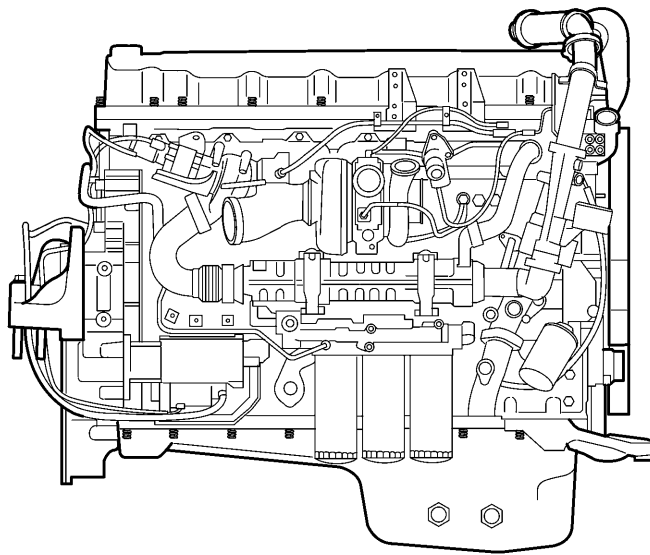


Oil Cooler
Replacement
D13F

Oil Cooler, Replacement



W2005779

This information covers replacement of the oil cooler on the Volvo D13F engine.

Contents

- "Special Tools" page 2
- "Oil Cooler, Replacement" page 3

Note: Information is subject to change without notice.
Illustrations are used for reference only and can differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

Tools

Special Tools

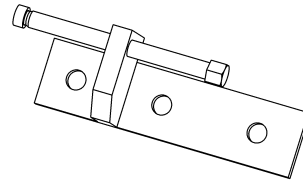
For special tools ordering information, refer to Tool Information, group 08.



W0001795

9996049

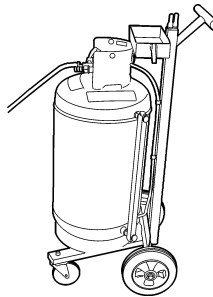
Coolant Drain Hose



T0012870

88800022

Assembly Tool



W2004191

DBT2V700

Coolant Extractor

Service Procedures

2231-03-02-01

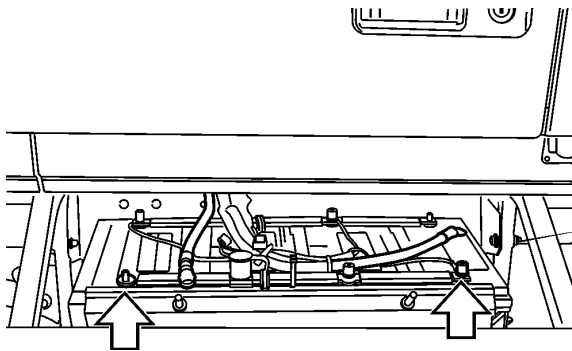
Oil Cooler, Replacement

You must read and understand the precautions and guidelines in Service Information, group 20, "General Safety Practices, Engine" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

Special tools: 9996049, DBT2V700, 88800022

Removal

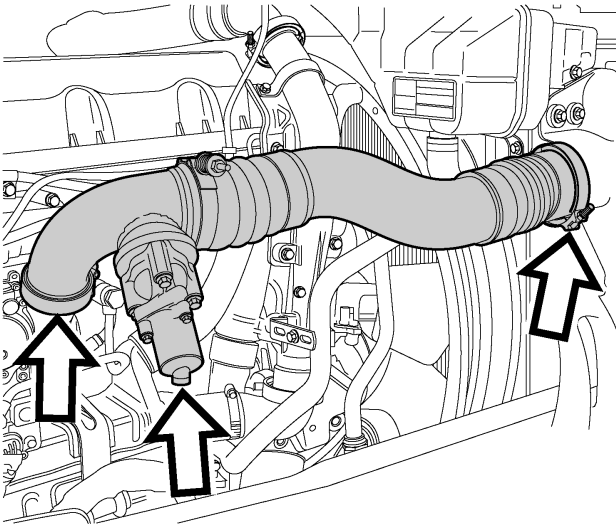
- 1**
Apply the parking brake and place the shift lever in neutral.
- 2**
Remove all cables from ground (negative) battery terminals to prevent personal injury from electrical shock.



W2003815

- 3**
Remove inner splash guard as an assembly.
Note: Some models may be equipped with fender extenders, attached to the inner splash guard. Remove these as an assembly.
- 4**
Connect the coolant extractor to the drain fitting at the bottom of the radiator and drain the coolant.
Note: An alternate method is to connect the coolant drain hose to the drain fitting and drain the coolant into a suitable container.

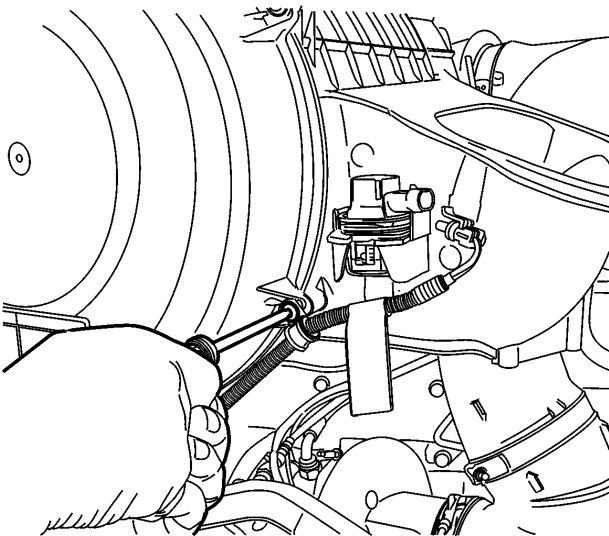
DBT2V700, 9996049



W2006107

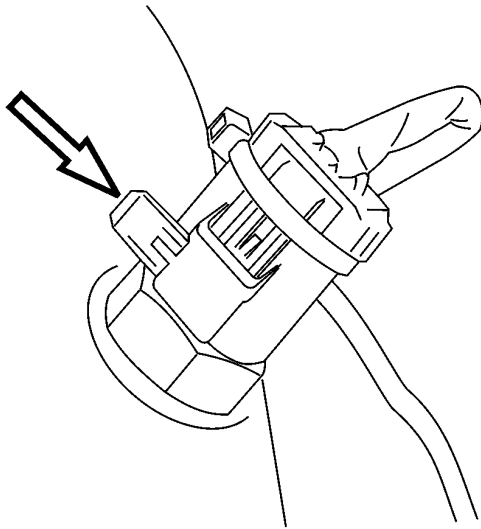
- 5**
Remove the charge air pipe from between the turbocharger and the charge air cooler.

Note: Disconnect the Discharge Recirculation Valve (DRV) air supply line.



W2003861

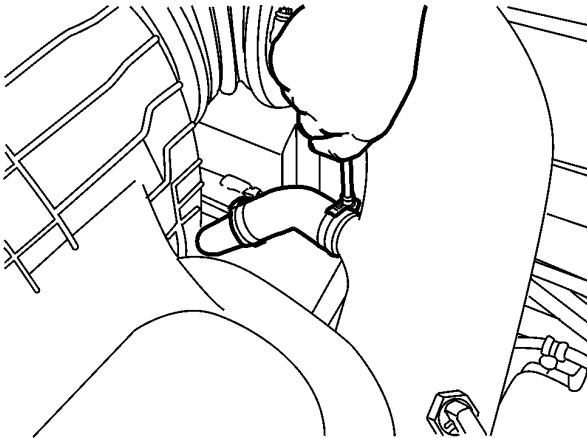
- 6**
Disconnect and remove the air filter restriction gauge wiring harness from the air filter housing.



W2004720

7

Unplug the air temperature sensor wiring harness connector. First, remove the lock tab, then separate the connector from the sensor. Remove the clamp securing the sensor harness to the main fresh air pipe.



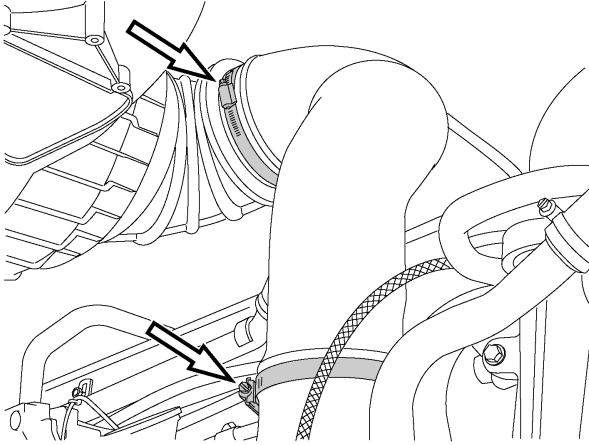
W2004719

8

Loosen the air compressor fresh air hose clamp.

9

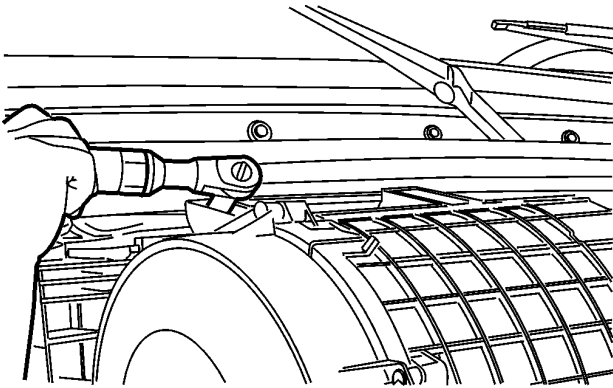
Loosen the clamps and remove the main fresh air pipe from the air compressor fresh air hose, the air filter housing and turbocharger inlet elbow.



W2006005

10

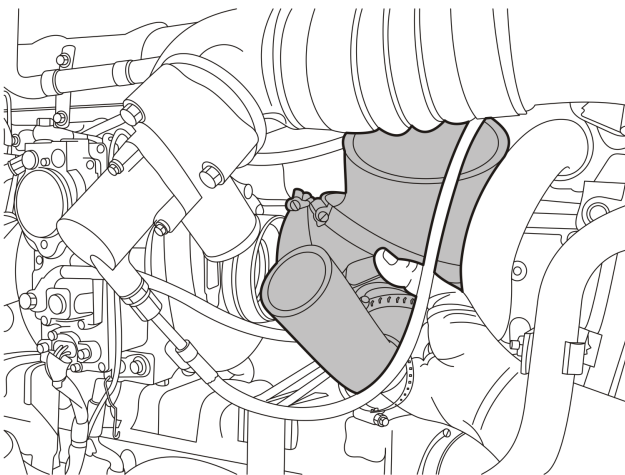
Remove the fasteners and lift the air filter housing away from the cab.



W2003858

11

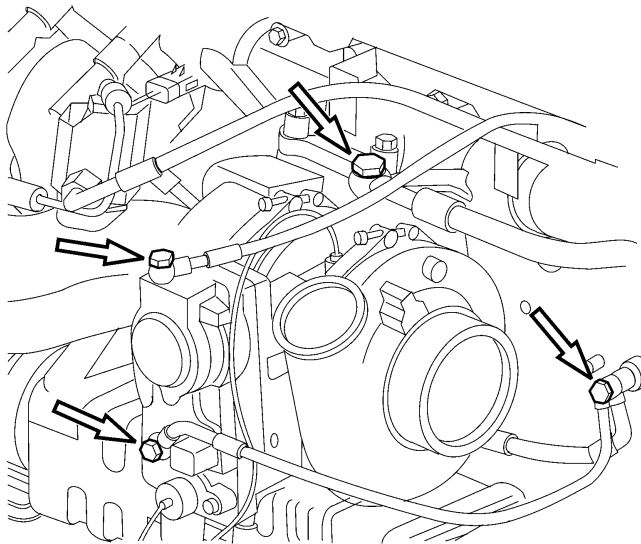
Remove the turbocharger inlet elbow.



W2005973

12

Remove the right-hand hood support bracket.

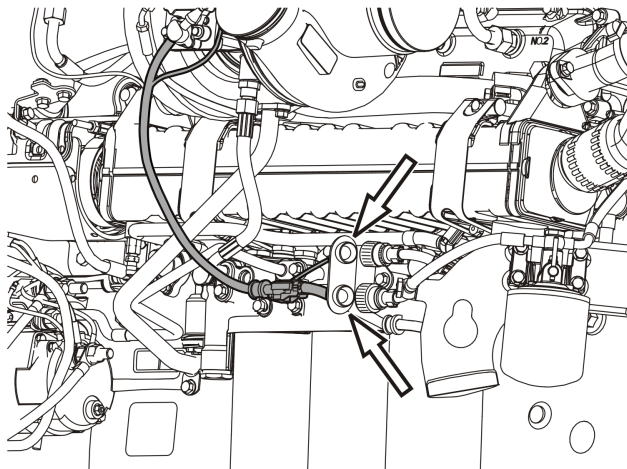


W2005965

13

Disconnect all the coolant supply and the coolant return lines from the turbocharger and turbocharger actuator.

