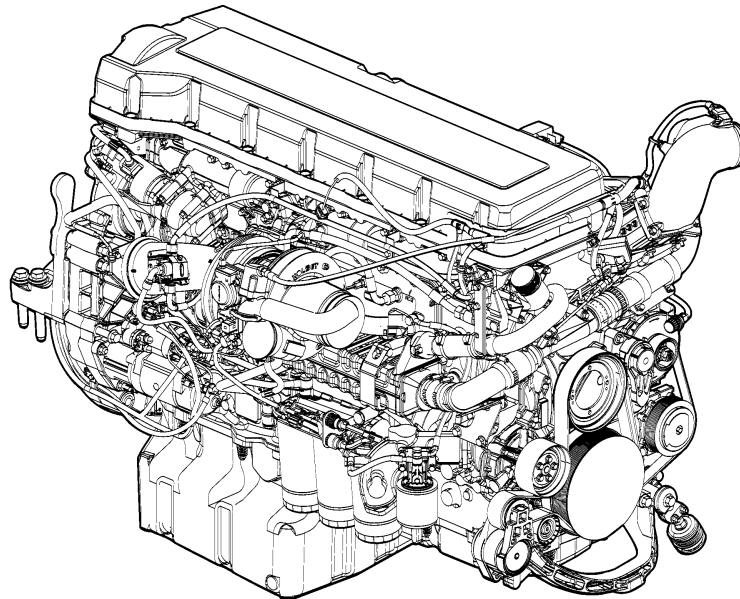


EGR Cooler Replacement D16F

EGR Cooler Replacement



W2005772

This information covers the proper replacement procedure for the EGR cooler on the Volvo D16F engine.

For information on the design and function of the EGR system, refer to Service Information, group 25.

Contents

- "Special Tools" page 2
- "EGR Cooler, Replacement" page 3
- "EGR Cooler, Cleaning" page 27

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

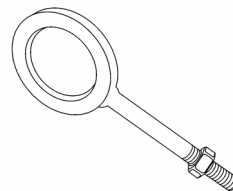
Special Tools

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



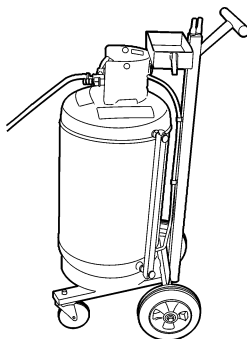
9996049

Drain Hose for Coolant



85108575

Turbo Lifting Tool



DBT2V700

Coolant Extractor

2547-03-02-01 EGR Cooler, Replacement

See also:

- "EGR Cooler Replacement" page 1

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.

Not Included:

- "EGR Cooler, Cleaning" page 27

Special tools: 9996049, 85108575, DBT2V700

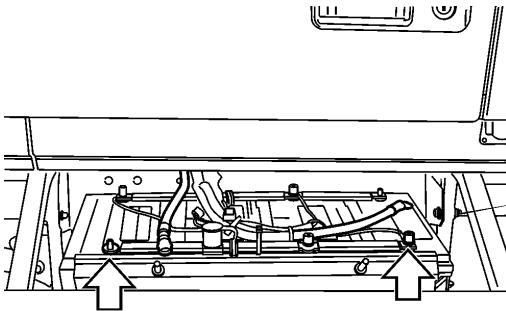
Removal

1

Apply the parking brake and place the shift lever in neutral.

2

Turn the master switch OFF (if equipped) or disconnect the batteries by disconnecting the negative battery cable.



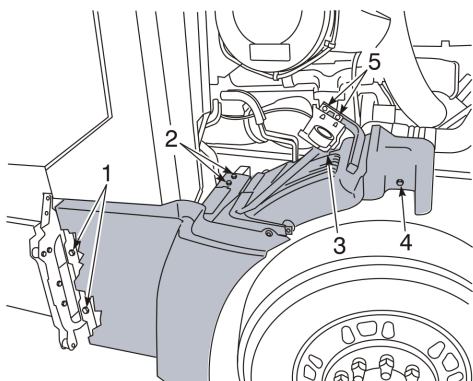
W2003815

3

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 drain hose to the drain fitting and drain the coolant into an approved container.

DBT2V700, 9996049



W2005189

1-Two (2) fender
extender bolts [rear,
at bracket]

4-One (1) splash
guard bolt [lower, to
frame]

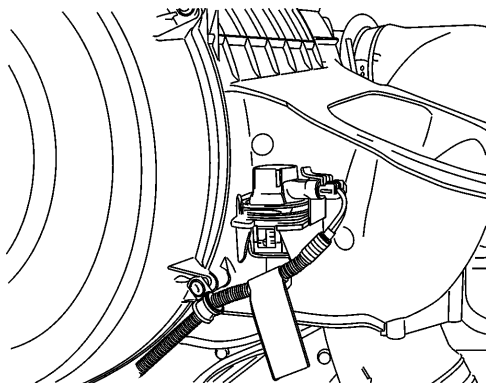
2-Two (2) fender
extender bolts [at
brace]

5-Two (2) splash
guard bolts [upper
brace]

3-One (1) fender
extender brace at
hood release [bolt
and nut]

4

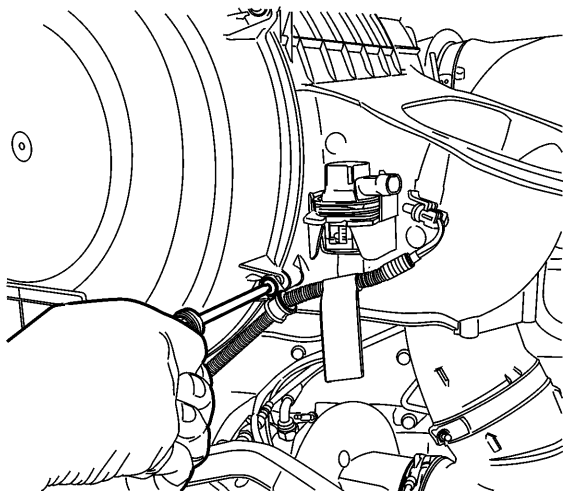
Dependent upon chassis, remove the splash guard and the fender extender as an assembly, if required.



W2004249

5

Remove the air filter housing by first disconnecting the air restriction gauge connector.



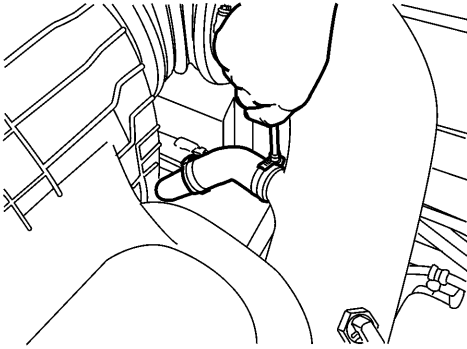
W2003861

6

Remove the clamps securing the wiring harness to the air filter housing.

7

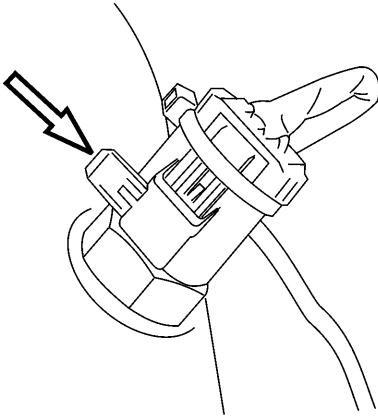
Loosen the clamp and remove the air compressor fresh air pipe from the main fresh air pipe.



W2004719

8

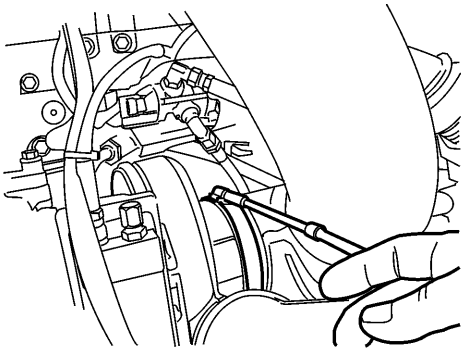
Disconnect the air temperature sensor connector from the sensor. Cut the tie strap and disengage the lock tab. Also, remove the bolt securing the temperature sensor harness P-clamp to the fresh air pipe for the turbocharger.



W2004720

9

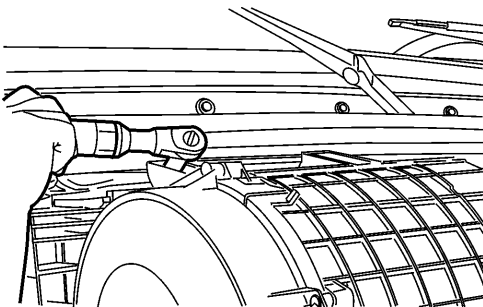
Loosen the clamp of the main fresh air pipe at the turbocharger. Disconnect the fresh air pipe from the turbocharger.



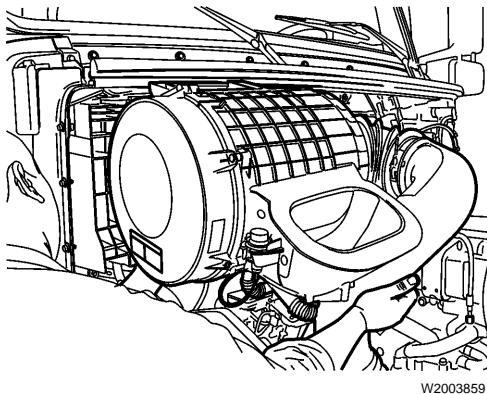
W2004721

10

Remove the two bolts at the top of the air filter housing.



