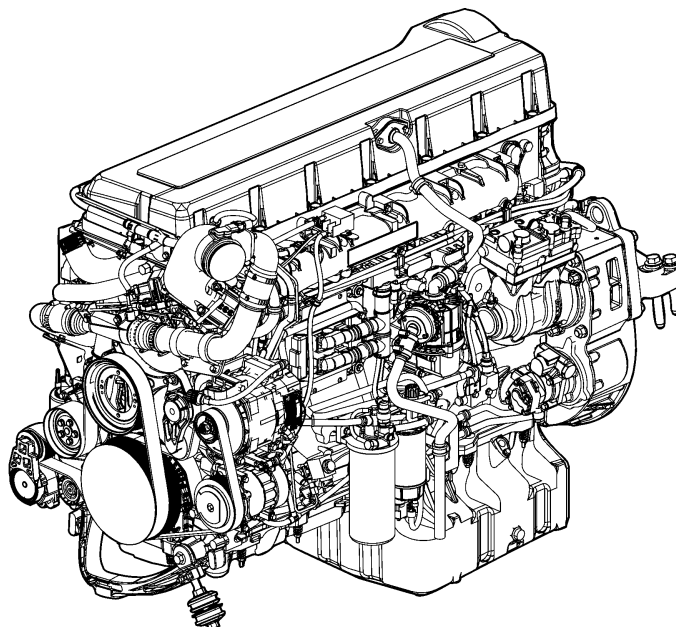


Date	Group	No.	Page
12.2007	<b>212</b>	<b>30</b>	1(46)

## Flywheel Housing, Replacement D16F

### Flywheel Housing, Replacement



W2005773

This information covers replacement of the flywheel housing on the Volvo D16F engine.

### Contents

- "Special Tools" page 2
- "Flywheel Housing, Replacement" page 3

**Note:** Information is subject to change without notice.  
Illustrations are used for reference only and may 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.



W0001793

**9992000**

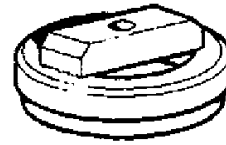
Standard Handle for Drifts (18 x 200)



C0000972

**9994030**

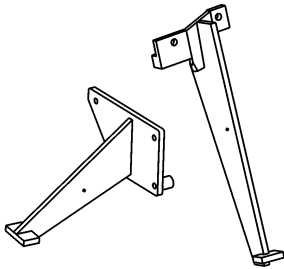
Slide Hammer



W0001798

**9998238**

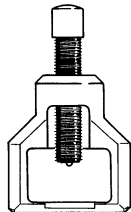
Rear Seal Install Drift



T0011241

**9990181-1 & 2**

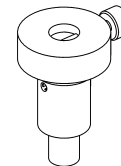
Engine Supports



W0001240

**9996201**

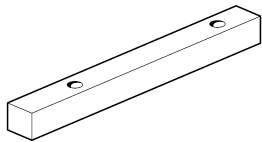
Tie Rod Separating Tool



T0013033

**88800031**

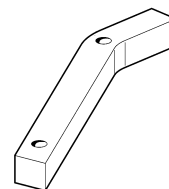
Sensor Depth Gauge



W2005150

**85109033A**

Timing Cover Clamp Tool (Straight)



W2005151

**85109033B**

Timing Cover Clamp Tool (Angled)

# Service Procedures

**2125-03-03-01**

## Flywheel Housing, Replacement

Flywheel and air filter housing removed and coolant drained

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: 9992000, 9994030, 9998238, 9990181-1, 9990181-2, 9996201, 85109033A, 85109033B, 88800031*

### Removal

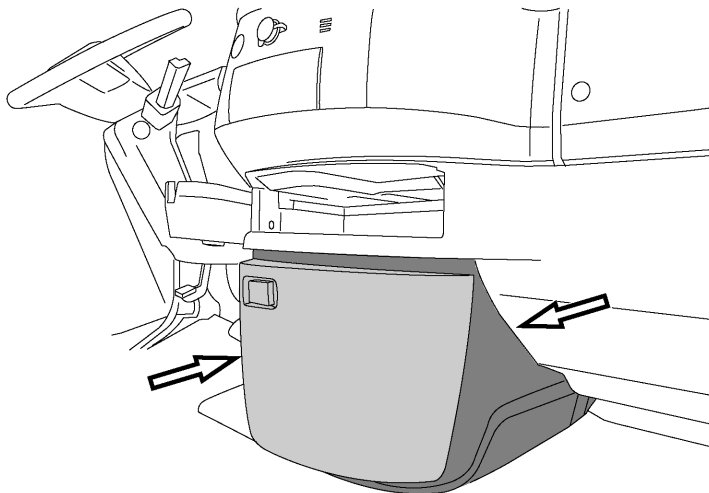
**1**

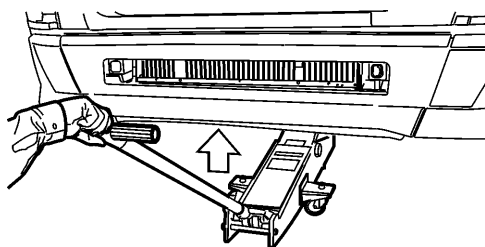
Remove inner splash guard as an assembly.

**Note:** Some models may be equipped with fender extenders, attached to the inner splash guard. Remove these as an assembly.

**2**

Remove the fasteners securing the center dash trim and remove the trim. Then, remove the fasteners securing outer section of the engine cover from inside the cab (includes attached waste basket). Remove cover and place in a secure location.





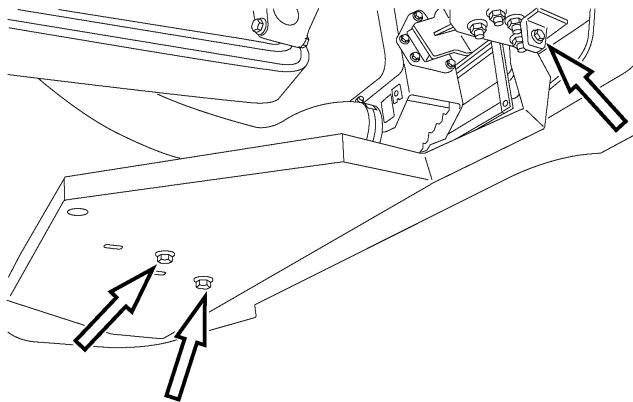
W2003873

**3**

Using a hydraulic jack, lift the front axle until the front wheels are off the ground. Position jackstands of a suitable size and capacity under the front axle to support the weight of the vehicle.

**4**

If required, remove the rock guard from underneath the radiator to allow access for oil pan removal.

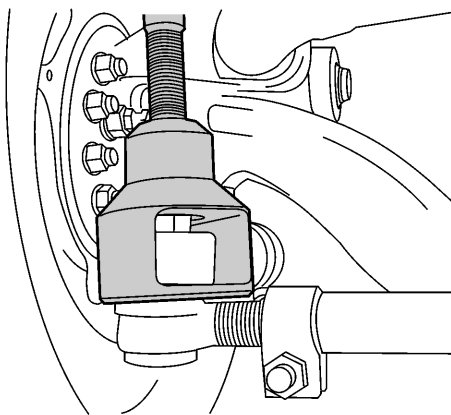


W2006077

**5**

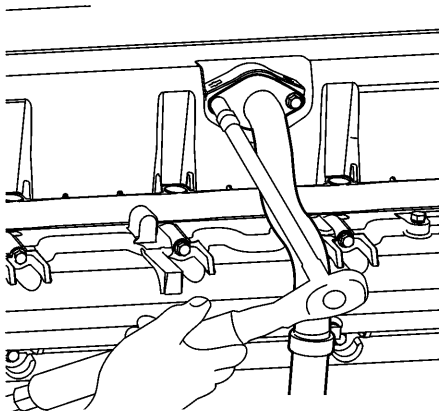
Vehicles equipped with the sump located behind the front steering axle require removal of the tie rod from the left-side steering knuckle using the tie rod separating tool. Disconnecting the tie rod provides adequate clearance for oil pan removal.

9996201



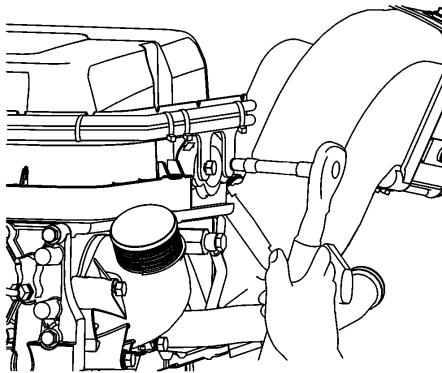
W2004875





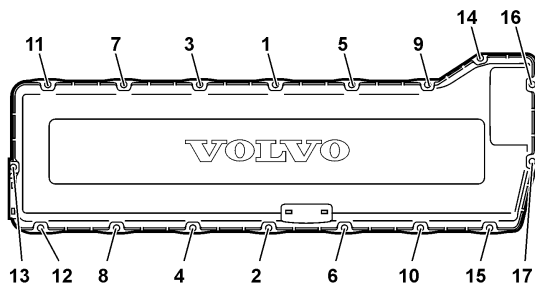
W2004680

- 6**  
Disconnect the breather tube from the side of the valve cover.



W2004679

- 7**  
Remove the engine wiring harness support bracket from the front of the valve cover.



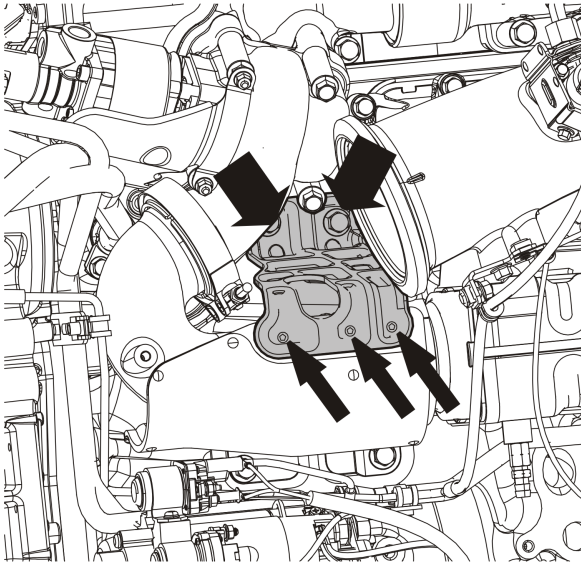
T2020552

- 8**  
Remove the spring-loaded attaching bolts from the valve cover.

- 9**  
Lift and remove the valve cover.

**10**

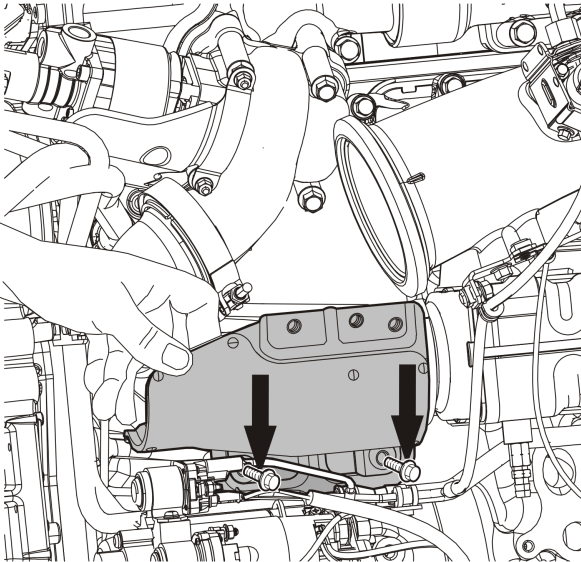
Remove the fasteners and bolts securing the upper EGR hot pipe shield and remove the shield.



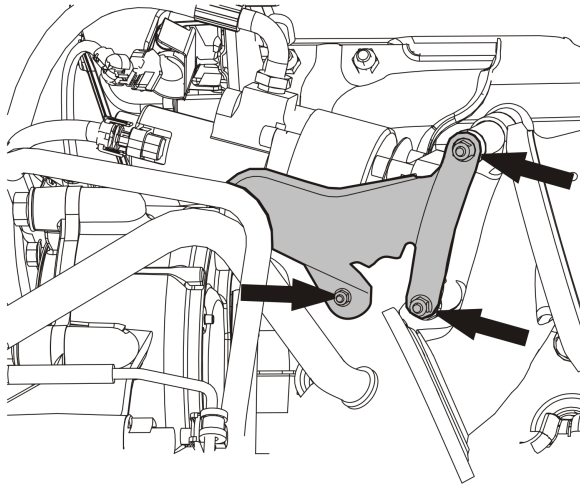
W2005686

**11**

Remove the bolts securing the lower EGR hot pipe shield and remove the shield.