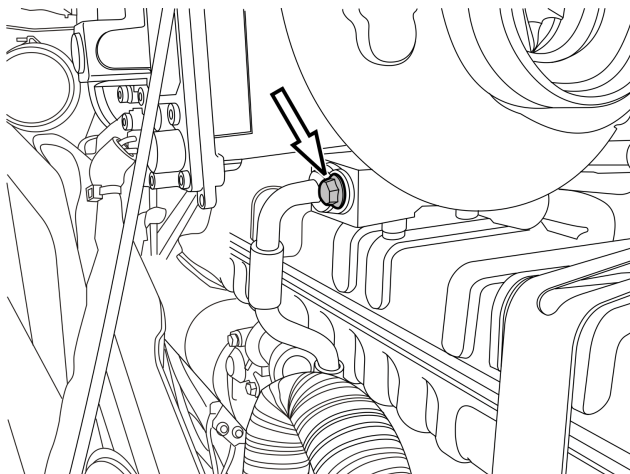
Note: The bottom return line must be removed from the cylinder block.



W2005620

14

Release the actuator and turbocharger speed sensor wiring harnesses by cutting the tie straps. Disengage the connectors located above the oil filter housing.



W2005966

15

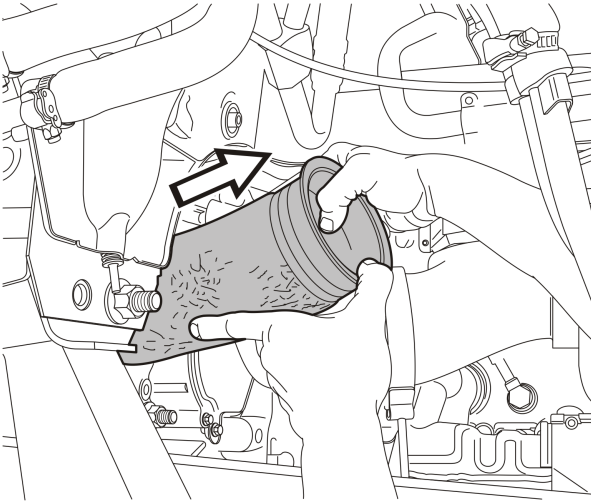
Disconnect the oil supply line at the turbocharger.

16

Disconnect the aftertreatment fuel injector wiring harness connector. Remove all clips and tie straps to allow harness to hang free.

17

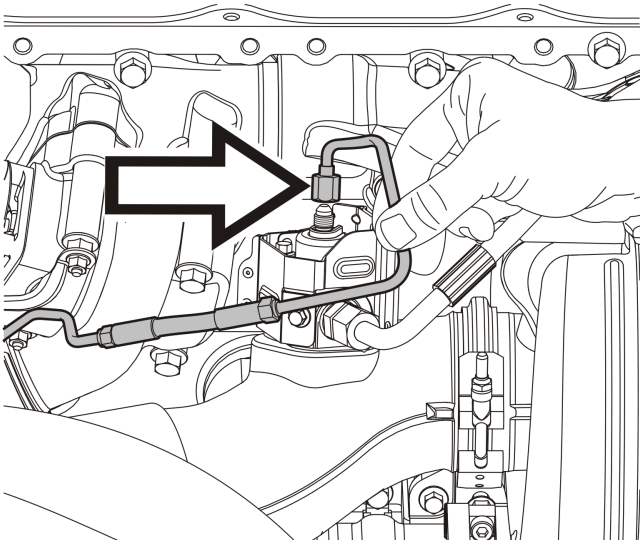
Remove the exhaust pipe from between the diffuser pipe and the Diesel Particulate Filter (DPF) muffler inlet pipe. Lift the pipe over the diffuser and out from under the cab.



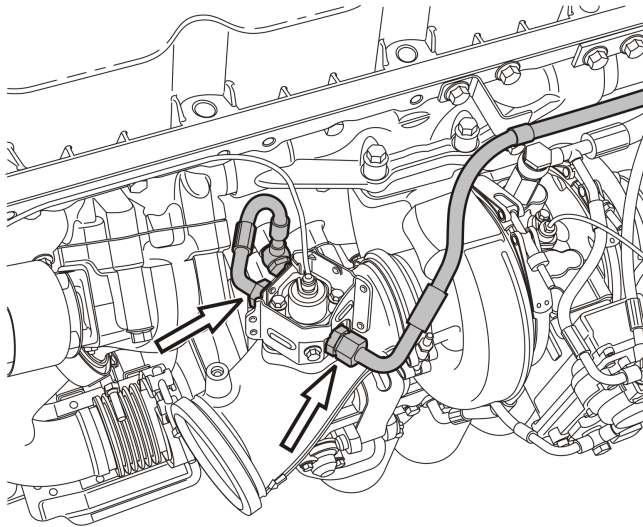
W2005952

18

Remove the fuel line from the aftertreatment fuel injector.



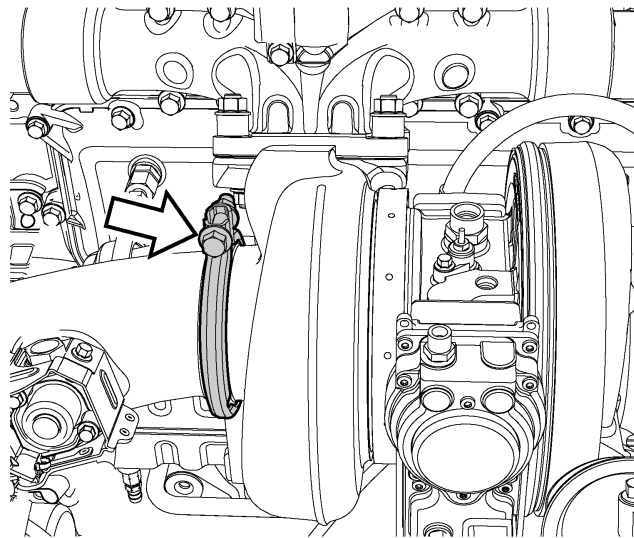
W2005951



W2005925

19

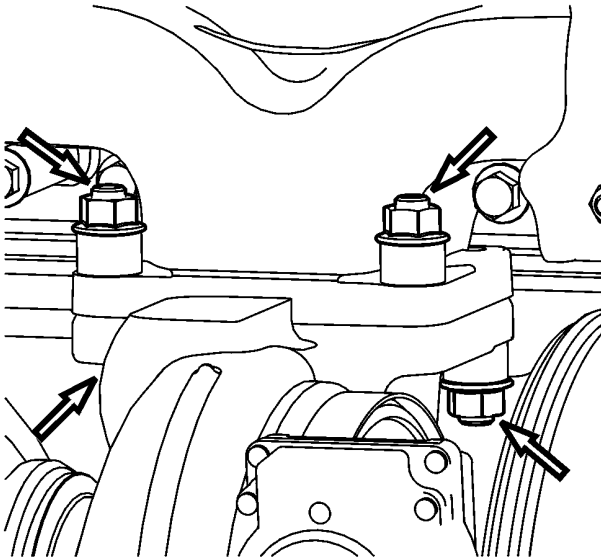
Disconnect the inlet and outlet coolant lines from the aftertreatment fuel injector fittings.



W2006136

20

Loosen the V-band clamp at the turbocharger and remove the diffuser pipe.



W2005011

21

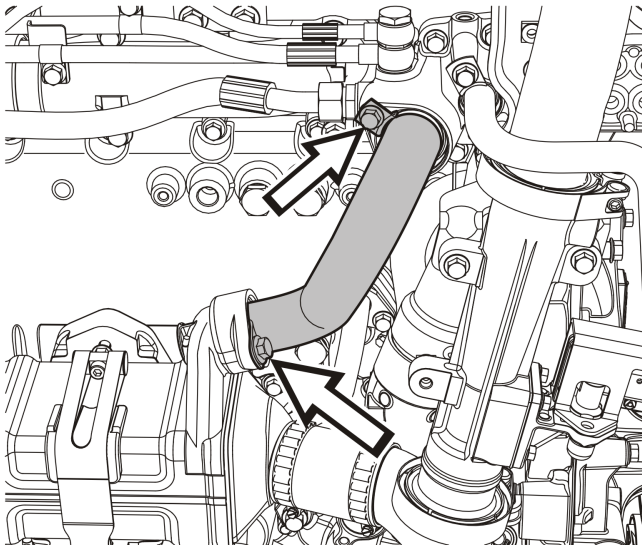
Remove all four turbocharger flange mounting nuts and spacers.

22

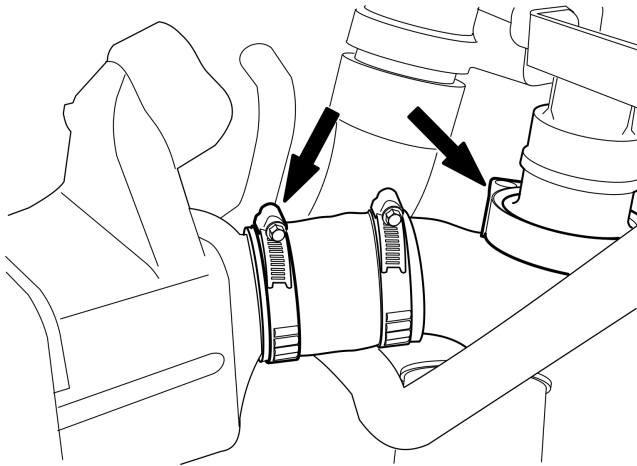
Remove the turbocharger from the exhaust manifold.

23

Remove bolts and retainer clips securing the EGR cooler coolant pipe. Remove the coolant pipe.



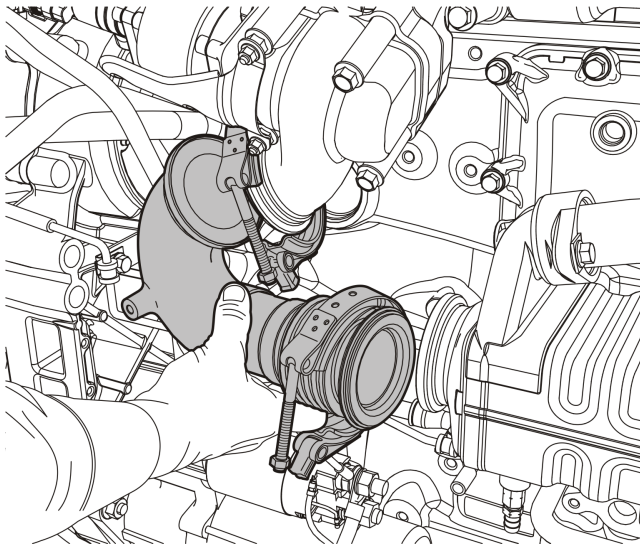
W2005967



W2005968

24

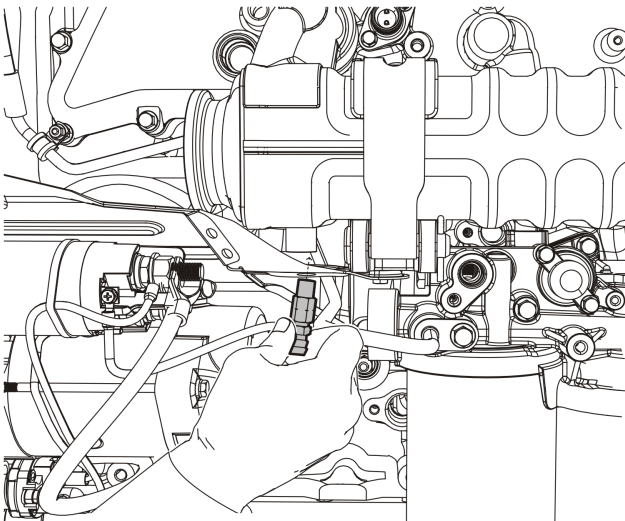
Remove the V-clamp from the venturi inlet elbow. Loosen the clamp and remove the EGR hose and pipe located between the EGR cooler and the venturi.



W2005641

25

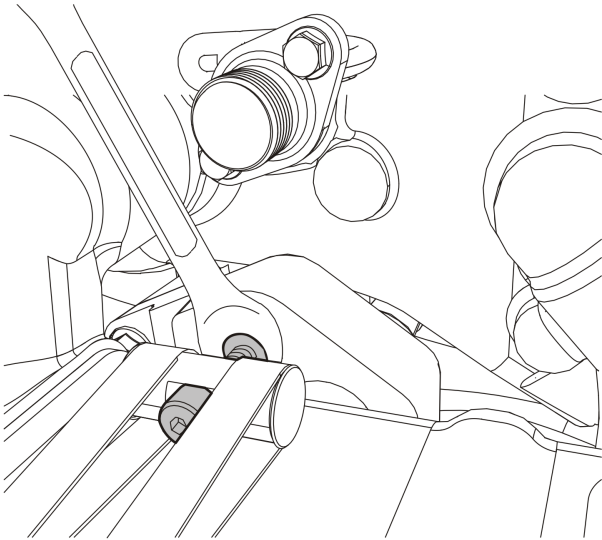
Remove the V-band clamps retaining the EGR hot pipe. Remove the pipe.