W2003858

**11**

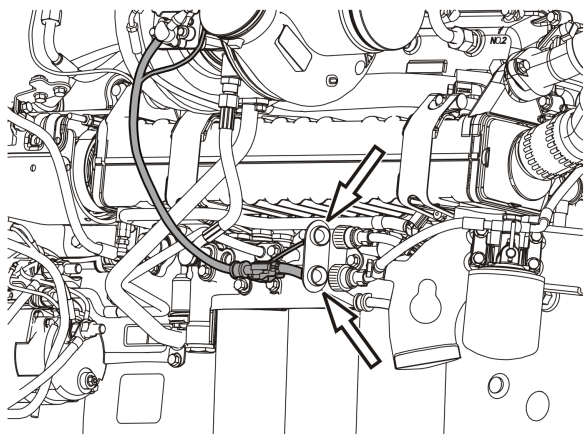
Remove the air filter housing and the main fresh air pipe as an assembly.

12

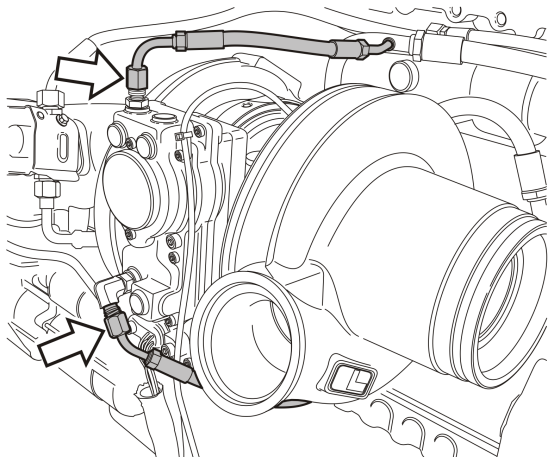
Remove the lower charge air pipe from the turbocharger.

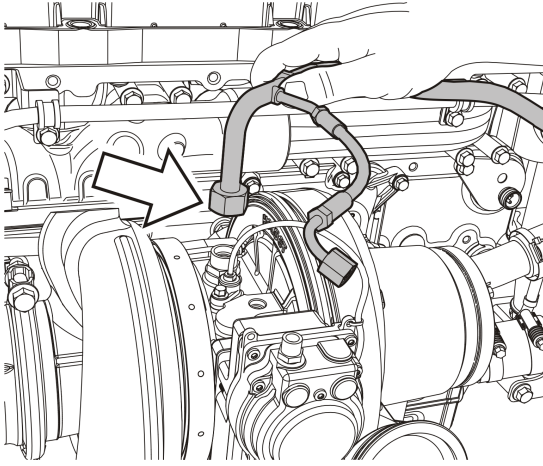
13

Release the actuator and turbocharger speed sensor wiring harnesses by cutting the nylon tie straps to free the harnesses. Disconnect the connectors located on the right side of the engine above the oil filter housing. Match mark the connectors for reassembly purposes.

**14**

Disconnect the coolant inlet and outlet lines from the turbocharger actuator.

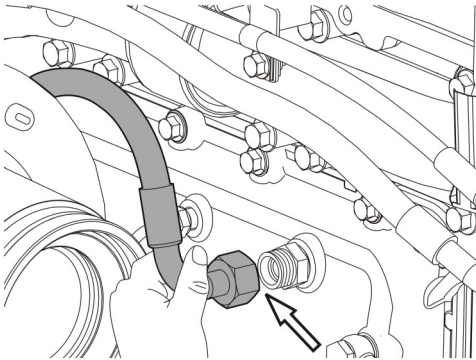




W2005622

15

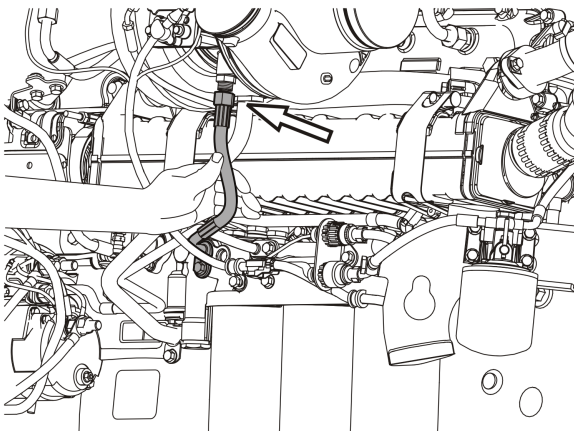
Disconnect the coolant line from the top of the turbocharger bearing housing.



W2005623

16

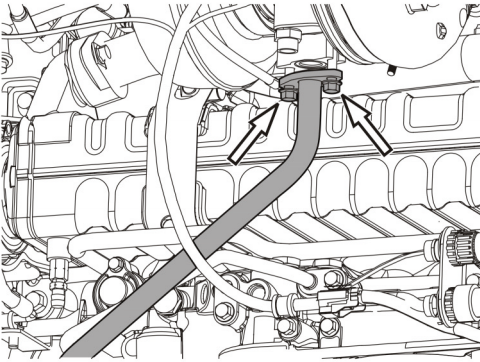
Disconnect the turbocharger coolant line that connects to the oil cooler cover.



W2005624

17

Disconnect the oil supply line that connects from the bottom of the turbocharger bearing housing to the oil filter housing.



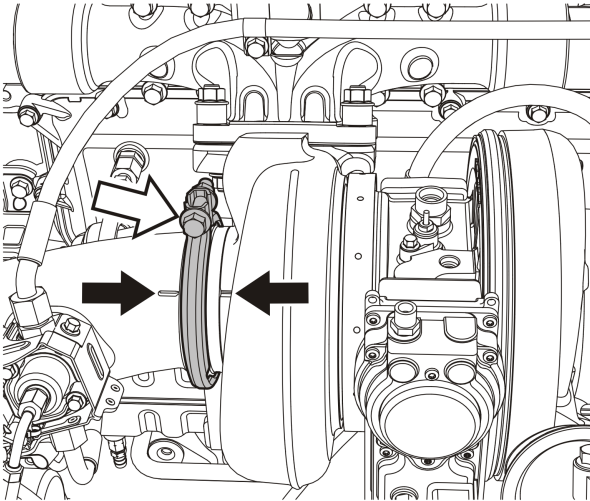
W2005628

18

Remove the two small capscrews securing the oil return/drain back pipe to the bottom of the turbocharger bearing housing and disconnect the pipe from the spacer block. Collect the spacer block. Discard the gasket and O-ring from the spacer block.

19

Loosen the clamp at the turbocharger exhaust pipe and slide the exhaust injector pipe backward slightly to allow the turbocharger to be free of the exhaust system.

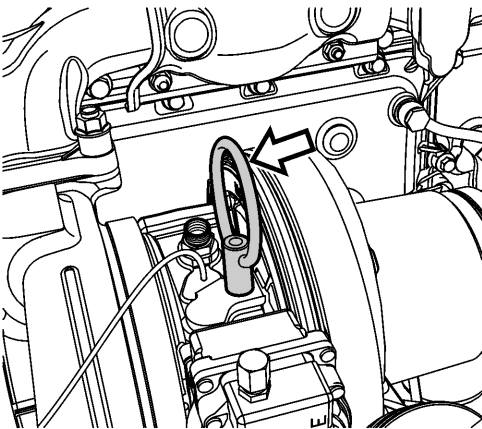


W2005626

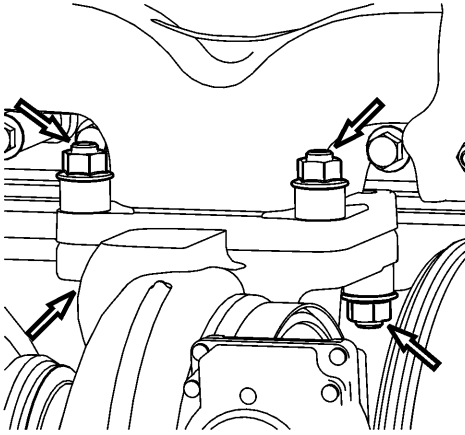
20

Remove the bolt/plug at the top of the turbocharger bearing housing and install the turbocharger lifting tool 85108575 into the threaded hole.

85108575



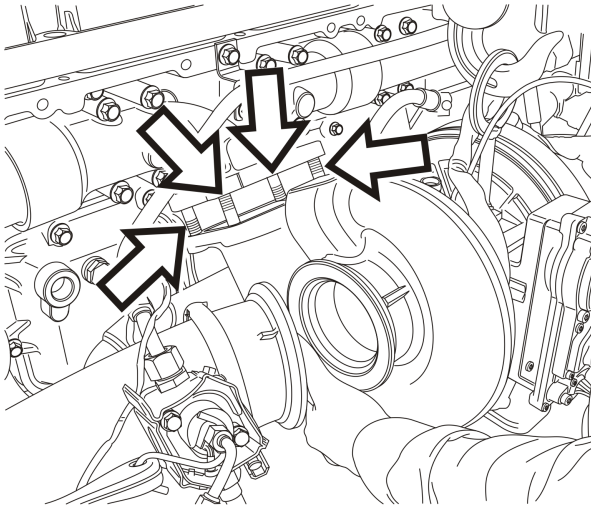
W2005042



W2005011

21

Support the weight of the turbocharger using a mobile floor crane such as OTC 16-1815 or equivalent crane capable of safely lifting the weight of the turbocharger. Remove all four turbo flange mounting nuts and spacers.