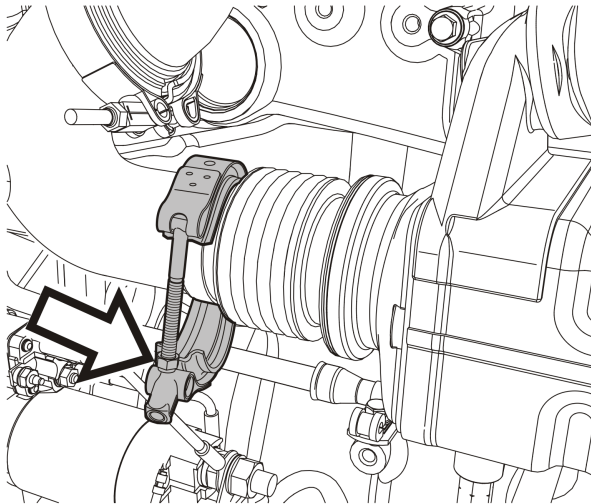
W2005687



W2005685

**12**

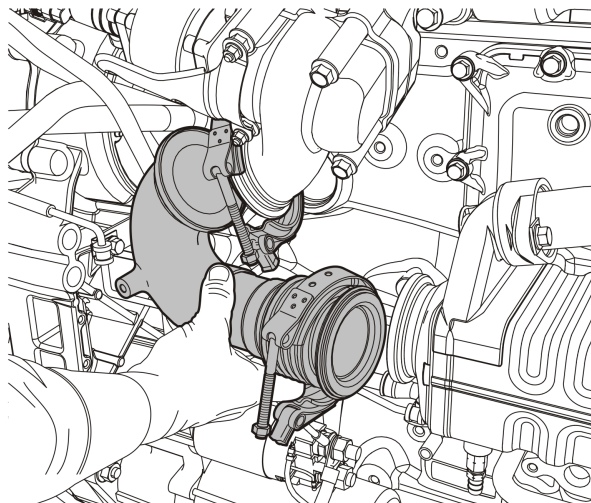
Remove the nuts and bolts securing the EGR valve heat shield and remove the shield.



W2005642

**13**

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.



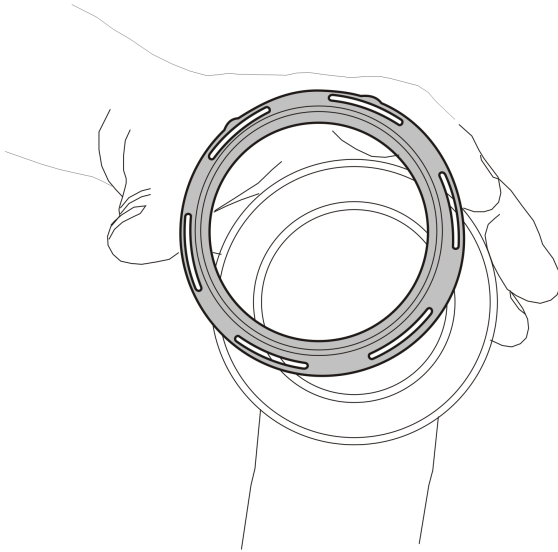
W2005641

**14**

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

**15**

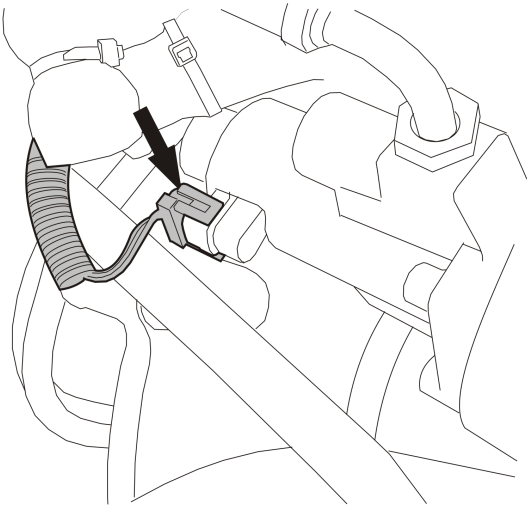
Remove the high temperature gaskets from the EGR valve end of the hot pipe and the EGR cooler end of the hot pipe. Discard the gaskets.



W2005688

**16**

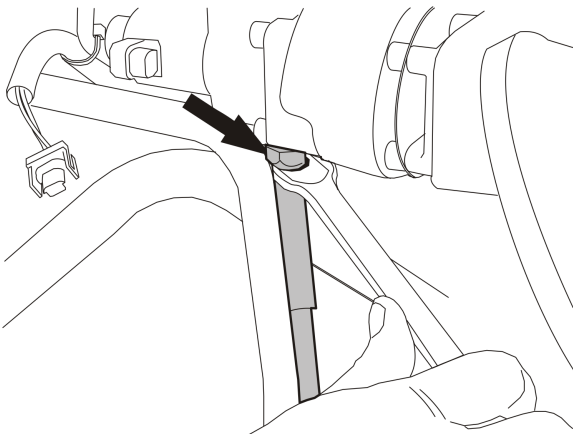
Remove the electrical connector from the EGR valve.



W2005689

**17**

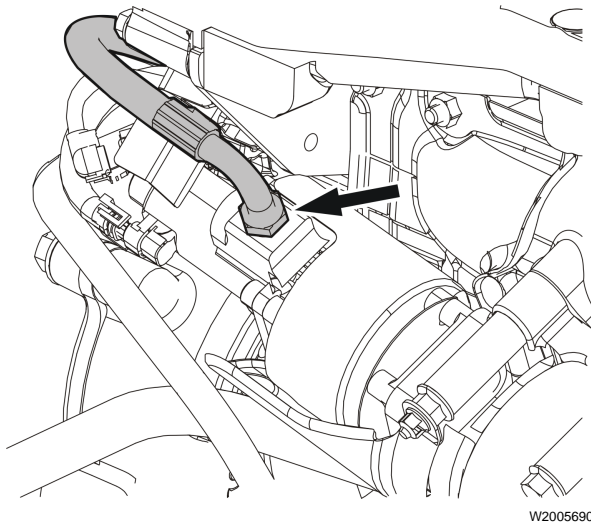
Loosen both the inlet and the return oil line fittings on the valve.



W2005692

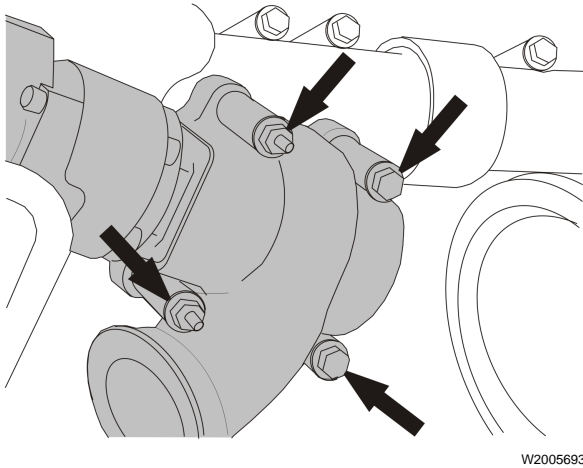
**18**

Remove the inlet oil line from the EGR valve.



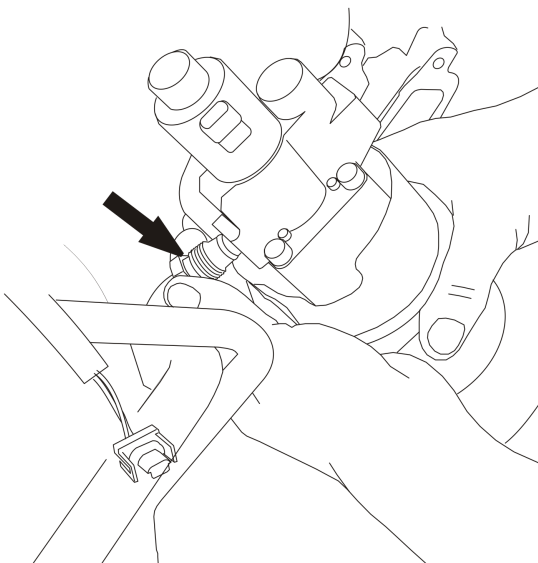
**19**

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



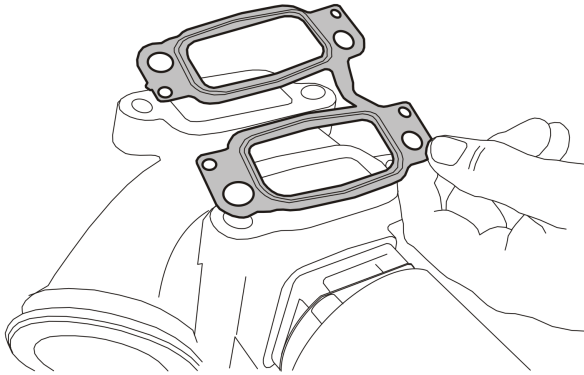
**20**

Remove the return oil line from the bottom of the EGR valve.



**21**

Remove the metal gasket from the EGR valve.



W2005696

**22**

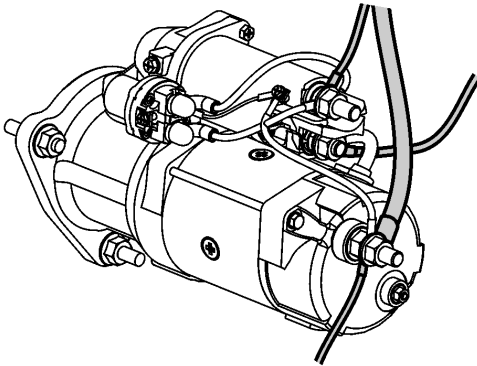
Remove the battery cable and transmission cooler line clamps from under the bell housing.

**23**

Disconnect the block heater harness and the main air line from the air compressor.

**24**

Remove the starter motor wiring harness and mark the wires for reassembly. Remove the nuts securing the starter motor to the flywheel housing and remove the starter.



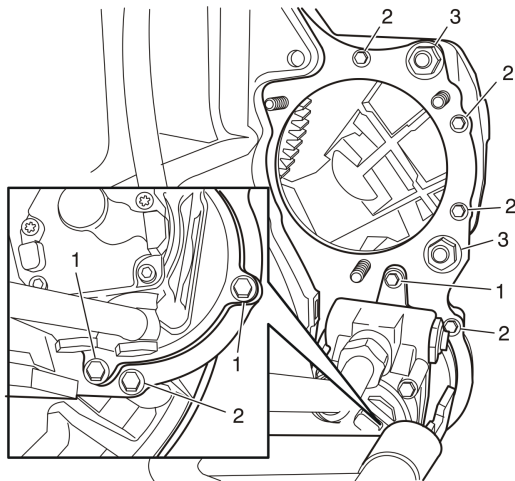
W2004714

**25**

Disconnect the coolant and oil supply lines from the air compressor.

**26**

Remove the cable ties securing the harnesses to the air compressor, then remove the mounting nuts securing the air compressor to the front of the flywheel housing and remove the air compressor.

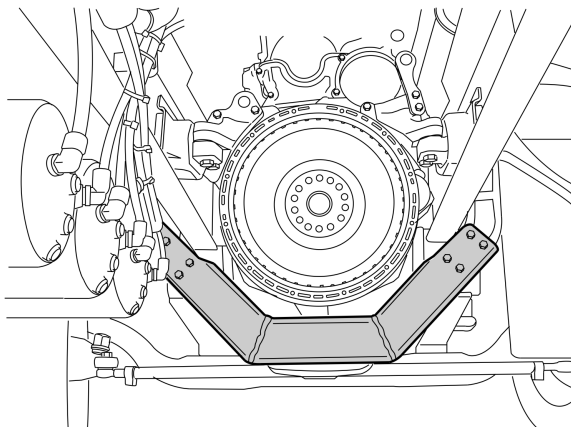


W2005380

1-Power Steering  
Attaching Bolts

3-Flywheel  
Attaching Bolt and  
Nut

2-Timing Gear  
Plate to Flywheel  
Attaching Bolts



W2005428

**27**

Remove the power steering and fuel pump mounting bolts (1). Do not disconnect the hoses from the pumps, instead allow the pumps to hang from the heavy-duty inlet and outlet hoses. Next, remove the timing gear plate to the flywheel housing bolts (2). Remove the nuts (3) securing the rear engine mount to the flywheel housing.

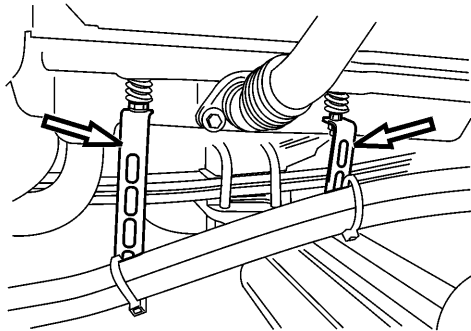
**28**

Remove the frame under-slung crossmember located under the transmission area.

**29**

Place an approved container under the oil pan and remove the oil drain plug.

**Note:** Use only hand tools when removing or tightening the drain plug. Do not use an air ratchet or similar air tool.

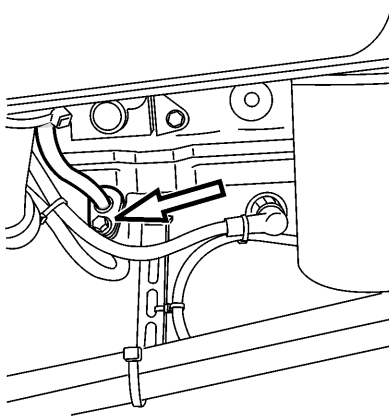


W2004874

**30**

If the vehicle is equipped with a transmission oil cooler, remove the transmission cooler line bracket nuts and separate the brackets from the oil pan fasteners. Position the cooler lines and brackets to the side.

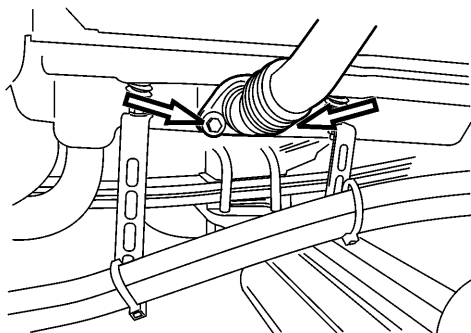
**Note:** Mark the transmission oil cooler bracket stud locations to aid in reassembly.



