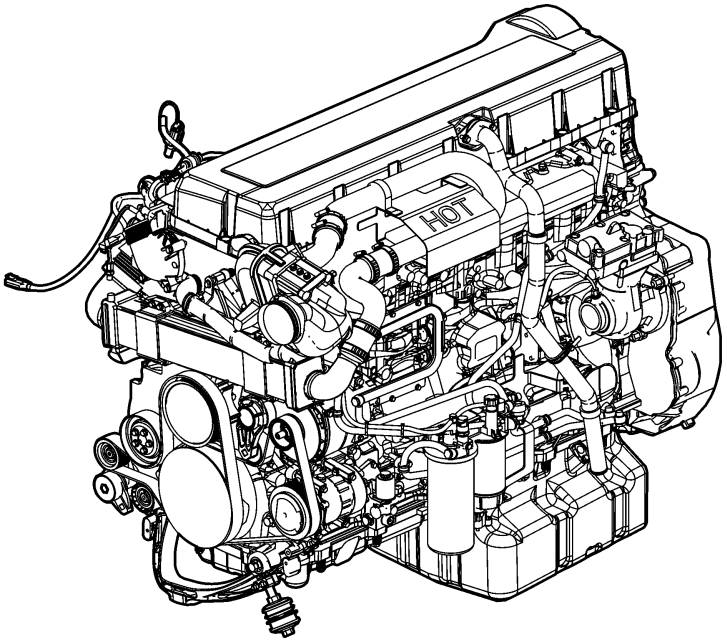
Flywheel Housing, Replacement



W2004978

This information covers replacement of the flywheel housing on the Volvo D16D engine.

Contents

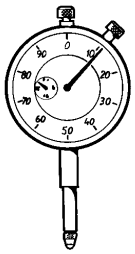
- “Special Tools” page 2
- “Flywheel Housing, Replacement” page 4

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.



998 9876

T0008543

Dial Indicator

W0001793

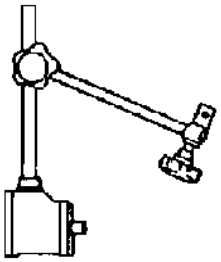
9992000

Standard Handle for Drifts (18 x 200)

C0000972

9994030

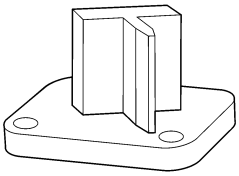
Slide Hammer



W0001790

9999696

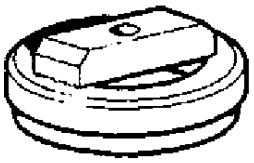
Magnetic Stand



W0002269

85109131

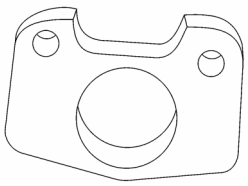
Flywheel Blocking Tool



W0001798

9998238

Rear Seal Install Drift



W0002267

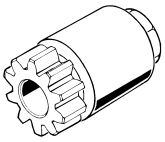
85108855

Flywheel Turning Tool Adapter

W0001774

9996956

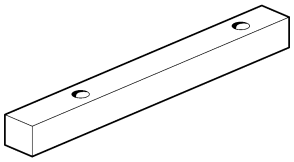
Flywheel Turning Tool



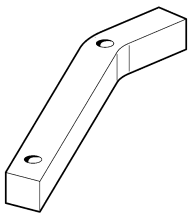
T0012612

88800014

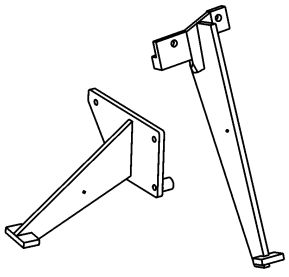
Flywheel Turning Tool (Optional)



W2005150



W2005151

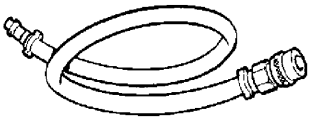


T0011241

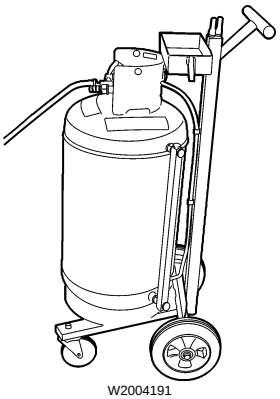
85109033A
Timing Cover Clamp Tool (Straight)

85109033B
Timing Cover Clamp Tool (Angled)