W2005629

22

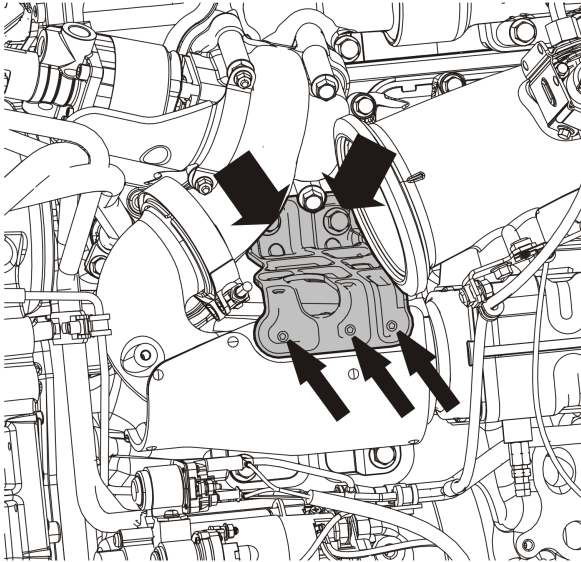
With the aid of an assistant, lower the turbocharger away from the exhaust manifold studs and remove it from the engine.

23

Place the turbocharger on a suitable support. Plug the turbo oil lines and outlet openings to prevent contamination. Install the cover on the turbo intake and exhaust openings to prevent foreign material from possibly becoming lodged in the turbine wheels.

24

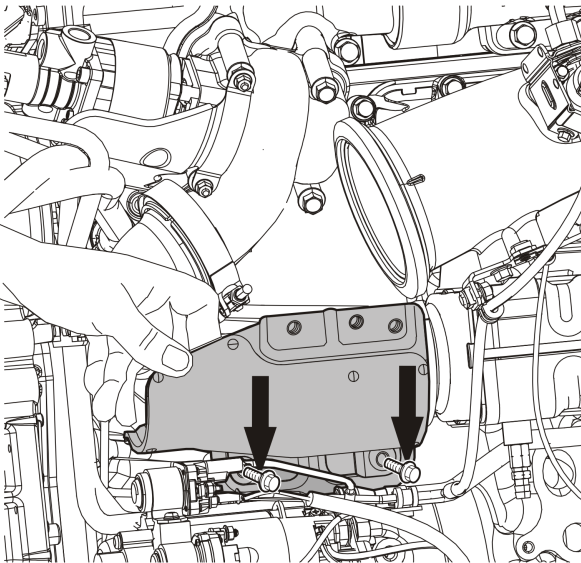
Remove the Allen head fasteners and bolts securing the upper portion of the EGR hot pipe shield and remove the upper shield.



W2005686

25

Remove the bolts securing the lower portion EGR valve heat shield and remove the shield.

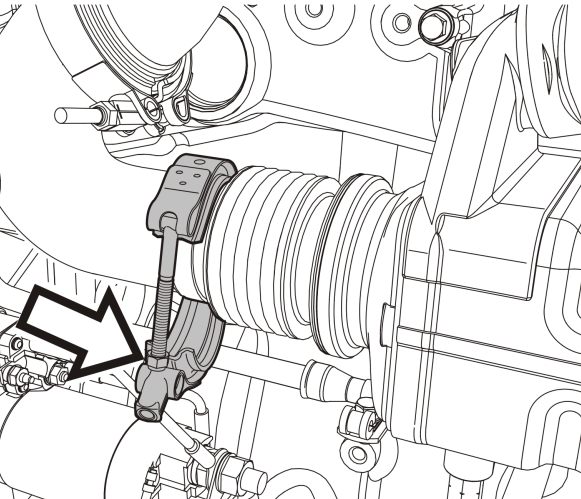


W2005687

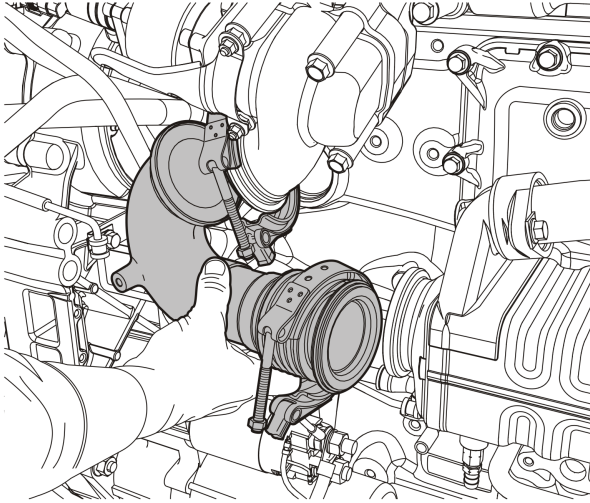
26

Loosen both high temperature V-clamps from the EGR hot pipe by removing the nuts from the T-bolts. Free the clamps from the EGR hot pipe flange.

Note: EGR V-clamps on the hot pipe are one time use only. Replace the V-clamps with new at installation.



W2005642



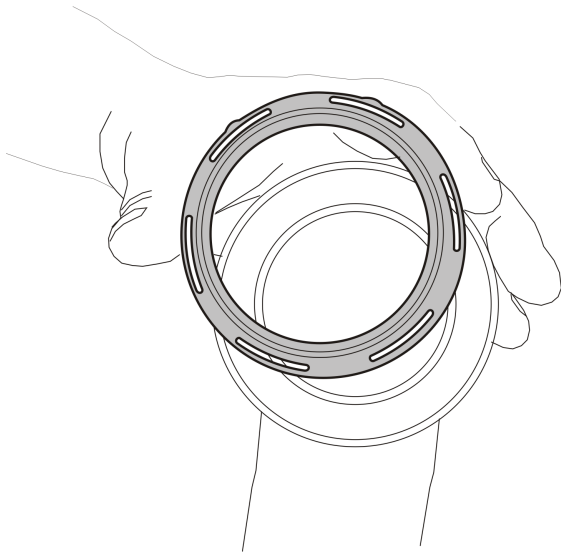
W2005641

27

Remove the EGR hot pipe from between the EGR valve and the EGR gas cooler.

28

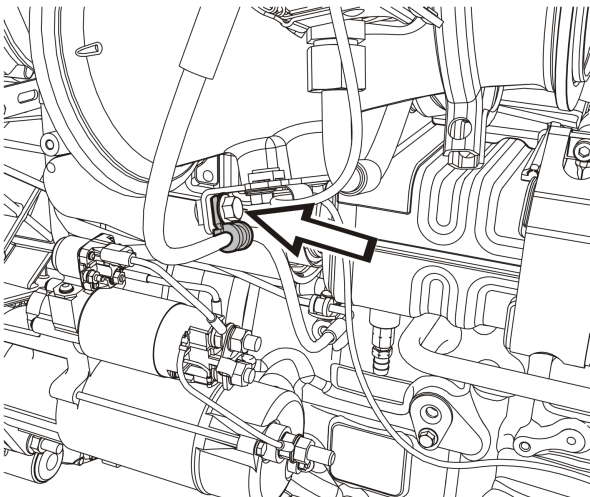
Remove the special high temperature gaskets from the EGR valve end of the hot pipe and the EGR gas cooler. Discard the gaskets.



W2005688

29

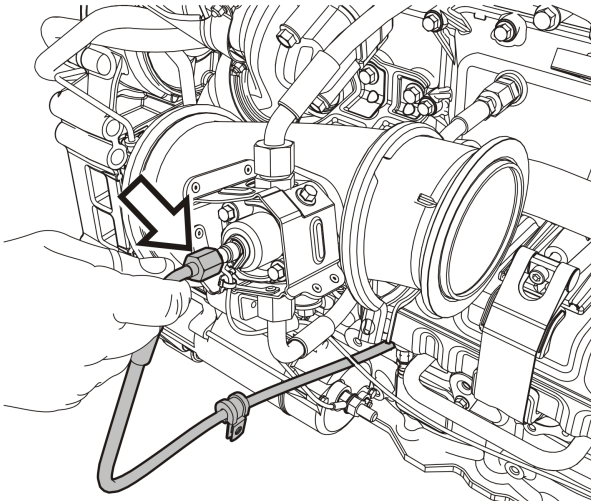
Remove the fuel line support clamp from the exhaust injector (HCI). The clamp is located at the bottom of the exhaust pipe.



W2005657

30

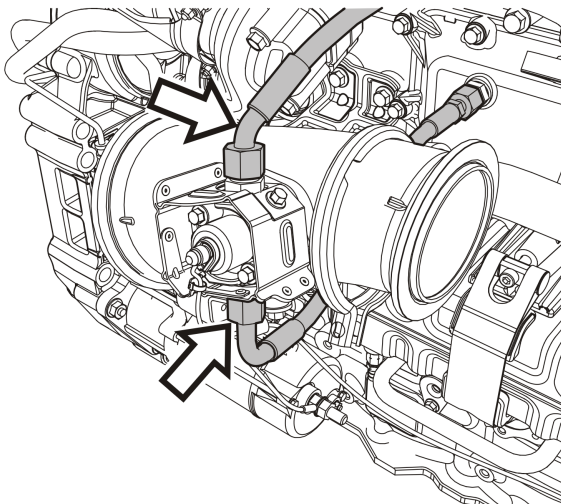
Remove the fuel line from the exhaust injector (HCI).