W2005086

**31**

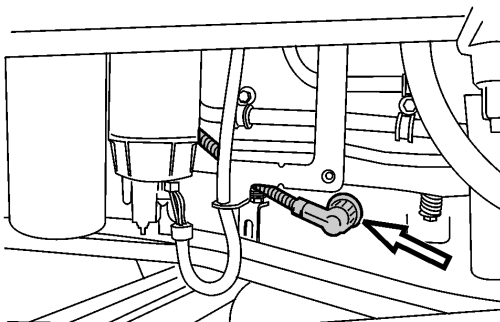
Pull the dipstick partially out of the dipstick tube, then remove the dipstick tube fastener and tube from the oil pan. Remove and discard the O-ring.



W2004884

**32**

Remove the oil fill tube fasteners and tube from the oil pan. Remove and discard the tube O-ring.



W2004876

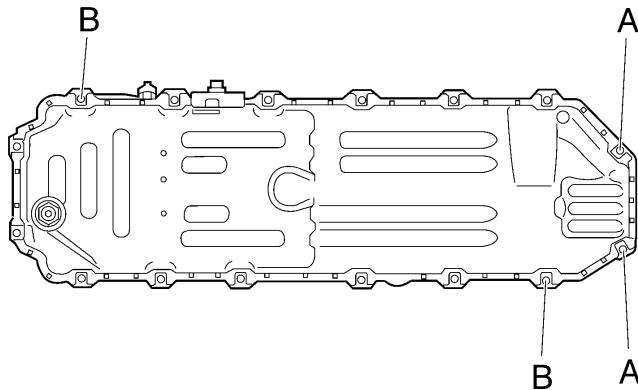
**33**

Disconnect the oil level/temperature sensor connector.



**34**

Remove the two bolts marked A. Loosen the two bolts marked B, but do not remove. Remove all other bolts.



W2005226

**35**

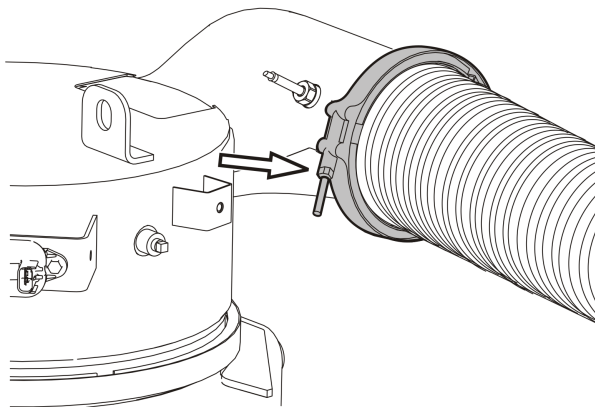
With the aid of an assistant, support the oil pan and remove the two bolts marked B. Carefully lower the pan to avoid contact with the oil pickup tube and the oil pump gear.

**36**

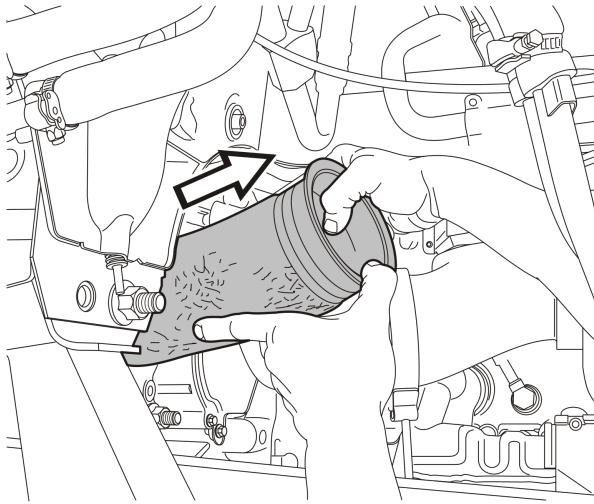
Clean the oil pan contact surface on the cylinder block, flywheel housing and front seal cover. All surfaces must be completely free of any grease or oil.

**37**

Remove the upper exhaust V-band clamp that connects the flex pipe to the inlet module of the Diesel Particulate Filter (DPF).



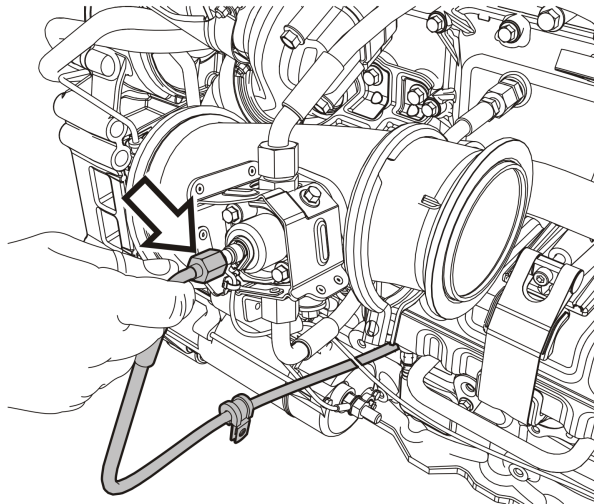
W2005910



W2005952

**38**

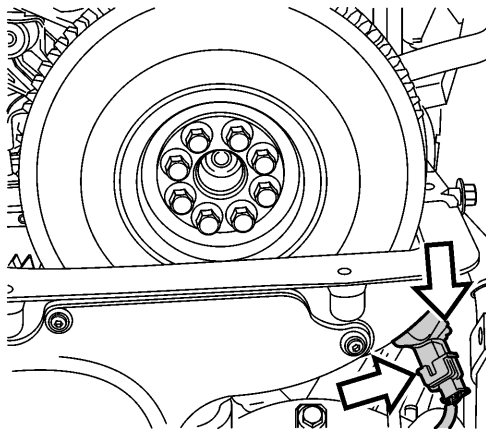
Remove the exhaust pipe from between the diffuser and the DPF muffler inlet pipe. Lift the pipe over the diffuser and out from under the cab.



W2005656

**39**

Remove the fuel line from the aftertreatment fuel injector.

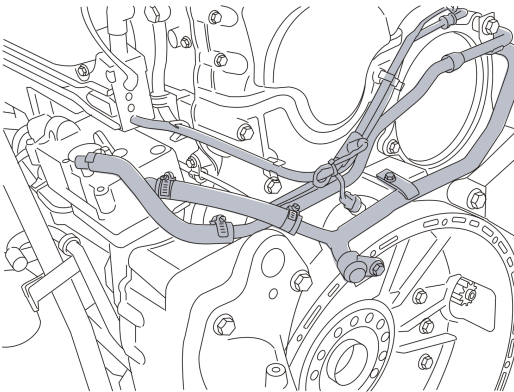


W2005104

**40**

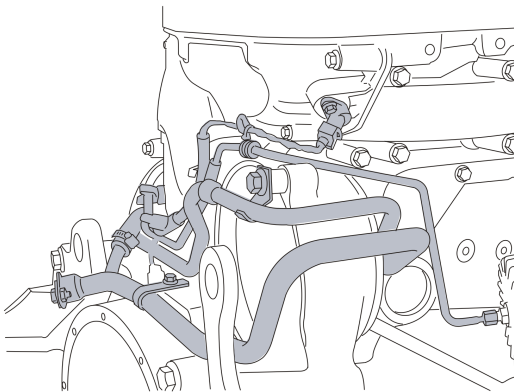
Disconnect the camshaft (engine) position sensor harness connector, remove the bolt and pull out the sensor.

**41**



W2005377

Harnesses and Tubing (Right Side)



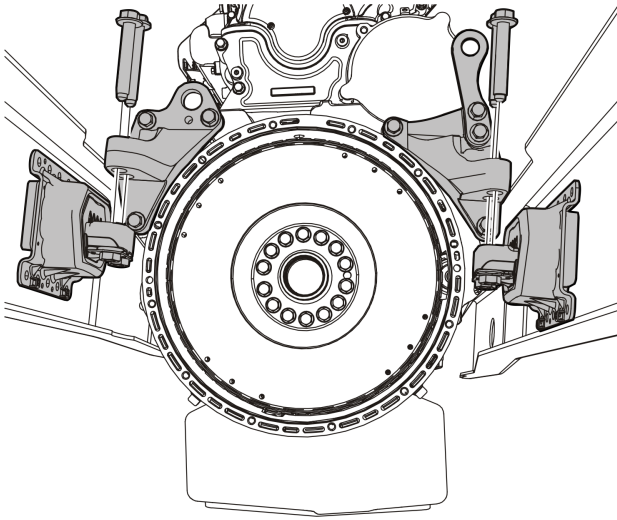
W2005378

Harnesses and Tubing (Left Side)

Remove all tubing such as compressor coolant lines (hard pipes), aftertreatment fuel injector fuel line and electrical harnesses that cross over the rear of the flywheel housing. Cut tie straps to remove electrical harnesses.

**42**

Position a hydraulic jack under the rear of the flywheel housing with sufficient capacity to support the rear of the engine.



W2005365

**43**

Remove the large engine mount-to-frame mounting bolts from both sides of the rear of the engine.

**44**

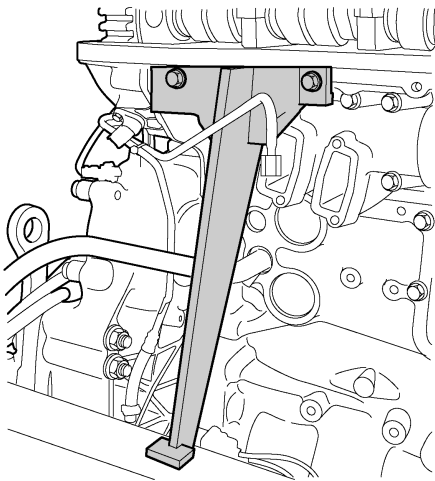
Raise the rear of the engine approximately 25.4 mm (1 inch) over the rear engine mounts.

**45**

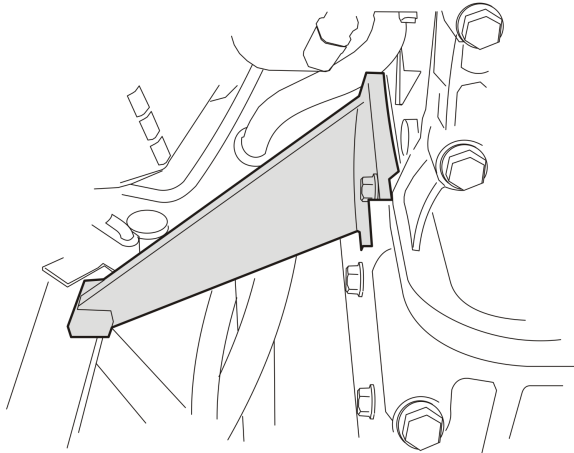
Position the right-side engine support tool 9990181-2 onto the right rear corner of the cylinder head and install the two bolts as indicated. Ensure the support tool foot will contact the upper portion of the frame.

**Note:** Use appropriate size and length bolts to secure the engine support.

9990181-2



W2006302



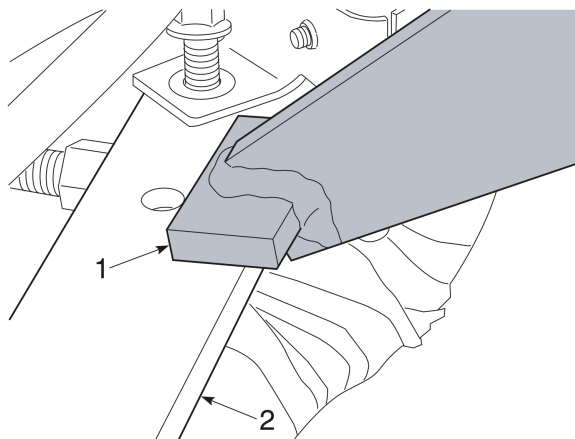
W2005362

**46**

Position the left-side engine support tool 9990181-1 onto the left rear corner of the cylinder head and install the three bolts. Ensure the support tool foot will contact the upper portion of the frame.

**Note:** Use appropriate size and length bolts to secure the engine support.

9990181-1



W2005370

1-Engine Support  
Tool Pad

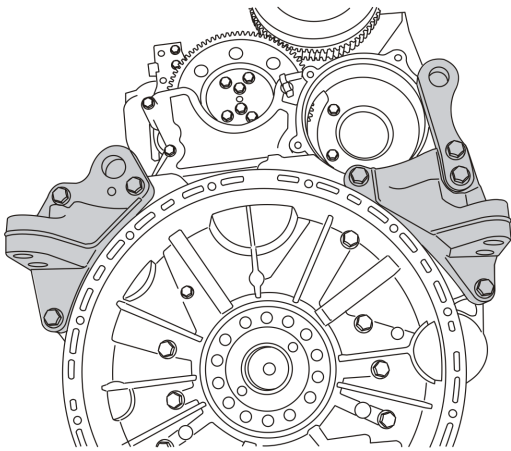
2-Left-Side Frame  
Rail

**47**

Slowly lower the rear of the engine until both the support tools rest securely on the frame rail, then remove the jack from under the rear of the engine.

