused by a wide variety of issues, but just like an unmetered intake air leak, an exhaust leak near the manifold, or everyone's favorite, a malfunctioning sensor or sensors that are not setting a code.

Of course, less common causes can include clogged fuel injectors or internal engine wear or damage.

One issue a lot of non-Volvo specialty shops run into is the fact that most generic scan tools are limited in what information they can get from a late Volvo.

The only scan tool out there that will give you complete and accurate scan data and information in one place is not just one stand-alone scan tool; it's VIDA installed on a laptop.

VIDA is constantly updated and is the only tool that you can use to install and update software in a Volvo.



Supercharger assembly removed from the engine

Opposite Page: Checking for smoke coming out of the supercharger check valve

## Where There's Smoke, There's Fire (But, Not Always)

Your shop should also have a good diagnostic smoke machine. Most of us know that a smoke machine is a must-have for the modern automotive shop.

Using a smoke machine to check for intake leaks should be a regular part of all engine system diagnostics, codes or not.

Even tiny unmetered intake air leaks can have big effects on many parts of the engine.

An example is Long Term Fuel Trim (LTFT). A regular small intake leak may not set a trouble code, but may be enough for the fuel system to adjust to try to mitigate the extra oxygen.

Extra oxygen may cause the air/fuel sensors to command the ECM to add more fuel, and the extra oxygen can shorten the life of the O<sub>2</sub> sensors and catalytic converters.

### Case Study

The XC90 in this case study came in with a complaint of poor fuel mileage and a Check Engine light on.

The first thing the technician did was to hook the car up to a laptop that had VIDA installed and running to check the stored codes, freeze frame, and live data.

VIDA will check all the modules for any issues all at one time, so it's easy to see if any other modules are having issues that may or may not be related to the current problem.

The code that was active in the ECM was PO171.

If you use VIDA, the stored code data will give you a more precise trouble code description, like if the code is permanent, intermittent, high, low, or missing signal. A lot of generic scan tools will only give you the basic OBD code.

The technician ran the car at idle until the engine was at operating temperature.

The technician then decided to check the intake system for air leaks as a first step based on the live data.

The first year of the second generation XC90 (2016) can be prone to develop intake air leaks over time, especially in the twin-charged versions with both turbo and supercharger.

There are two common causes of unmetered intake air leaks that can develop on the twin-charged 2.0L engines.

### Fault Tracing Information

## ECM-P017200 System Too Rich (Bank 1). General Failure Information. No sub type information

[Diagnostic trouble code \(DTC\) information ECM-P017200](#)  
[Fault-tracing](#)

### Diagnostic trouble code (DTC) information ECM-P017200

#### Condition

Engine Control module (ECM) receives information from the heated oxygen sensor about fuel/air mixture in different load areas. If Engine Control Module (ECM) registers that fuel/air mixture deviates too much from target lambda, so that adaptations for bank 1 end up in any of its end-positions, the diagnostic trouble code is generated.

#### Substitute value

- Nothing

#### Possible source

- Clogged air filter.
- Leak of crankcase ventilation.
- Oil level too high.
- Contaminated engine oil (gasoline mixed in oil).
- Leaking injectors.
- Leaking EVAP-valve.
- High fuel pressure.
- Damaged mass air flow sensor.

### VIDA ECM-P017200 failure information

The most common and easiest to fix is a breached check valve in the oil trap (or PCV box) bolted to the top of the engine.

In earlier Volvos, like the 2005-2012 V50, S40, C70, and C30, when the oil trap diaphragm cracks, the engine can make what some technicians have called a "flying saucer sound" at idle.

That's not the case when it comes to Volvo's 2.0L engines, where a leak in the PCV oil trap diaphragm will usually only result in a lean code being stored in the ECM.

You can check to see if the diaphragm is broken by removing the engine oil filler cap while the engine is idling.

If the oil trap diaphragm is intact, the filler cap will be easy to remove; but if there is excessive vacuum in the crankcase caused by a broken oil trap diaphragm, the oil cap will be difficult to remove while the engine is running.

# Keep the Work Flowing

Speed up repairs and get more done using Volvo Genuine Parts. They are designed to fit right the first time directly out of the box.

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On the early twin-charged models, however, the intake leaks may go a lot deeper than just a defective oil trap.

The 2017 XC90 T6 in this case study had a defective oil trap, but the intake air leaks went a lot deeper.

The superchargers on these late Volvos are very complex assemblies, with lots of parts.

There are lots of plastic and aluminum parts that are constantly exposed to heat, vibration, pressure, and vacuum.

Over time, some of these parts can shrink, warp, or even crack, causing an unmetered intake air leak into the engine or, in some cases, supercharger pressure to leak out.

This was the case with this 2017 XC90 T6, but there was a catch. When the technician used the smoke machine to check for leaks, the engine was not that warm and there were no apparent leaks, no "smoking gun" (pun intended).