W2005716

26

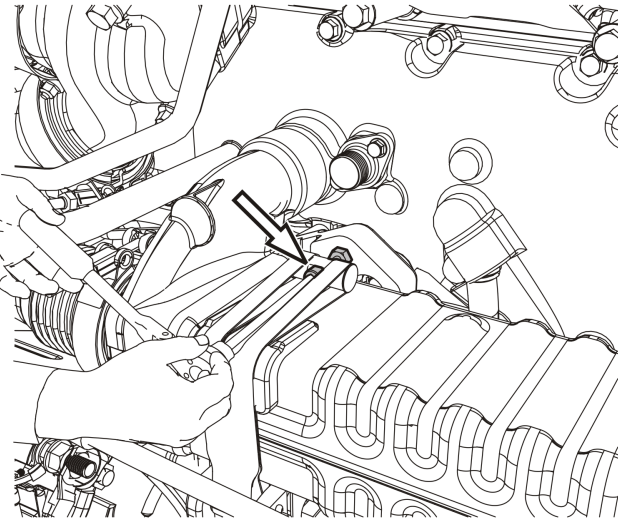
Loosen and remove the drain fitting from the EGR cooler. Drain the coolant into a suitable container.



W2005752

27

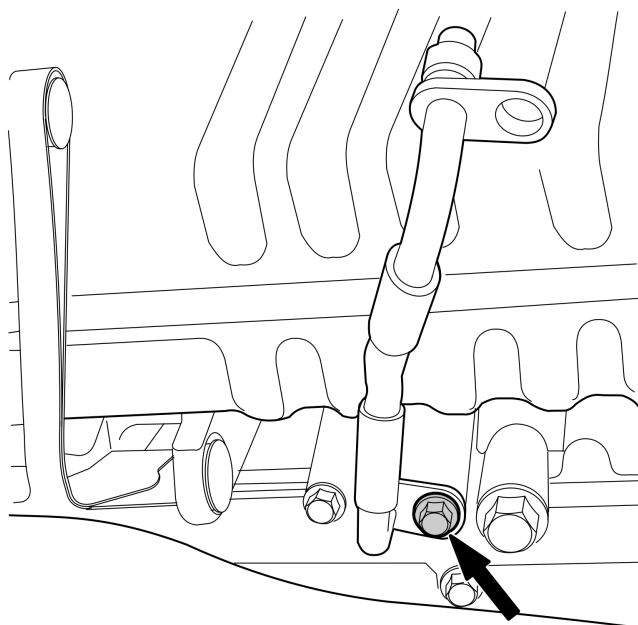
Loosen the jam nuts securing the clamp strap fasteners from the front and rear EGR cooler brackets.



W2005751

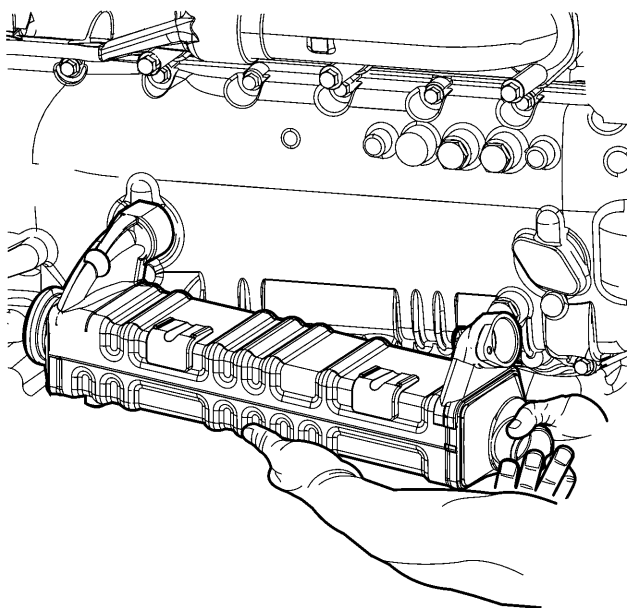
28

Remove the fasteners securing the retaining straps to the EGR mounting brackets. Move the straps out of the way.



W2005969

- 29**
Remove turbocharger oil supply line from oil filter housing.

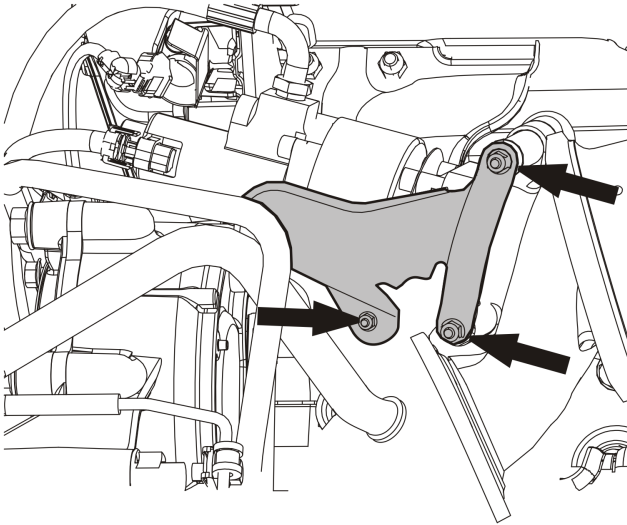


W2005970

- 30**
Remove the cooler from the mounting brackets.

31

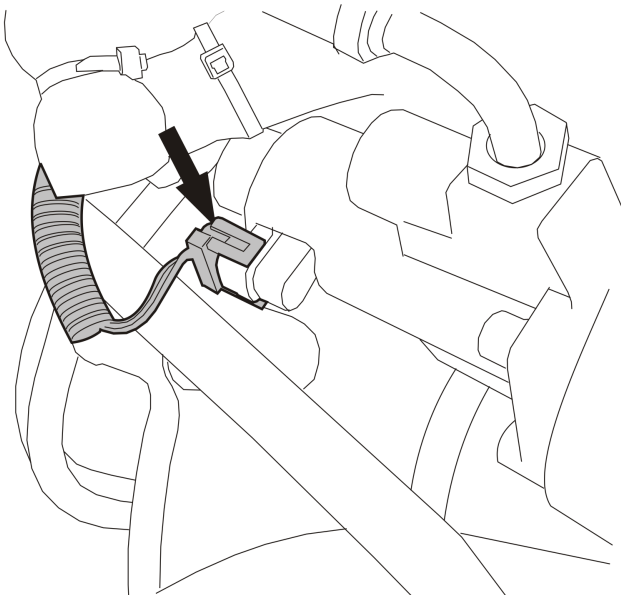
Remove the fasteners securing the EGR valve heat shield and remove the shield.



W2005685

32

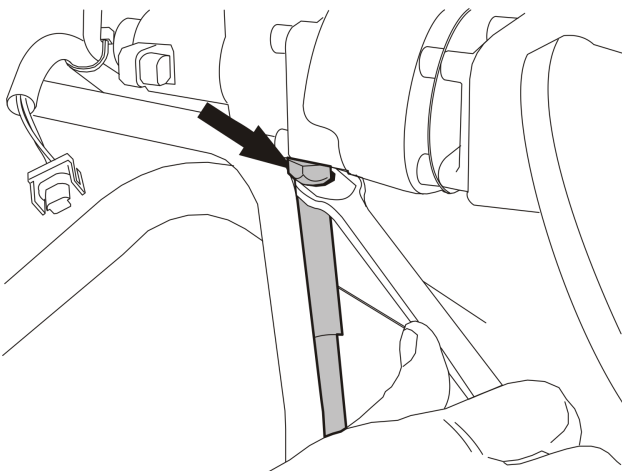
Disconnect the wiring harness connector from the terminal on the EGR valve.



W2005689

33

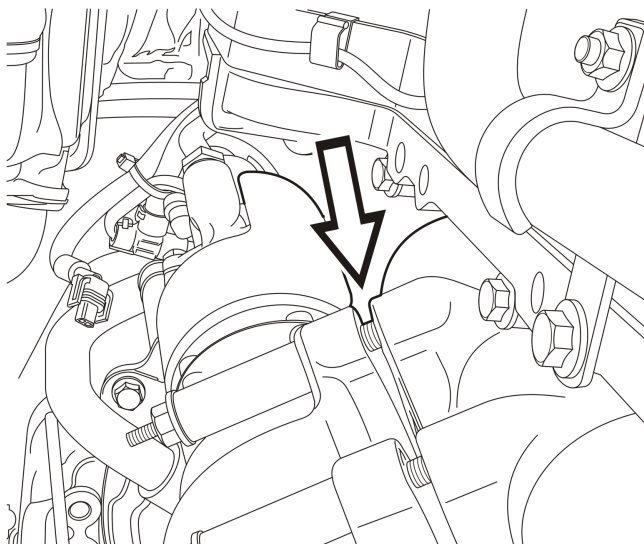
Loosen the oil supply line at the EGR valve.



W2005692

34

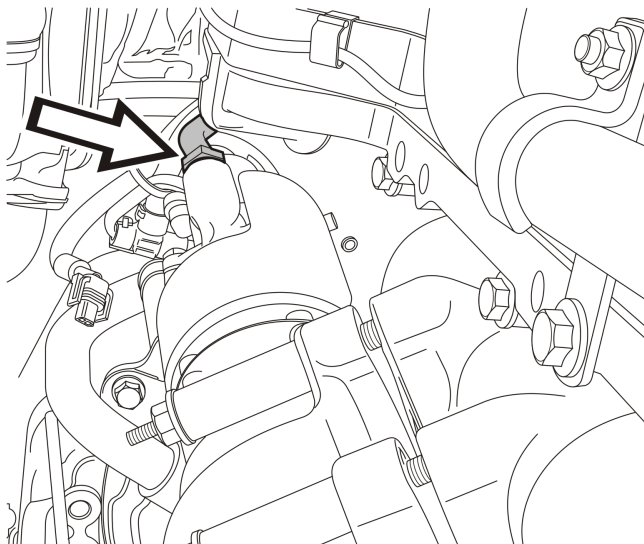
Loosen but do not remove all EGR valve mounting bolts.



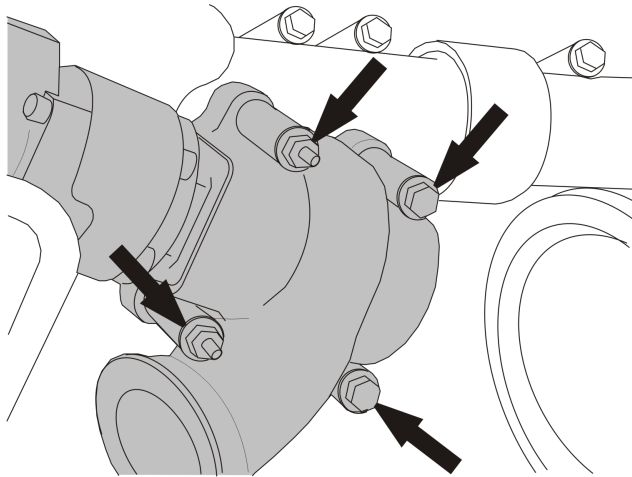
W2005954

35

Loosen the oil return line from the EGR valve.



W2005955

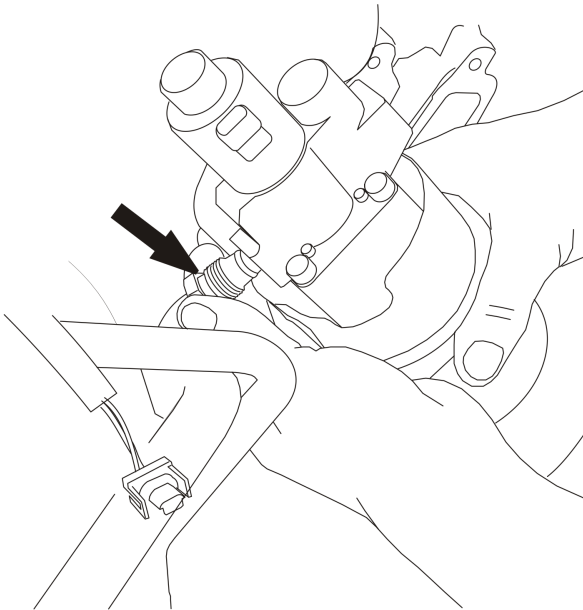


W2005693

36

Remove all EGR valve mounting bolts and remove the valve with gasket from the exhaust manifold.

Note: Both oil lines will still be attached to the EGR valve.