**48**

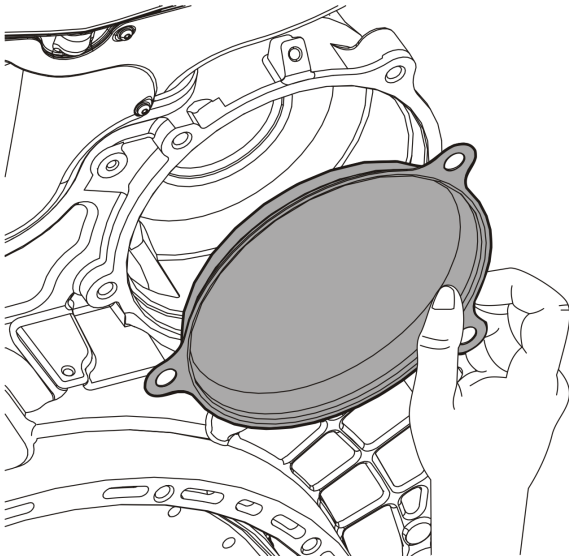
With the engine block supported, remove both frame-mounted engine mounts located at either side of the frame rail of the vehicle.



W2005369

**49**

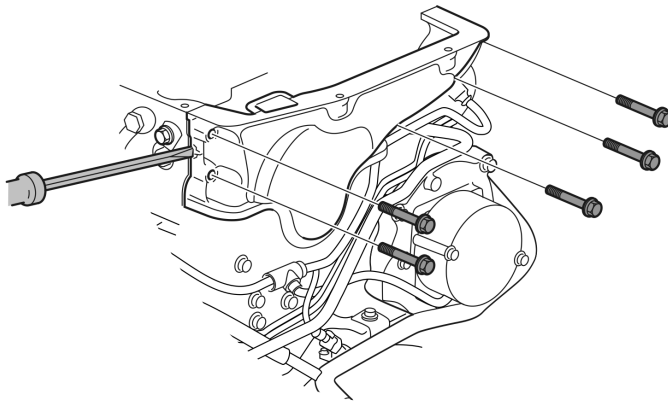
Remove the rear engine mounting brackets from the flywheel housing.



W2005368

**51**

Remove the screws attaching the timing gear cover to the cylinder head.

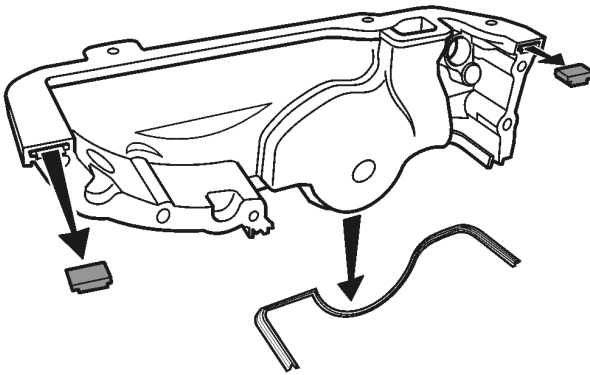


T2023198

**52**

Remove the upper timing gear cover.

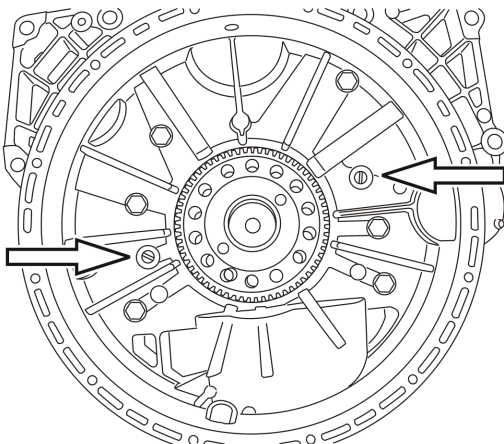
**Note:** Make sure that the rubber seals do not fall down into the engine.



T2019081

**53**

Remove and discard the timing gear cover seals.



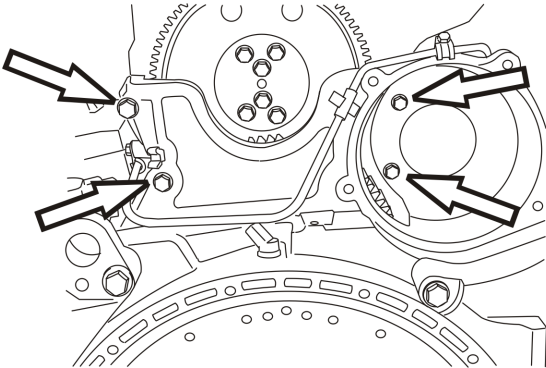
W2005372

**54**

Remove two opposing 14 mm flywheel housing bolts and install alignment dowels at these locations. Dowels should be made from 14 mm x 125 mm bolts with the heads removed and slots cut in to allow turning with a flat-blade screwdriver.

**55**

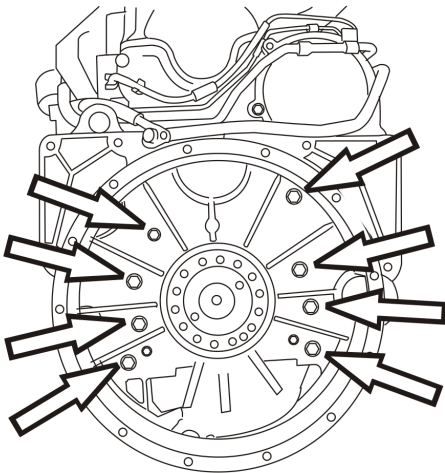
Remove the flywheel housing upper bolts. Note that two of the bolts are hidden inside the rear engine power take-off opening.



W2005375

**56**

Remove the remaining flywheel housing bolts.



W2005376

**57**

Remove the flywheel housing using slide hammer 9994030 alternately on the left- and right-hand sides.

9994030

**58**

Carefully remove the old sealant from the cylinder block and the flywheel housing.

**59**

Carefully tap the old crankshaft seal out of the flywheel housing.

**60**

Carefully clean the contact surface on the block and flywheel housing.

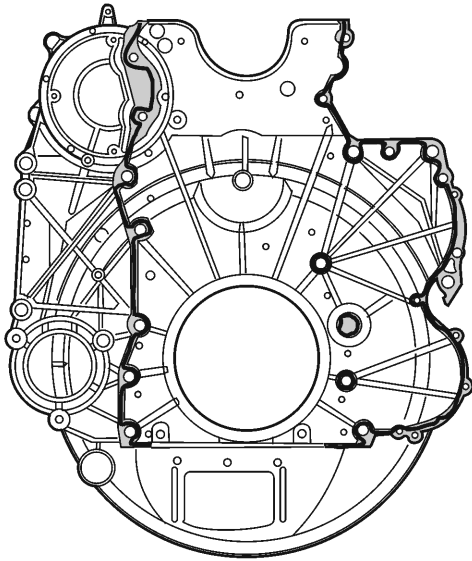
**Note:** The contact surface should be clean and dry.



## Installation

**1**

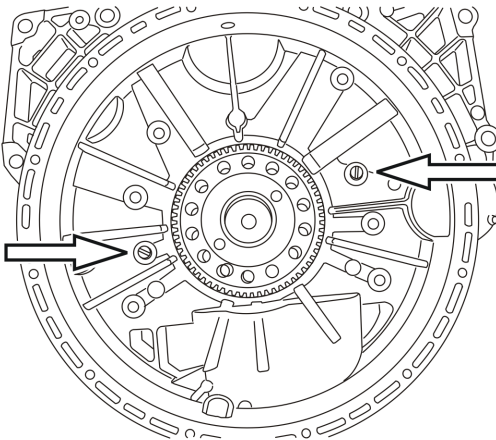
Evenly apply a two mm (0.080 inch) bead of Volvo sealant to the flywheel housing following the pattern shown. Install and tighten the flywheel housing to the cylinder block within 20 minutes of applying sealant to the housing.



W2005250

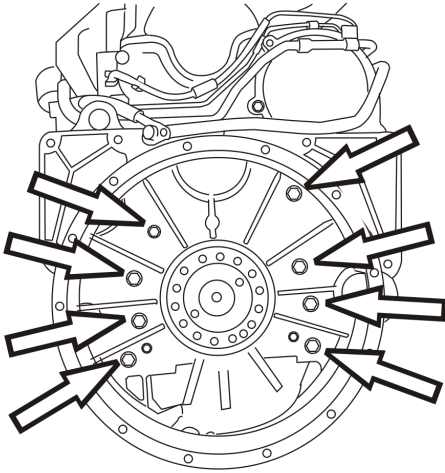
**2**

Position the flywheel housing over the two alignment bolts that were previously installed into the rear of the block at housing removal.



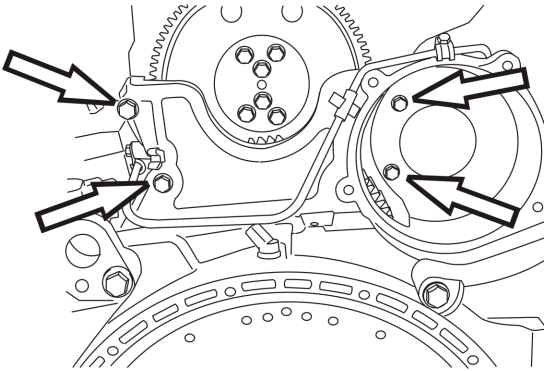
W2005373

**3**



J5376

Install the flywheel housing mounting bolts. Note the two bolt locations within the rear power take-off opening. Install all bolts snug to ensure a good application of the sealant.



W2005375

**4**

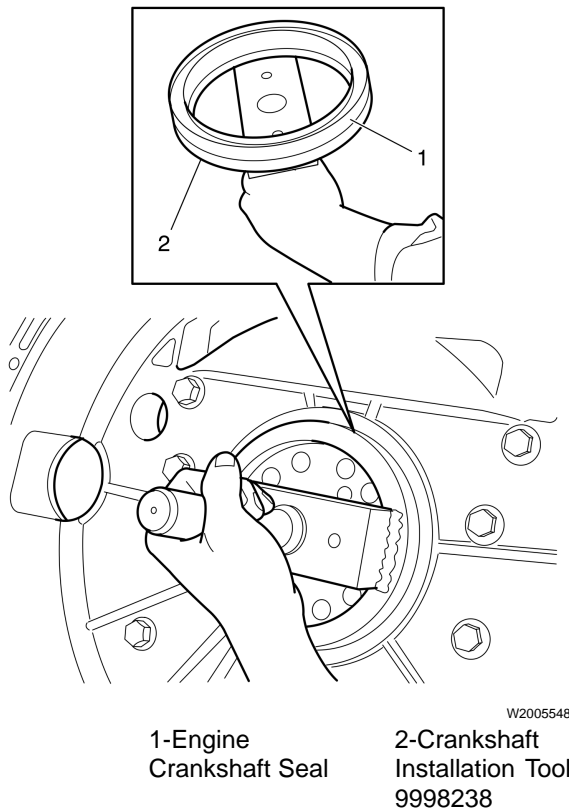
Torque-tighten the flywheel housing bolts to the following specifications:

- Tighten all M14 bolts  $140 \pm 25$  Nm ( $103 \pm 18$  ft-lb).
- Tighten all M10 bolts  $48 \pm 8$  Nm ( $35 \pm 6$  ft-lb).
- Tighten all M8 bolts  $24 \pm 4$  Nm ( $18 \pm 3$  ft-lb).

M14 =  $140 \pm 25$  Nm ( $103 \pm 18$  ft-lb)

M10 =  $48 \pm 8$  Nm ( $35 \pm 6$  ft-lb)

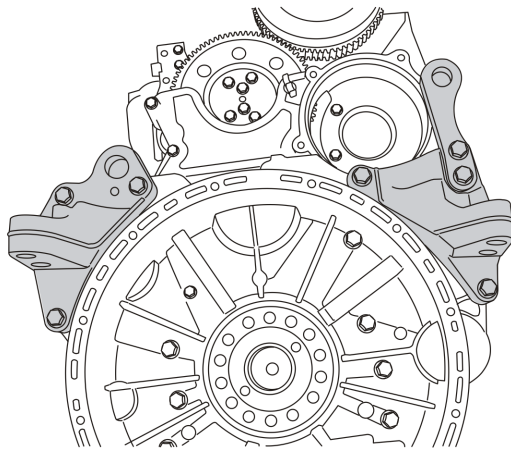
M8 =  $24 \pm 4$  Nm ( $18 \pm 3$  ft-lb)



**5**

Apply engine oil to the edge of the new crankshaft seal where it butts against the crankshaft. Carefully align the new seal onto the seal installer 9998238 and handle 9992000. Install the seal into the flywheel housing, using handle and seal installation tool until the seal installation tool bottoms out against the crankshaft.

9992000, 9998238



**6**

Install both the engine mounting brackets onto the rear of the flywheel housing. Torque-tighten the engine mounting bolts to specification of  $275 \pm 45$  Nm ( $203 \pm 33$  ft-lb).

$275 \pm 45$  Nm ( $203 \pm 33$  ft-lb)

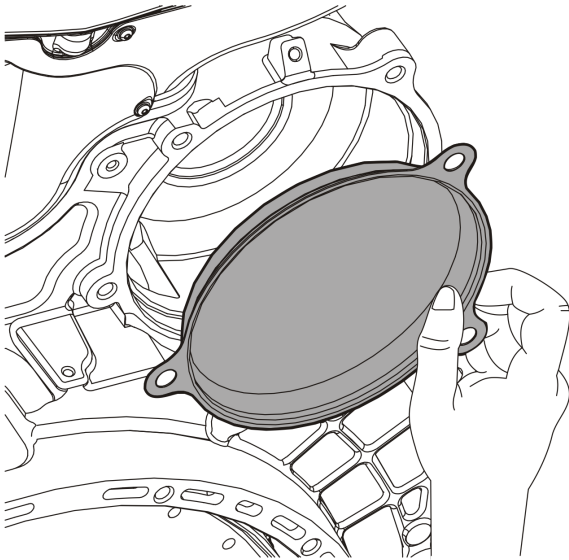
**7**

Install the rear frame-mounted engine supports on both frame rails. Torque-tighten the engine mounting bolts to specification of  $200 \pm 30$  Nm ( $148 \pm 22$  ft-lb).