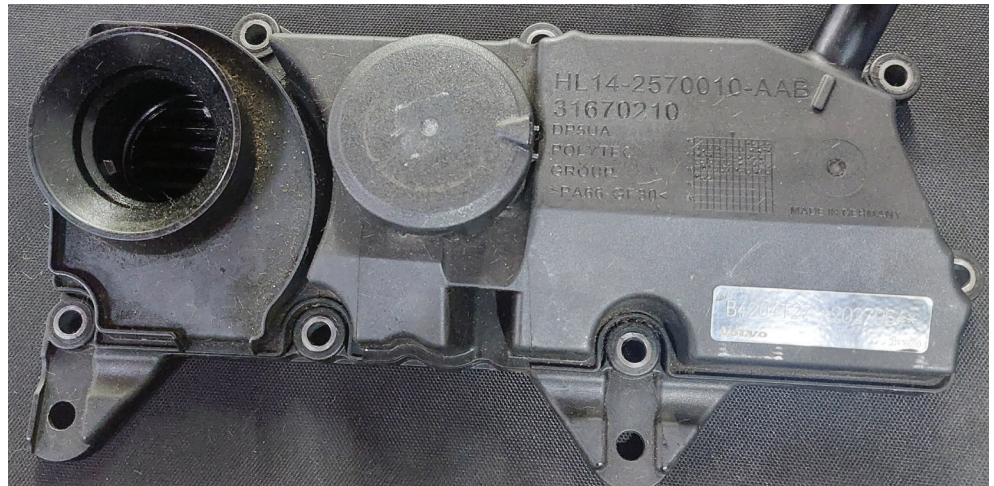
But the live data indicated that there was an active intake air leak.

The technician was thinking it was probably just the oil trap leaking internally, so he recommended replacement as a first step.

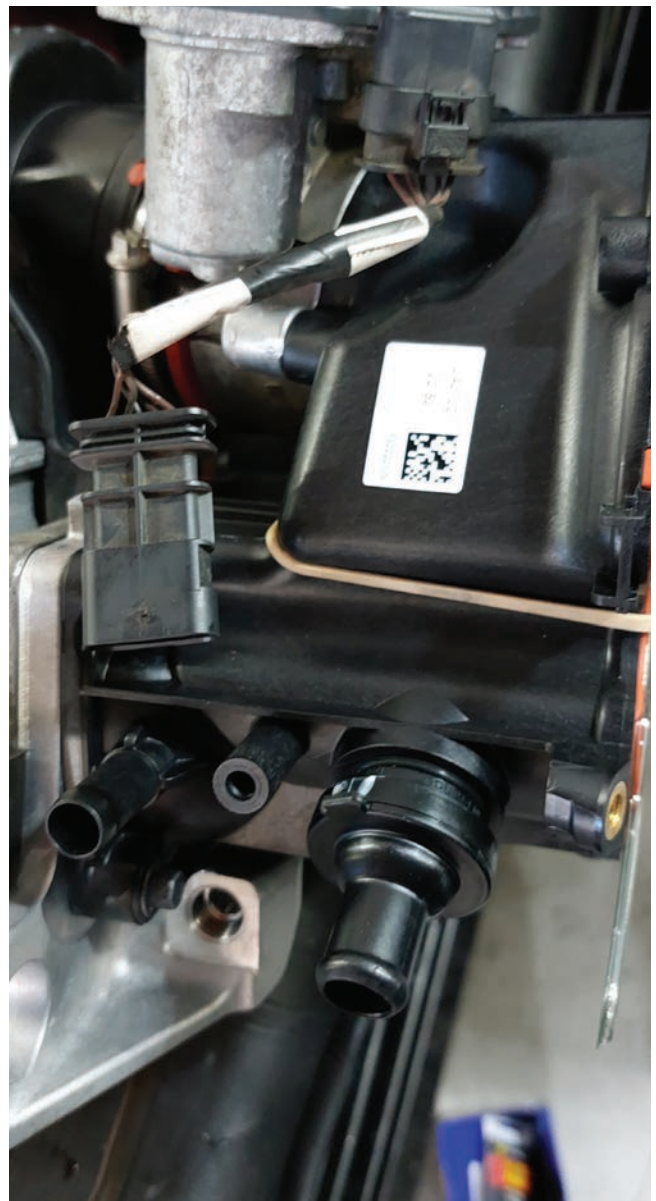
The supercharger has a check valve that connects to the oil trap (PCV) by a hose. This check valve is like a diode; air is only supposed to flow one way.

When you have one of these late-style supercharged XC90s with a PO171 and you are checking for intake air leaks the traditional way, you will most likely seal off the intake and pump smoke into the sealed part of the intake. If you only do it this way, you may not see that the check valve is leaking because the leak will be between the supercharger and the oil trap.

When you are smoke-checking these intake systems, you should remove the end of the hose that connects to the oil trap and pump smoke into the supercharger. If the check valve is good, no



One of the most common causes of unmetered intake air leaks in late Volvo 2.0L engines is an internally leaking oil trap diaphragm.



