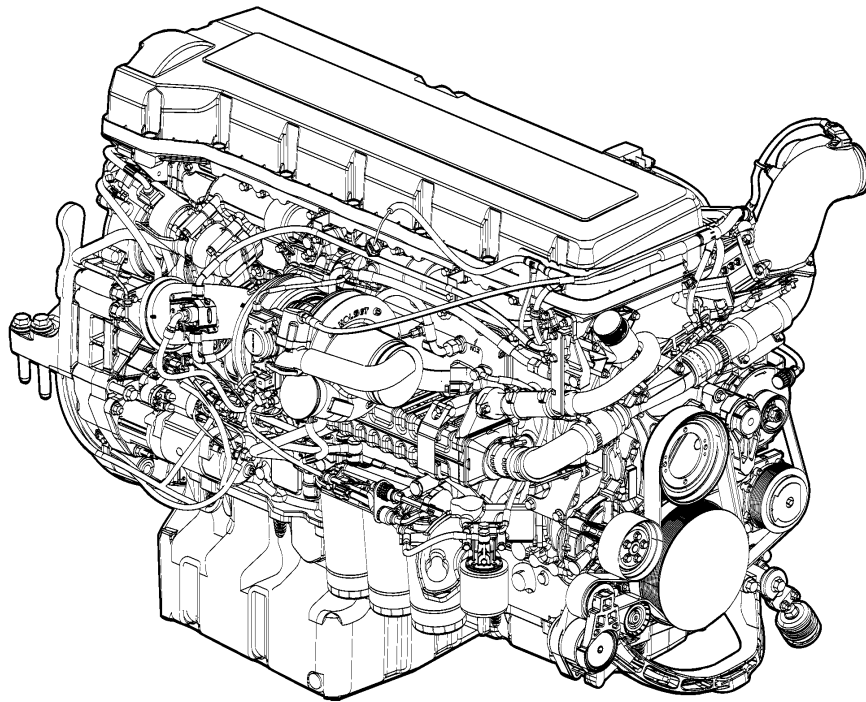


**Oil Cooler  
Service  
D16F****Oil Cooler, Service**

W2005772

This information covers procedures for servicing the oil cooler on the Volvo D16F engine.

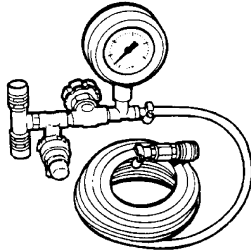
**Contents**

- "Special Tools" page 2
- "Oil Cooler, Replacement" page 3
- "Oil Cooler, Pressure Test" page 38

**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.

## Special Tools

For special tools ordering instructions, refer to Tools Information, group 08.

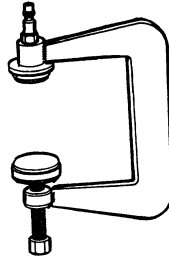


9996662

T0009699

**9996662**

Pressure Tester



C0000393

**9996845**

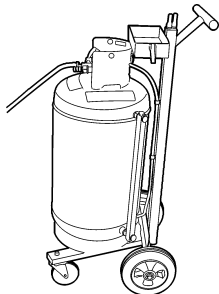
Clamp



W0001795

**9996049**

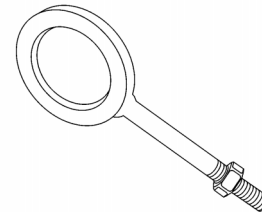
Coolant Drain Hose



W2004191

**DBT2V700**

Coolant Extractor



W0002266

**85108575**

Turbocharger Lifting Tool

## 2231-03-02-01 Oil Cooler, Replacement

See also:

- "Oil Cooler, Pressure Test" page 38

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: DBT2V700, 9996049, 85108575*

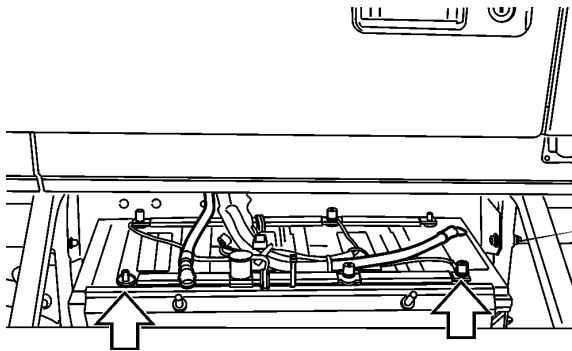
### Removal

**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.



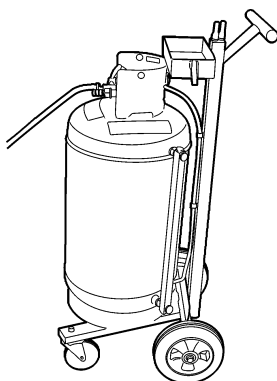
W2003815

**3**

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 a suitable container.

DBT2V700, 9996049



W2004191

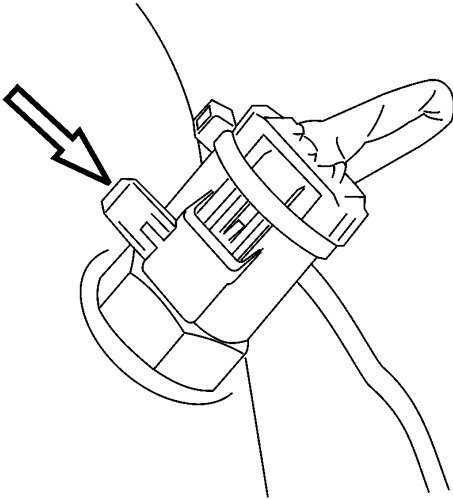
**4**

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.

**5**

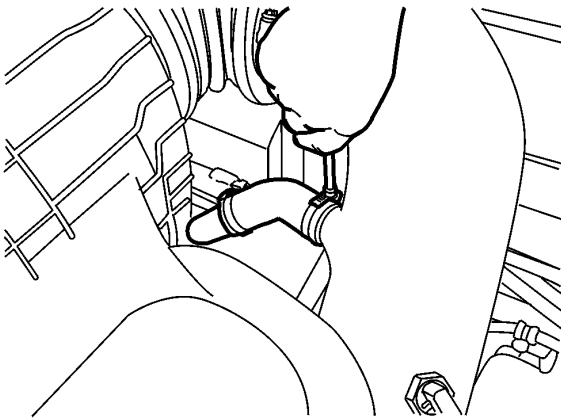
Disconnect the air temperature sensor connector from the sensor. Cut the tie strap and disengage the lock tab. Remove the clamp securing the harness to the main fresh air pipe.



W2004720

**6**

Loosen the air compressor fresh air pipe coupling hose clamp at the main fresh air pipe. Separate the hose from the pipe.

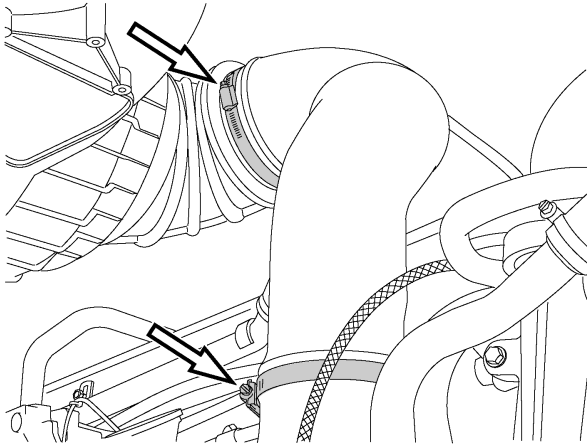


W2004719



**7**

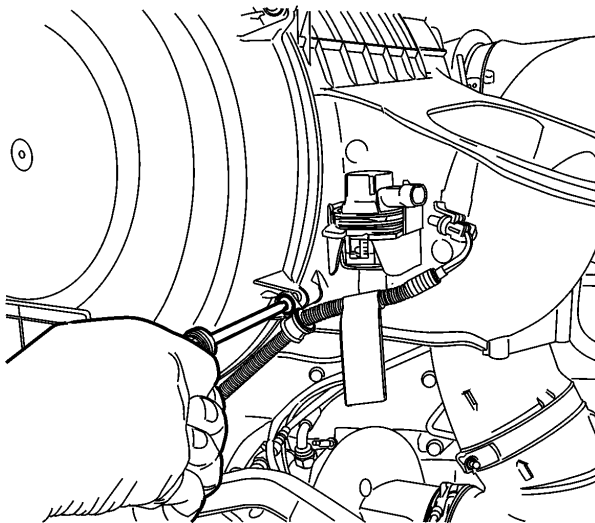
Loosen the clamps securing the main fresh air pipe to the air cleaner and to the turbocharger inlet elbow. Remove the main fresh air pipe.



W2006005

**8**

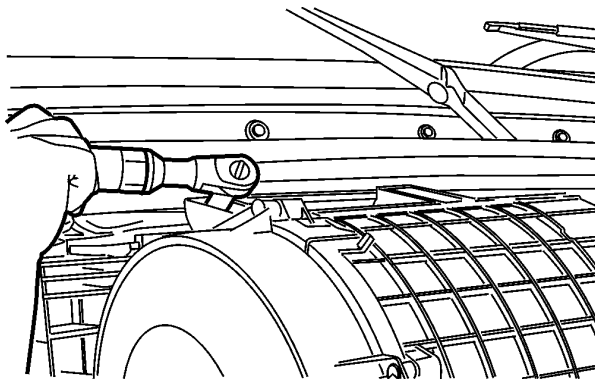
Disconnect the air restriction gauge harness connector and remove the clamps securing the wiring harness to the air filter housing.



W2003861

**9**

Remove the fasteners securing the air filter housing to the cab and remove the housing.

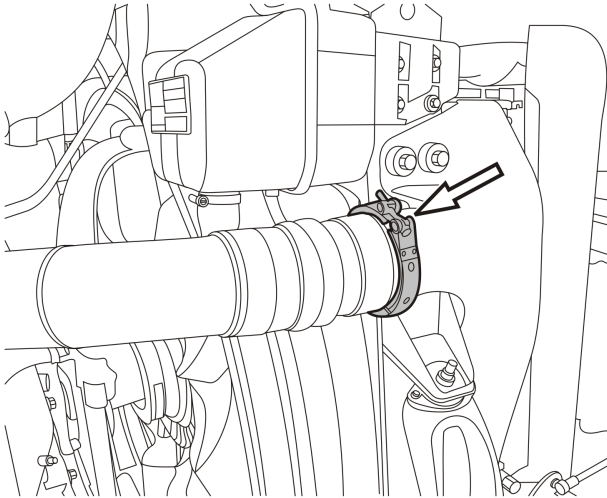


W2003858

**10**

Remove the charge air inlet pipe from between the turbocharger and the charge air cooler.

**Note:** Disconnect the Discharge Recirculation Valve (DRV) air line. Loosen the clamp and disconnect the recirculation hose from the inlet elbow.