$200 \pm 30$  Nm ( $148 \pm 22$  ft-lb)

**8**

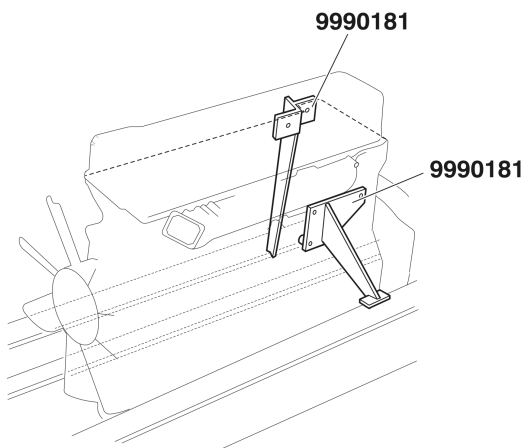
For engines **not** equipped with rear engine power take-off, install the access cover for the PTO opening.



W2005368

**9**

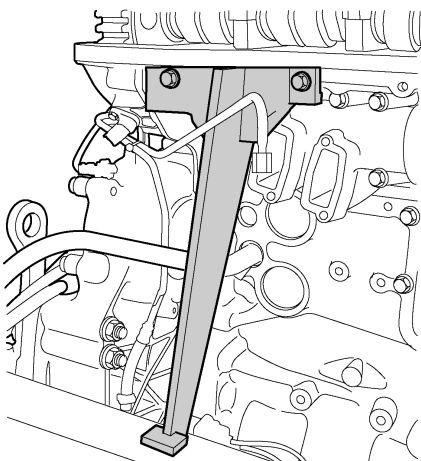
Position a hydraulic jack under the rear of the flywheel housing with sufficient capacity to support the rear of the engine. Raise the rear of the engine approximately 25.4 mm (1 inch) over the rear engine mounts. This action will remove the engine weight from the support tools.



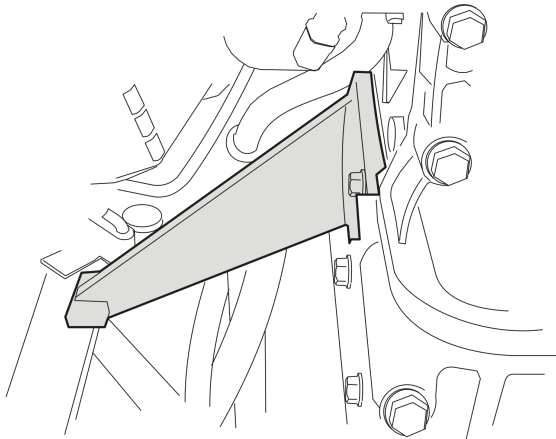
T2023204

**10**

Remove the bolts securing the right-hand rear engine support tool 9990181-2 and remove the tool.



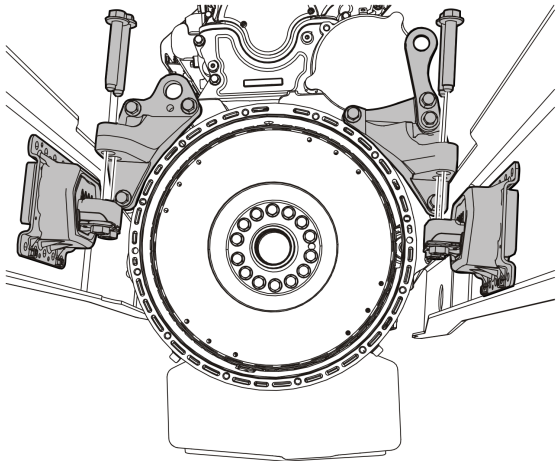
W2006302



W2005362

**11**

Remove the bolts securing the left-hand rear engine support tool 9990181-1 and remove the tool.



W2005365

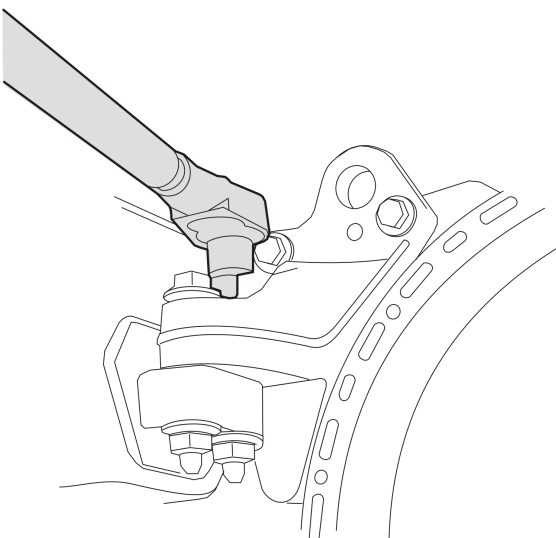
**12**

Lower the rear of the engine until the rear engine mounts are resting on the frame mounts and install the vertical rear engine support bolts. Hand-tighten the bolts snug using a socket and handle. Then, remove the jack used to support the rear of the engine.

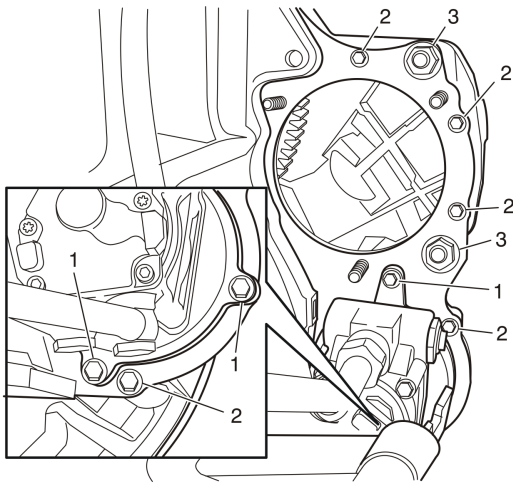
**13**

Torque-tighten the vertical rear engine support bolts to specification of  $540 \pm 90$  Nm ( $398 \pm 66$  ft-lb).

$540 \pm 90$  Nm ( $398 \pm 66$  ft-lb)



W2005367



W2005380

1-Power Steering  
Attaching Bolts

3-Flywheel  
Attaching Bolt and  
Nut

2-Timing Gear  
Plate to Flywheel  
Attaching Bolts

**14**

Install the power steering and fuel pump mounting bolts (1) to install the pumps which were allowed to hang in place (at disassembly) from the heavy-duty inlet and outlet hoses. Next, install the timing gear plate to the flywheel housing bolts (2) and install the nuts (3) securing the rear engine mount to the flywheel housing.

**15**

Install and secure the air compressor to the left side of the engine. Torque the air compressor nuts to  $85 \pm 15$  Nm ( $63 \pm 11$  ft-lb).

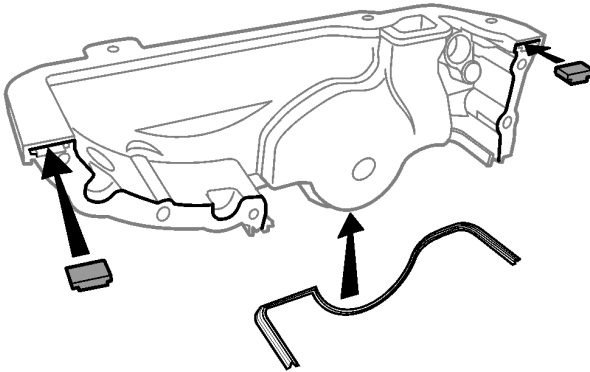
$85 \pm 15$  Nm  
( $63 \pm 11$  ft-lb)

**16**

Clean the timing gear cover sealing surfaces of the timing gear mounting plate and the flywheel housing.

**17**

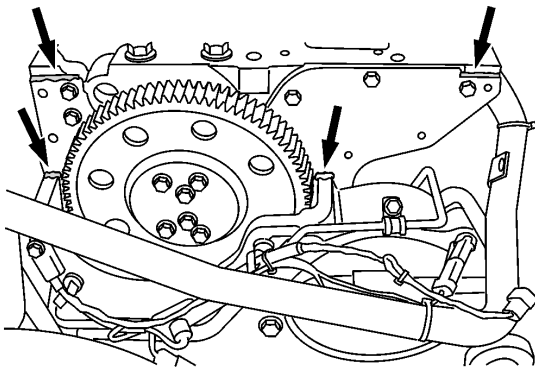
Clean the sealing surfaces of the timing gear cover and replace the cover seals.



T2019475

**18**

Apply Volvo sealant in the bottom corners where the timing gear plate and the flywheel housing meet. Also apply sealant at the top of the timing gear plate in the corner next to the cylinder head.

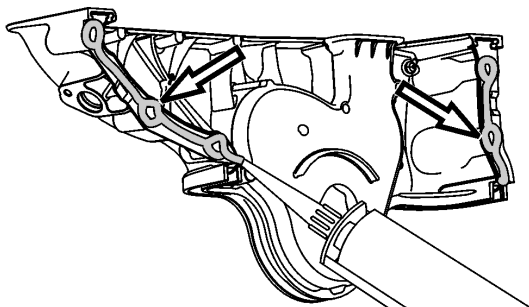


W2005102

**19**

Apply Volvo sealant to the mating surfaces of the timing gear cover.

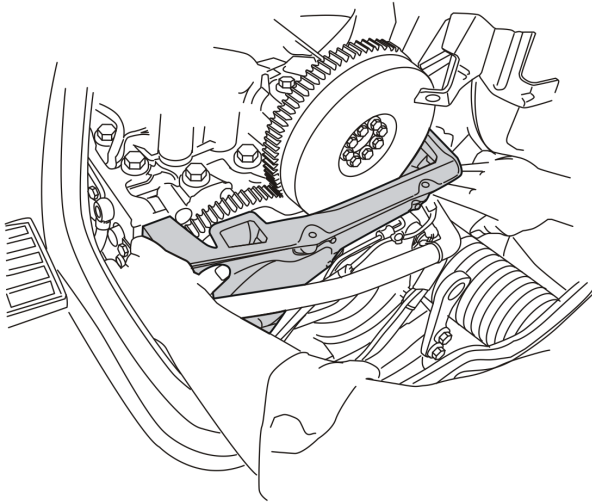
**Note:** The cover must be installed within 20 minutes of applying sealant.



W2005137

**20**

Position the timing gear cover on the flywheel housing and timing gear plate, install the fasteners and loosely tighten.



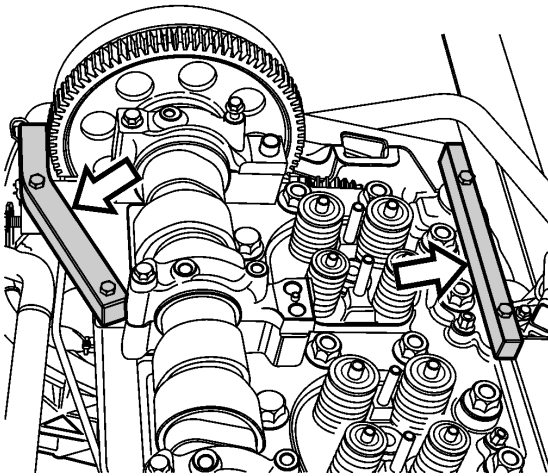
W2005371

**21**

Position the timing gear cover alignment tools onto the cylinder head sealing surface as shown.

- Tighten cover alignment tool fasteners so that the timing gear cover surface is level (flush) with the seal surface on the cylinder head.
- Tighten the timing gear cover screws to specification.
- Remove the timing gear cover alignment tools.

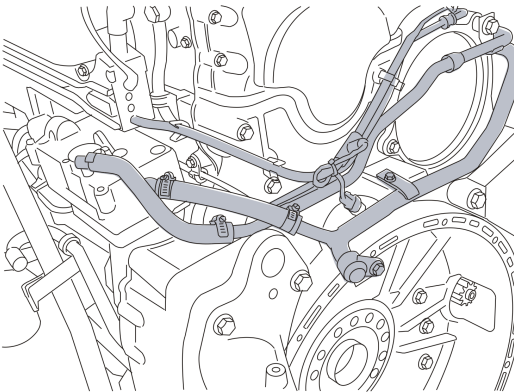
85109033A, 85109033B



W2005138

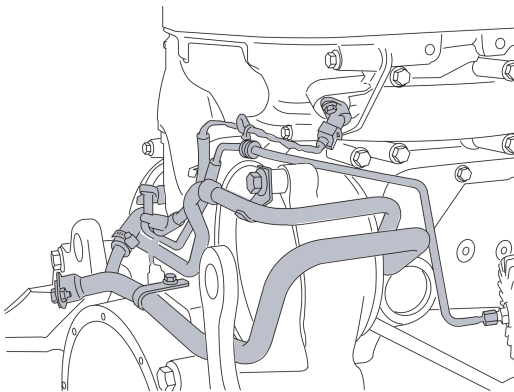


**22**



W2005377

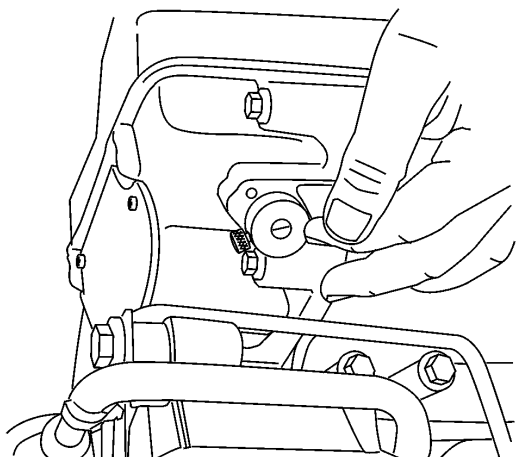
Harnesses and Tubing (Right Side)



W2005378

Harnesses and Tubing (Left Side)

Install all tubing such as compressor coolant lines (hard pipes), aftertreatment fuel injector fuel line and electrical harnesses that cross over the rear of the flywheel housing. Reattach the tie straps to secure the electrical harnesses.