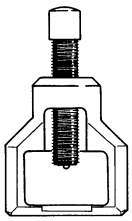
9990181-1 & 2
Engine Supports



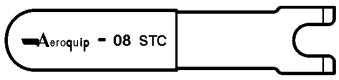
W0001795
9996049
Coolant Drain Hose



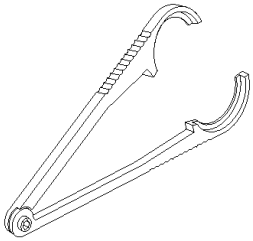
W2004191
DBT2V700
Coolant Extractor



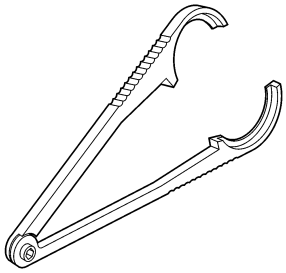
W0001240
9996201
Tie Rod Separating Tool



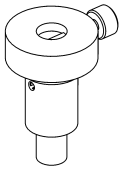
W0002179
85104846
STC Fitting Release Tool



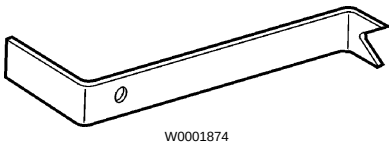
W4002806
85108826
Transmission Line Tool, 15 mm



W4002807
85108827
Transmission Line Tool, 18 mm

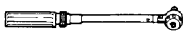


T0013033
88800031
Sensor Depth Gauge



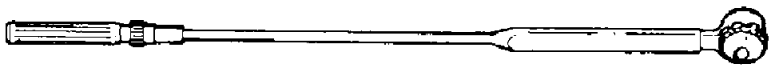
W0001874
J44773
Airline Release Tool

Other Special Equipment



W0001840
Torque wrench, 10-100 Nm (8-73 ft-lb)

W0001841
Torque wrench, 40-340 Nm (30-250 ft-lb)



W0001842
Torque wrench, 150-800 Nm (110-590 ft-lb)

Service Procedures

2125-03-02-03
Flywheel Housing, Replacement

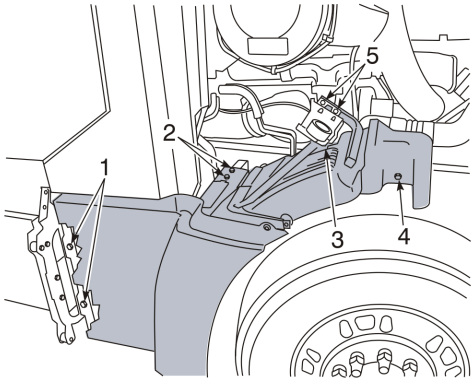
You must read and understand the precautions and guidelines in Service Information, group 20, "General Safety Practices, Engine" before performing this procedure. If you are not properly trained and certified in this procedure, ask your supervisor for training before you perform it.

Special tools: 9992000, 9994030, 9996956, 9998238, 9990181-1, 9990181-2, 9996201, 9996049, 85109033A, 85109033B, 85109131, 85104846, 85108826, 85108827, 85108855, 88800031, DBT2V700, J44773

Removal

1
Apply the parking brake and place the shift lever in neutral.

2
Disconnect the electrical power from the vehicle by turning off the main switch or by disconnecting the batteries.



W2005189

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

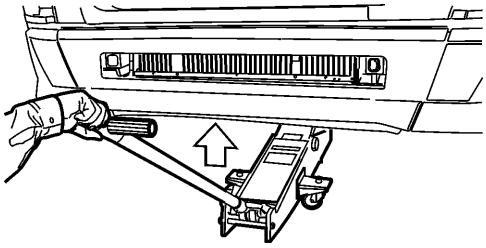
2-Two (2) fender extender bolts [at brace]

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

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

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

3
Remove both the left and right splash guards and the fender extenders as an assembly.



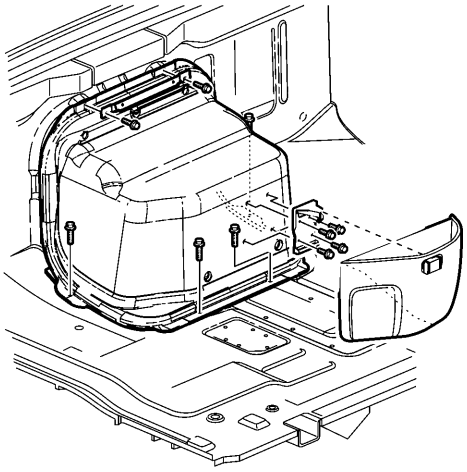
W2003873

4
Using a hydraulic jack, lift the front axle until the front wheels are off the ground and position jackstands of a suitable size and capacity to support the weight of the truck under the front axle.