W2005656

31

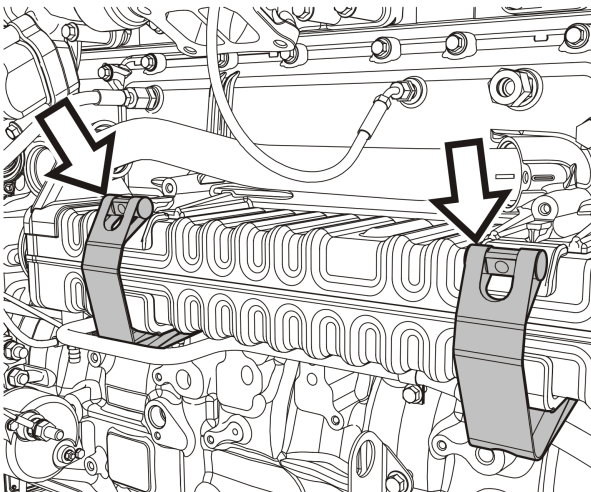
Remove the coolant inlet and outlet lines that connect to the exhaust injector (HCI).



W2005655

32

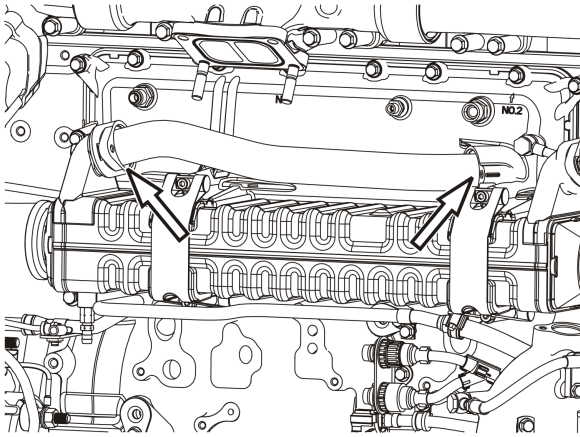
Reposition the exhaust injector (HCI) pipe away from the EGR cooler to allow access to the cooler connections.



W2005645

33

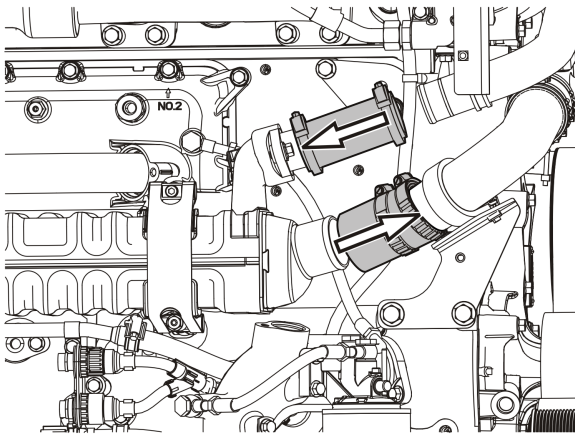
Disconnect the EGR cooler straps by removing the top bolts and lower nuts with spacers.



W2005646

34

Remove the capscrews securing the coolant hard pipe clamps at the oil cooler cover port and the EGR cooler and remove the clamps.



W2005647

35

Remove the clamps securing the coolant hose from the EGR cooler to the thermostat housing and slide the hose rearward. Also, remove the clamps securing the EGR cool gas hose to the delta pressure venturi pipe and slide the hose forward. Remove both hoses and discard. These hoses should not be reused.

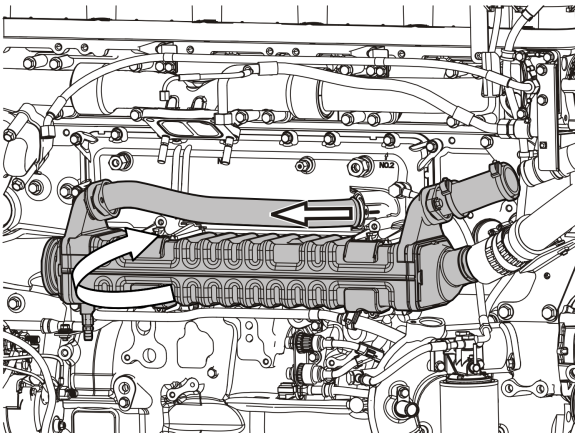
Note: Inspect the EGR gas hose connection pipes for hose residue and clean connections as necessary.

36

Remove the static fill pipe to the EGR cooler.

37

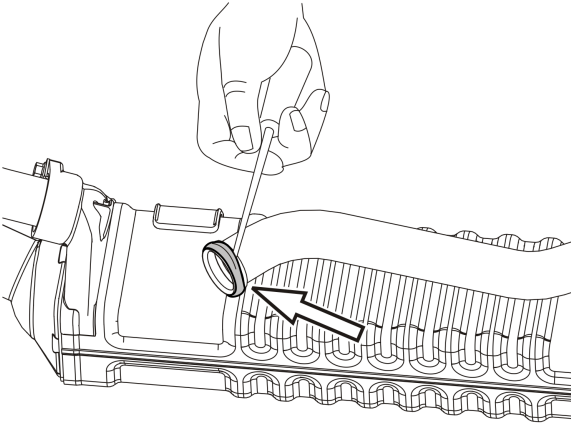
Pull the EGR cooler outward and at same time, slide it backward to free the coolant hard pipe from the oil cooler cover. Remove the EGR cooler from the left side of the engine.



W2005658

38

Using a small pick, remove the O-ring from both ends of the EGR cooler coolant hard pipe.



W2005659

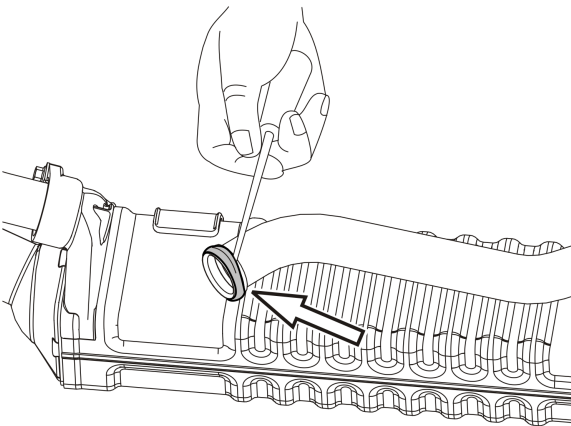
Installation

Note: The EGR cooler may require cleaning before installation; see "EGR Cooler, Cleaning" page 27.

1

Place a new O-ring seal on both ends of the EGR cooler hard pipe and lubricate with a coating of fresh antifreeze. Slide the hard coolant pipe into the top port of the EGR cooler. Ensure the O-ring on the coolant hard pipe is not pinched during installation.

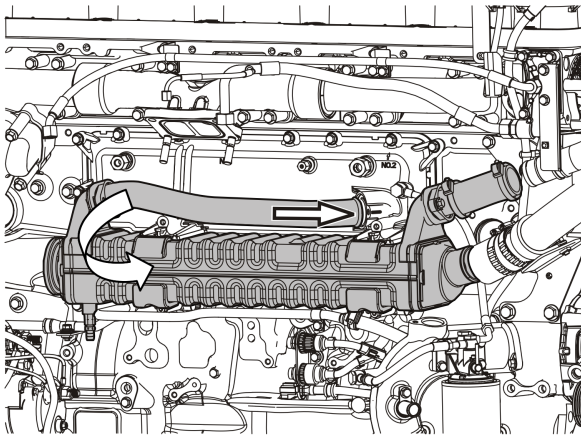
Note: Use a new O-ring on the pipe.



W2005659

2

Slide the EGR cooler straps onto the studs. This step must be completed before positioning the EGR cooler onto the engine brackets.



W2005660

3

Position the EGR cooler onto the cast brackets located on the oil cooler cover and at same time, slide it forward to connect the coolant hard pipe with the oil cooler cover coolant port. Ensure the O-ring on the coolant hard pipe is not pinched during installation.

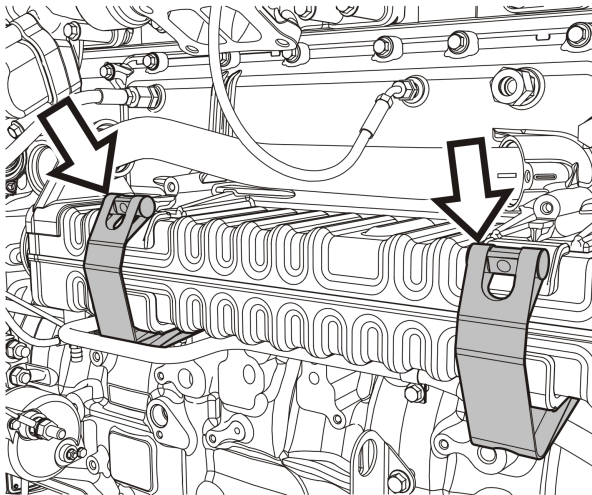
Note: Use a new O-ring on the pipe.