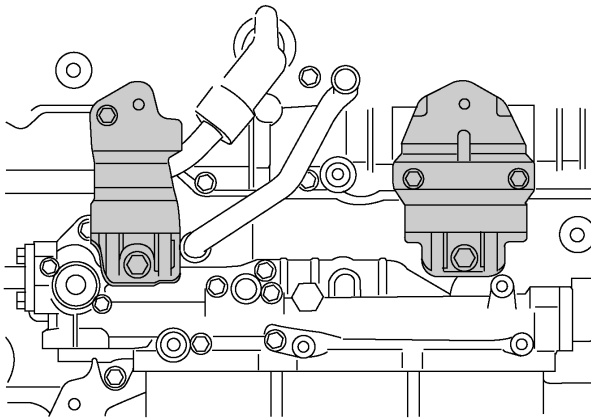
W2005694

37

Remove both oil lines from the EGR valve and remove EGR valve from engine compartment.

38

Remove the bolts securing the EGR cooler brackets to the oil cooler cover and cylinder block. Remove the brackets from the engine.



W2005901

39

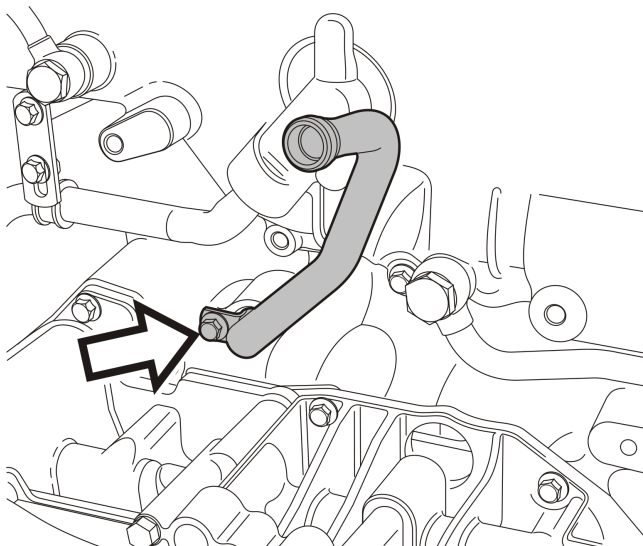
Using a suitable tool, remove turbocharger mounting studs from the exhaust manifold.

40

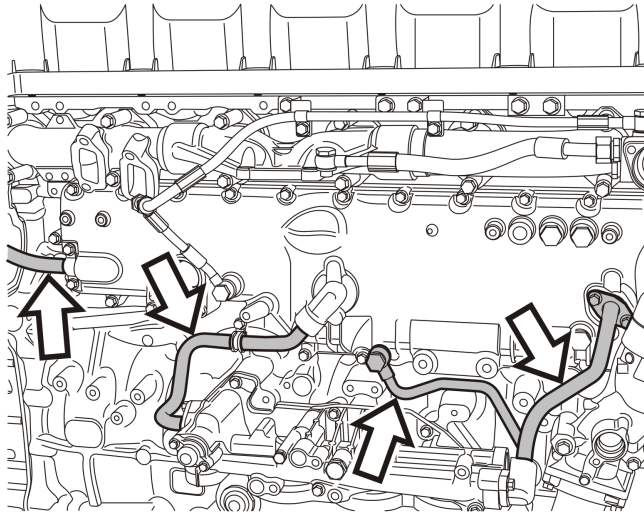
Using the coolant extractor, drain the coolant from the oil cooler cover using the coolant extractor connection.

41

Remove the turbocharger oil return pipe from the cylinder block.



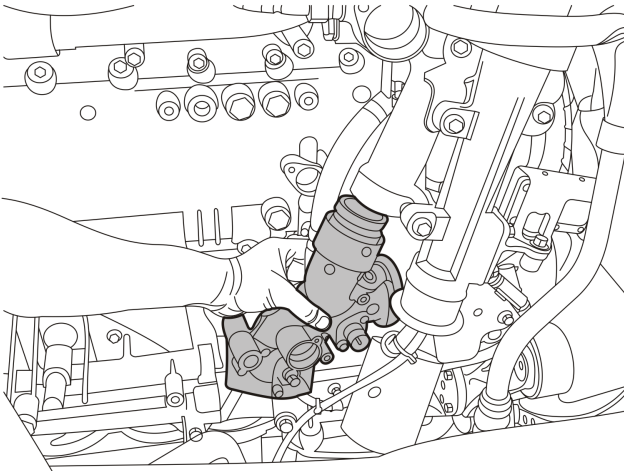
W2006067



W2006068

42

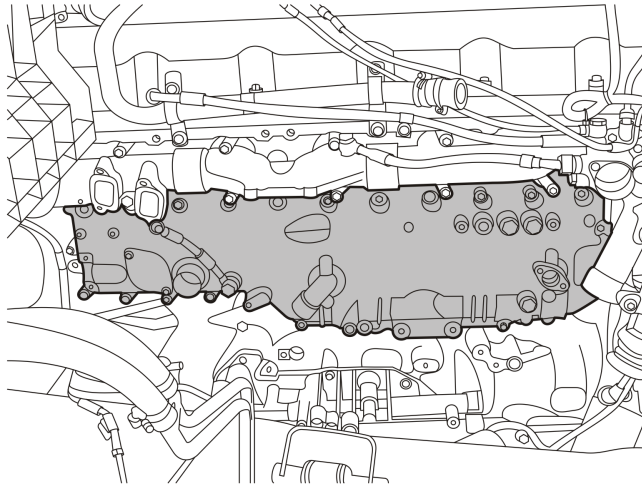
Remove all hard pipes (coolant and oil) from the oil cooler cover. Collect coolant as hard lines are removed.



W2006069

43

Remove the water pump inlet housing with the coolant hose connected.

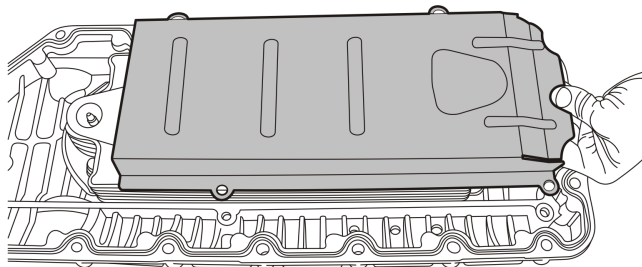


W2006070

44

Remove the oil cooler cover fasteners and remove the oil cooler and cover assembly from the engine.

Note: Note all fastener locations as some fasteners may be different lengths.



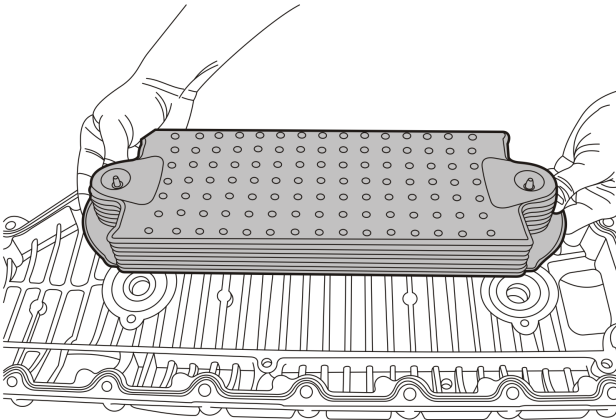
W2006071

45

Place the oil cooler and cover assembly on a clean work surface and remove the flow plate.

46

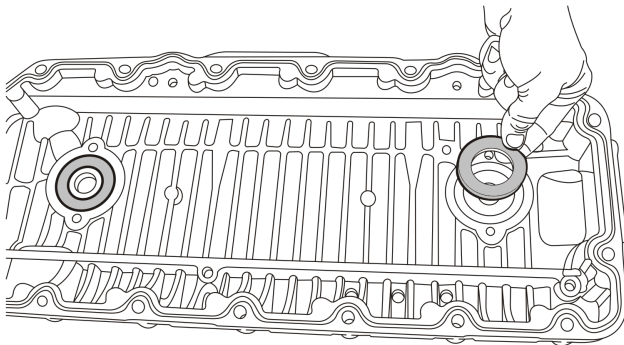
Remove oil cooler fasteners and remove the cooler from the cover.



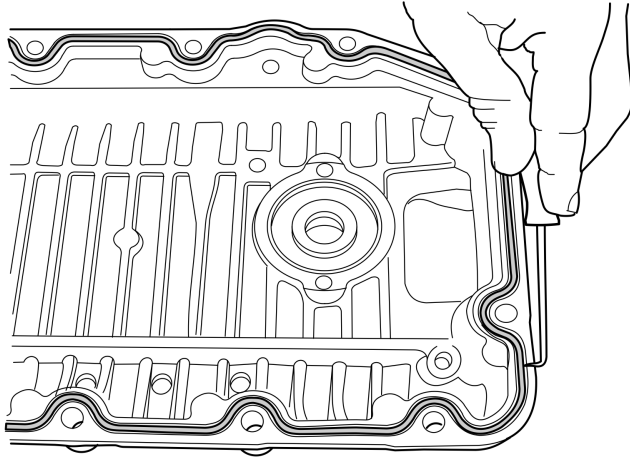
W2006072

47

Remove the oil cooler sealing O-ring gaskets between the oil cooler and cover using a suitable pick. Discard the O-rings.



W2006073



W2006074

48

Remove the formed gasket from the groove of the cover using a suitable pick. Discard the formed gasket.

49

Clean all gasket sealing surfaces.

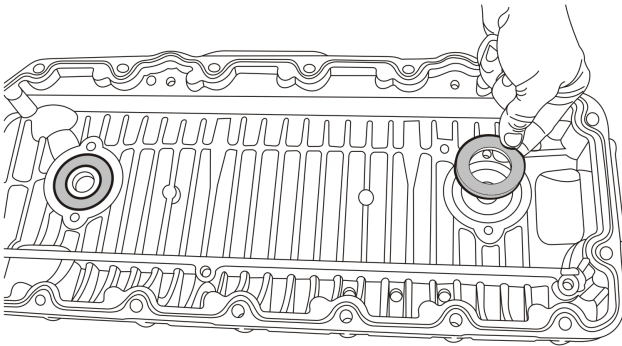
Installation

1

Install a new formed gasket in the groove of the cover.

2

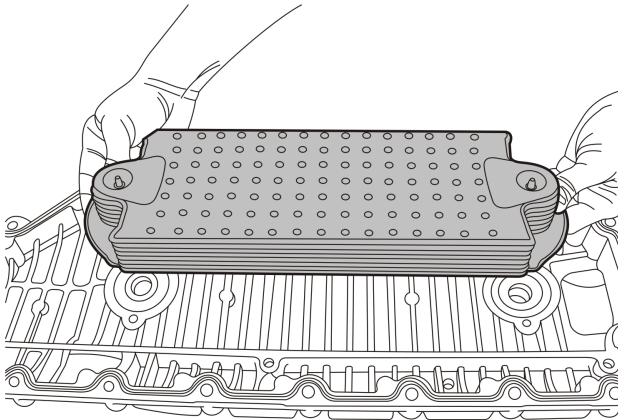
Install new oil cooler sealing O-rings between the oil cooler and cover. Install the sealing O-rings into the grooves in the cover.



W2006073

3

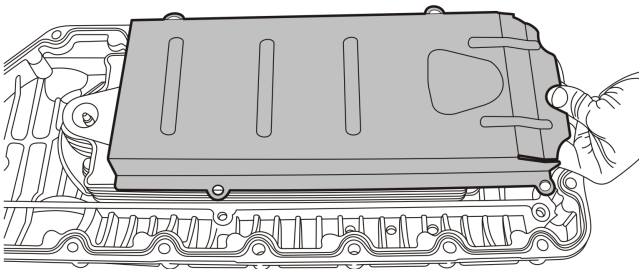
Install the oil cooler in the oil cooler cover. Torque-tighten fasteners to specification.



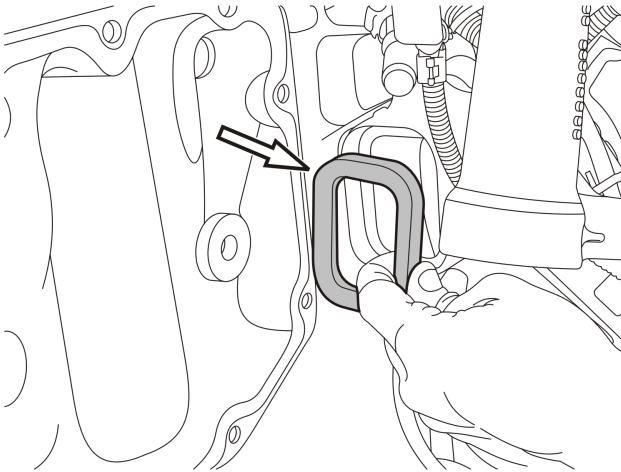
W2006072

4

Install the oil cooler flow plate over the oil cooler. Tighten fasteners to specification.