5
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



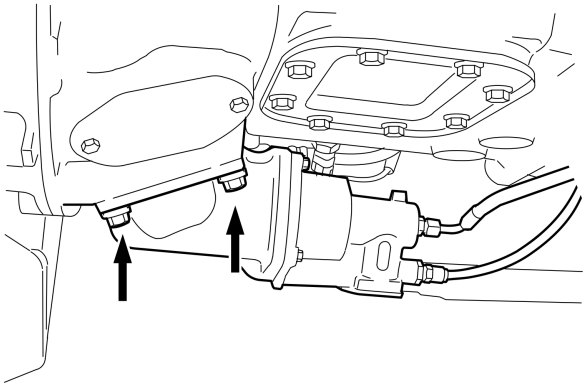
W2004750

6
Remove the outer section of the engine cover (includes waste basket and center dash trim panel).

7
Remove the front section of the drive line.

8
Remove the driveshaft from the rear engine power take-off and remove the power take-off assembly, if equipped. Refer to Service information, group 43.

9
Remove the clutch slave cylinder and forks at the transmission.

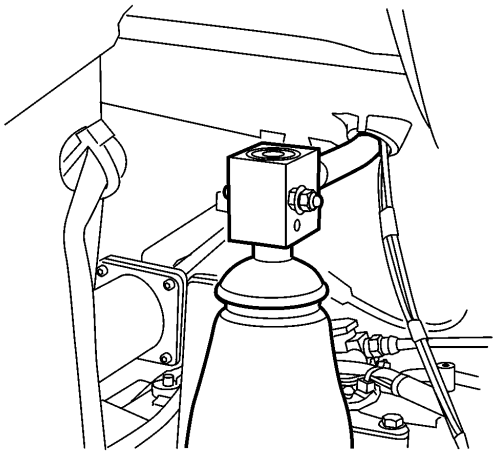


W2005430

10
Remove the slave cylinder line bracket at the rear of the transmission. Lay cylinder and fork aside, do not disconnect lines from the slave cylinder.

11
Disconnect and plug the transmission oil cooler lines at the transmission. Engines built after March 14, 2005 will also require transmission line tools 85108826 and 85108827 needed to release oil cooler lines.

85104846, 85108826, 85108827



W2004755

12
Drain the air supply, then remove the air lines at the transmission.

J44773

13
Remove the gear stick lever from the gear tower.

14
Disconnect the block heater harness and the main air line from the air compressor. Position away from the transmission to allow free movement of the transmission to move rearward.

15
Remove the transmission-to-lower flywheel housing bolts.

16
Remove the “E” clip from the release bearing grease hose and slide fitting from the flywheel housing.

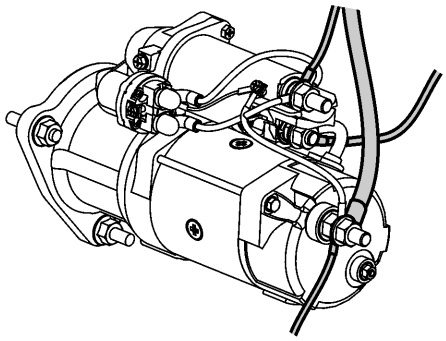
17
Position the transmission jack under the transmission and adjust to fit the transmission properly.

18
Remove all the remaining flywheel housing bolts.

19
Slide transmission back while ensuring the input shaft clears the clutch and pressure plate, then lower the transmission to the floor.

20
Remove the clutch and pressure plate from the flywheel.

Note: Pressure plate springs must be caged before removing mounting bolts.

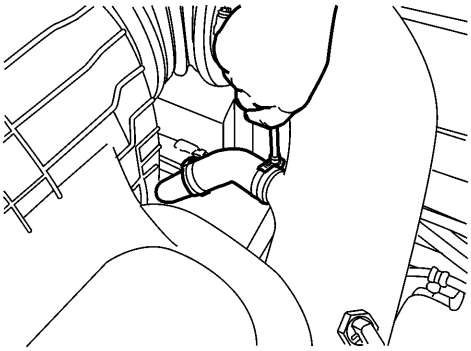


W2004714

21
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.