W2005068

### 23

Check for proper camshaft position sensor clearance using the sensor depth gauge to determine if shims are required for proper sensor depth. The camshaft position sensor clearance specification is 0.3–1.0 mm (0.011–0.039 inch).

- 1 Rotate the engine until a tooth of the camshaft toothed wheel is aligned with the sensor bore.
- 2 Insert the sensor depth gauge into the sensor bore until the outer part of the gauge is fully seated against the timing gear cover.
- 3 Loosen the thumb screw of the depth gauge and push the inner part of the gauge in until it contacts the camshaft gear tooth.
- 4 Tighten the thumb screw to secure the inner part of the depth gauge.
- 5 Carefully remove the depth gauge from the camshaft sensor bore and observe the location of the steps between the inner and outer portions of the gauge:

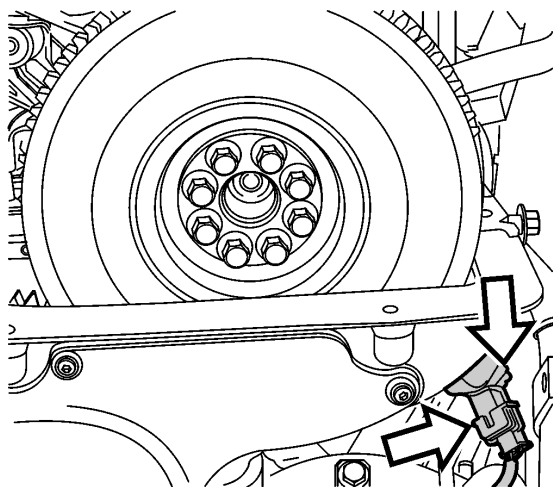
- Both steps below the surface of the tool = no shims required.
- One step below the surface of the tool = one shim required.
- Both steps above the surface of the tool = two shims required.

88800031

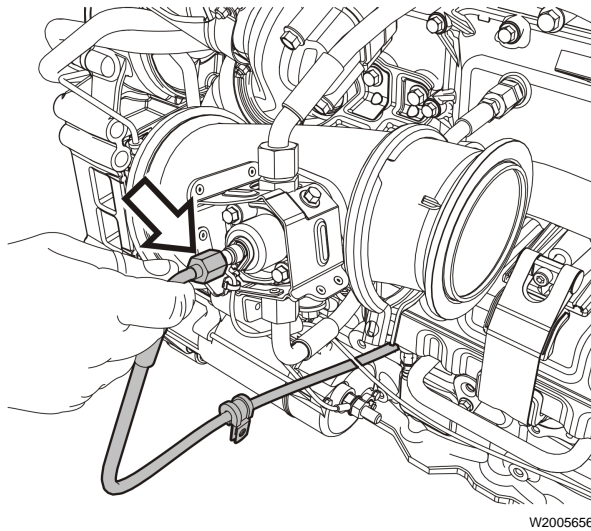
### 24

Install the camshaft position sensor with appropriate shim(s) and new O-ring. Secure the sensor with the bolt and plug in the harness connector.

**Note:** The camshaft position sensor shim part number is 20556179.



W2005104



**25**

Connect the aftertreatment fuel injector fuel line to the fitting on the injector.

**26**

Reconnect the coolant and oil supply lines to the air compressor.

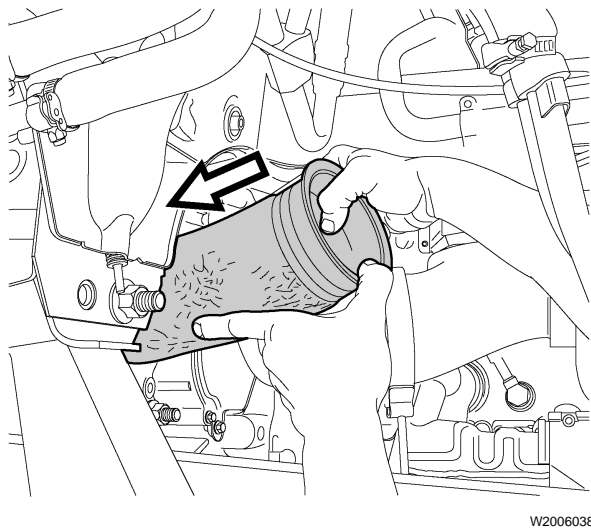
**27**

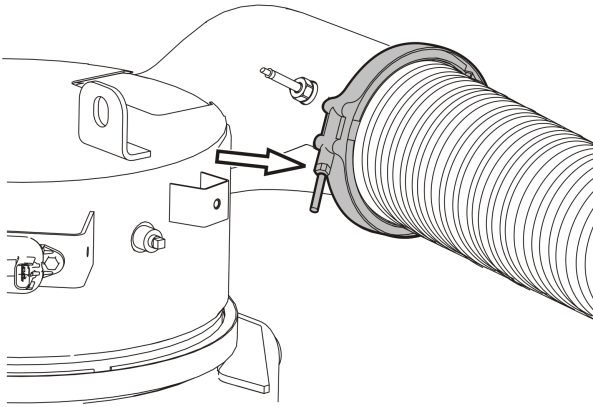
Position the exhaust pipe between the diffuser pipe and the DPF muffler inlet pipe and loosely install the V-band clamps. Align the exhaust pipe at the diffuser and torque-tighten the V-band clamp fastener to  $7 \pm 2$  Nm ( $62 \pm 18$  in-lb).

**Note:** Replace exhaust gaskets at each joint that is separated.

---

$7 \pm 2$  Nm  
( $62 \pm 18$  in-lb)





W2005910

**28**

Install the upper exhaust V-band clamp that connects the flex pipe to the inlet module of the DPF. Position the clamp as shown to prevent the clamp from contacting other components. Torque-tighten the clamp fastener to  $7 \pm 2$  Nm ( $62 \pm 18$  in-lb).

$7 \pm 2$  Nm  
( $62 \pm 18$  in-lb)

**29**

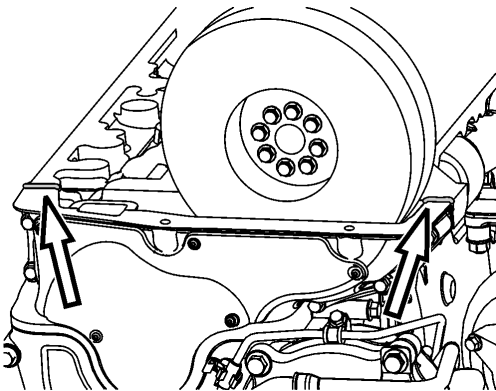
Clean and inspect the mating surface of the valve cover gasket. Replace the gasket if it is damaged or deformed.

**30**

Clean the valve cover contact surface on the cylinder head and the timing cover. All surfaces should be completely free of grease and oil.

**31**

Apply a 2 mm (0.079 inch) bead of Volvo sealant to the area where the timing cover and the cylinder head meet. This parting line is on both sides of the cylinder head.

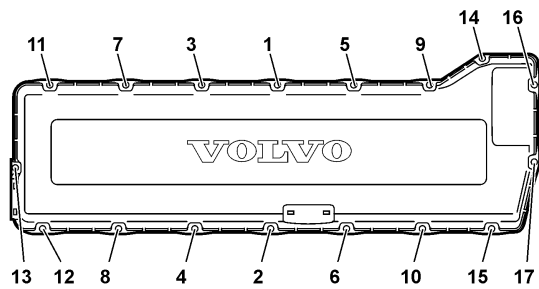


W2005157

**32**

Carefully position the valve cover on the cylinder head, making sure that the seal remains properly seated.

**Note:** The valve cover must be installed within 20 minutes of applying sealant to the parting line area.



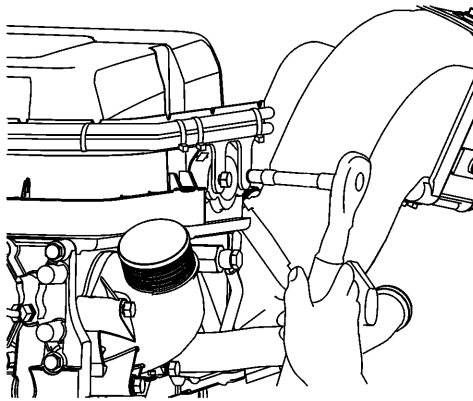
T2020552

### 33

Install the spring-loaded attaching bolts in the valve cover. Tighten the attaching bolts to  $24 \pm 3$  Nm ( $18 \pm 2$  ft-lb) in the sequence shown.

**Note:** The bolt spring provides even tension on the valve cover gasket.

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

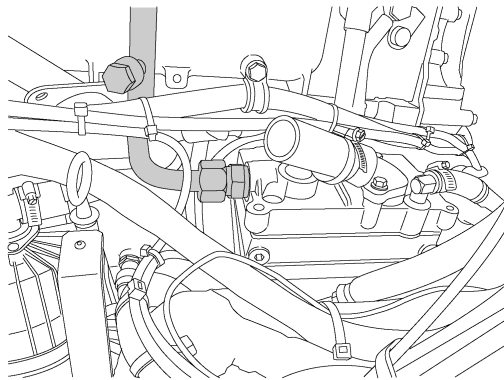


W2004679

### 34

Place the engine electrical wiring harness in position at the front of the valve cover and install the harness support brackets. Securely tighten the bolts.

**Note:** Ensure the same bolts removed at disassembly are reinstalled in their respective bracket locations. Damage to the valve cover will result if bolts that are too long are installed in the wrong locations.



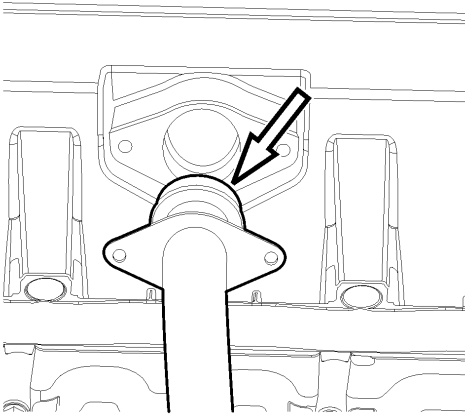
W5001572

### 35

Connect the air discharge line to the air compressor and install the clamp bracket securing the line to the intake manifold.

**36**

Inspect the crankcase ventilation tube O-ring and replace if necessary.



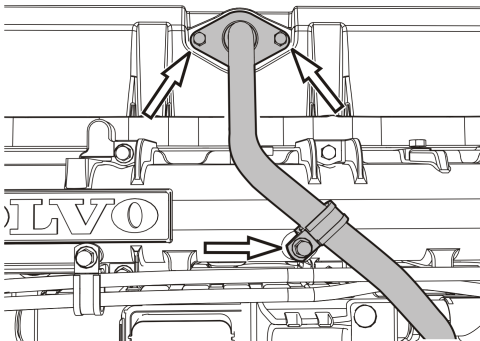
W2004681

**37**

Place the ventilation tube in position at the side of the valve cover and install the mounting bolts in the tube flange. Tighten the bolts to  $24 \pm 3$  Nm ( $18 \pm 2$  ft-lb). Install the P-clamp to secure the tube to the intake manifold.

**Note:** Ensure that the bolts removed at disassembly are reinstalled in the same location. Damage to the valve cover will result if the bolts installed are too long.

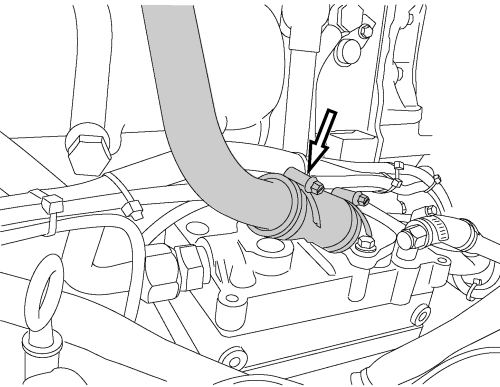
$24 \pm 3$  Nm  
( $18 \pm 2$  ft-lb)



W2005747

**38**

Place the air compressor fresh air inlet pipe in position over the valve cover and connect the pipe to the coupling hose at the compressor. Tighten the coupling hose clamp and install the clamp brackets to secure the pipe.



W5001571

**39**

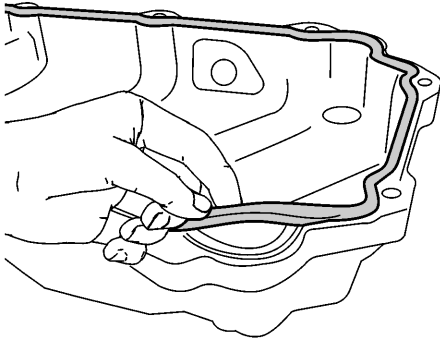
Connect the coolant lines, oil supply line and air governor signal line to the air compressor.

**40**

Clean and inspect the mating surface of the oil pan seal. Replace the seal if it is damaged or deformed.