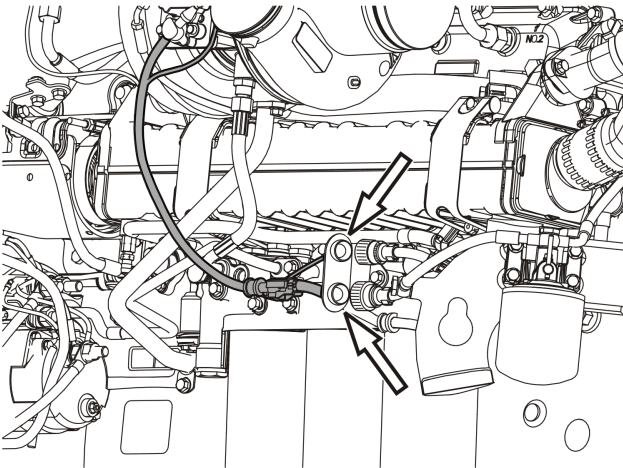
W2006040

**11**

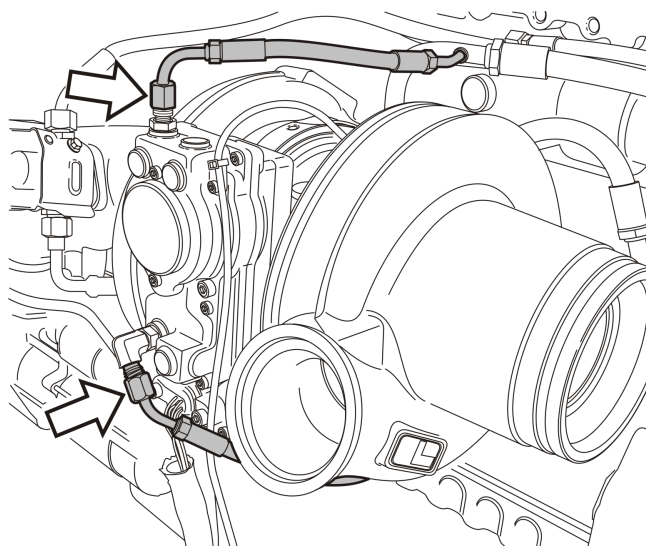
Remove the turbocharger inlet elbow.

**12**

Cut the tie straps securing the turbocharger actuator and speed sensor wiring harnesses. Disconnect and remove the connectors mounted in bracket at the oil filter housing.



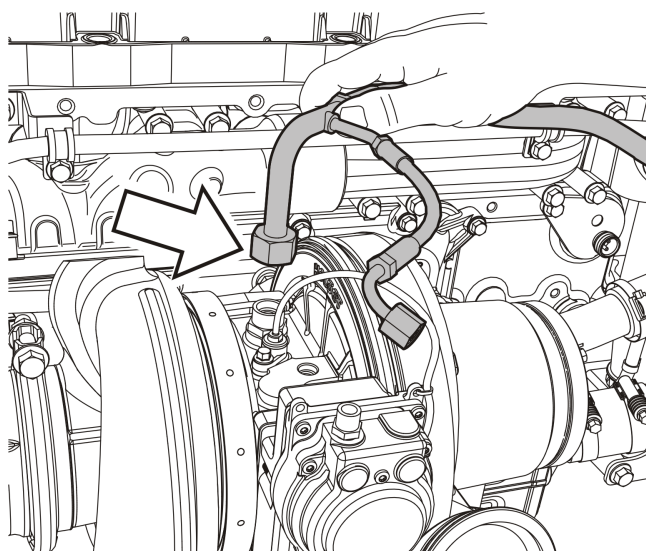
W2005620



W2005621

**13**

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



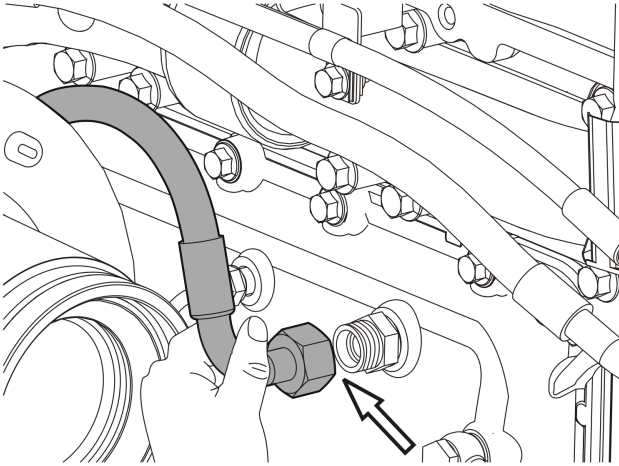
W2005622

**14**

Disconnect the coolant line from the top of the turbocharger.

**15**

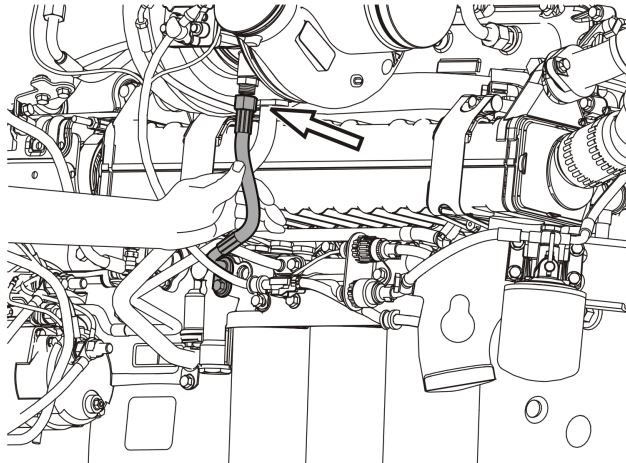
Disconnect the turbocharger coolant line from the oil cooler cover.



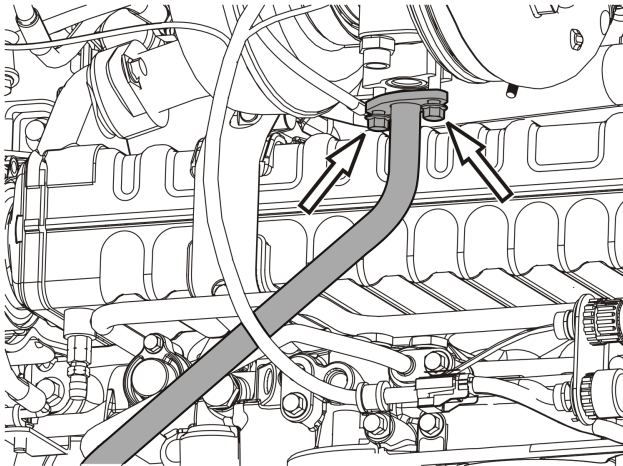
W2005623

**16**

Disconnect the oil supply line from the bottom of the turbocharger.



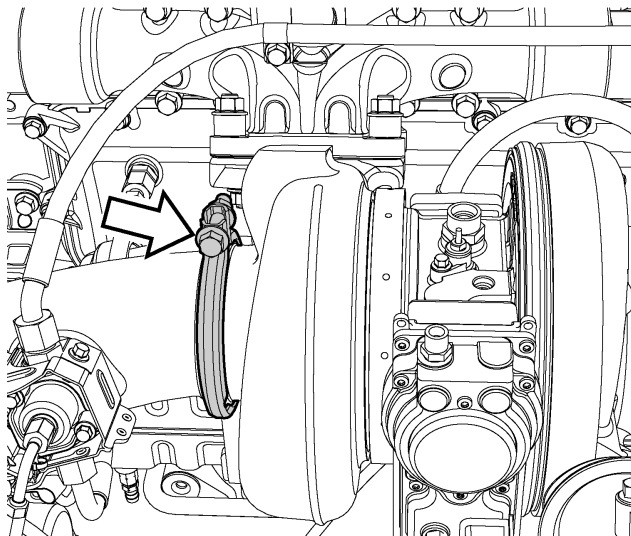
W2005624



W2005628

**17**

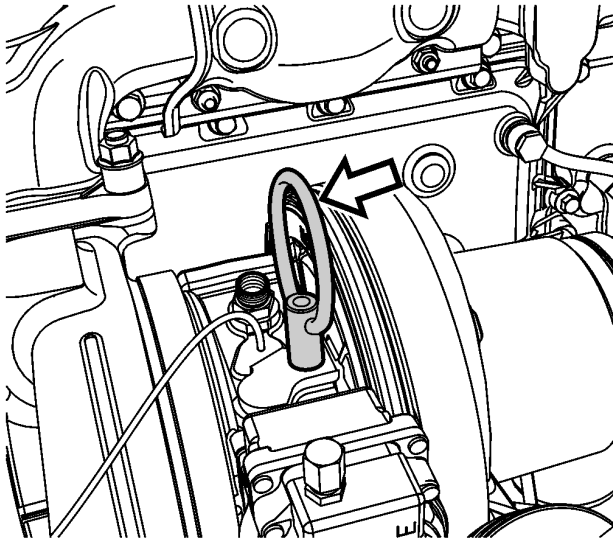
Remove the fasteners securing the oil drain pipe to the bottom of the turbocharger and spacer block. Remove the spacer block. Separate the gasket and O-ring from the spacer block and discard.



W2006108

**18**

Loosen the diffuser-to-turbocharger clamp and slide the diffuser away from the turbocharger.

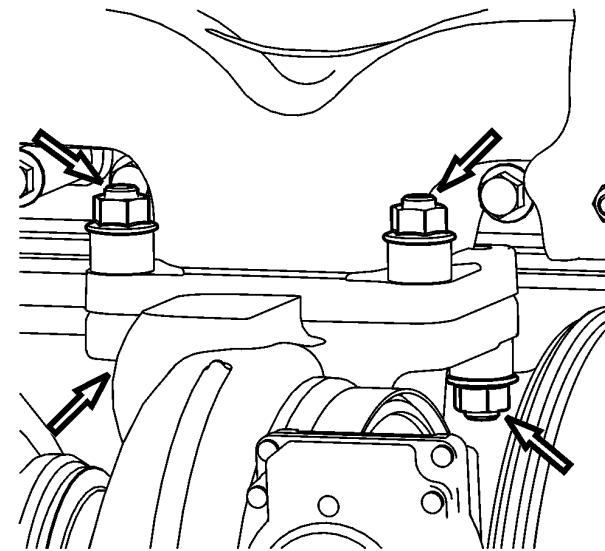


W2005042

**19**

Remove the plug at the top of the turbocharger and install the turbocharger lifting tool.

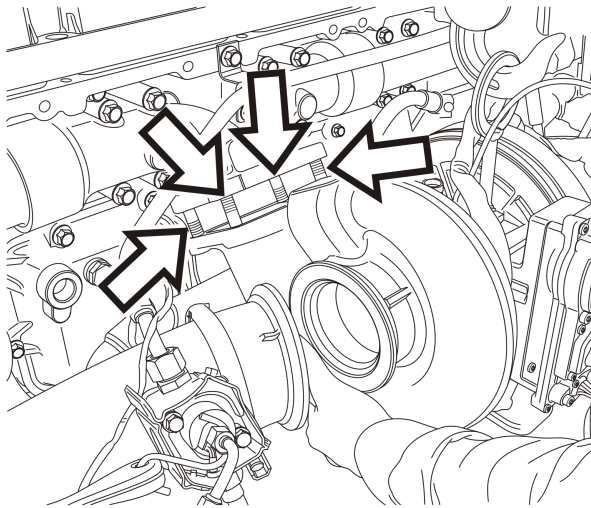
85108575



W2005011

**20**

Support the weight of the turbocharger using a mobile floor crane such as OTC 16-1815 or equivalent. Remove the turbocharger mounting nuts and spacers.