22
Remove the main supply air line (hard pipe) from the air compressor.

23
Remove the fresh air inlet pipe from the air compressor to the air filter housing.

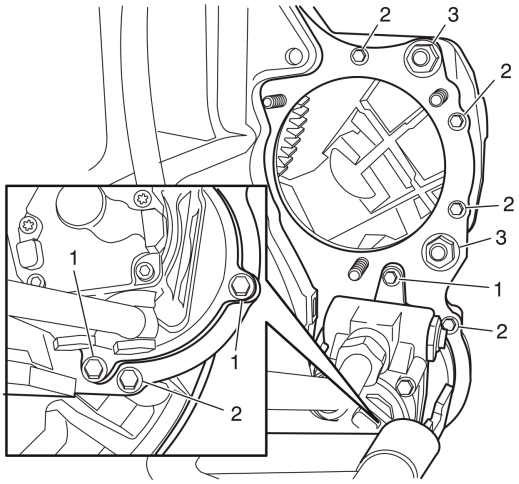


W2004719

24
Disconnect the coolant and oil supply line to the air compressor.

25
Disconnect the EPG air signal line from the fitting on the air compressor.

26
Remove the cables 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

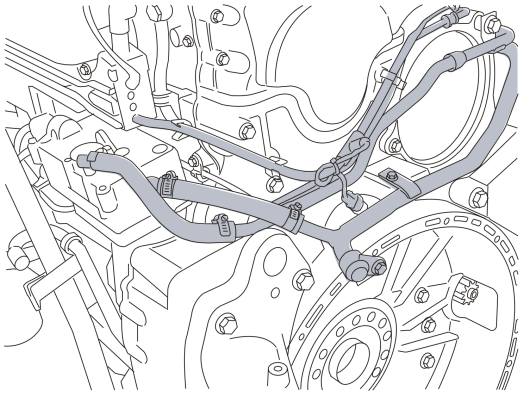
2-Timing gear plate to flywheel attaching bolts

3-Flywheel attaching bolt and nut

27

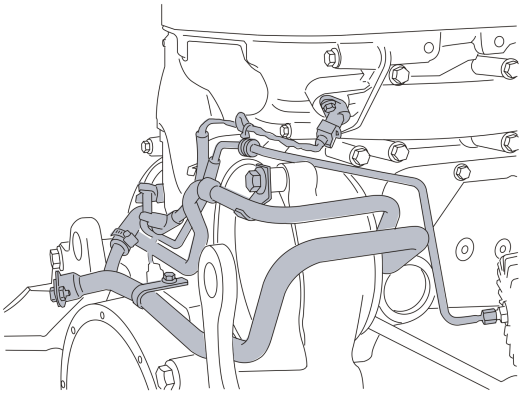
Remove the power steering and fuel pump mounting bolts (1). Do not disconnect the hoses from the pumps, instead allow the pumps to hang from the heavy-duty inlet and outlet hoses. Next, remove the timing gear plate to the flywheel housing bolts (2). Remove the nuts (3) securing the rear engine mount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

28



W2005377

Harnesses and Tubing (Right Side)



W2005378

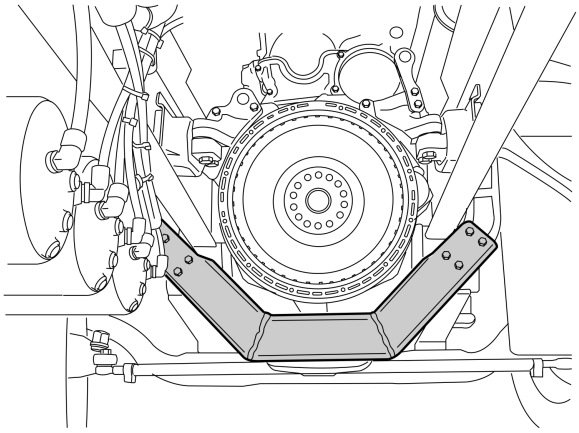
Harnesses and Tubing (Left Side)

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

29
Place an approved container under the oil pan. Drain the oil by removing the drain plug.

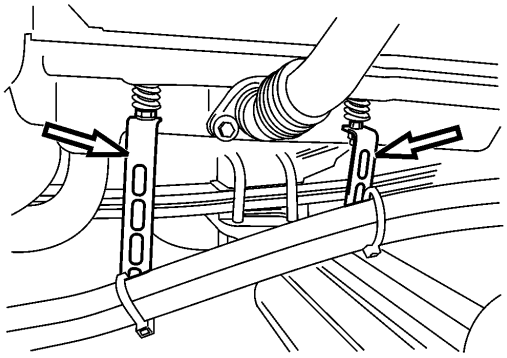
Note: Use only hand tools when removing and tightening the drain plug. Do not use an air ratchet or similar air tool.

30
Disconnect the APCS wiring harness. Cut the harness ties securing the wiring harness. Relocate both the starter harness and the APCS wiring harnesses over the left side of the engine.



W2005428

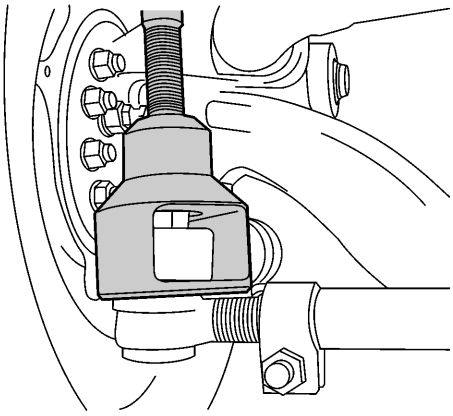
31
Remove the frame under-slung crossmember located under the transmission area.



W2004874

32
Remove the transmission cooler line bracket nuts and separate the brackets from the oil pan fasteners. Allow the cooler lines to hang free.

Note: Mark the transmission oil cooler bracket stud locations. This will aid in reassembly.