**41**

Install the oil pan seal into the groove of the oil pan. Check that the seal locating tabs are properly aligned and seated in the locating holes on the mounting flange.

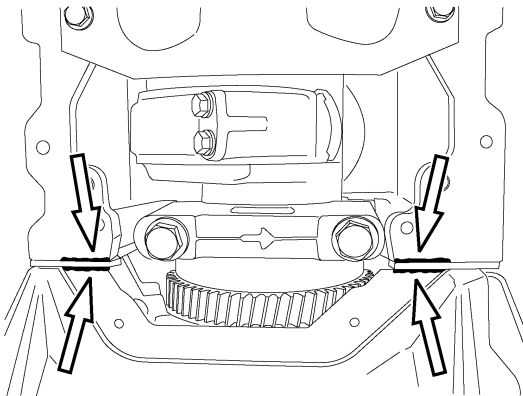


W2004878

**42**

Apply a two mm (0.079 inch) bead of Volvo sealant to the seam between the flywheel housing and the timing gear mounting plate and between the timing gear mounting plate and the engine block.

**Note:** Make sure that the block flange is flush with the flywheel housing to prevent leaking. If not flush, flywheel housing must be realigned.

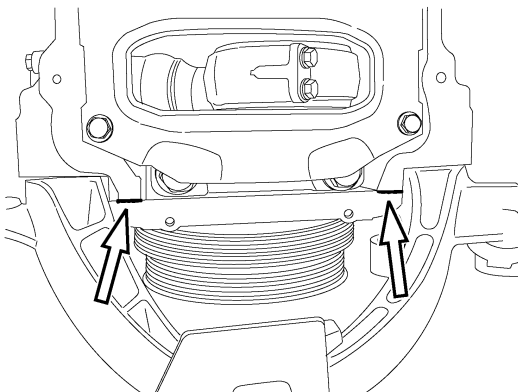


W2006078

**43**

Apply a two mm (0.079 inch) bead of Volvo sealant to the seam between the front seal cover and the engine block.

**Note:** Make sure that the block flange is flush with the crankshaft front cover to prevent leaking. If not flush, front cover must be realigned.



W2006079

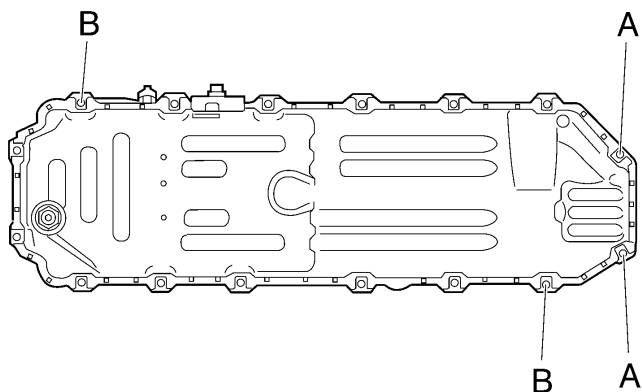
**44**

With assistance, position the oil pan to the engine block and install the bolts marked B. Install all other bolts, except those marked A, which should be installed last.

**Note:** Press the oil pan rearward as far as possible before tightening the bolts.

**Note:** Use care to prevent damage to the oil pickup.

**Note:** Install transmission oil cooler bracket studs in locations marked previously.

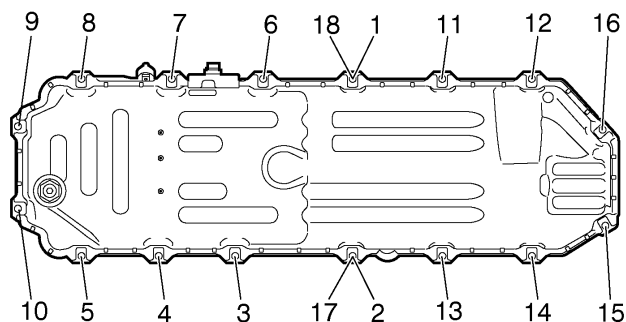


W2005226

**45**

Torque-tighten the bolts to  $24 \pm 4$  Nm ( $18 \pm 3$  ft-lb) following the numbered sequence.

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



W2005985

**46**

Install the oil drain plug and tighten to specification.

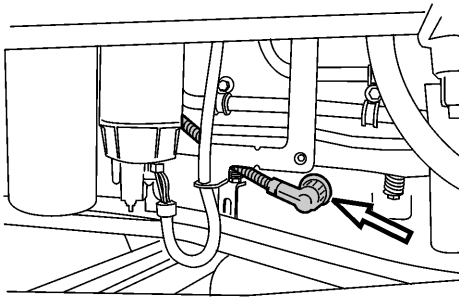


**CAUTION**

Do not use a copper washer with the hex-head oil drain plug. Always use the steel washer.

**Note:** Do not use air tools when installing the oil drain plug.

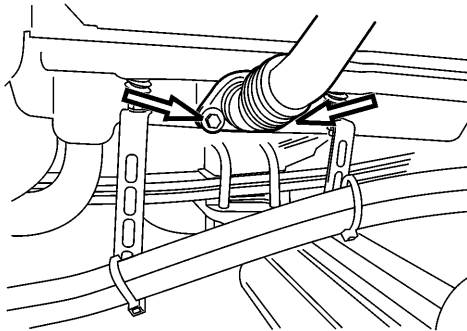




W2004876

**47**

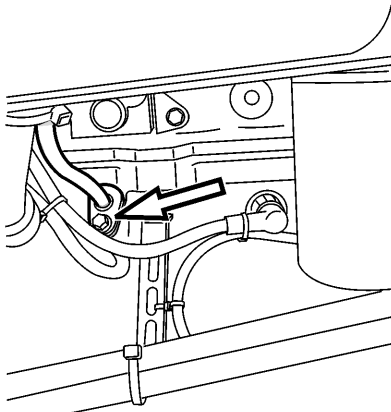
Reconnect the oil level/temperature sensor connector.



W2004884

**48**

Install a new O-ring on the oil fill tube and install the tube to the side of the oil pan. Install the oil fill tube fasteners and tighten to secure.



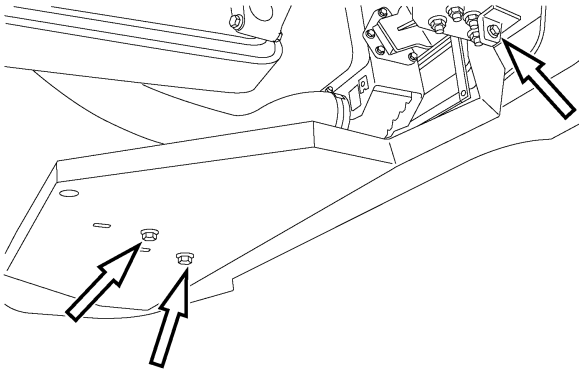
W2005086

**49**

Install a new O-ring on the dipstick tube, then install the tube and secure with the fastener. Install the dipstick.

**50**

Install skid plate if removed for access.

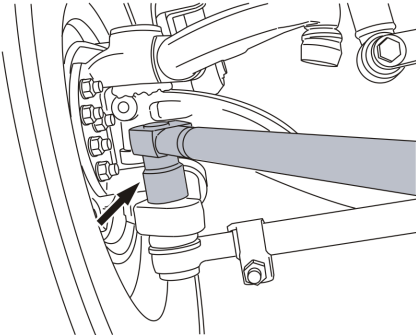


W2006077

**51**

If previously removed, reconnect the tie rod into the left-side steering knuckle and torque-tighten the locknut to  $200 \pm 30$  Nm ( $148 \pm 22$  ft-lb). Insert the cotter pin and lock in place.

$200 \pm 30$  Nm  
( $148 \pm 22$  ft-lb)



W2005190

**52**

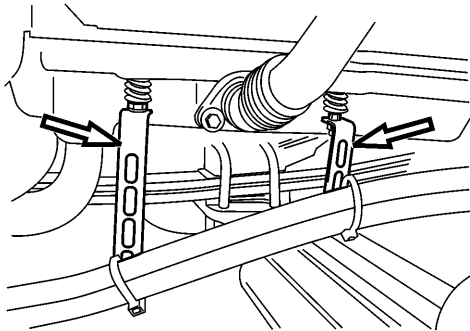
Position the starter motor into the opening on the right side of the engine and install the nuts securing the starter motor to the flywheel housing. Torque-tighten the starter motor nuts to specifications.

**53**

Route the battery cables and transmission cooler lines and secure under the flywheel housing.

**54**

Connect the oil cooler lines to the transmission.

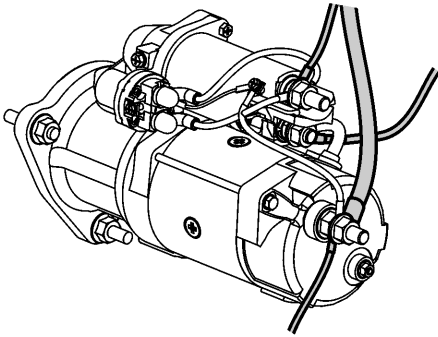


W2004874

**55**

Position the transmission cooler brackets onto the oil pan fasteners as marked at disassembly, and then install the cooler line bracket nuts.

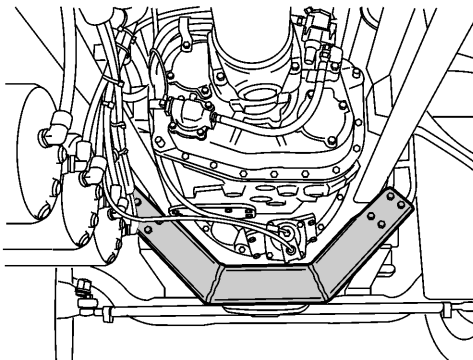
**Note:** Position the transmission oil cooler brackets at stud locations marked at disassembly.



W2004714

**56**

Install the starter motor wiring harness per the markings on the wires made at disassembly. Tighten the harness nuts securely.



W2004715

**57**

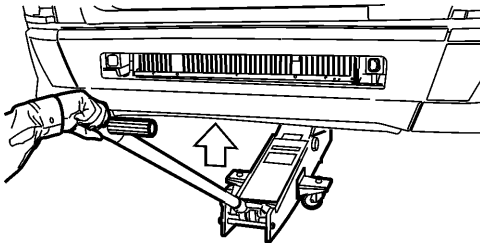
Install the frame under-slung crossmember located under the transmission.

**58**

Reconnect the block heater (if equipped) and secure the harness.

**59**

Secure the main air line (hard pipe) to the bracket at the flywheel housing, then connect the flexible air line.



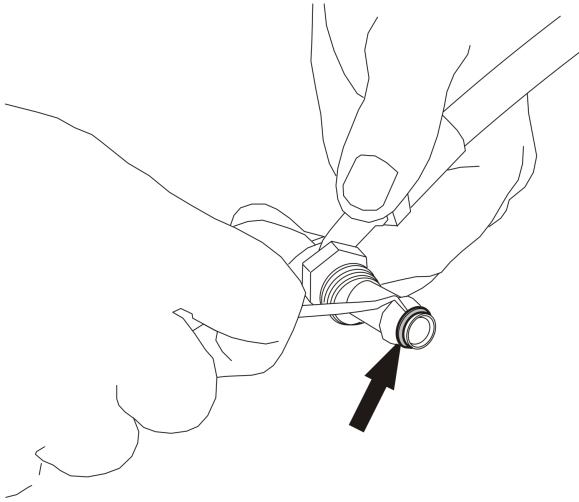
W2003873

**60**

Using a hydraulic jack, raise the front axle and remove the jack stands from the front axle. Lower the front axle and remove the hydraulic jack.

**61**

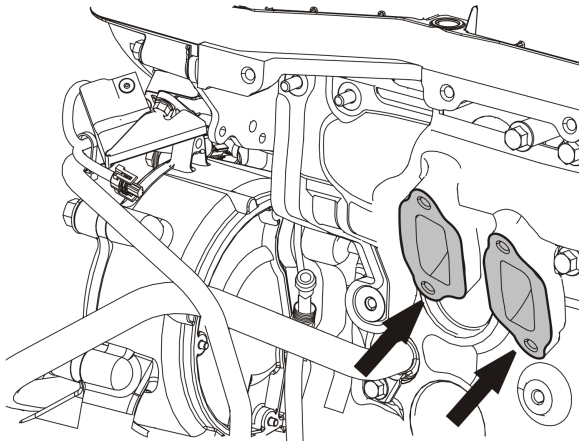
Replace the O-rings on both the inlet and return oil line fittings of the EGR valve. Lubricate the new O-rings with fresh engine oil.



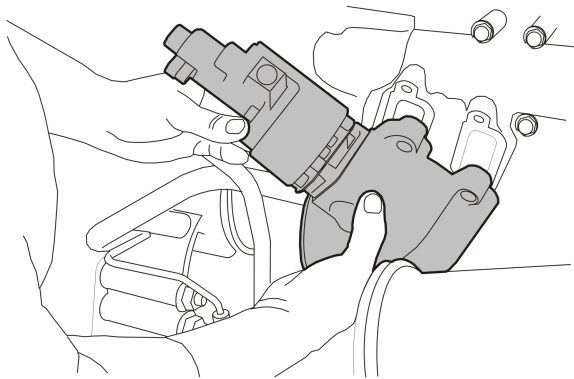
W2005691

**62**

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



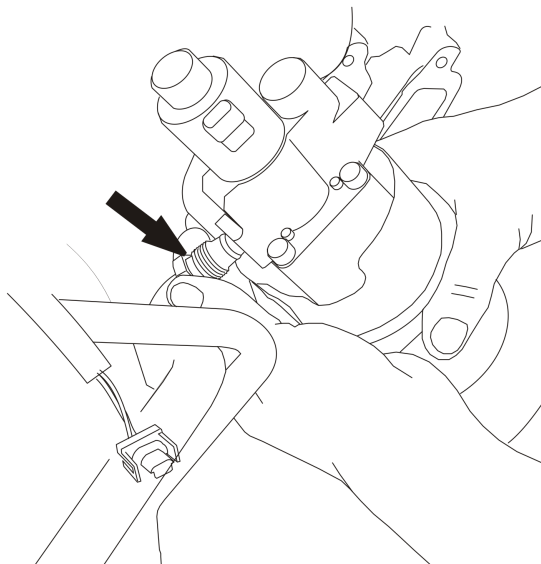
W2005697



W2005695

**63**

Position the EGR valve near the exhaust manifold EGR ports.