New supercharger check valve



When you have to remove the supercharger on one of these XC90s to replace a leaking part, you should replace all the old seals and worn parts at the same time.

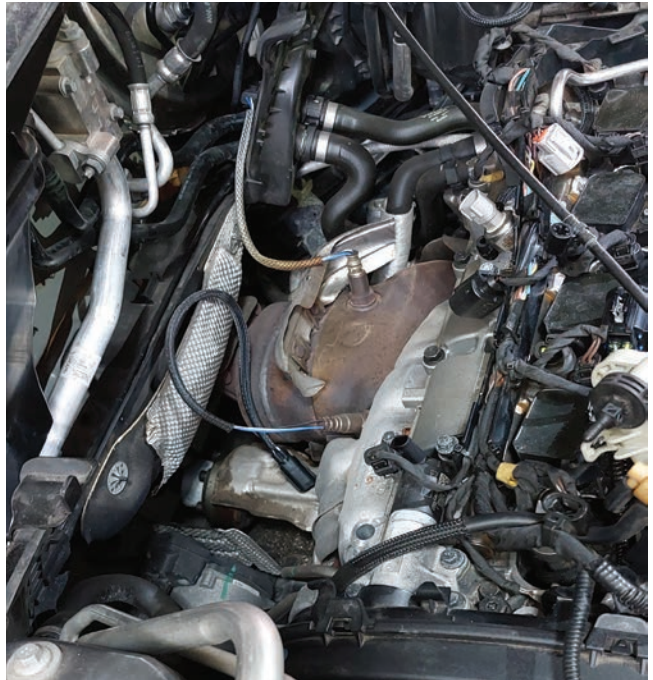
smoke should come out of the hose. If it does smoke, the check valve is bad and needs to be replaced.

The check valve is not replaceable on its own though; it's part of an assembly that's part of the supercharger called a resonator assembly, and to replace it you will need to remove the supercharger from the engine.

The problem is that when this check valve fails, it's usually not the only leak in the supercharger; there are multiple parts, seals, and chambers in this assembly, and if you are going to remove it from the engine anyway, you should replace all the worn parts.

Here is a list of the recommended replacement parts and gaskets you should get when resealing one of these superchargers:

1. 32222165 Resonator
2. 32222167 Fresh air intake
3. 32252302 Sound insulation
4. 31492821 Sound insulation
5. 31657599 Bellows
6. 31459808 Gasket
7. 31459809 Bracket
8. 31657725 Plug
9. 31657726 O-Ring
10. 314744343 Sealing Ring
11. 32222126 O-Ring



You should include a new upstream oxygen sensor in your estimate because of wear and the access to the sensor when the supercharger assembly is removed.



Supercharger removed

12. 982758 Flange Supercharger 1
13. 30622986 Flange Supercharger 2

You should probably include a new (B1S1) upstream oxygen sensor in your list of replacement parts because of the possibility of the sensor being worn; with the supercharger assembly removed, you will have easy access to remove and replace the sensor.

You will have to remove the supercharger assembly from the engine to replace the worn parts and seals.

NOTE: Removing the supercharger was covered in "Diagnosing and Repairing Manifold Exhaust Leaks, Part 1" in *Volvo TechTips* Fall/Winter 2022. Visit [VolvoTechTips.com](http://VolvoTechTips.com) to read this article and access the complete Volvo TechTips archives.

This is a fairly large job and not for everyone, but once you do your first one, the next one will be a lot easier to get through.





Using a top side creeper to access back of the engine compartment

These newer style XC90s are large and the engine compartment is high off the ground for those of us who are less than six feet tall, especially when performing this job, since a lot of the work is done in the back of the engine up against the firewall.

If you work on a lot of the later XC90s, and other big trucks in your shop, you should consider getting a topside creeper. This useful piece of equipment will make this, and other underhood jobs on taller vehicles, more comfortable to do. And it will also help save your back.

When you get the supercharger assembly out of the engine compartment, you can seal it up and use a smoke machine to check for leakage; it will probably come from multiple worn seals in the assembly.

When you start to disassemble the supercharger assembly, in some cases you will be able to see the areas that were not sealing well due to age and wear.

Make sure to keep track of all your bolts and screws when you disassemble the supercharger, and perform your overhaul on a clean work bench; you don't want a stray nut or bolt to end up inside the supercharger when you reassemble it and install it back on the car.

You can imagine the possibilities if that happened!

Clean all surfaces and reassemble the supercharger with new seals and parts.

Double check your work before you reinstall the supercharger back onto the engine by sealing any openings with plugs and using a smoke machine to check for any leaks.

After you reinstall the resealed supercharger assembly, make sure to reset the adaption and clear the codes in the ECM. Take a good long test drive and recheck for any codes that may pop up. ●



A smoke check of the supercharger assembly when it is first removed will show most of the leaks.



Worn supercharger parts