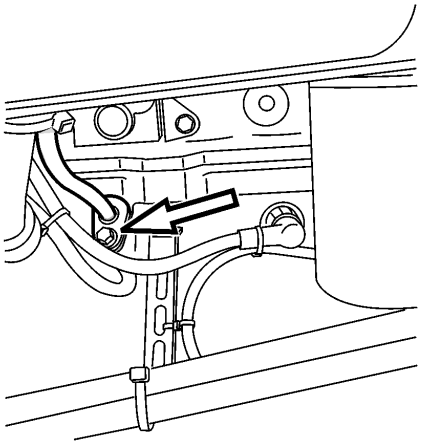


W2004875

33
Using tie rod separating tool 9996201, remove the tie rod from the left-side steering knuckle. Disconnecting the tie rod allows more clearance for the oil pan to drop in a later step.

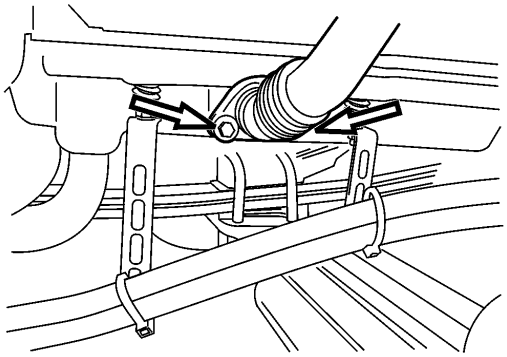
Note: This step is only required on a chassis equipped with a rear sump oil pan.

9996201



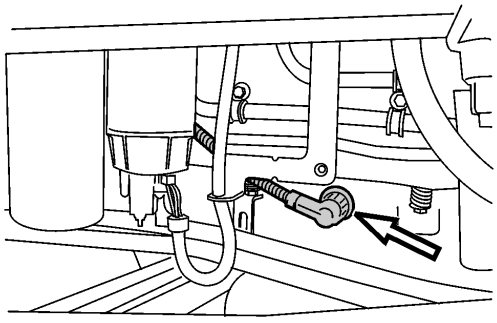
W2005086

34
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.



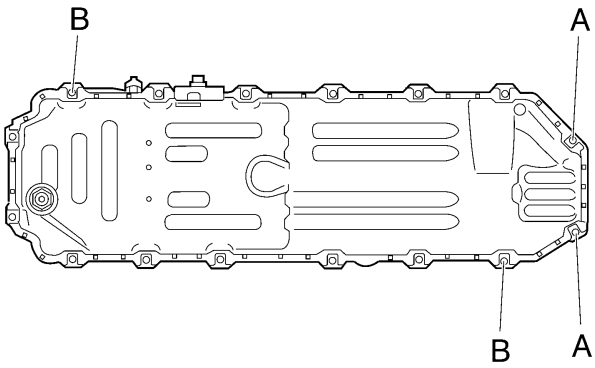
W2004884

35
Remove the oil fill tube fasteners and tube from the oil pan. Remove and discard the tube O-ring.



W2004876

36
Disconnect the oil level sensor external connector and oil heater connector, if equipped.

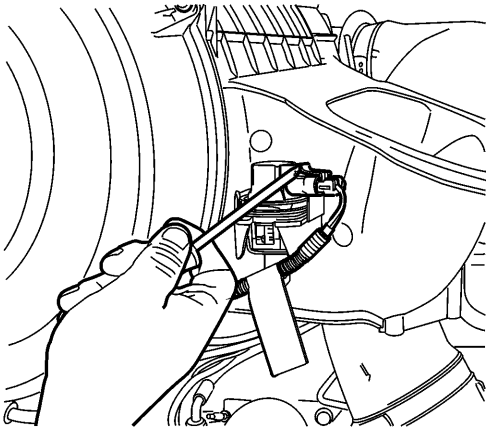


W2005226

37
Remove the two bolts marked **A** in the illustration first. Leave the two bolts marked **B** in the illustration loose. Then remove the other bolts.

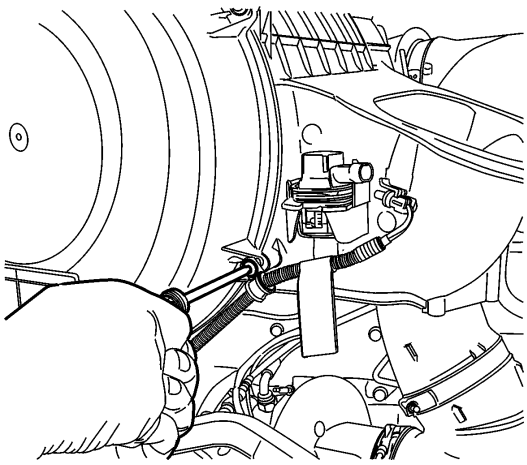
38
Remove the two remaining bolts. With the aid of a **certified technician**, carefully lower the oil pan free of the engine and remove from under the truck.