W2005629

**21**

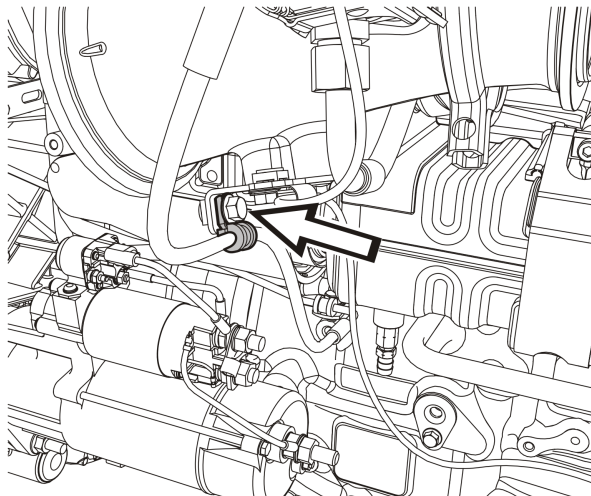
With the aid of an assistant, lower the turbocharger away from the exhaust manifold studs and remove it from the engine.

**22**

Place the turbocharger on a suitable support. Plug the turbocharger oil lines and outlet openings to prevent contamination. Install covers on the intake and exhaust openings of the turbocharger to prevent foreign material from entering.

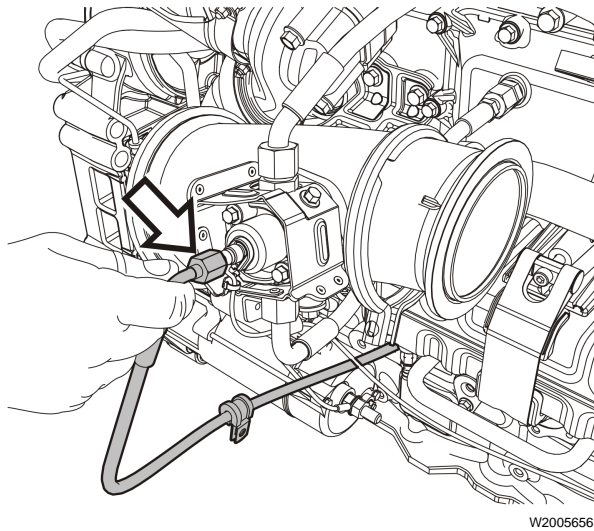
**23**

Remove the aftertreatment fuel line clamp at the bottom of the diffuser.



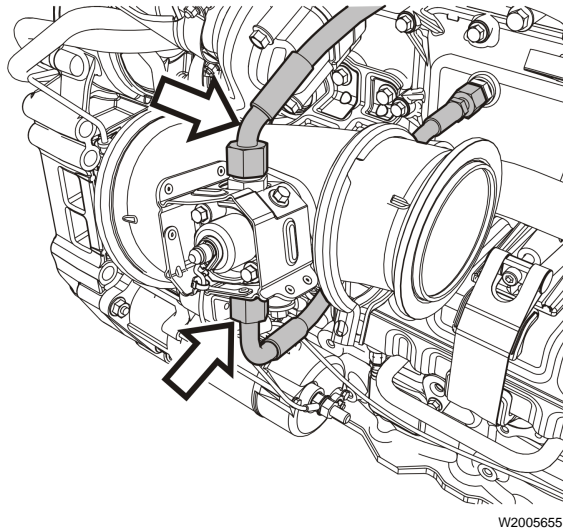
W2005657





**24**

Remove the fuel line from the aftertreatment fuel injector.



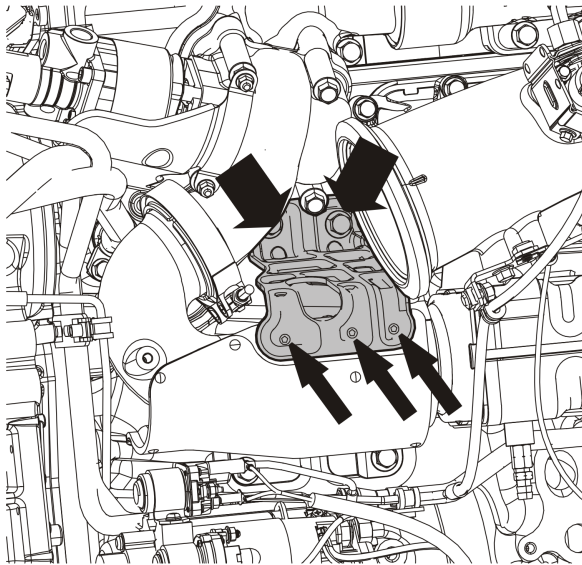
**25**

Remove the supply and return coolant lines from the aftertreatment fuel injector.

**26**

Remove the diffuser-to-exhaust pipe clamp and move the diffuser away from the EGR cooler for easier access to cooler connections.

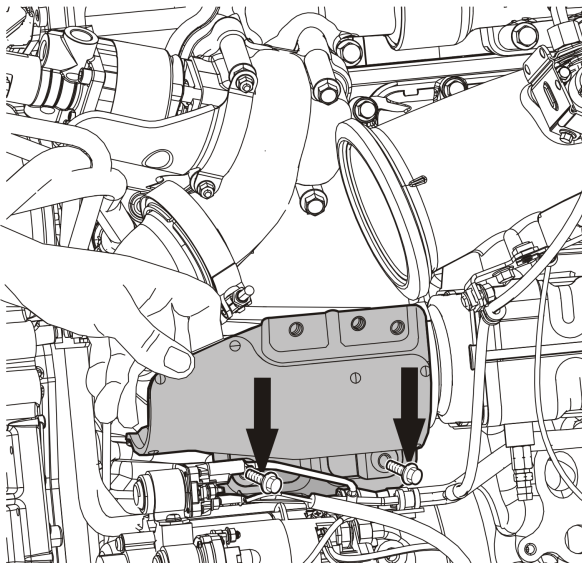




W2005686

**27**

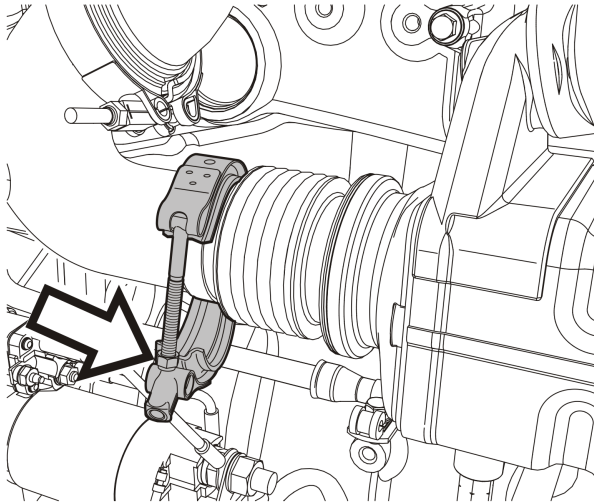
Remove the fasteners securing the upper portion of the EGR hot pipe shield and remove the shield.



W2005687

**28**

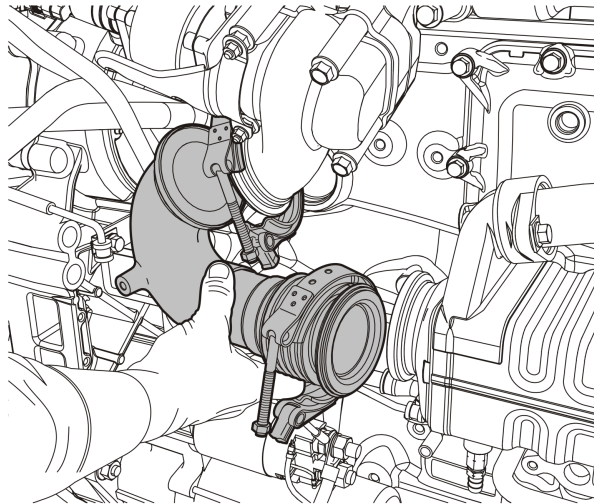
Remove the fasteners securing the lower portion of the EGR hot pipe shield and remove the shield.



W2005642

**29**

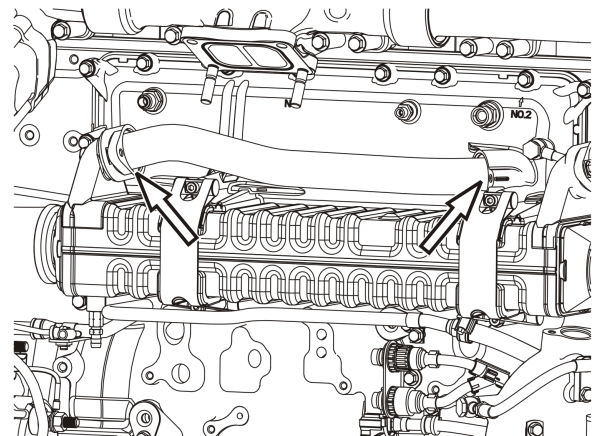
Loosen the EGR hot pipe V-clamps. Free the EGR hot pipe clamps from the flanges at the EGR valve and at the EGR cooler.



W2005641

**30**

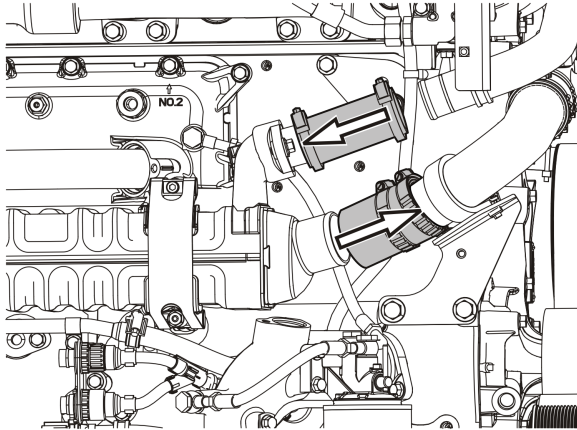
Remove the EGR hot pipe from between the EGR valve and the EGR cooler. Remove and discard the gaskets.



W2005646

**31**

Remove the fasteners and clamps securing the coolant pipe to the oil cooler cover and the EGR cooler.