W2006071



W2006075

5

Replace the water pump inlet housing formed rubber gasket. Lubricate new gasket upon installation.

6

With assistance, set oil cooler cover assembly in place. Install the upper left corner fastener.

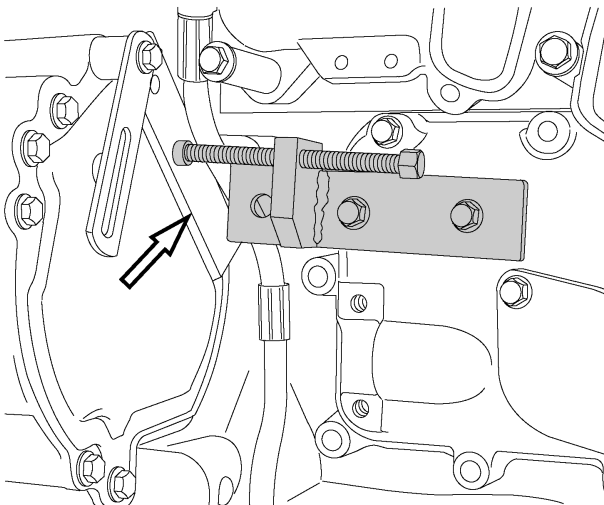
Note: This mounting location is slotted for adjustment.

7

Using the assembly tool, push the cover forward to compress the formed rubber gasket at the water pump inlet. Install upper right corner fastener.

Note: A small piece of metal stock should be used to keep from deforming stamped cover that is being pressed against.

88800022



W2006076

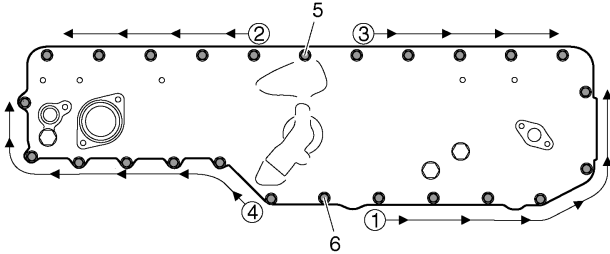
8

Adjust cover as required to allow upper and lower center fasteners to be installed. Using a feeler gauge to check clearance, maintain a constant gap between cover and the lip of the cylinder head. Adjust cover as necessary to match the above criteria and tighten center fasteners to hold cover in place.

Note: The upper center mounting location has a tighter tolerance than other mounting locations.

9

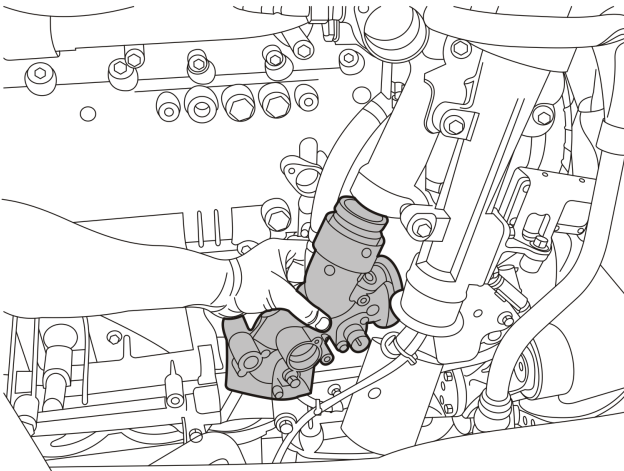
Start all remaining cover fasteners and torque-tighten fasteners to specification in the order shown.



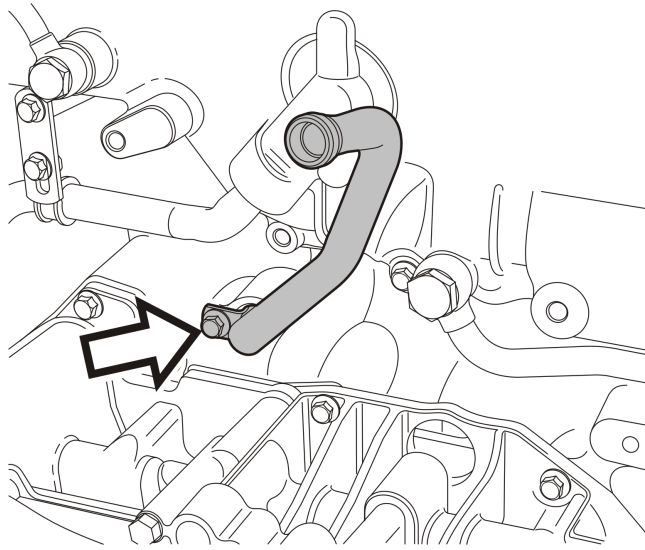
W2006216

10

Install the water pump inlet housing with the hose attached. Replace and lubricate all sealing O-rings.



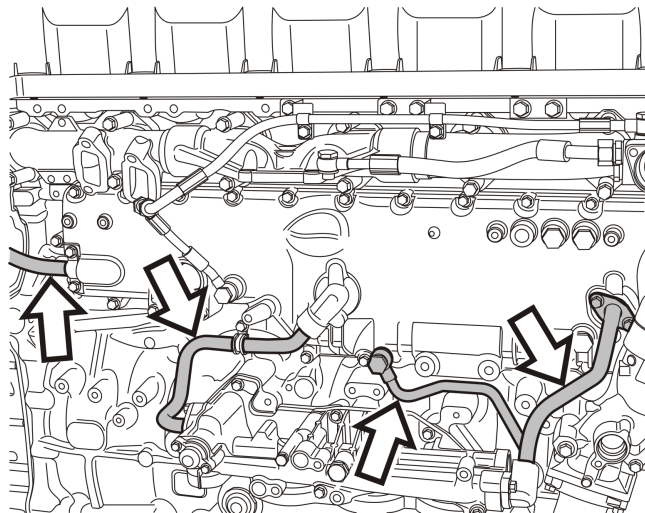
W2006069



W2006067

11

Install the turbocharger oil return pipe into the cylinder block. Replace and lubricate all sealing O-rings.



W2006068

12

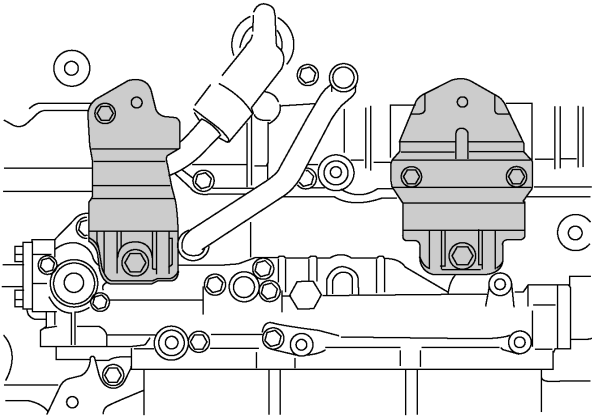
Install all hard pipes (coolant and oil) to the oil cooler cover. Replace and lubricate all sealing O-rings. Also, replace sealing washers for the banjo fitting on oil cooler cover. Tighten banjo fittings to specification.

13

Using a suitable tool, install turbocharger mounting studs into exhaust manifold.

14

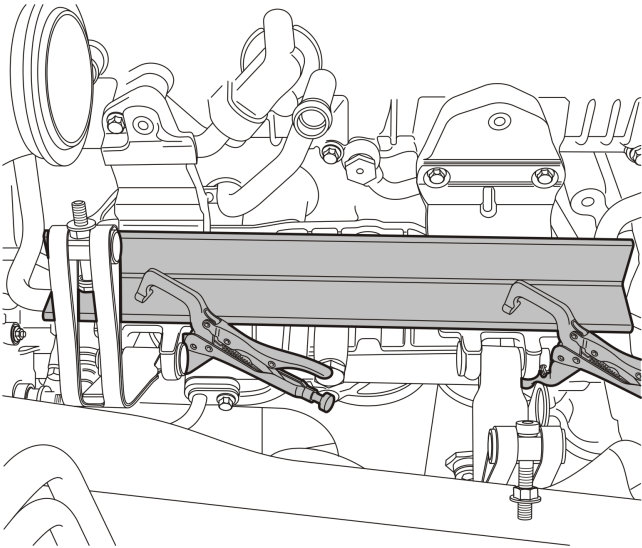
Install the front and rear EGR cooler brackets in position over the oil cooler cover and cylinder block. Loosely install mounting bolts. Do not tighten at this time.



W2005901

15

Place a straightedge across the mounting pads of the EGR cooler brackets and clamp the straightedge in place on the pads.



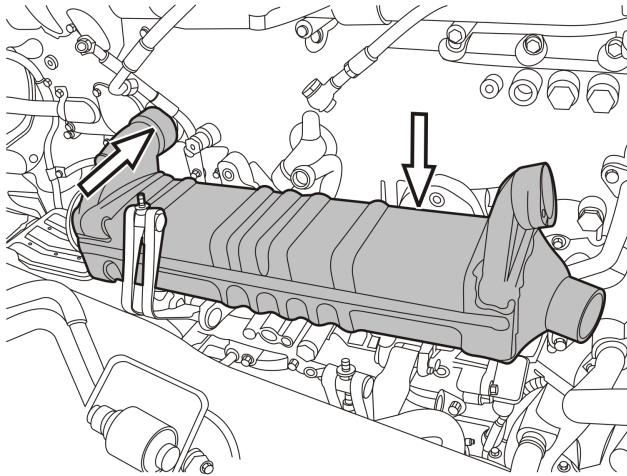
W2005974

16

Tighten upper mounting bolts on both brackets to specification. Remove the clamps and alignment straightedge. Now, secure the lower mounting bolts to specification.

17

Replace and lubricate the O-ring that seals the EGR cooler to the oil cooler housing.

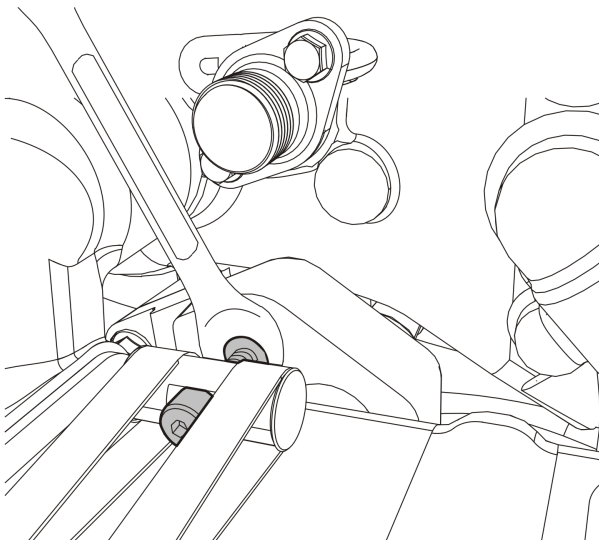


W2005971

18

Place the EGR cooler in position on the mounting brackets. Align the EGR cooler with the coolant return port and engage the cooler.

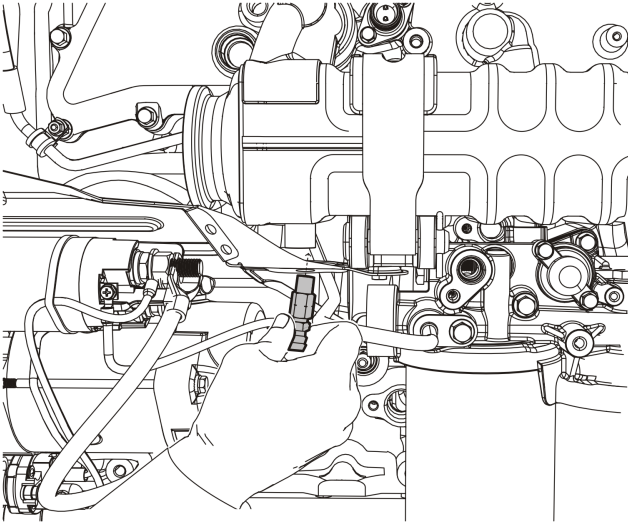
Note: The alignment pin at the bottom of the cooler must fall into the groove on the front bracket.



W2005752

19

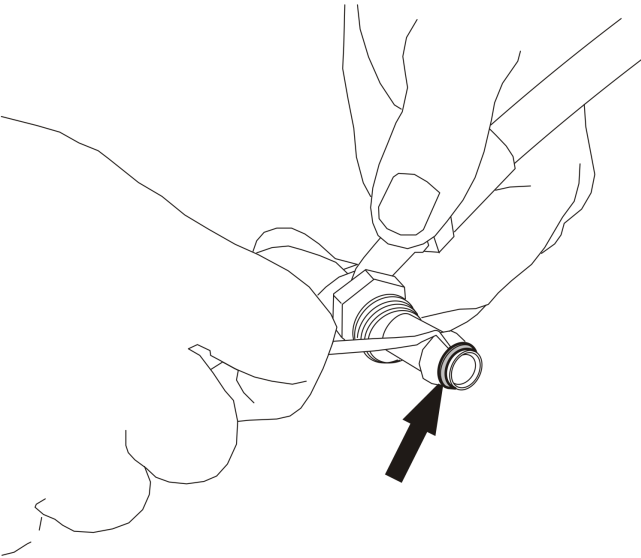
Rotate the retaining straps into position and tighten the fasteners on each strap to specification. Tighten the jam nut to secure each fastener.