Note: The need for an additional certified technician is required to help remove the oil pan to the engine.



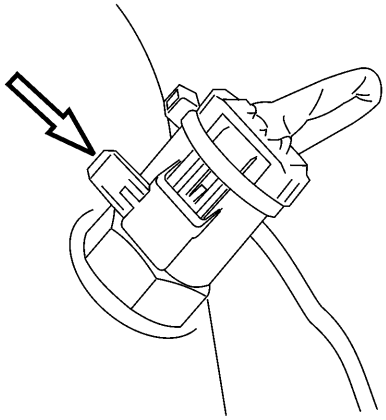
W2003860

39
Begin removing the air filter housing by disconnecting the air filter restriction gauge wiring harness.



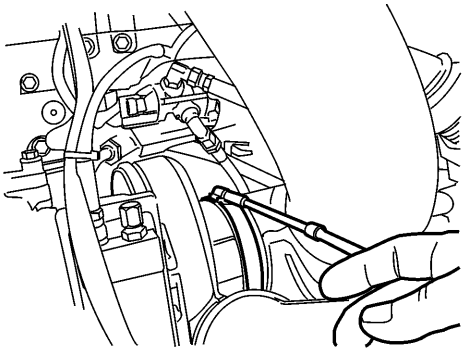
W2003861

40
Remove the wiring harness clamps and tie straps (upper portion of housing). Secure the harness away from the air filter housing.



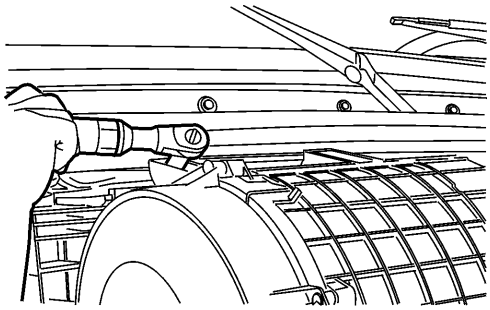
W2004720

41
Detach the air temperature sensor harness connector (located on the fresh air pipe). Pull out the lock tab and cut the tie strap. Remove the sensor harness bolt and clamp from the fresh air pipe.



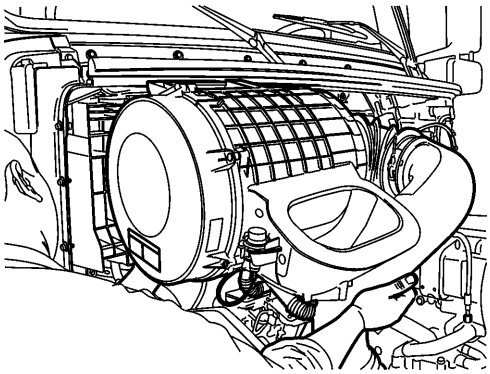
W2004721

42
Loosen the clamp from the main fresh air pipe to the turbocharger. Pull the pipe away from the turbocharger and air compressor fresh air pipe.