W2005647

**32**

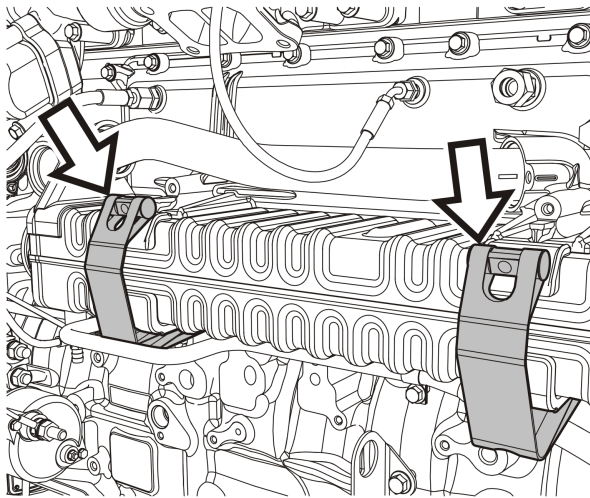
Remove the clamps securing the coolant hose to the EGR cooler and thermostat housing and slide the hose rearward. Remove the clamps securing the EGR cooler hose to the EGR pipe and slide the hose forward.

**33**

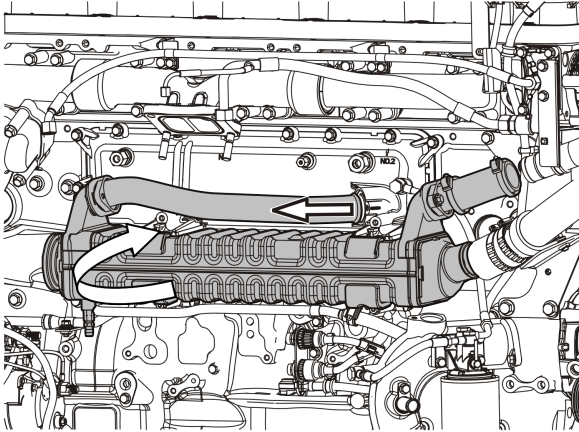
Remove the static fill pipe from the EGR cooler.

**34**

Disconnect the EGR cooler straps by removing the top bolts and pulling straps back to allow clearance.



W2005645



W2005658

**35**

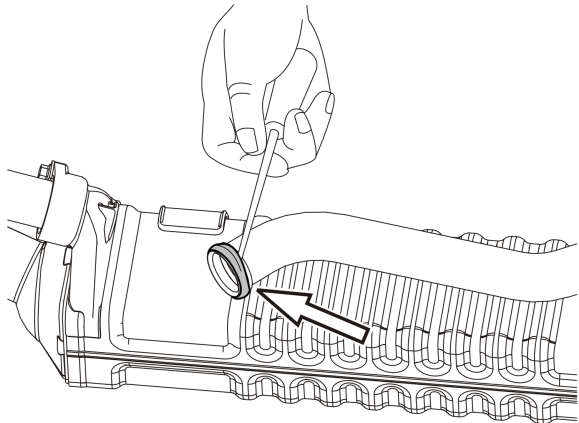
Pull the EGR cooler outward and back to free the coolant pipe from the oil cooler cover. Remove the EGR cooler.

**36**

Remove EGR pipe coupling hose and replace with new hose.

**37**

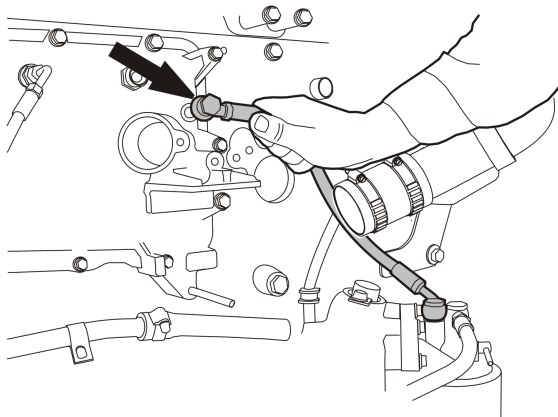
Remove the O-ring at each end of the EGR cooler coolant pipe and discard.



W2005659

**38**

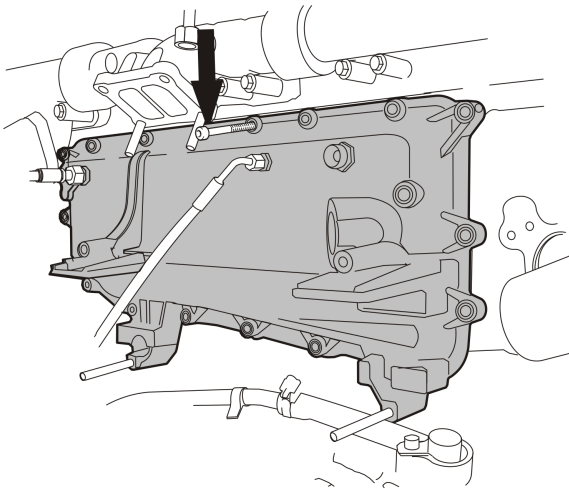
Remove the bottom strap nuts and spacers, then remove straps.



W2005661

**39**

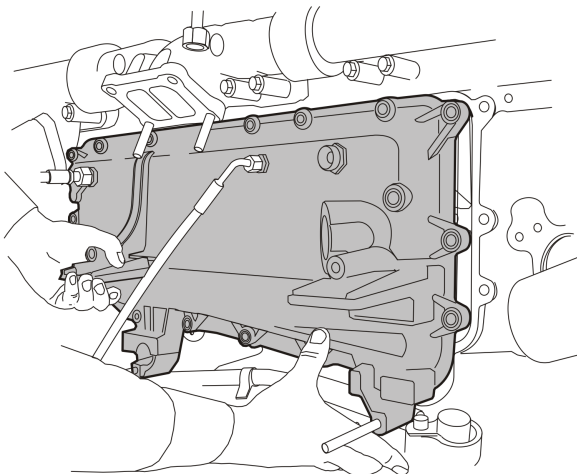
Disconnect the coolant conditioner hose from the oil cooler cover.



W2005662

**40**

Remove all oil cooler cover bolts except the one at the top center of the cover.

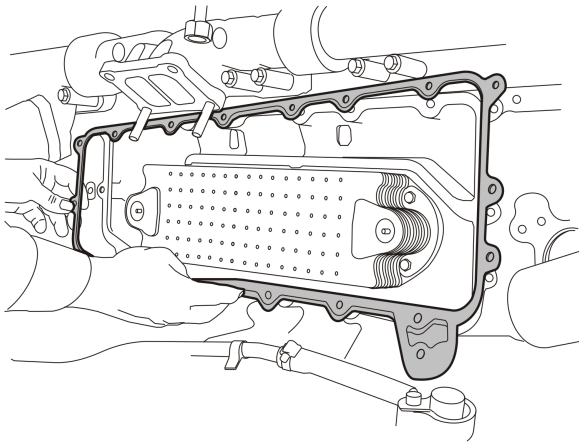


W2005668

**41**

Support the cover and remove the top center bolt. Remove the oil cooler cover.

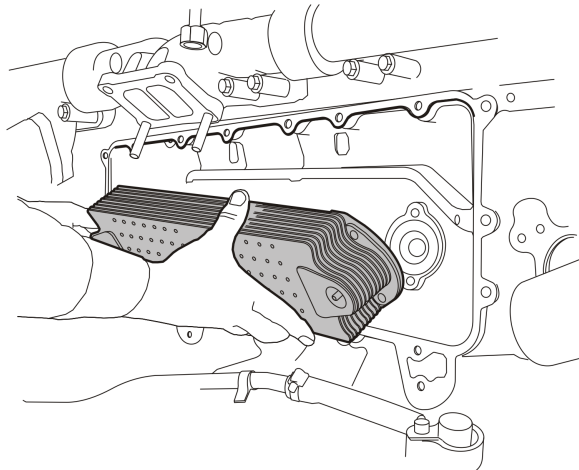
**Note:** Tap the cover with a soft mallet to loosen the cover if necessary.



W2005664

**42**

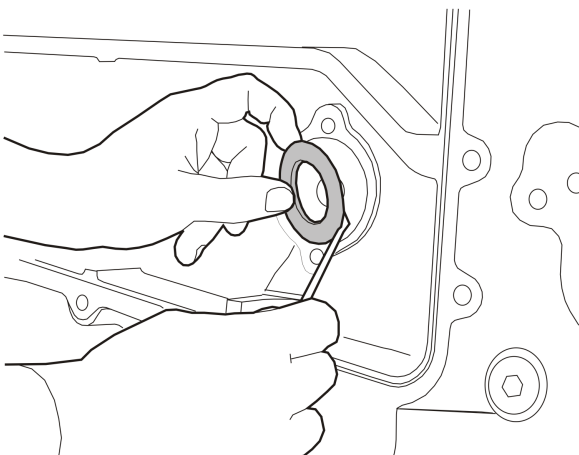
Remove the oil cooler cover gasket from the cylinder block.



W2005667

**43**

Remove the bolts securing the oil cooler to the cylinder block and remove the cooler.



W2005663

**44**

Remove the oil cooler sealing rings.

**45**

Clean the sealing surfaces of the oil cooler, cooler cover and cylinder block.

**46**

For information regarding oil cooler leak testing, refer to  
"Oil Cooler, Pressure Test" page 38.



## Installation

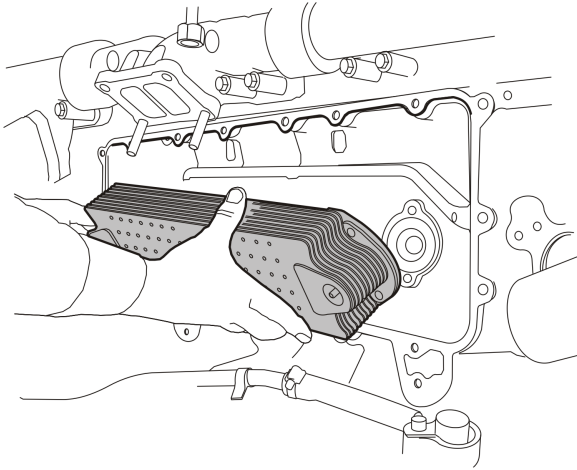
**1**

Install new oil cooler sealing rings in the cylinder block.

**2**

Install the oil cooler and tighten the bolts to  $27 \pm 4$  Nm ( $20 \pm 3$  ft-lb).