W2005694

**64**

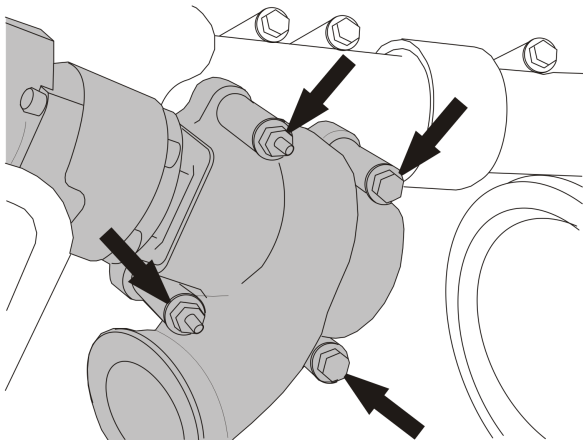
Install the return oil line to the bottom of the EGR valve. Allow the fitting to remain only finger tight at this time.

**65**

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

**Note:** The EGR mounting bolts are one-time use only. Whenever the EGR valve is removed for service, the mounting bolts must be replaced with new.

**Note:** Apply anti-seize compound to the threads and under the heads of the fasteners. Anti-seize helps prevent fastener oxidation corrosion and reduces friction to help achieve the intended clamp load on the component when tightening the fasteners to specification.



W2005693

**66**

Install the other two new EGR valve bolts. Torque-tighten all EGR valve bolts to  $62 \pm 5$  Nm ( $46 \pm 3.5$  ft-lb).

**Note:** The EGR mounting bolts are one-time use only. Whenever the EGR valve is removed for service, the mounting bolts must be replaced with new.

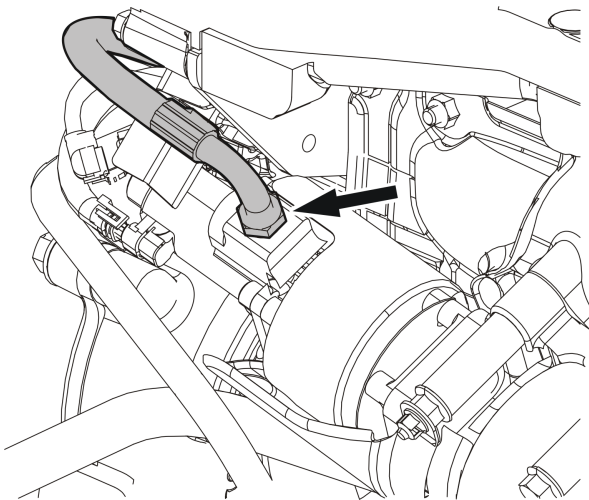
**Note:** Apply anti-seize compound to the threads and under the heads of the fasteners. Anti-seize helps prevent fastener oxidation corrosion and reduces friction to help achieve the intended clamp load on the component when tightening the fasteners to specification.

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$62 \pm 5$  Nm  
( $46 \pm 3.5$  ft-lb)

**67**

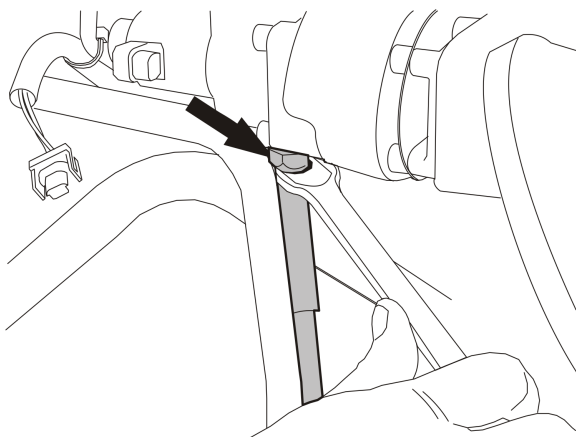
Install the inlet oil line to the EGR valve and tighten to specification.



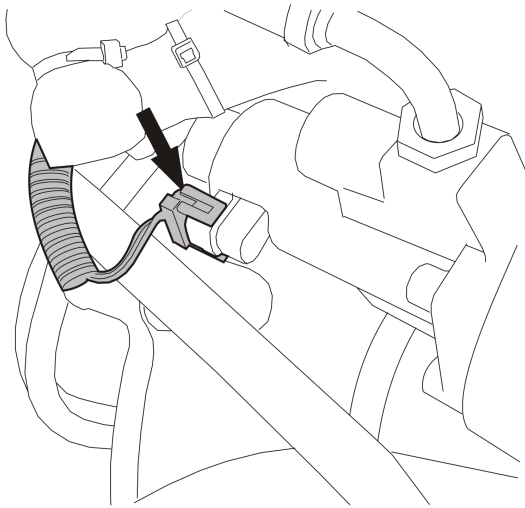
W2005690

**68**

Tighten the return oil line to specification.



W2005692



W2005689

**69**

Inspect the electrical connector for damage. Make sure that the rubber seal is in good condition and in place on the connector. Install the electrical connector onto the EGR valve.

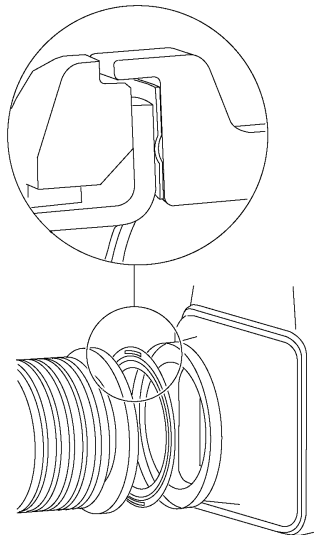
**70**

Position the EGR valve heat shield and install nuts and bolts.

**71**

Install new high temperature gaskets onto the EGR valve end of the hot pipe and the inlet of the EGR cooler. Ensure the gasket lays flat against the flange surfaces with the bead of the gasket facing the hot pipe.

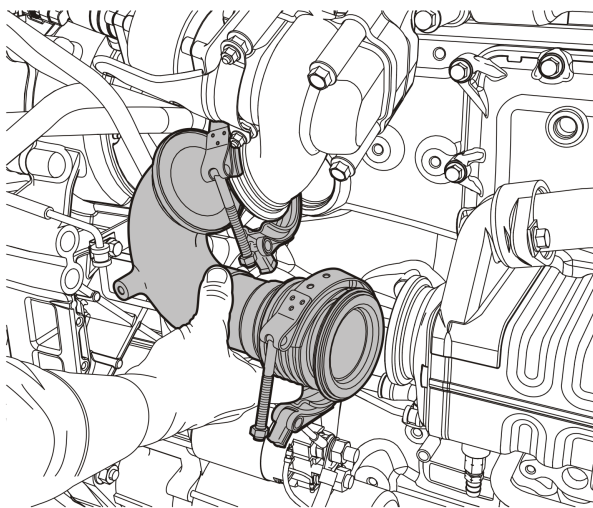
**Note:** Gaskets are one-time use only. Do not reuse gaskets.



W2006187

**72**

Inspect the V-clamps and T-bolt threads for wear or damage. If they are OK, lubricate the V-inserts of the clamps.



W2005641

**73**

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

**74**

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

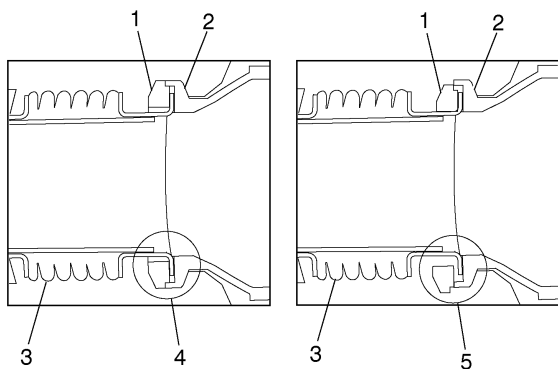
**75**

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. Slide the lower V-clamp over the flange of the EGR cooler and tighten the clamp until snug.

**76**

Visually inspect the floating flange through the gap in the V-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



**77**

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

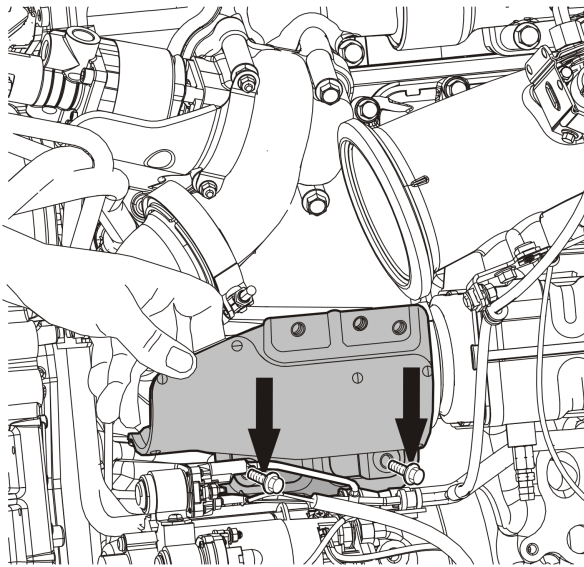
**Note:** After reaching the specified torque, inspect the V-clamps to ensure that no portion of the clamp has "bottomed out."

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

**78**

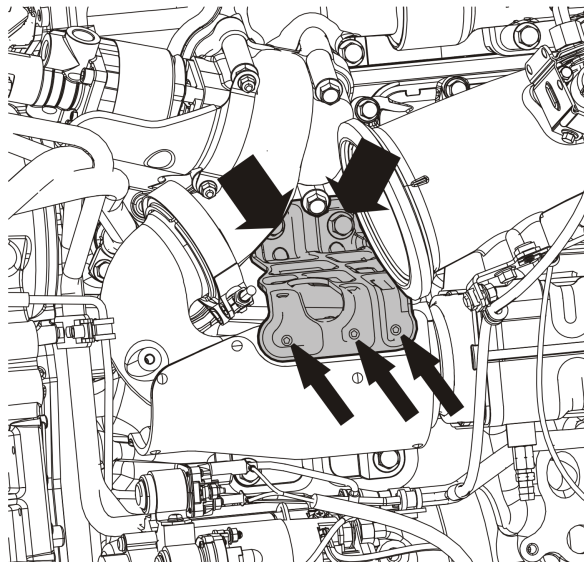
Position the lower EGR hot pipe heat shield over the hot pipe and secure with bolts. Do not tighten at this time.



W2005687

**79**

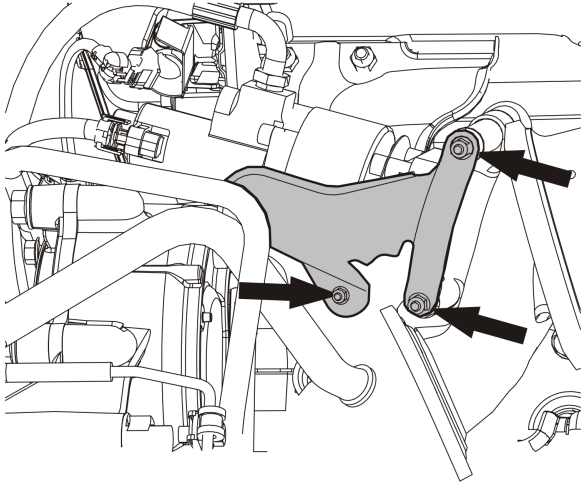
Position the upper EGR hot pipe heat shield and install the fasteners and bolts. Tighten the fasteners to specification.



W2005686

**80**

Position the EGR heat shield over the EGR valve and secure using the nuts that attach to the EGR bolts and the bolt that attaches to the cylinder head. Tighten the fasteners to specification.



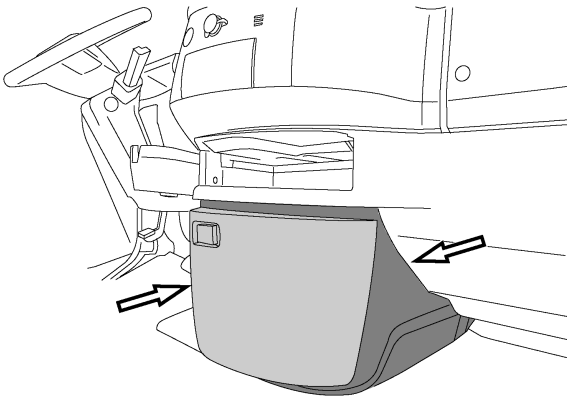
W2005685

**81**

Refill the engine with the specified quality of oil to the full level on the dipstick.

**82**

Install the outer section of the engine cover (includes waste basket and center dash trim panel).



W8003859

**83**

Install the inner splash guard assembly.