4

Install the spacers and nuts onto the bottom studs for the EGR cooler straps. Only hand tighten the nuts snug at this time.

5

Install the EGR cooler strap top bolts and hand tighten snug.



W2005645

6

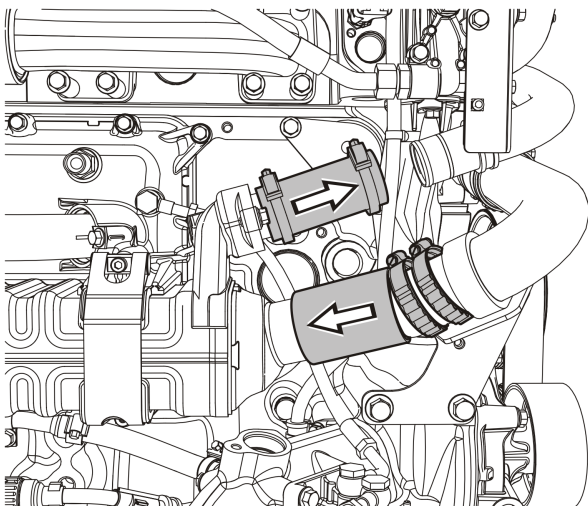
Torque the nuts located on the bottom of the EGR cooler straps to specification before tightening the bolts located at the top of the straps. Torque-tighten the bottom nuts to 24 ± 3 Nm (18 ± 2 ft-lb).

24 ± 3 Nm
(18 ± 2 ft-lb)

7

Torque-tighten the EGR strap bolts located at the top to 12 ± 2 Nm (110 ± 1 in-lb).

12 ± 2 Nm
(110 ± 1 in-lb)

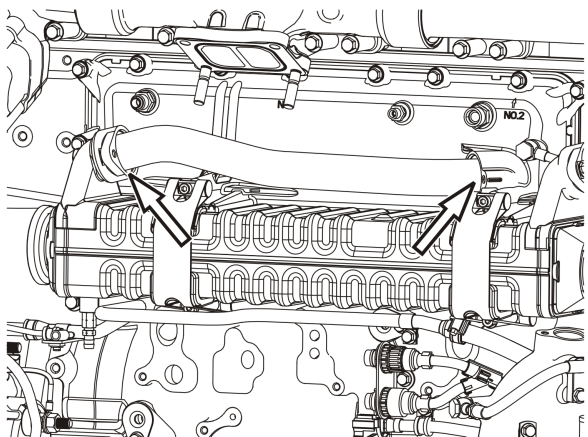


W2005648

8

Install a new coolant hose between the EGR cooler to the thermostat housing and slide the hose forward to its original position. Also, install a new EGR cool gas hose to the delta pressure venturi pipe and slide the hose rearward to its original position. Secure both hoses with the original clamps tightened securely.

Note: It is important to install new hoses at both locations for the EGR cooler.



W2005646

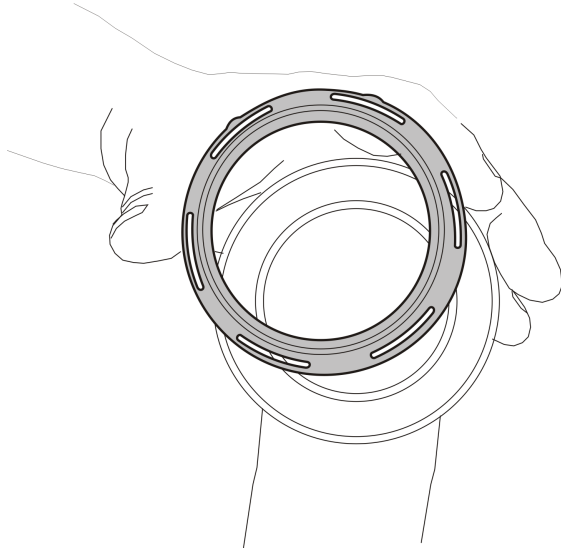
9

Install the coolant hard pipe clamps at the oil cooler cover port and the EGR cooler port. Install the capscrews securing the clamps and tighten securely.

10

Install the static fill pipe to the EGR cooler. Torque-tighten to 10 ± 2 Nm (7 ± 1 ft-lb).

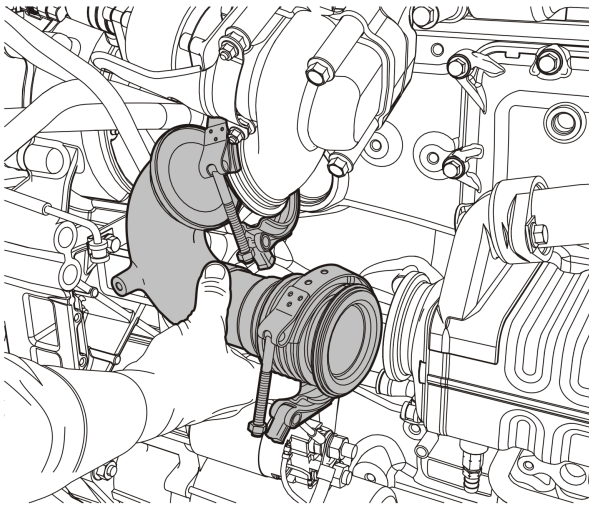
10 ± 2 Nm
(7 ± 1 ft-lb)



W2005688

11

Install new special high temperature gaskets into the EGR valve end of the hot pipe and the inlet of the EGR gas cooler. Ensure the gasket lays flat against the flange surfaces.



W2005641

12

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

Note: Do not reuse clamps. Install new clamps and sealing rings.

13

Lubricate both the flange on the EGR cooler inlet and the flange on the EGR hot pipe with fresh engine oil. This lubrication will aid in V-clamp installation.

14

Position the EGR hot pipe between the EGR valve and the EGR gas cooler. Be sure the flange engages 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.

15

Visually inspect that the flange is still seated in the EGR cooler. The flange needs to be concentric with the cooler.

16

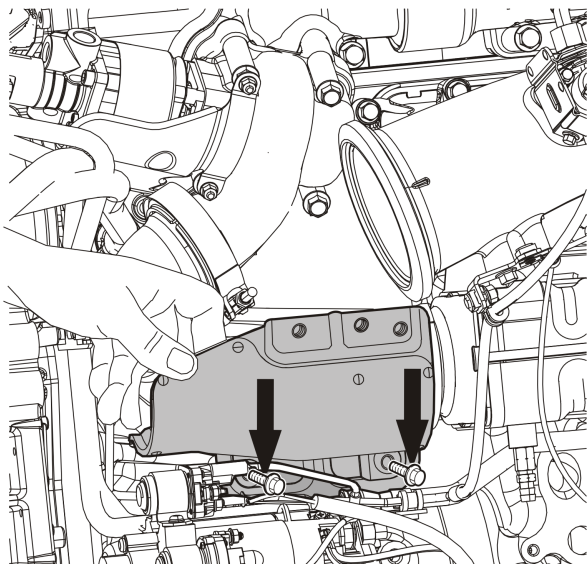
Position the V-clamps so that the T-bolts will clear both heat shields. Apply anti-seize to the threads of the T-bolts and tighten to specifications. Torque-tighten to 20 ± 3 Nm (15 ± 2 ft-lb).

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

20 ± 3 Nm
(15 ± 2 ft-lb)

17

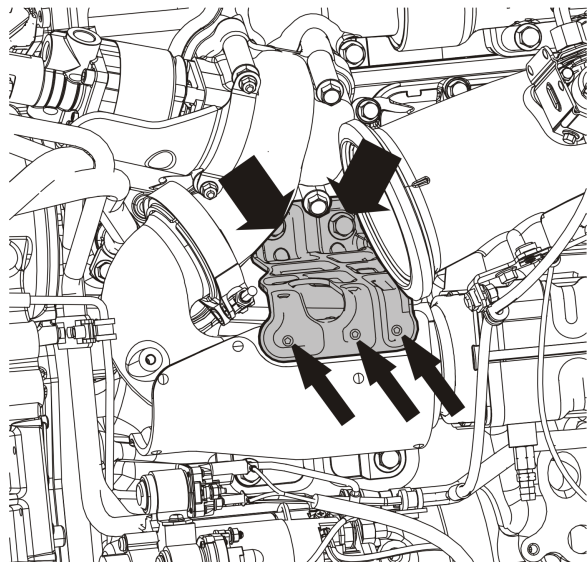
Position the lower portion of the EGR valve heat shield over EGR hot pipe and secure with bolts. Tighten fasteners to specifications.



W2005687

18

Position the upper portion of the EGR hot pipe shield and install the Allen head fasteners and bolts securing the upper portion of the EGR hot pipe shield to the cylinder block. Tighten fasteners to specifications.