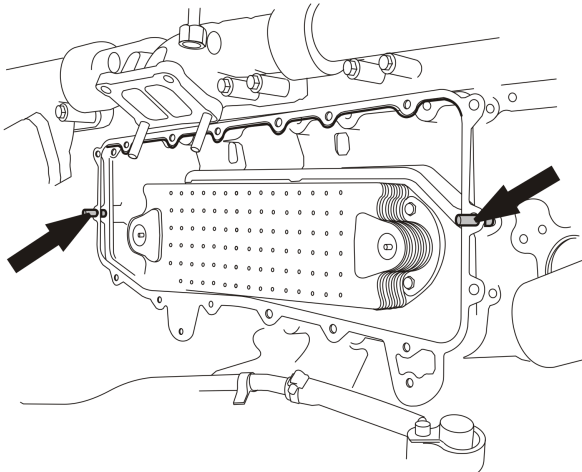
$27 \pm 4$  Nm ( $20 \pm 3$  ft-lb)



W2005667

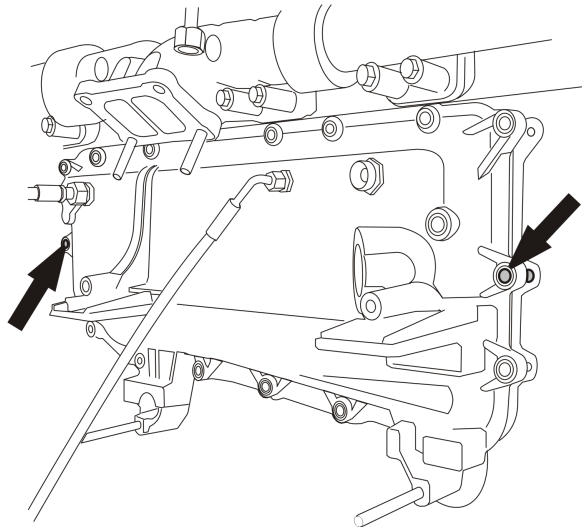
**3**

Install two alignment pins one on each side of the oil cooler cover opening. Install a new oil cooler cover gasket on the alignment pins.



W2005666

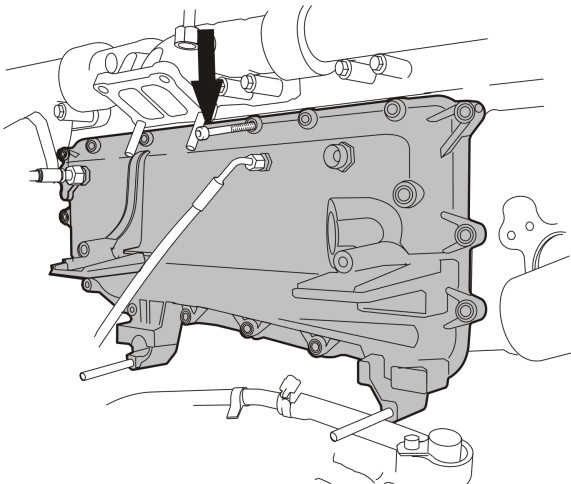




W2005665

**4**

Install the oil cooler cover over the alignment pins and against the gasket.

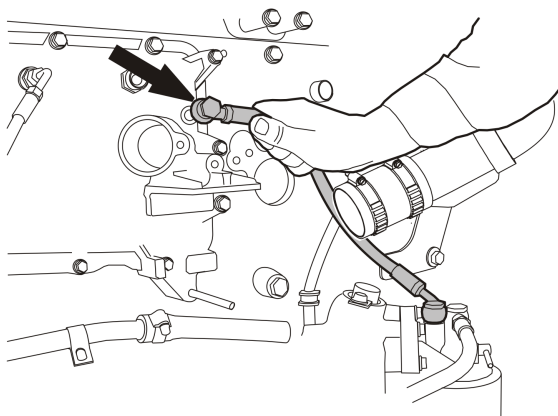


W2005662

**5**

Install the top center bolt and all remaining bolts. Tighten the bolts in steps to  $24 \pm 3$  Nm ( $18 \pm 2$  ft-lb), evenly around the cover.

$24 \pm 3$  Nm ( $18 \pm 2$  ft-lb)



W2005661

**6**

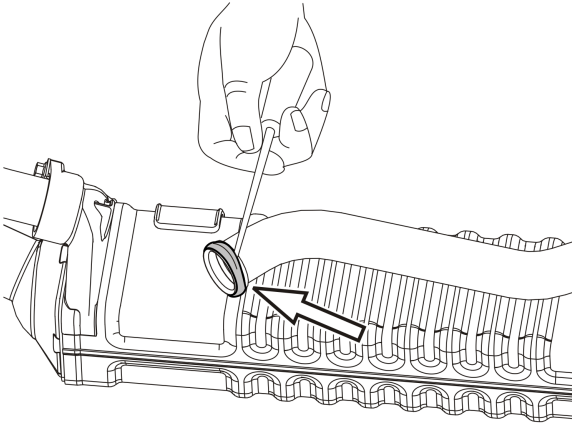
Install the coolant conditioner hose with new seals to the oil cooler cover. Tighten the fitting to secure.

**7**

Position straps on bottom mounts, install the spacers and nuts.

**8**

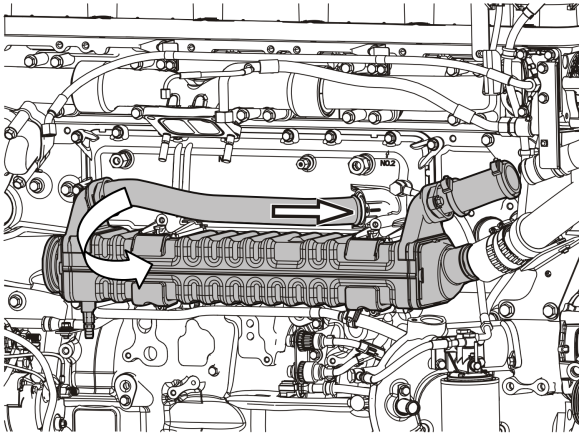
Install a new O-ring at each end of the EGR cooler coolant pipe and lubricate with coolant. Install the coolant pipe into the EGR cooler.



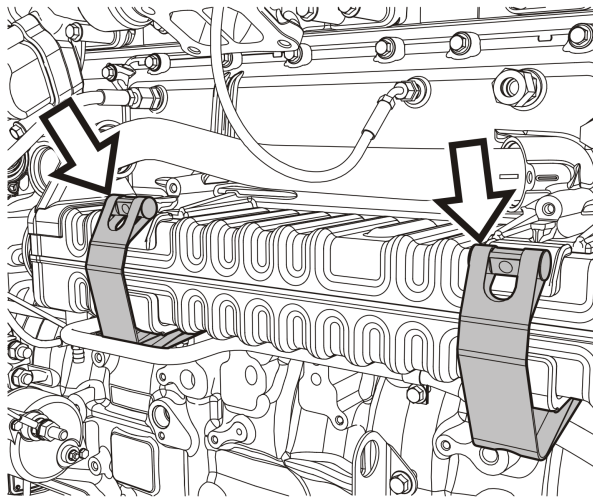
W2005659

**9**

Position the EGR cooler onto the cooler brackets. Slide the cooler forward to engage the coolant pipe with the oil cooler cover.



W2005660



W2005645

**10**

Position the straps over the EGR cooler, install the strap bolts and hand tighten.

**11**

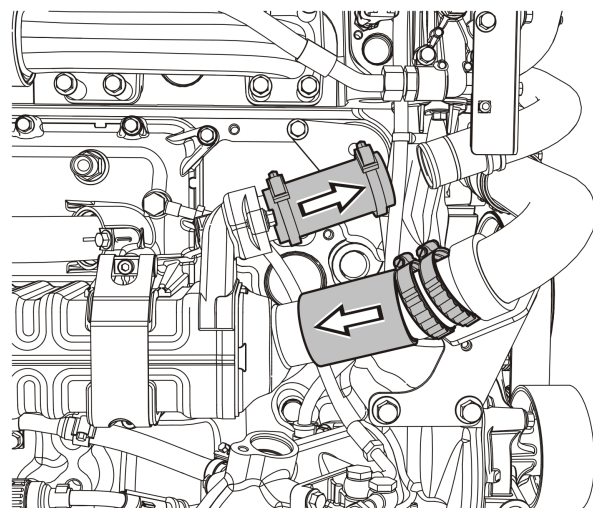
Tighten the nuts at the bottom of the cooler straps to  $24 \pm 3$  Nm ( $18 \pm 2$  ft-lb).

$24 \pm 3$  Nm ( $18 \pm 2$  ft-lb)

**12**

Tighten the EGR strap bolts to  $12 \pm 2$  Nm ( $106 \pm 18$  in-lb).

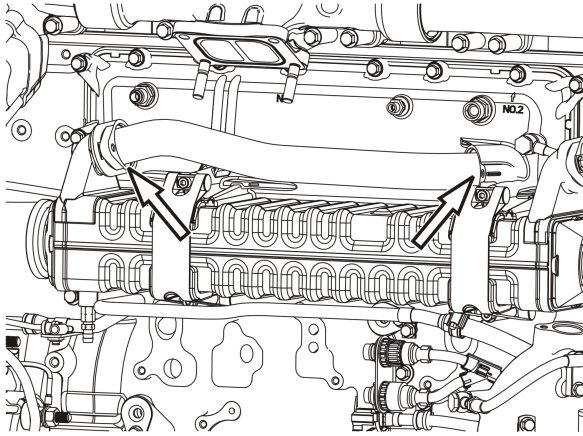
$12 \pm 2$  Nm ( $116 \pm 18$  in-lb)



W2005648

**13**

Connect the EGR cooler coolant hose, position the clamps and tighten to secure. Connect the EGR cooler hose to the EGR pipe, position the clamps and tighten to secure.



W2005646

**14**

Install the coolant pipe clamps and fasteners and tighten to secure.

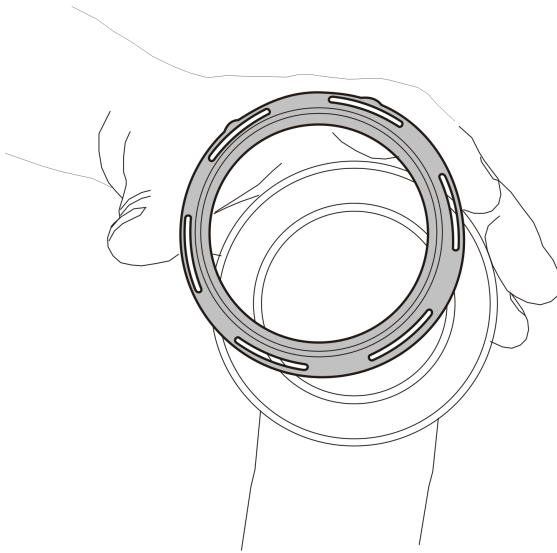
**15**

Install the static fill pipe to the EGR cooler. Tighten to  $10 \pm 2$  Nm ( $89 \pm 18$  in-lb).

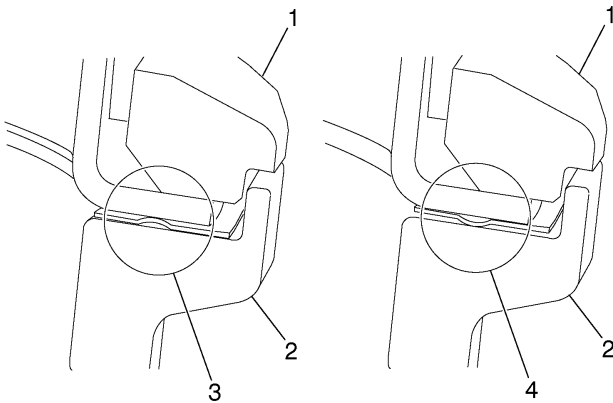
$10 \pm 2$  Nm ( $89 \pm 18$  in-lb)

**16**

Install new gaskets onto the EGR valve end of the hot pipe and into the inlet flange of the EGR cooler.