W2005716

20

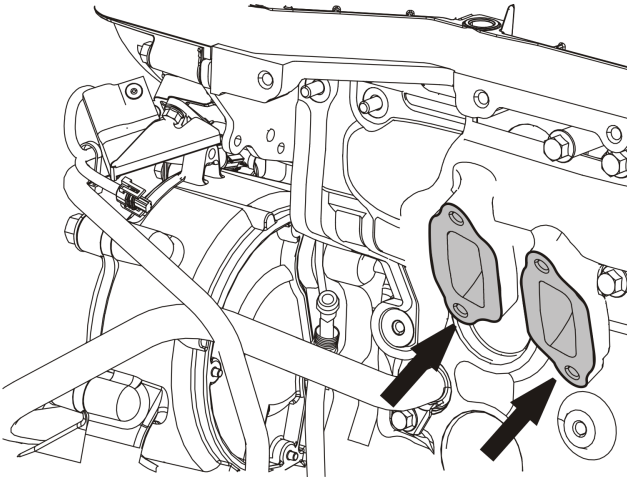
Apply sealant to threads of the drain valve. Install the drain valve in the cooler and tighten to specification.



W2005691

21

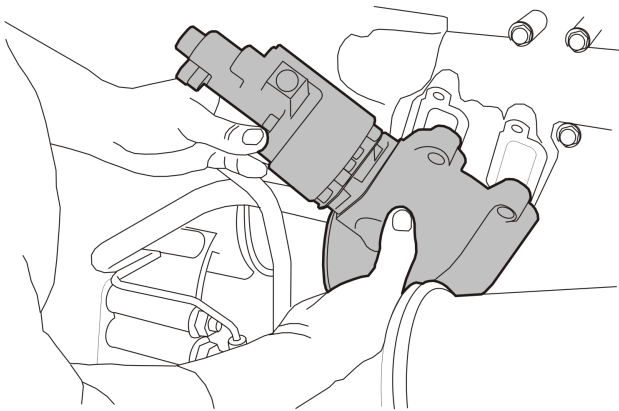
If EGR oil lines are equipped with O-rings, replace and lubricate.



W2005697

22

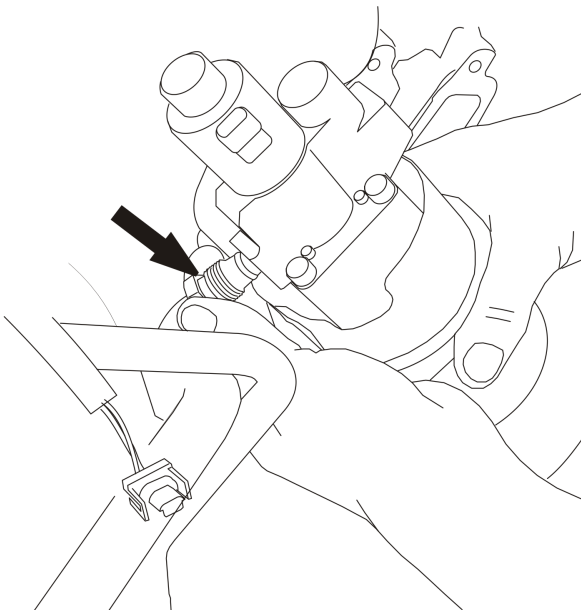
Clean any carbon deposits from the sealing surface of the EGR ports of the exhaust manifold.



W2005695

23

Position the EGR valve over the exhaust manifold EGR ports.



W2005694

24

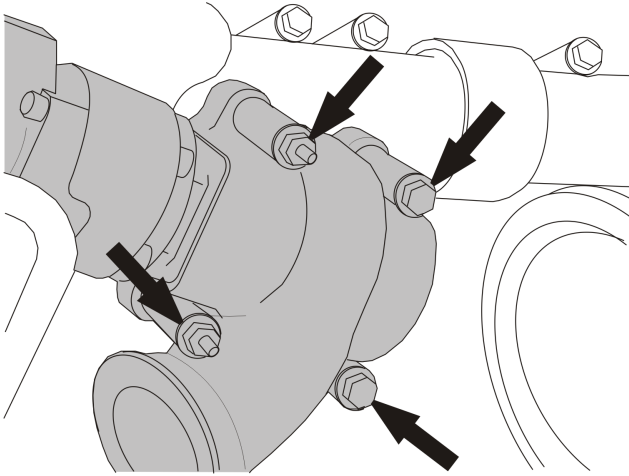
Install both oil lines to the EGR valve. Allow both fittings to remain finger tight at this time.

25

With the EGR valve positioned close to the exhaust manifold ports, slip a new metal gasket between the valve and manifold. Start two new bolts to the top of the EGR valve to hold the gasket in place.

26

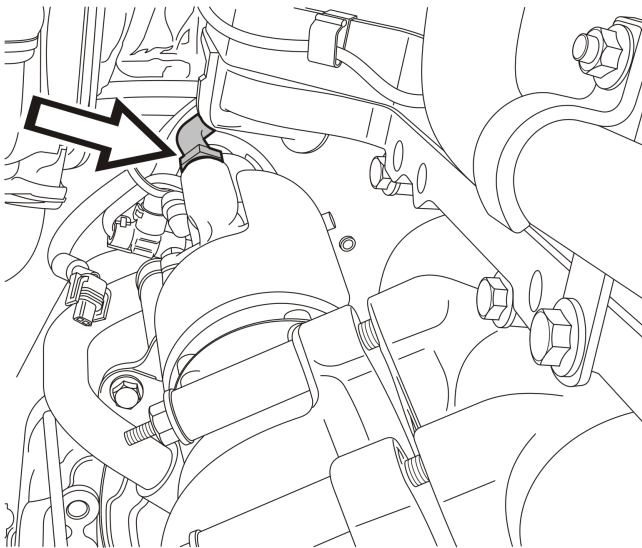
Start the remaining new bolts used to secure the EGR valve.



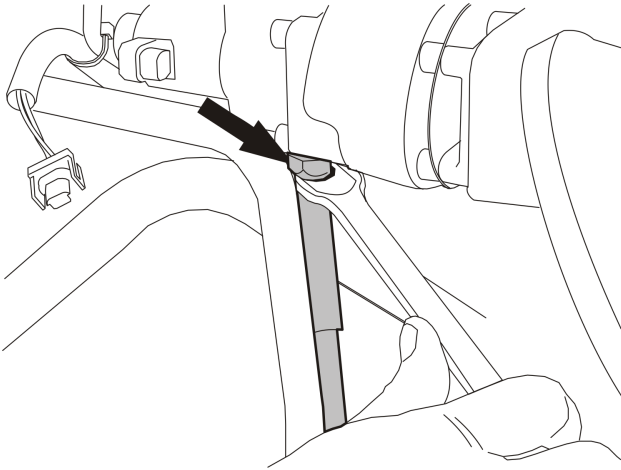
W2005693

27

With the EGR valve loose, securely tighten the oil return line to the rear of the EGR valve.



W2005955



W2005692

28

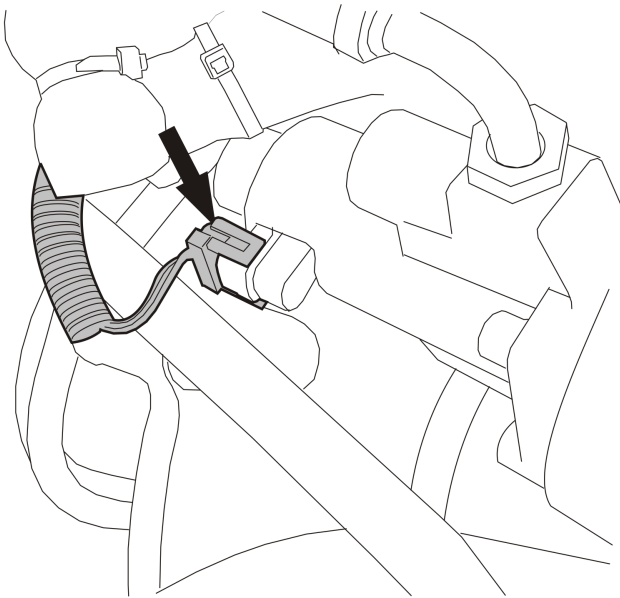
Securely tighten the oil supply line to the bottom of the EGR valve.

29

Tighten the EGR valve mounting bolts to specification.

30

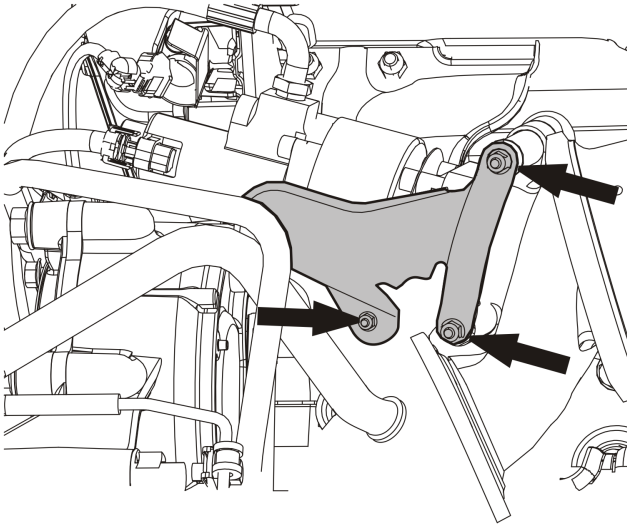
Connect the wiring harness lead to the EGR valve terminal.



W2005689

31

Place the EGR heat shield in position over the EGR valve. Install the fasteners to secure the shield to the cylinder block and to the studs on the valve mounting bolt heads. Tighten the fasteners to specification.

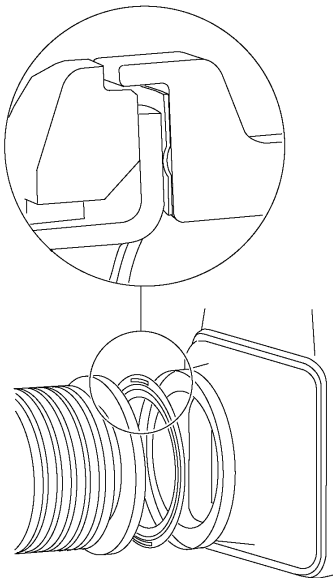


W2005685

32

Install new high-temperature gaskets into the EGR valve end of the hot pipe and the inlet of the EGR cooler. Ensure the gaskets lay flat against the flange surfaces with the bead of the gaskets facing toward the hot pipe.

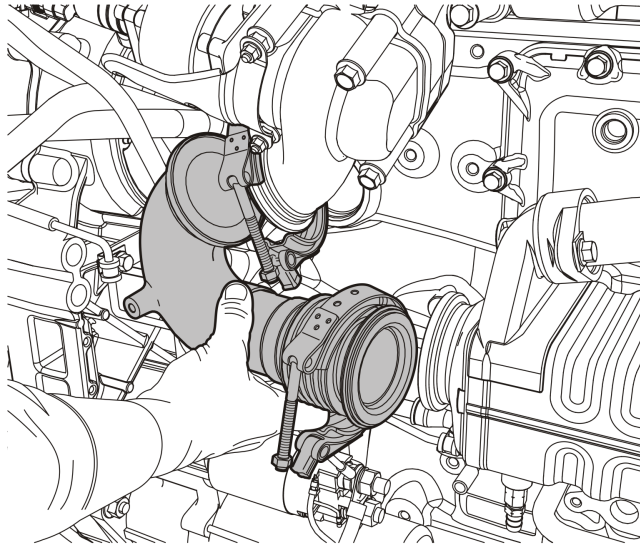
Note: Gaskets are one-time use only. Do not reuse gaskets.



W2006187

33

Inspect the V-clamps and T-bolt threads for wear or damage. If they are OK, apply anti-seize compound to the T-bolt threads. Lubricate the V-inserts of the clamps with forminol (or equivalent release and assembly oil) to clamp inner segments.