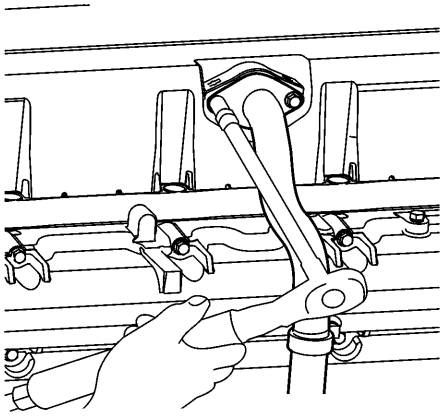
W2003858

43
Remove the two upper bolts at the top of the air filter housing.



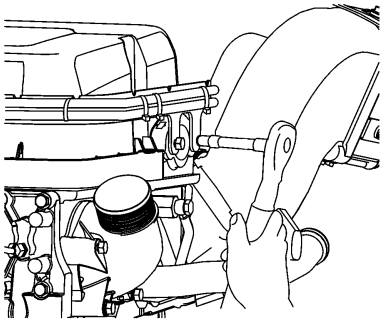
W2003859

44
Lift the air filter housing (with the fresh air pipe attached) away from the cab.



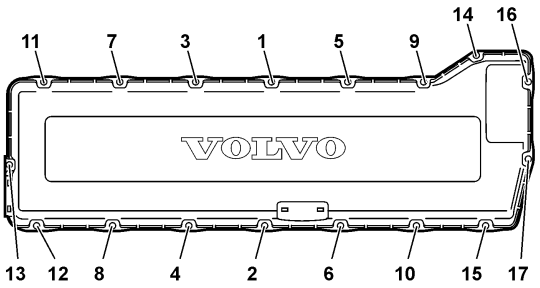
W2004680

45
Disconnect the breather tube from the side of the valve cover.



W2004679

46
Remove the engine wiring harness support bracket from the front of the valve cover.

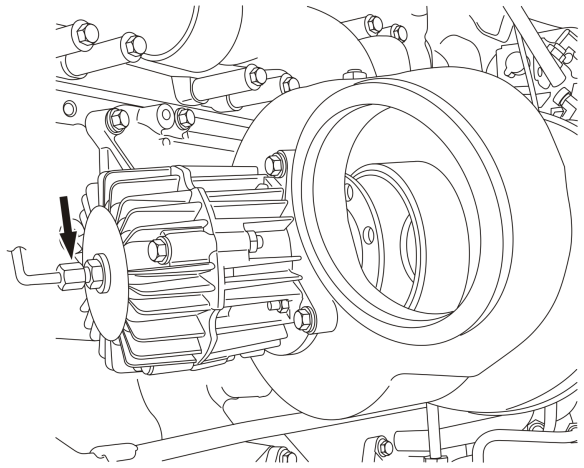


T2020552

47
Remove the spring-loaded attaching bolts from the valve cover.

48
Lift and remove the valve cover.

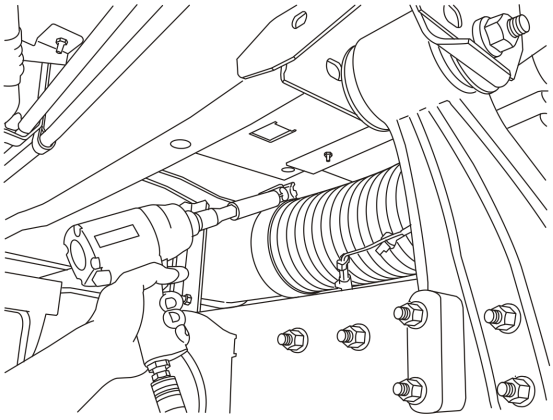
49
Disconnect the pyrometer harness connector and the signal line from the EPG line fitting.



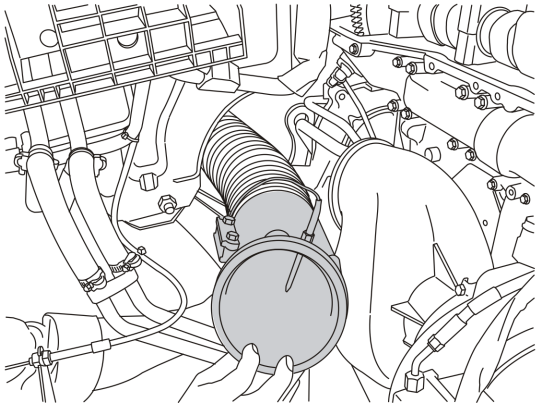
W2005173

Exhaust pipe removed for clarity

50
Remove the clamp from the exhaust pipe, then loosen the clamps at both the turbocharger and the EPG. Separate the exhaust pipe from the EPG and rotate the EPG upward to allow clearance to remove the short piece of exhaust pipe.

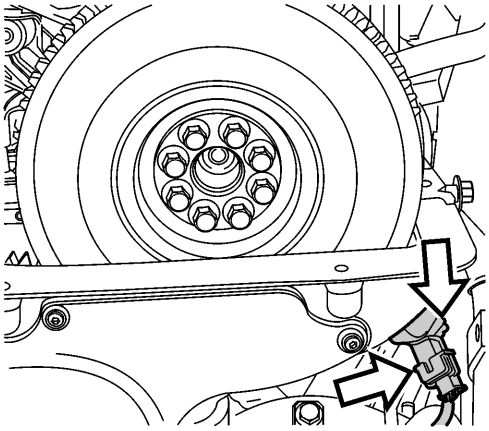


W2005390



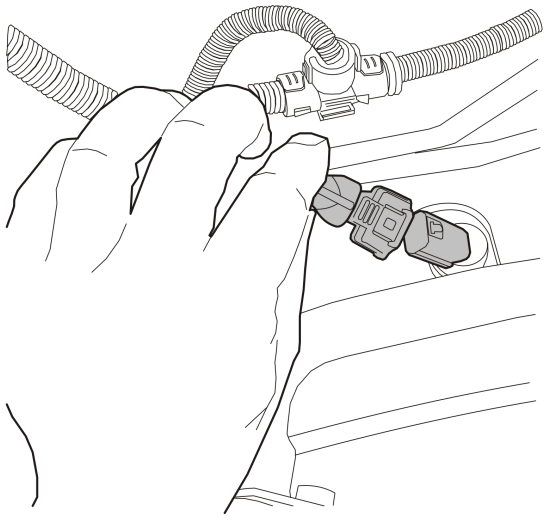
W2005374

51
Remove the exhaust band clamp, then separate the flex pipe from the rigid exhaust pipe. Slide the short exhaust flex pipe forward and out of the engine compartment.