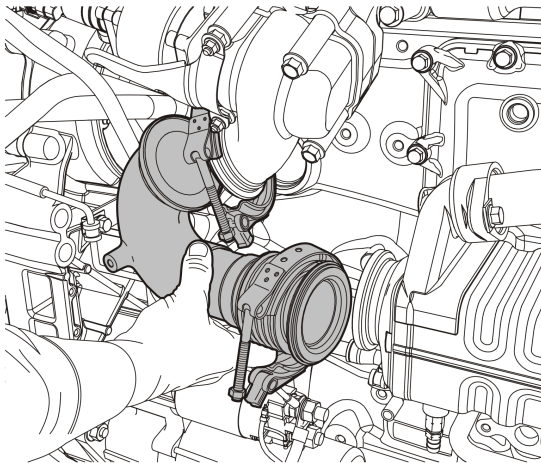


W2005688



W2006165

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



W2005641

**17**

Make sure the gaskets lay flat against the flanges correctly and are assembled with the bead of the gasket facing the EGR pipe as shown.

**18**

Inspect and lubricate the V-clamps. Hook the upper V-clamp over the EGR valve flange. Place the lower V-clamp over the bellows on the hot pipe.

**Note:** The V-band clamps can be reused if no wear or damage is visible.

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

**19**

Lubricate the flange on the EGR cooler inlet and the flange on the EGR hot pipe. Lubricate the V-band clamps and T-bolt threads. Lubricating the flanges and clamps aids in V-clamp installation.

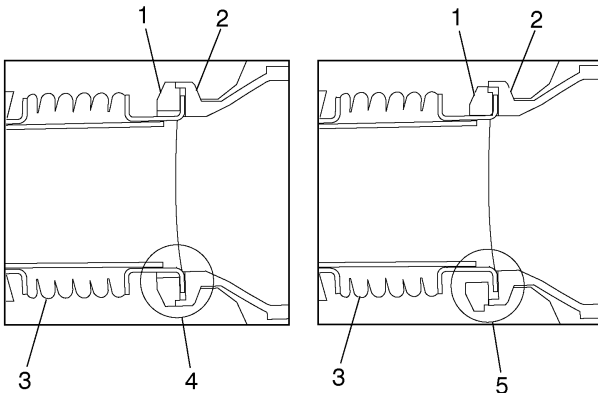
**20**

Position the EGR hot pipe between the EGR valve and the EGR cooler. Make sure the flange engages properly. While holding the hot pipe in position, slide the upper V-clamp over the flange and tighten until snug. Slide the floating flange into the groove of the EGR cooler flange. Slide the lower V-clamp over the flange of the EGR cooler and tighten the clamp until enough pressure prevents the floating flange from falling out of the EGR cooler flange.

**21**

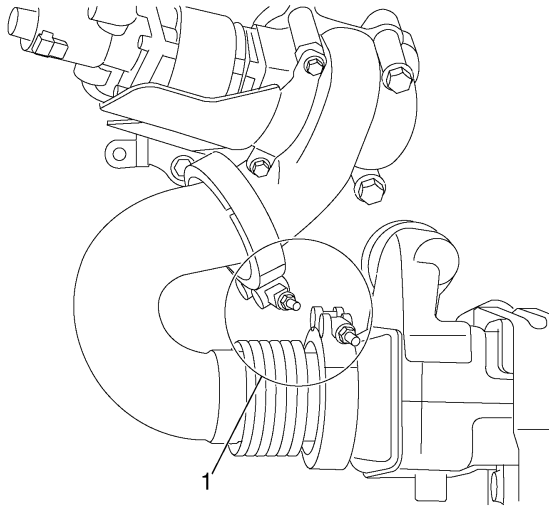
Visually inspect the floating flange through the gap in the V-band clamp to make sure it is properly seated in the EGR cooler flange. The floating flange must be concentric with the EGR cooler flange.

**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.



W2006163

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



W2006164

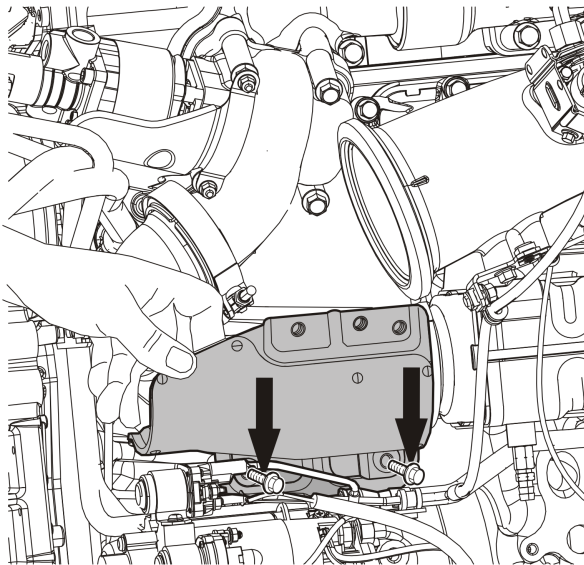
1 EGR Pipe Clamp Position

**22**

Position the V-clamps as shown so that the T-bolts clear both heat shields. Apply anti-seize to the threads of the T-bolts. Tighten to  $20 \pm 4$  Nm ( $15 \pm 3$  ft-lb).

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

$20 \pm 4$  Nm ( $15 \pm 3$  ft-lb)

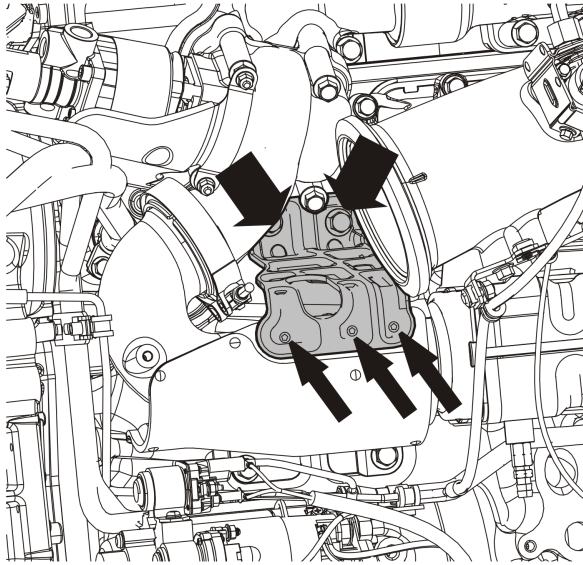


W2005687

**23**

Position the lower EGR hot pipe heat shield over the pipe and secure with bolts. Do not tighten at this time.





W2005686

**24**

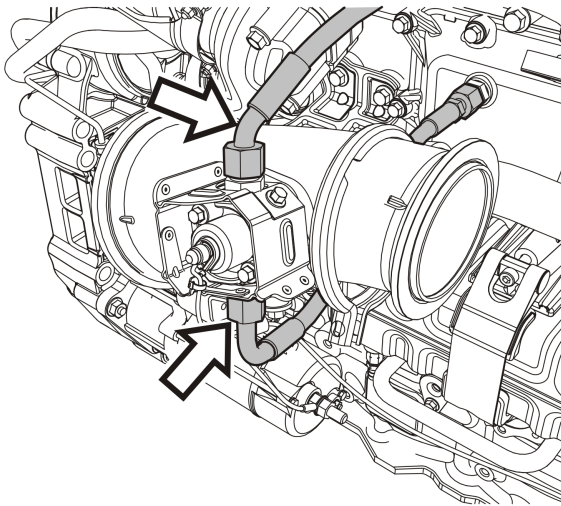
Position the upper EGR hot pipe heat shield and install the fasteners to secure the shield. Tighten all fasteners to specification.

**25**

Position the diffuser to the exhaust pipe and loosely install the V-band clamp.

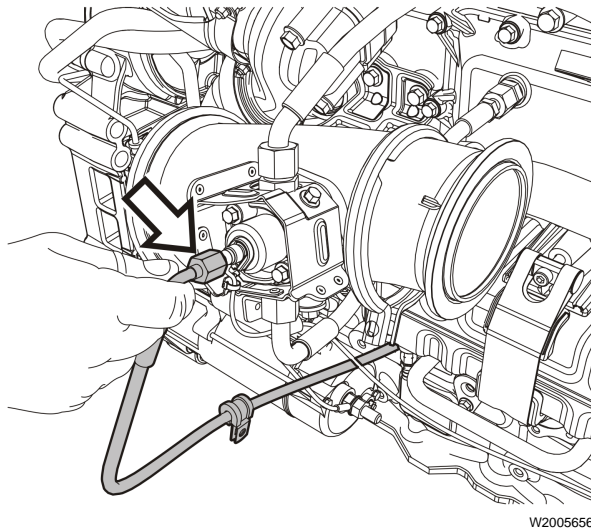
**26**

Install the coolant supply and return lines to the aftertreatment fuel injector.



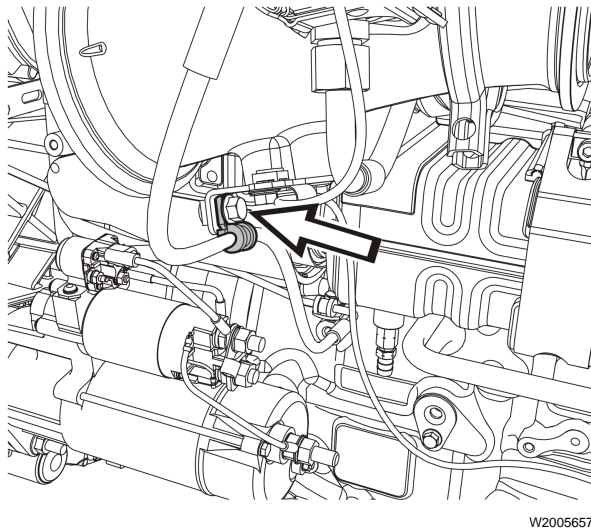
W2005655





**27**

Install the fuel line onto the aftertreatment fuel injector.



**28**

Install the aftertreatment fuel injector line clamp and fastener to the bottom of the diffuser.

**29**

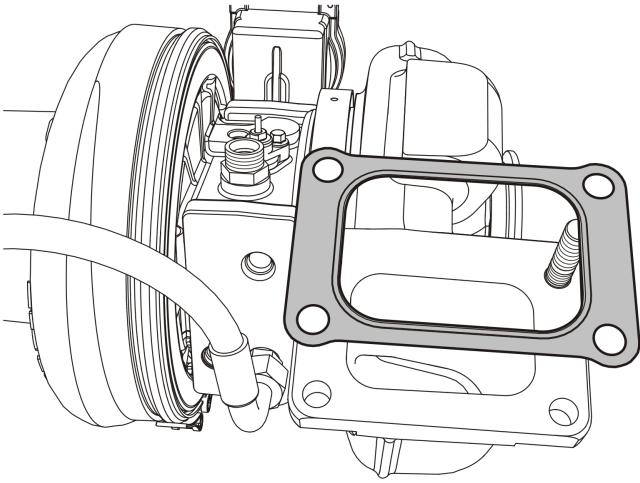
Clean the contact surface of the exhaust manifold and the turbocharger.