34

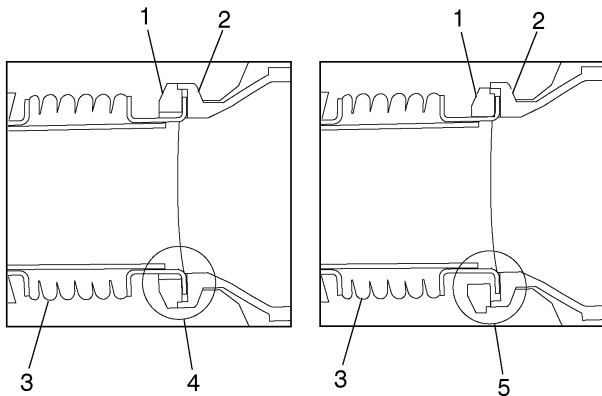
Hook the upper V-clamp over the EGR valve flange. Next, place the remaining V-clamp over the bellows on the hot pipe.

35

Lubricate both the flange on the EGR cooler inlet and the flange on the EGR hot pipe with fresh engine oil. Lubrication aids in proper V-clamp performance.

36

Position the EGR hot pipe between the EGR valve and the EGR cooler. Make sure the flanges engage properly. While holding the hot pipe in position, slide the upper V-clamp over the flange and tighten until snug. Next, slide the lower V-clamp over the flange of the EGR cooler and tighten the clamp until snug.



- 1 EGR Pipe Floating Flange
- 2 EGR Cooler Flange
- 3 EGR Pipe
- 4 Flange Assembled Correctly
- 5 Flange Assembled Incorrectly

W2006163

37

Visually inspect that the floating flange through the gap in the V-band clamp to make sure it is properly seated in the EGR cooler flange. The floating flange must be concentric with the EGR cooler flange.

Note: If the floating flange is not properly seated in the EGR cooler flange, the gasket will not be compressed and the seal will leak.

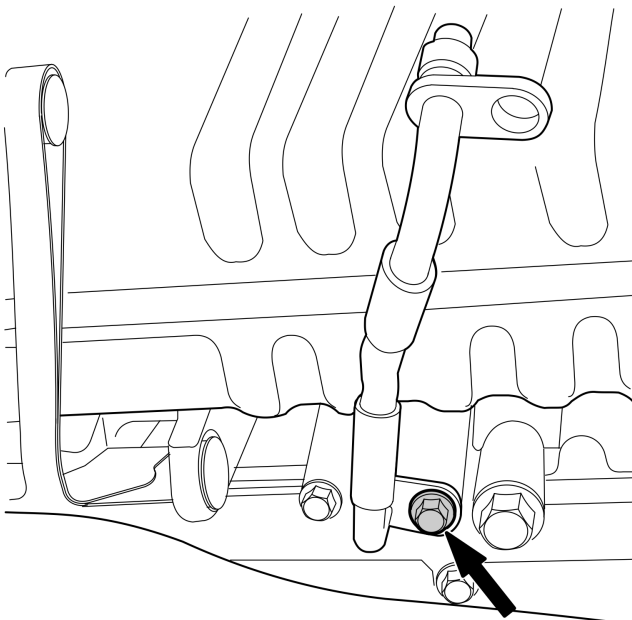
38

Position the V-clamps so that the T-bolts clear the heat shield. Tighten the clamps to specification.

Note: After reaching the specified torque, inspect the V-clamps to make sure that no portion of the clamp has bottomed out.

39

Replace and lubricate the turbocharger oil feed line O-rings. Connect the turbo oil feed line to the port on the oil filter housing.



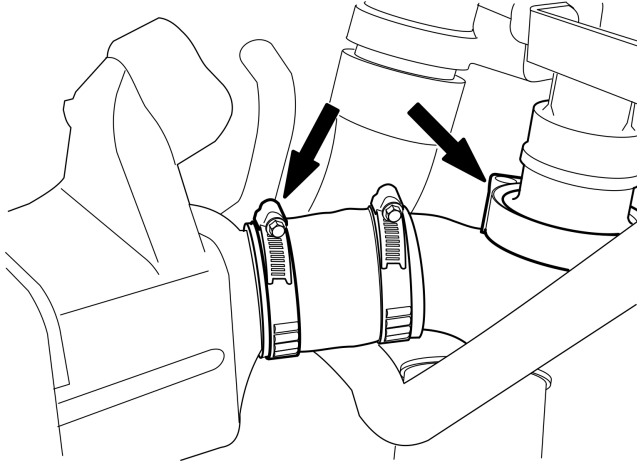
W2005969

40

Replace the hose and O-ring on the pipe that connects the EGR cooler outlet to the venturi.

41

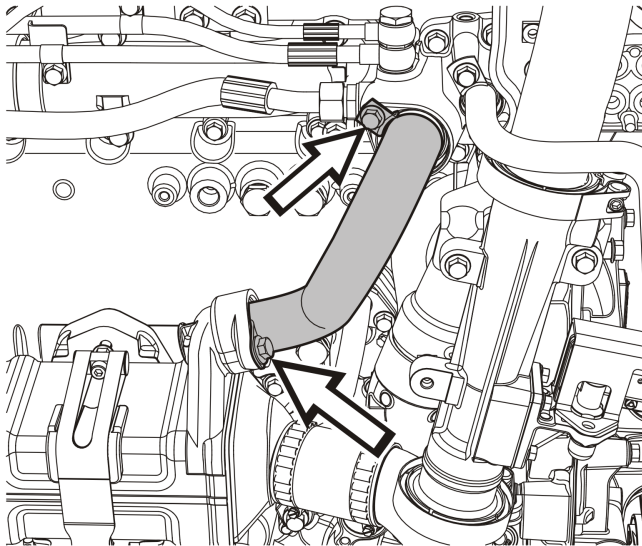
Position the pipe with the hose attached to the EGR cooler outlet. Securely tighten the V-band clamp at the venturi and the hose clamp at the cooler.



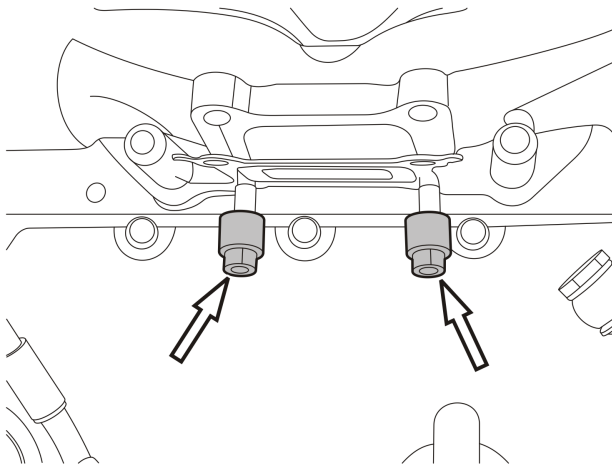
W2005968

42

Install and lubricate new O-rings on the coolant pipe. Position the pipe on the engine. Install the retainer clips with fasteners and tighten to specification.



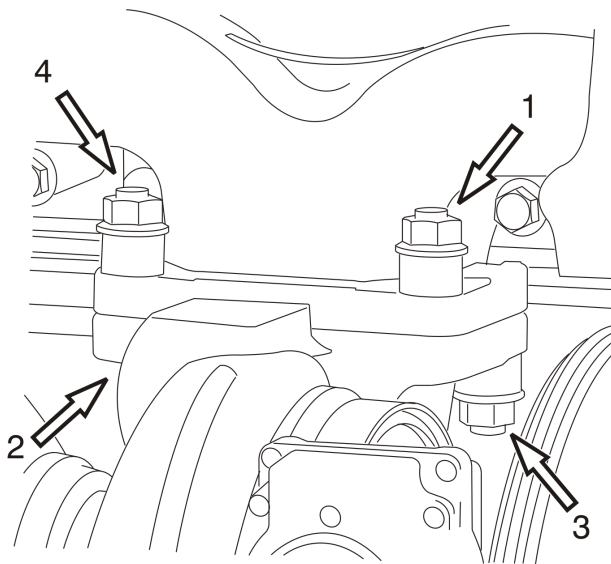
W2005967



W2005972

43

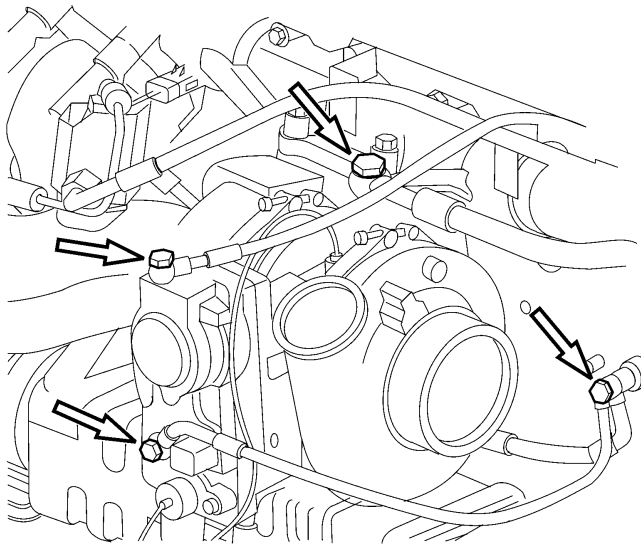
Place the turbocharger gasket onto the studs followed by the spacers and nuts. Start nuts onto studs to hold gasket and spacers.



W2005206

44

Insert the turbocharger oil return. Position the turbocharger on the studs of the exhaust manifold. The turbocharger flange slots slide onto the manifold studs. Install the turbocharger mounting nuts and spacers. Torque-tighten fasteners to specification in the sequence shown.

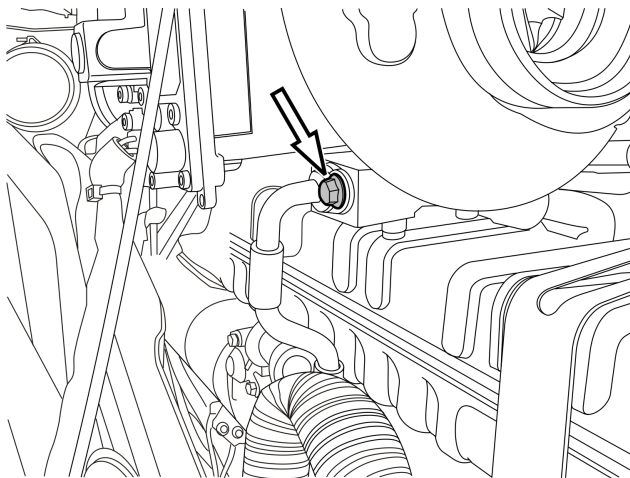


W2005965

45

Replace all sealing washers used on the banjo fittings for the turbocharger and turbocharger actuator. Connect all coolant supply and return lines to the turbocharger and turbocharger actuator.

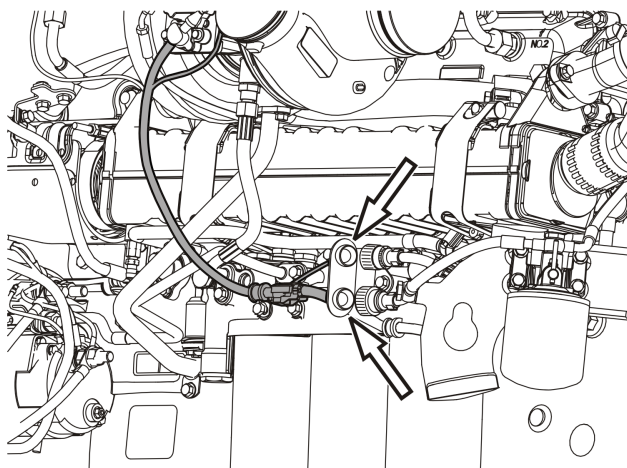
Note: The turbocharger coolant line must be reconnected to the cylinder block.



W2005966

46

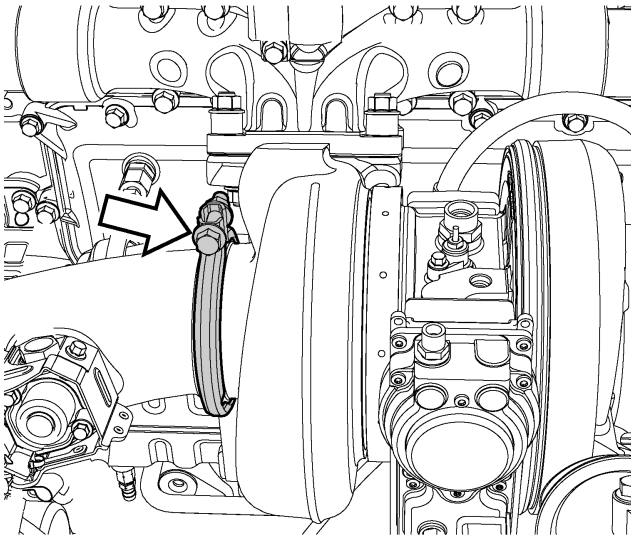
Connect the turbocharger oil feed line to turbocharger.



W2005620

47

Connect the turbocharger actuator and wheel speed sensor wiring harness. Position the connector with the flat side toward the flat in the bracket. Secure the harness to oil filter housing using a P-clamp.