W2005686

19

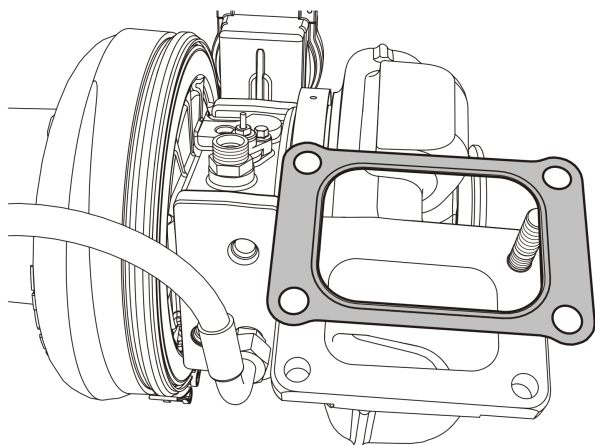
Clean the contact surface on the exhaust manifold and the oil return/drain back pipe and spacer block.

20

Remove the plugs from the turbo oil lines and outlet openings used to prevent contamination. Remove the covers used on the turbo intake and exhaust openings.

21

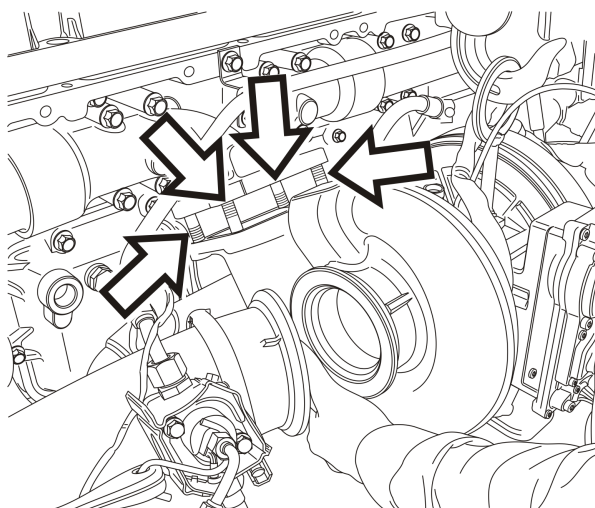
Replace the turbocharger-to-manifold metal gasket and install it onto the two studs of the turbocharger exhaust opening.



W2005636

22

Support the weight of the turbocharger using a mobile floor crane such as OTC 16-1815 or equivalent crane capable of safely lifting the weight of the turbocharger. With the aid of an assistant, position the turbocharger against the exhaust manifold and align the two studs of the turbocharger with the two studs of the exhaust manifold.

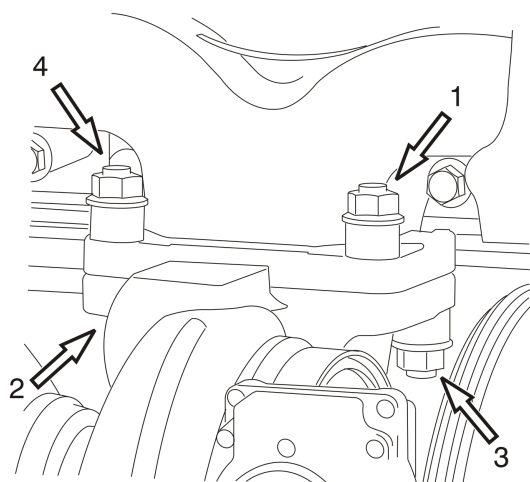


W2005629

23

Install the turbocharger flange nuts and spacers to the exhaust manifold and torque-tighten to the specification of 135 Nm (100 ft-lb). Nuts should be tightened in the sequence shown.

135 Nm
(100 ft-lb)



W2005206

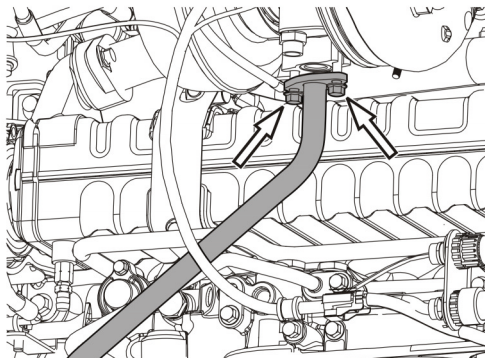
24

Remove the hoist and special lifting tool 85108575. Reinstall the bolt/plug in the turbo lift threaded hole which is located in the top of the bearing housing.

25

Position a new lubricated O-ring and gasket on the oil return/drain back spacer block and install the turbocharger oil return/drain back pipe with spacer to the bottom of the turbo. Secure using the two small capscrews. Torque-tighten the capscrews to 24 ± 4 Nm (18 ± 3 ft-lb).

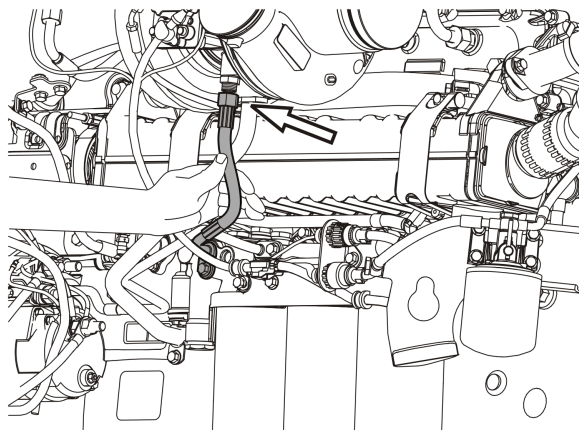
24 ± 4 Nm
(18 ± 3 ft-lb)



W2005628

26

Install the turbocharger oil supply line to the bottom fitting of the turbo bearing housing and tighten the fittings.



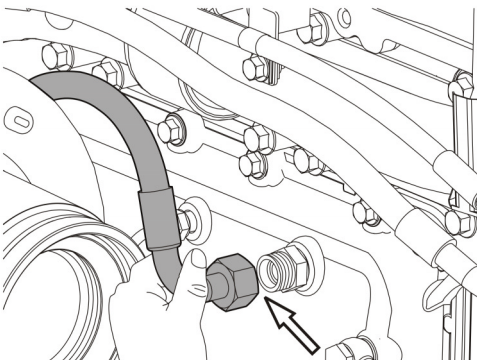
W2005624

**CAUTION**

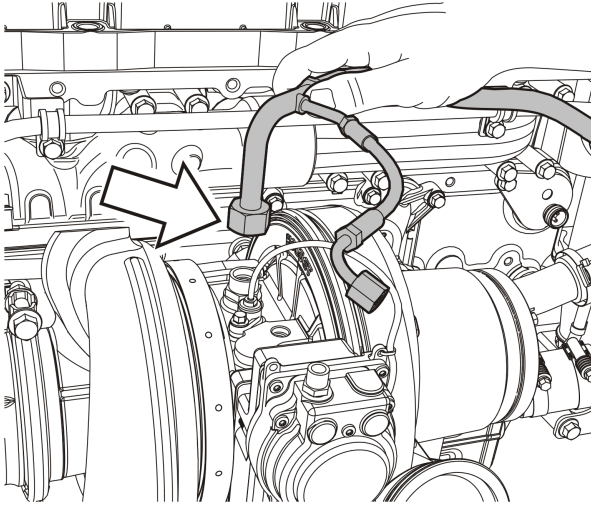
Before starting the engine after turbocharger replacement, make sure the turbocharger is pre-filled with clean engine oil. Starting the engine without oil pressure and a "dry" turbocharger can damage the turbocharger bearings.

27

Install the coolant line that connects from the rear of the turbocharger to a fitting on the oil cooler and tighten the fitting.



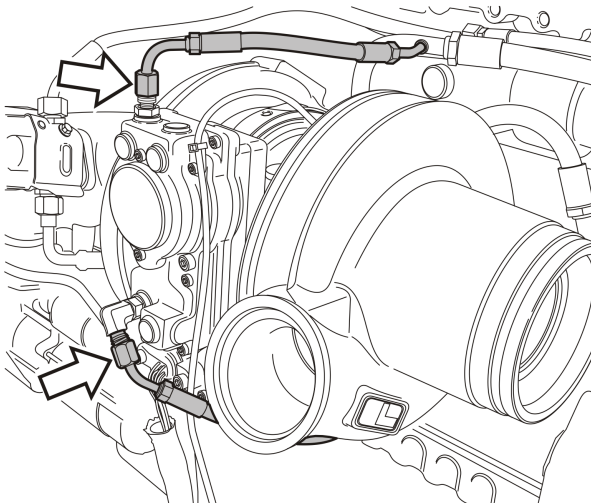
W2005623



W2005622

28

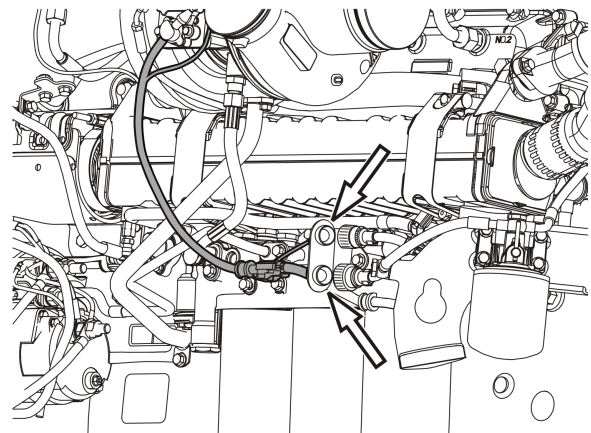
Install the coolant line that connects to the fitting at the top of the turbocharger bearing housing and tighten the fitting. This coolant line also branches off the turbocharger actuator top coolant fitting.