**30**

Remove the plugs from the turbocharger oil lines.  
Remove the covers from the turbocharger intake and exhaust openings.

**31**

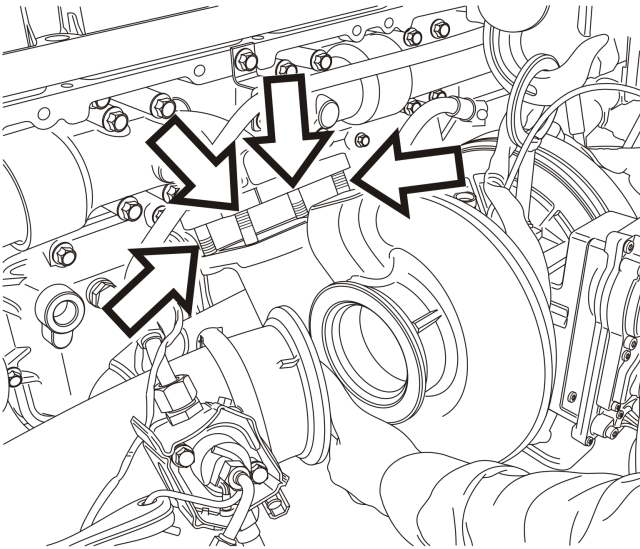
Install a new gasket onto the studs of the turbocharger.



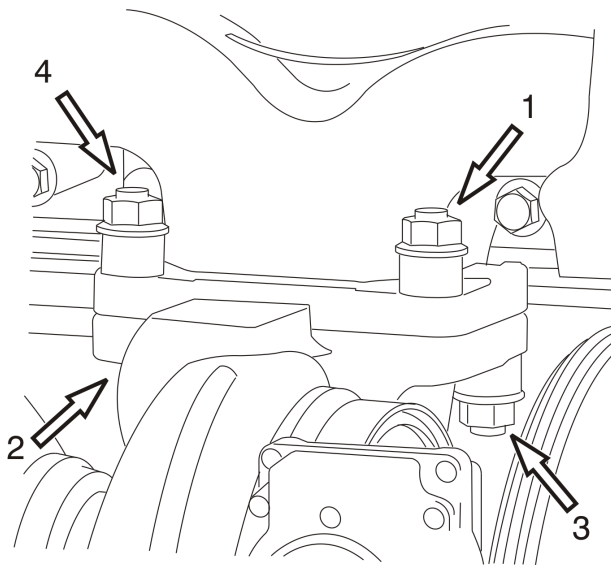
W2005636

**32**

Attach the turbocharger to a mobile floor crane such as OTC 16-1815 or equivalent. With the aid of an assistant, position the turbocharger against the exhaust manifold, aligning the studs with the holes.



W2005629



W2005206

**33**

Install the turbocharger flange nuts and spacers and tighten to 135 Nm (100 ft-lb). The nuts should be tightened in the sequence shown.

135 Nm (100 ft-lb)

**34**

Remove the hoist and turbocharger lifting tool. Install the plug in the threaded hole at the top of the turbocharger.

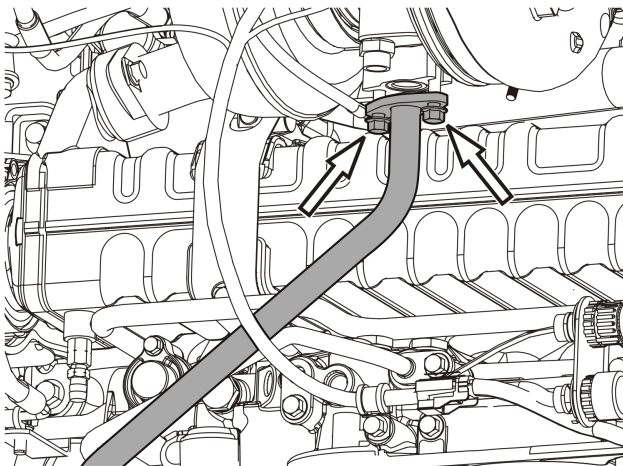
**35**

Clean the contact surface of the turbocharger, spacer block and drain back pipe.

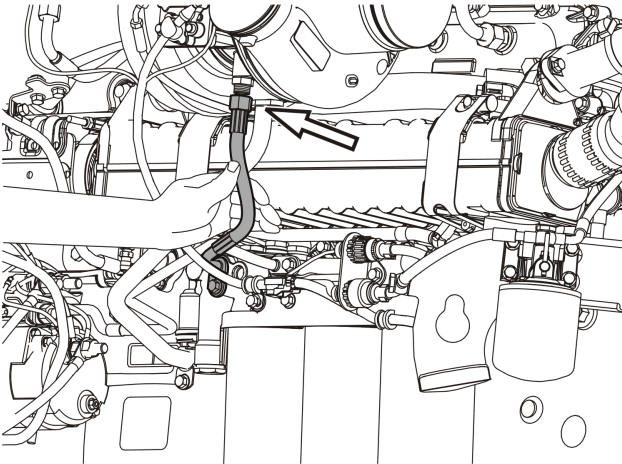
**36**

Position a new O-ring and gasket on the spacer block and install the turbocharger oil drain pipe and spacer block to the bottom of the turbocharger. Tighten the fasteners to  $24 \pm 4$  Nm ( $18 \pm 3$  ft-lb).

$24 \pm 4$  Nm ( $18 \pm 3$  ft-lb)



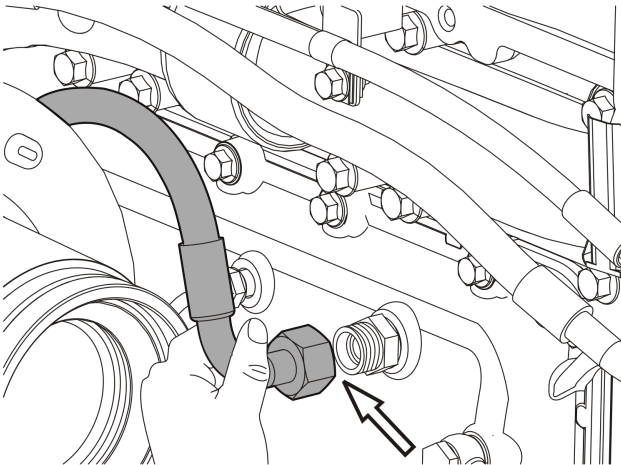
W2005628



W2005624

**37**

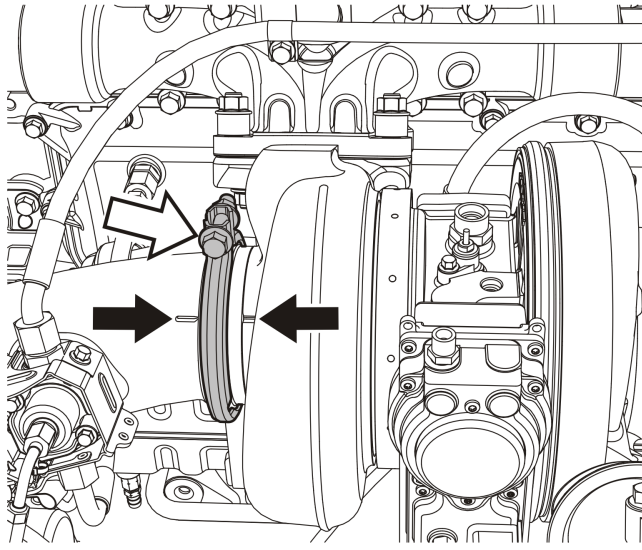
Install the turbocharger oil supply line to the bottom fitting of the turbocharger and tighten the fitting.



W2005623

**38**

Install the turbocharger coolant line to the fitting on the oil cooler cover and tighten to secure.

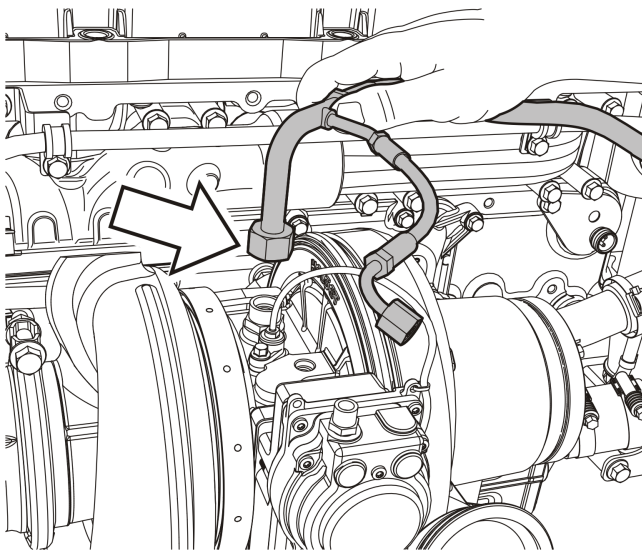


W2005626

**39**

Position the diffuser against the turbocharger and install a new V-band clamp. Align the cast marks on the diffuser with the mark on the turbocharger and tighten the clamp to secure. Tighten the diffuser-to-exhaust pipe clamp.

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

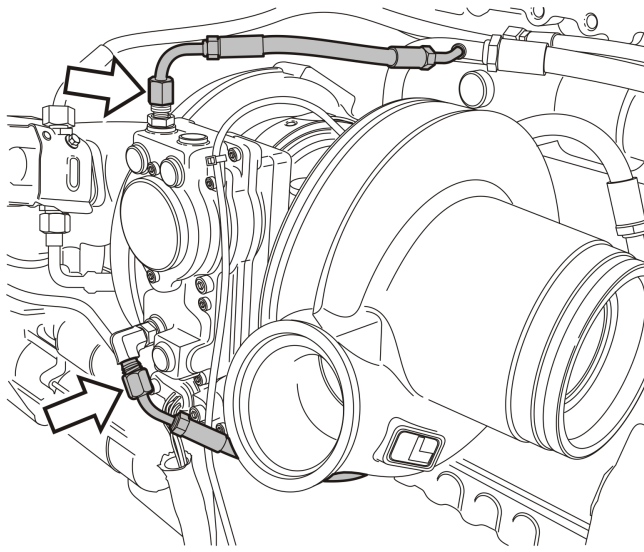


W2005622

**40**

Install the coolant line to the top of the turbocharger and tighten the fitting to secure.

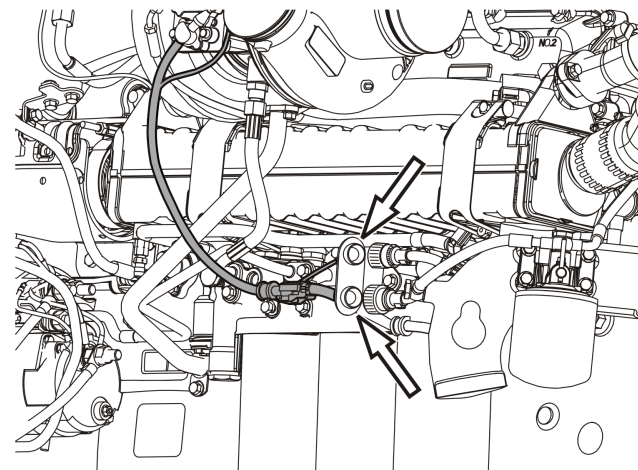
**Note:** This coolant line also connects to the turbocharger actuator.