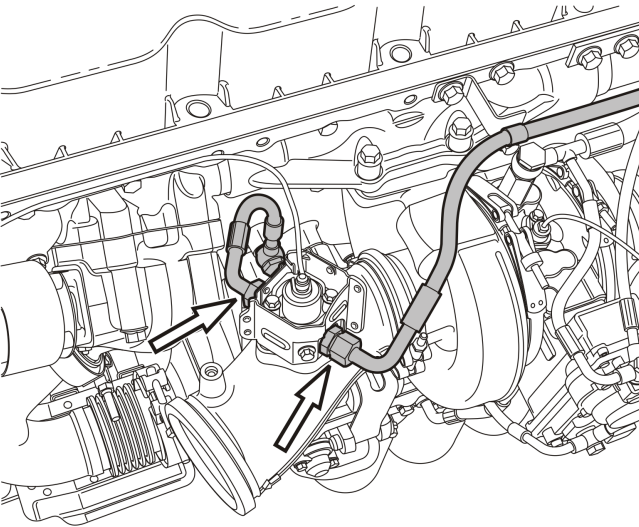


W2006136

48

Position the diffuser against the turbocharger and loosely install a new V-band clamp.

Note: The diffuser V-band clamp is a one time use clamp.



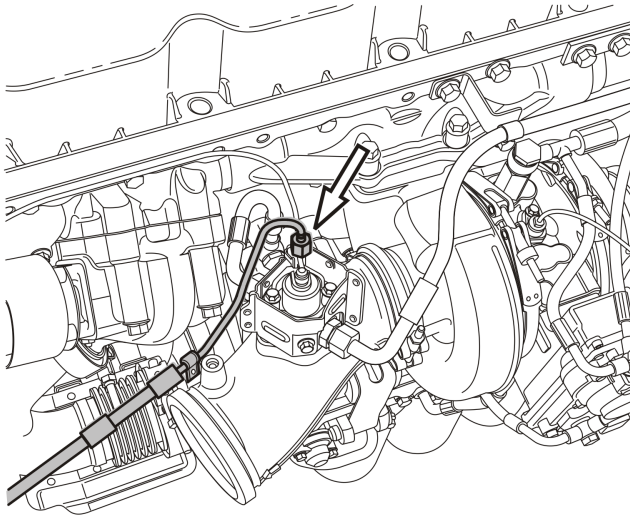
W2005925

49

Reconnect the aftertreatment fuel injector wiring harness connector. Secure the injector wiring harness with clips and tie straps.

50

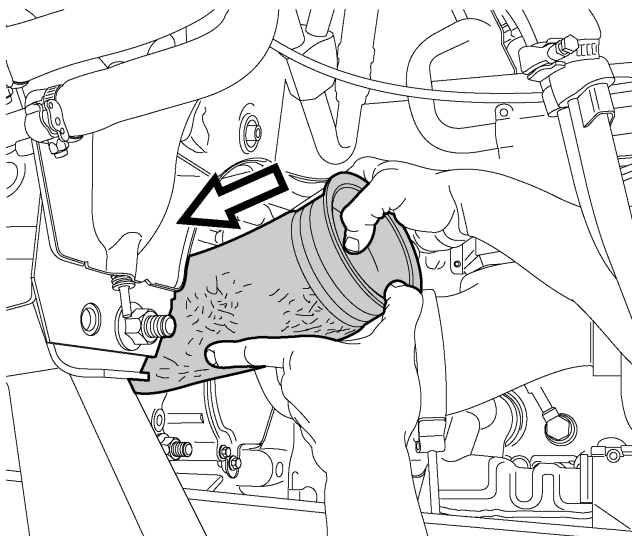
Reconnect the coolant lines to the aftertreatment fuel injector fittings and tighten to secure.



W2005926

51

Connect the aftertreatment fuel injector fuel supply line and tighten to secure.



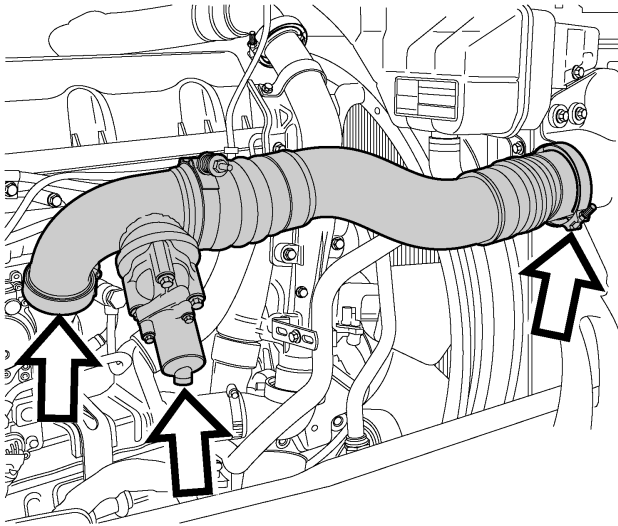
W2006038

52

Position the exhaust pipe between the diffuser pipe and the DPF muffler inlet pipe and loosely install the V-band clamps. Align all exhaust pipes and torque-tighten all V-band clamps to specification.

53

Replace all sealing O-rings on the charge air pipe.

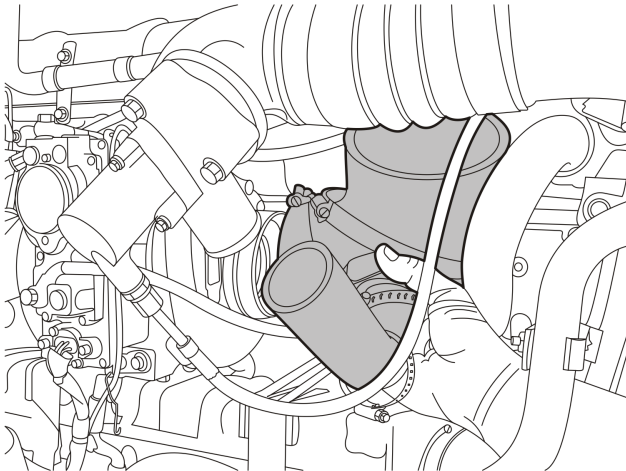


W2006107

54

Install the charge air pipe between the turbocharger and charge air cooler.

Note: Connect the DRV air supply line.



W2005973

55

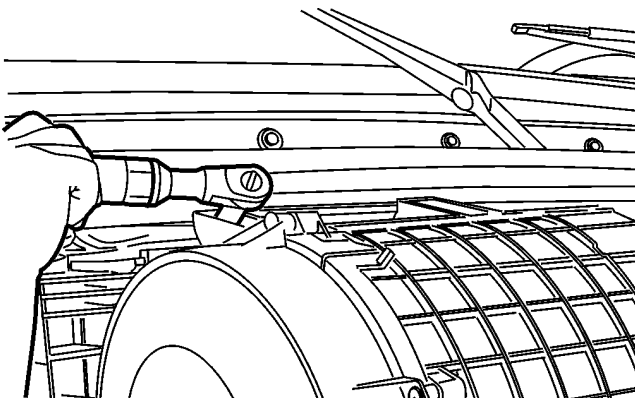
Install the turbocharger inlet elbow. Tighten the DRV and turbocharger inlet clamps.

56

Install the hood support bracket.

57

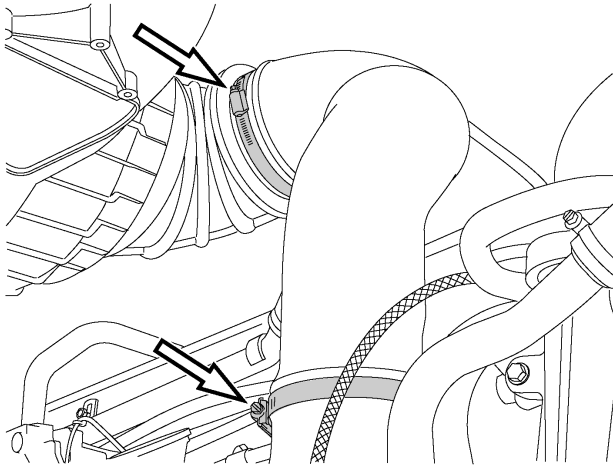
Position the filter housing against the cab and install the fasteners to secure.



W2003858

58

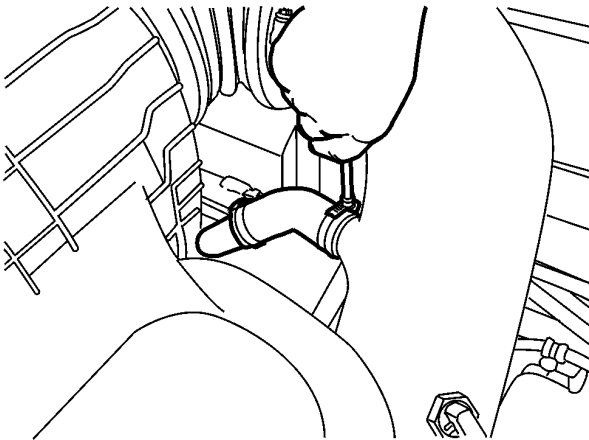
Install the main fresh air pipe to the air filter housing and the turbocharger inlet elbow. Tighten the clamps to secure.



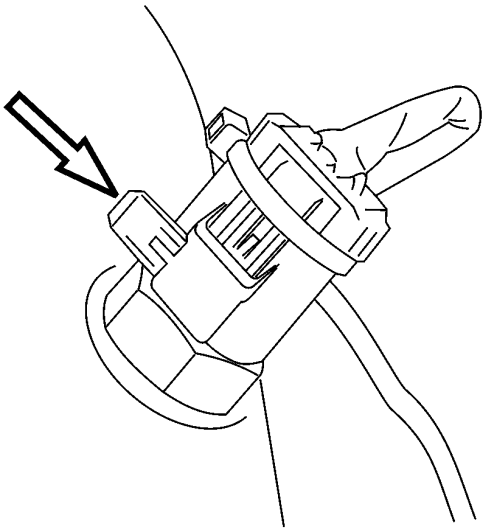
W2006005

59

Install the air compressor fresh air hose to the main fresh air pipe. Position the clamp and tighten to secure.



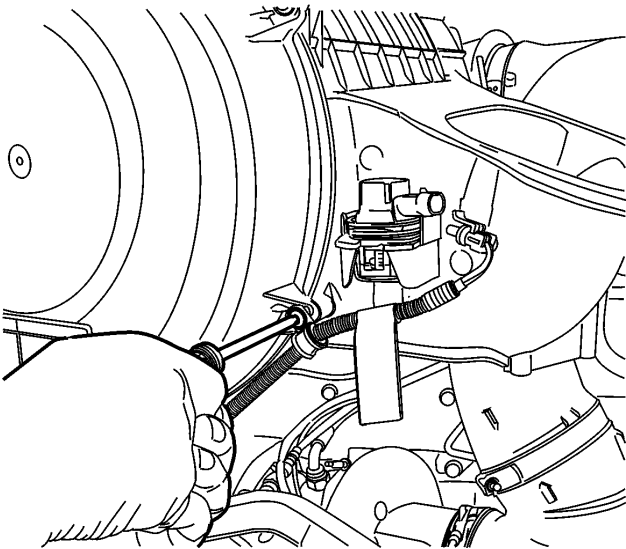
W2004719



W2004720

60

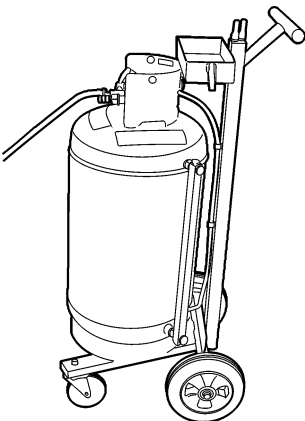
Install the air temperature sensor connector to the sensor. Insert the connector lock tab, push in place and secure with a tie strap.



W2003861

61

Connect and secure the air filter restriction gauge wiring harness to the air filter housing.



W2004191

62

Fill the cooling system with the recommended coolant using the coolant extractor.

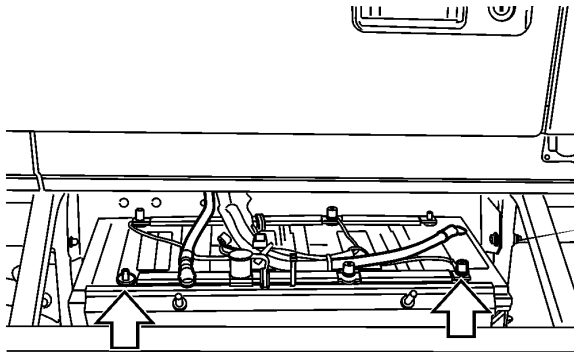
DBT2V700

63

Install the inner splash guard assembly.

64

Install all previously removed cables to the ground (negative) battery terminals.



W2003815

65

Start the engine, check for leaks and proper operation. After shutdown, replenish fluids as necessary.