W2005621

29

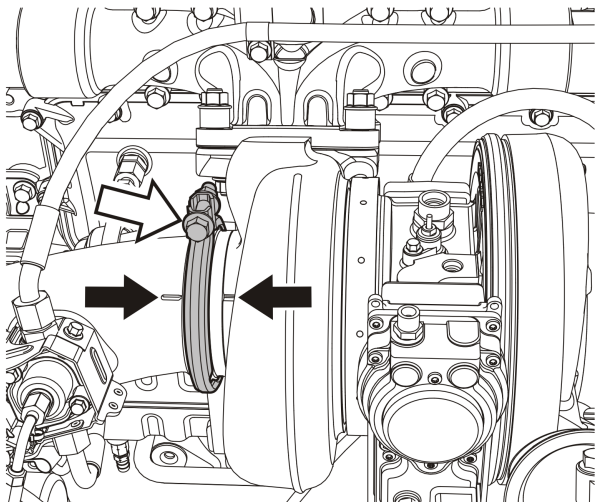
Install the coolant lines that connect to the fittings at the top and bottom of the turbocharger actuator and tighten the fittings.



W2005620

30

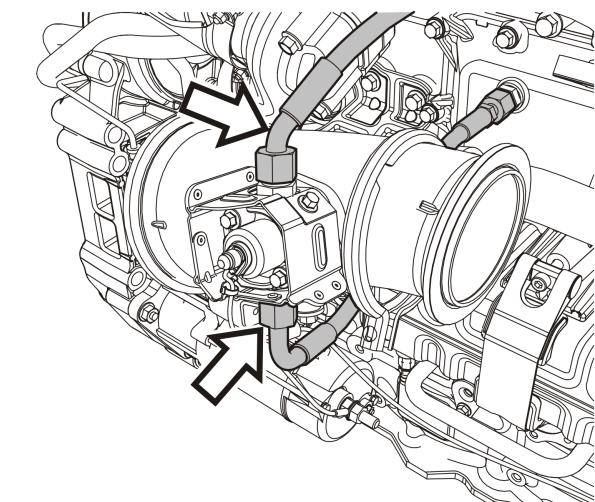
Reconnect the turbocharger actuator and turbocharger wheel speed sensor wiring harness. Ensure the connectors are reconnected in the same positions as marked at disassembly and position the connector with the flat side toward the flat in the bracket. Reinstall the cable clamp on the oil filter housing and using the proper high temperature ties, secure the wiring harness to itself and the turbocharger drain pipe.



W2005626

31

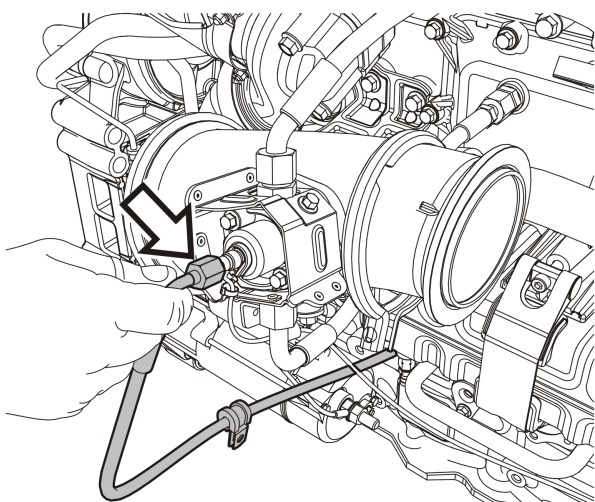
Position the exhaust injector pipe against the exhaust port on the turbocharger and install a new clamp from the exhaust pipe to the turbocharger. Align the cast in match marks on the exhaust pipe with the turbocharger and tighten the clamp to secure in this position.



W2005655

32

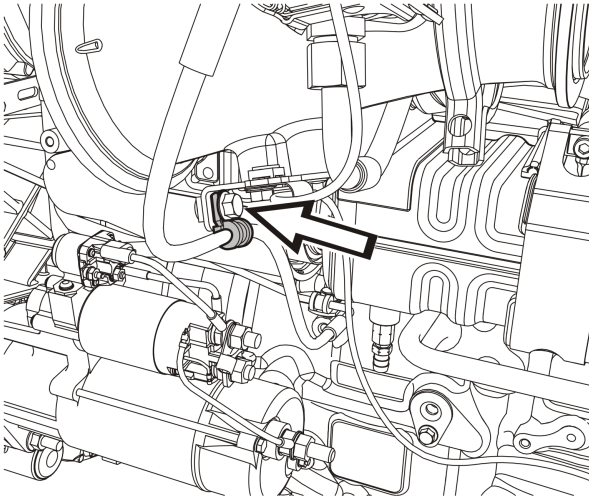
Install the coolant inlet and outlet lines that connect to the exhaust injector (HCI).



W2005656

33

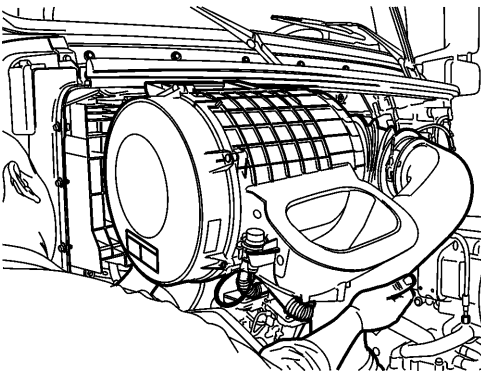
Install the fuel line onto the exhaust injector (HCI).



W2005657

34

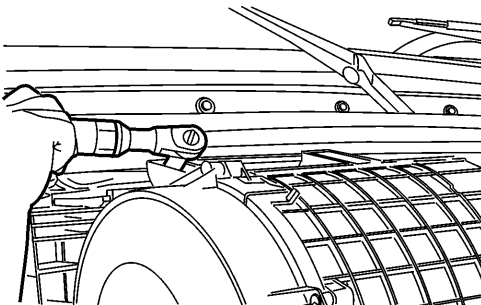
Install the fuel line support clamp onto the exhaust injector (HCI). The clamp is located at the bottom of the exhaust pipe.



W2003859

35

Position the main fresh air pipe and the filter housing against the cab.



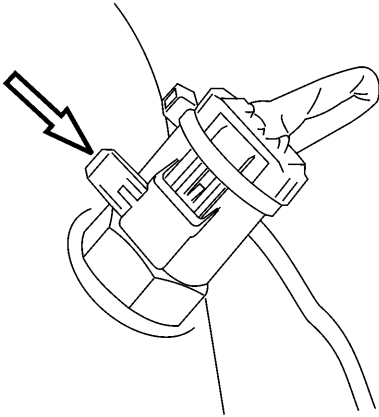
W2003858

36

Install the two bolts at the top of the air filter housing.

37

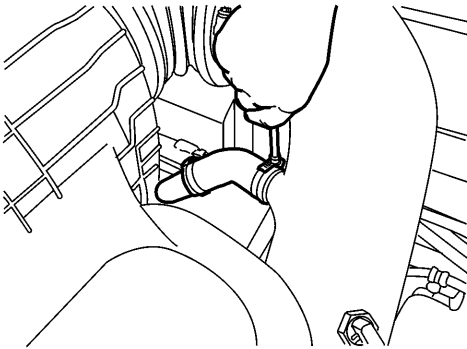
Install the main fresh air pipe to the turbocharger. Tighten the clamps.



W2004720

38

Install the air temperature sensor connector to the sensor. Insert the connector lock tab, push in place and secure with a tie strap. Also, install the P-clamp securing the temperature sensor harness to the fresh air pipe for the turbocharger.



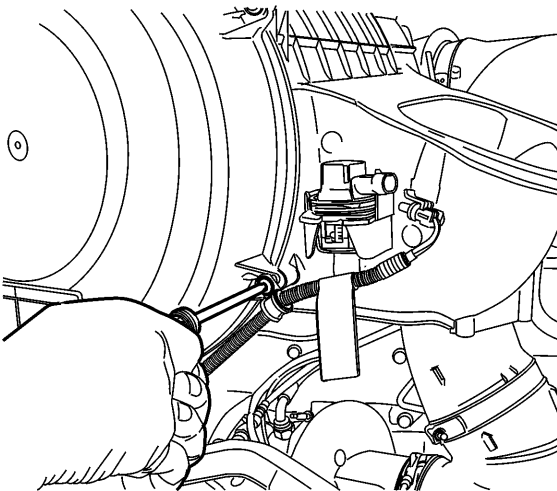
W2004719

39

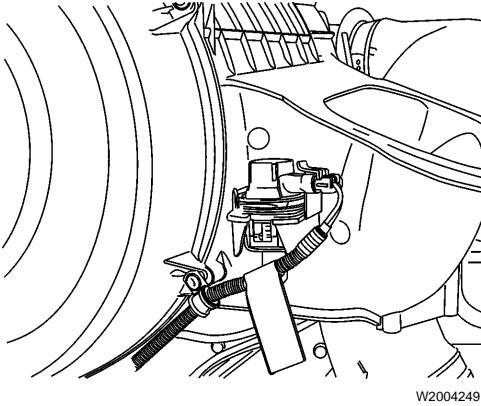
Install the air compressor fresh air pipe to the main fresh air pipe, position the clamp and tighten to secure.