W2005621

**41**

Install the turbocharger actuator coolant lines to the fittings and tighten to secure.



W2005620

**42**

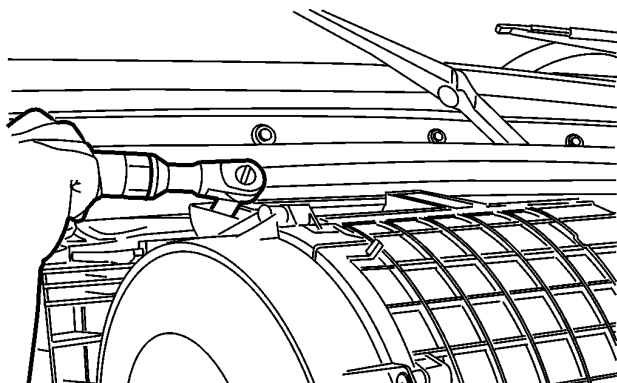
Connect the turbocharger actuator and turbocharger wheel speed sensor wiring harnesses. Make sure the connectors are oriented with the flat side toward the flat in the bracket. Install the cable clamp on the oil filter housing. Secure the wiring harness to itself and to the turbocharger oil drain pipe using tie straps.

**43**

Install the inlet elbow to the turbocharger. Do not tighten.

**44**

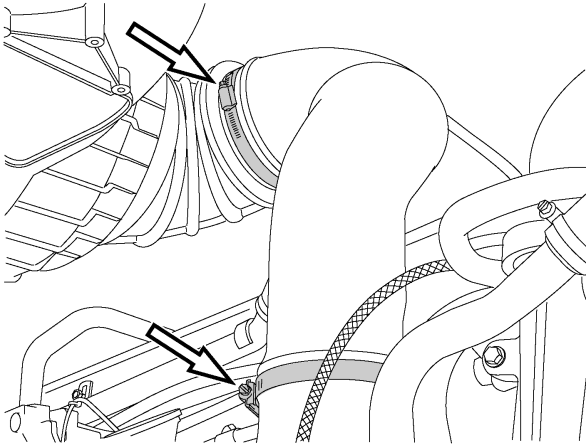
Position the air filter housing against the cab, install the bolts and tighten to secure.



W2003858

**45**

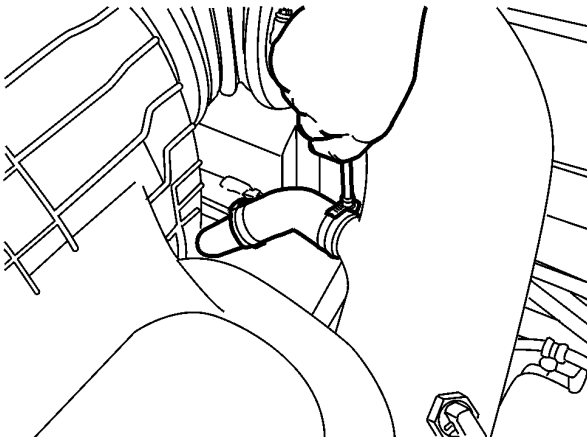
Install the main fresh air pipe to the air filter housing and the turbocharger inlet elbow. Tighten the clamps to secure.



W2006005

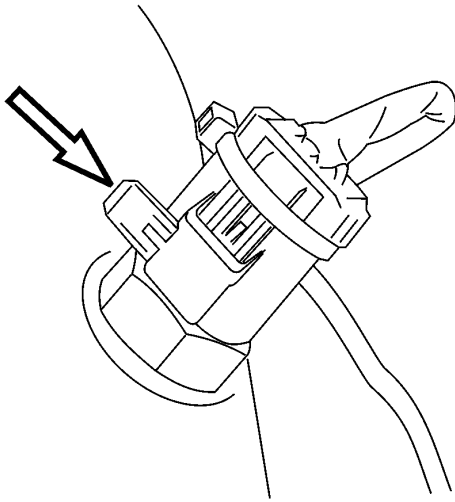
**46**

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



W2004719

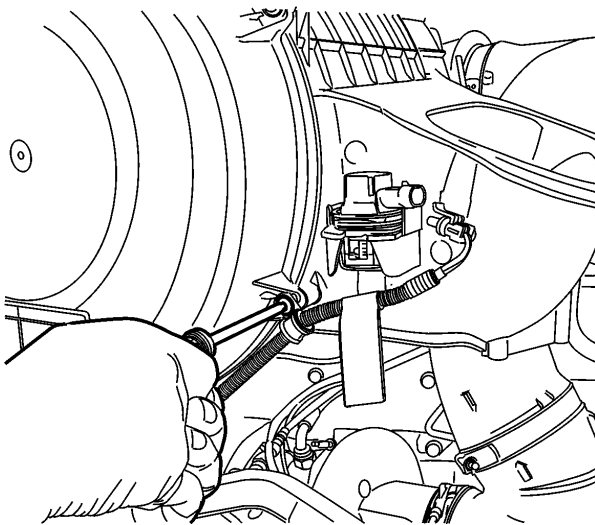




W2004720

**47**

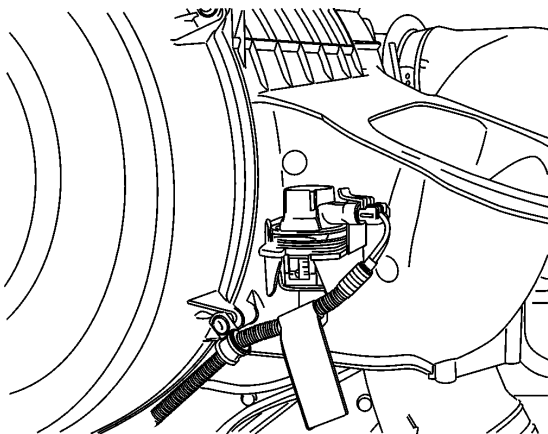
Install the air temperature sensor connector to the sensor. Insert the connector lock tab, push in place and secure with a tie strap. Install the clamp and fastener to secure the harness to the main fresh air pipe.



W2003861

**48**

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

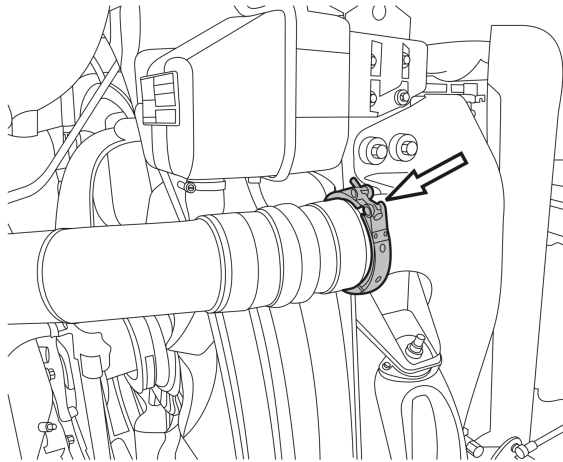


W2004249

**49**

Connect the air filter restriction gauge electrical harness connector.





W2006040

**50**

Inspect the O-rings at each end of the charge air inlet pipe for damage, replace if needed. Install the charge air inlet pipe assembly between the turbocharger and charge air cooler.

**Note:** Connect the DRV air line. Connect the recirculation hose to the inlet elbow, position the clamp and tighten to secure.

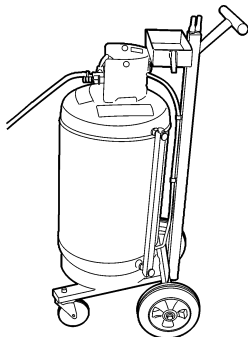
**51**

Check the engine oil level and replenish as needed with the recommended oil.

**52**

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

DBT2V700



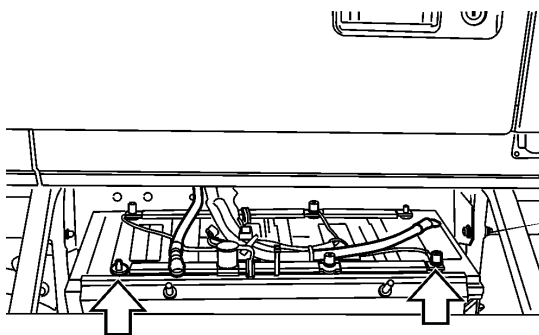
W2004191

**53**

Install the inner splash guard assembly.

**54**

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



W2003815

**55**

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

## 2231-06-05-01 Oil Cooler, Pressure Test Oil cooler removed

See also:

- "Oil Cooler, Replacement" page 3

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: 9996662, 9996845*

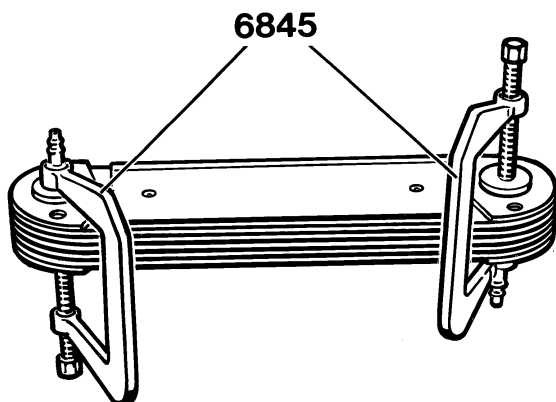
**1**

Wash the coolant side of the oil cooler with a water-soluble degreasing fluid. Flush the oil side of the cooler with degreasing solvent.

**2**

Install the clamps making sure they are properly seated.

9996845

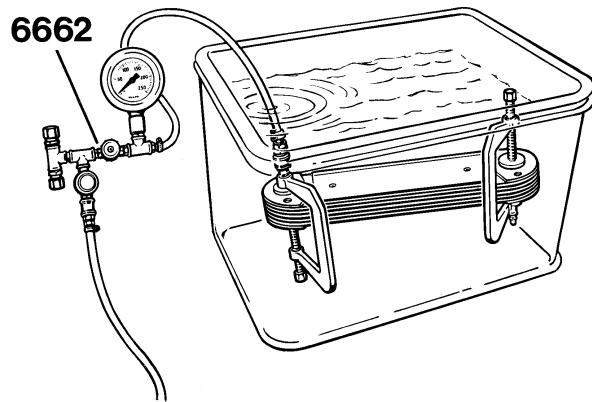


T2006695

**3**

Adjust the pressure gauge reduction valve knob until the pressure gauge needle is at zero.

9996662



T2006696

**4**

Connect the pressure gauge assembly to the fitting on the clamp. Lower the oil cooler into a bath of water. The water temperature should be at approximately 70°C (160°F).

9996845

**5**

Increase the pressure to 250 kPa (35 psi) using the reduction valve knob. The test period should last for at least one minute.

**Note:** Air bubbles emerging from the oil cooler indicate a leak. The oil cooler should be replaced.