40

Install the filter restriction gauge wiring harness to the air filter housing and tighten the clamps.



W2003861

**41**

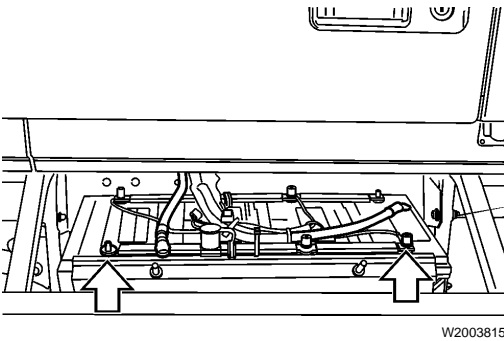
Connect the air restriction gauge electrical harness connector.

42

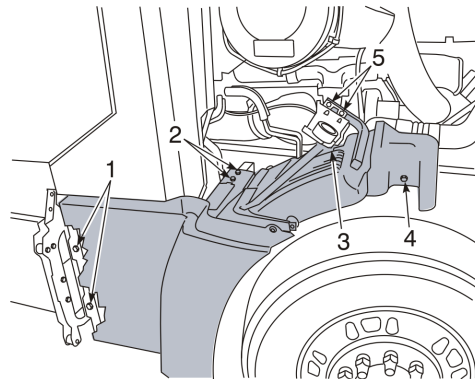
Reinstall the charge air pipe to the turbocharger.

43

Turn the master switch ON (if equipped) or connect the batteries by reconnecting the negative battery cable.

**44**

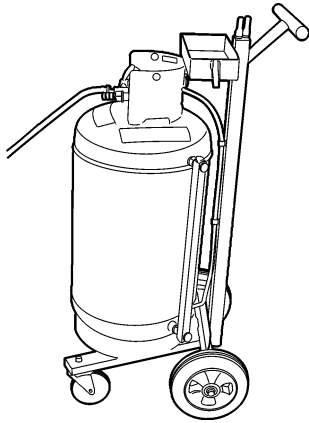
Install the splash guard and the fender extender as an assembly, if removed for access.



- | | |
|--|---|
| 1-Two (2) fender extender bolts [rear, at bracket] | 4-One (1) splash guard bolt [lower, to frame] |
| 2-Two (2) fender extender bolts [at brace] | 5-Two (2) splash guard bolts [upper brace] |
| 3-One (1) fender extender brace at hood release [bolt and nut] | |

45

Check the engine oil level and replenish as necessary with approved engine oil.



W2004191

46

Using coolant extractor DBT2V700, fill the system with approved coolant per specifications.

DBT2V700

47

Start the engine and check for proper operation. Check for coolant, oil and air leaks. Check the coolant and oil level, and refill as necessary.

**CAUTION**

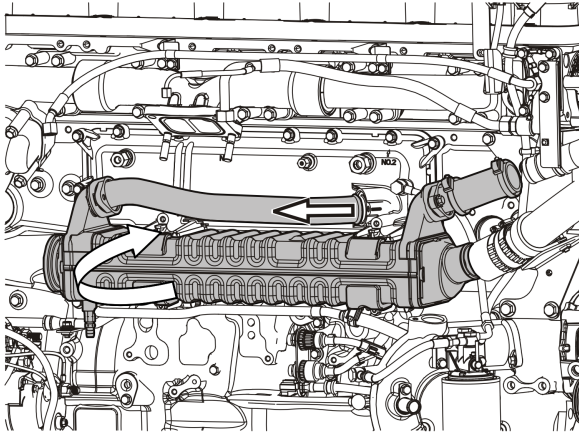
Before starting the engine after turbocharger replacement, make sure the turbocharger is pre-filled with clean engine oil. Starting the engine without oil pressure and a “dry” turbocharger can damage the turbocharger bearings.

EGR Cooler, Cleaning

See also:

- "EGR Cooler Replacement" page 1

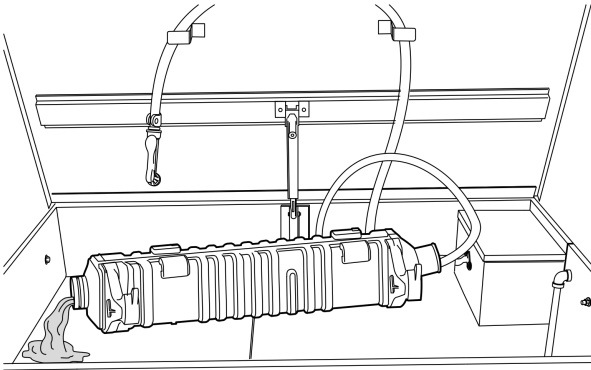
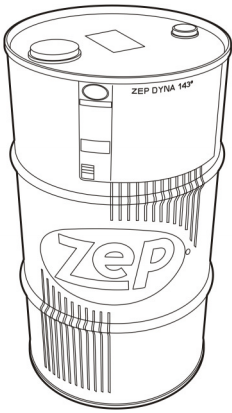
You must read and understand the precautions and guidelines in Service Information, group 20, "General Safety Practices, Engine" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.



W2005658

1

Remove the EGR cooler from the engine, then separate the coolant pipe from the cooler.

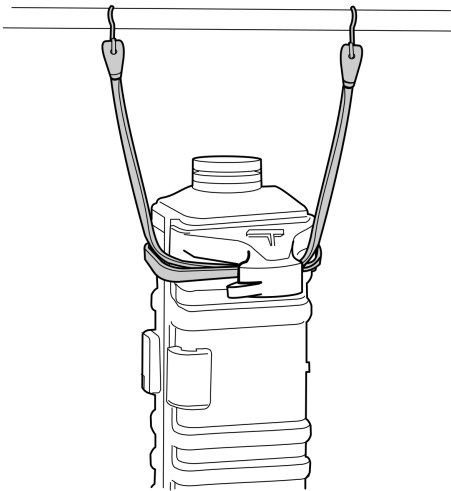
2

Place the cooler in the parts washer and fill with Dyna 143 cleaning solvent. Let soak for one hour.

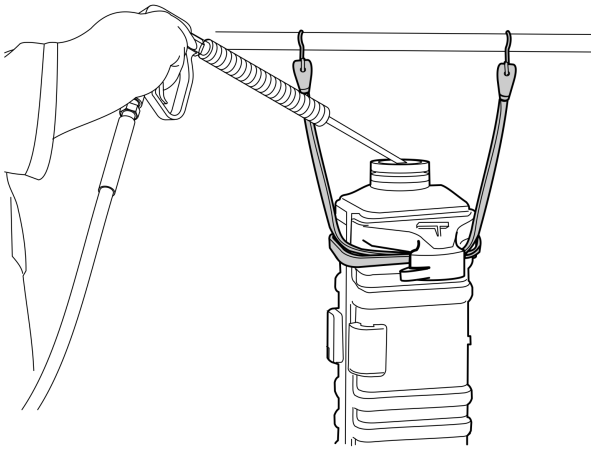
W2005763

3

Hang the cooler.



W2005759

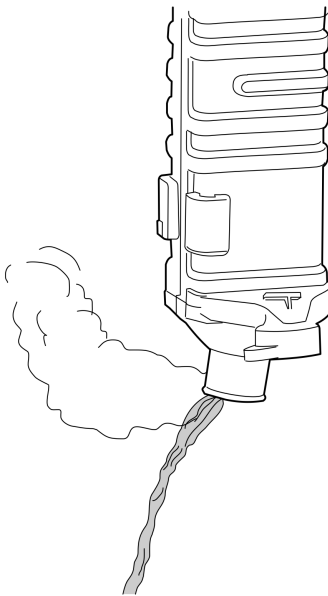


W2005760

4

Steam clean the cooler from the inlet end first, until the water clears up.

Note: Avoid contact from steam and air nozzle to EGR fins during cleaning operation. This may damage the EGR fins.



W2005761

5

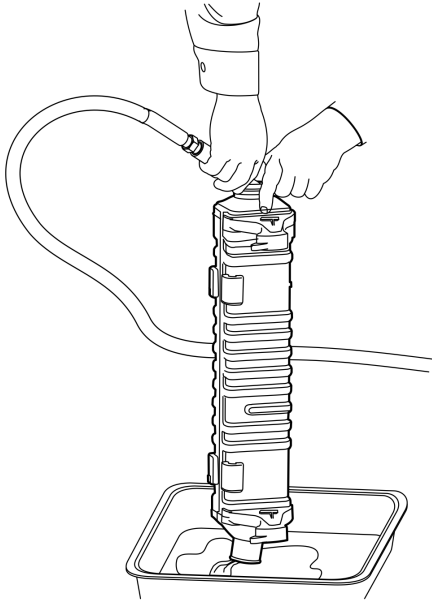
Steam and soot should flow out from the lower end of the cooler.

6

Turn the cooler over and steam clean from the outlet end.

7

Steam clean the cooler from the outlet end until the water clears up.



W2005762

8

Using a shop air blower, from the inlet end, blow air into the cooler until all the water is out. Do this with the cooler hanging up so that the leftover water can flow downward.

9

Using a shop air blower, from the outlet end, blow air into the cooler until all the water is out. Do this with the cooler hanging up so that the leftover water can flow downward.

10

With the EGR cooler completely clear of water and cleaning solution, reinstall the coolant pipe with new O-rings and install the cooler back on the engine.