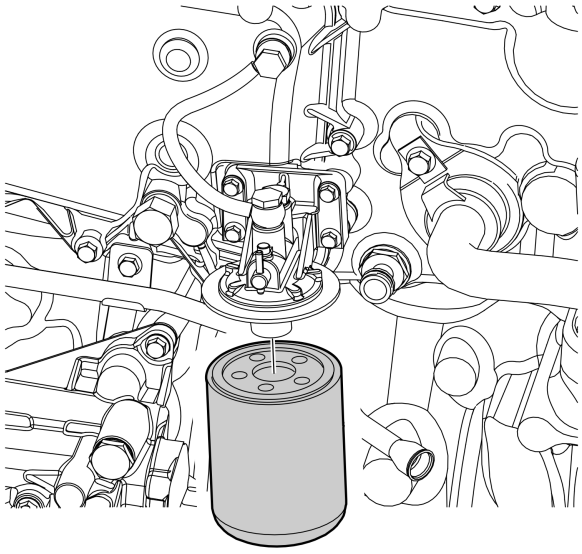
W2005104

52
Disconnect the camshaft (engine) position sensor harness connector, remove the bolt and pull out the sensor.



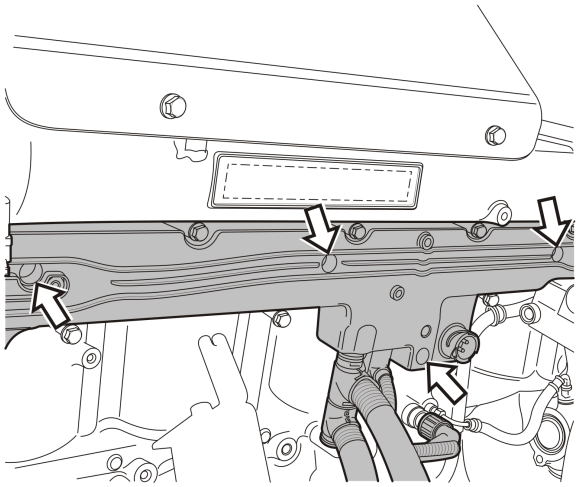
W2005359

53
Disconnect the flywheel speed sensor harness connector and remove the mounting bolt and pull out the sensor. Also, cut the sensor harness tie straps and relocate the sensor harnesses to the left side of the engine.



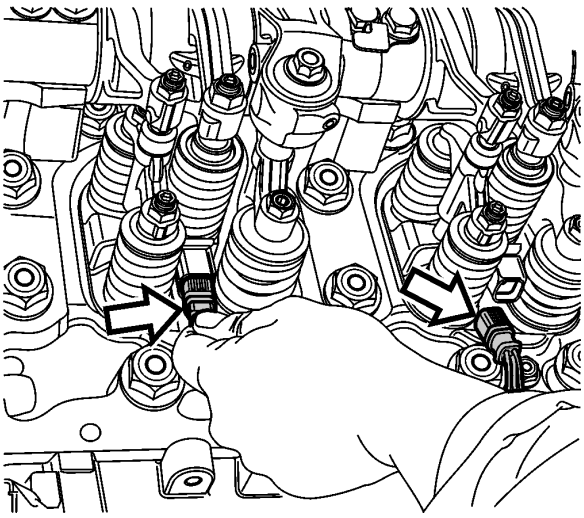
W2005429

54
Remove the coolant conditioner filter by turning counterclockwise to free the filter canister from the pedestal.



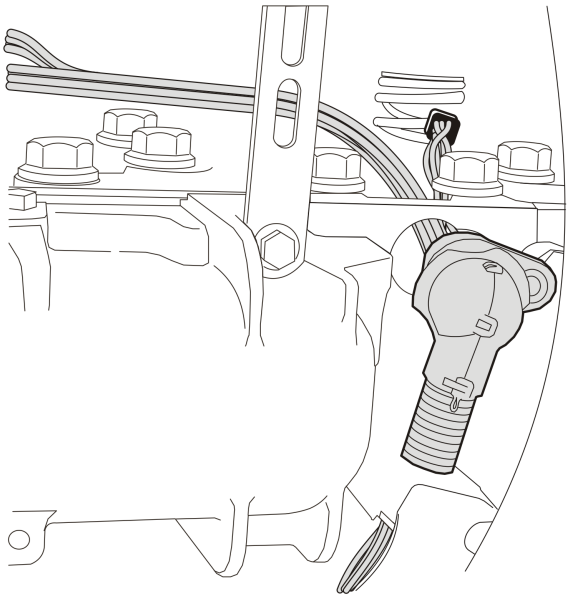
W2005361

55
Remove all the mounting bolts securing the engine harness box to the left side of the engine block.



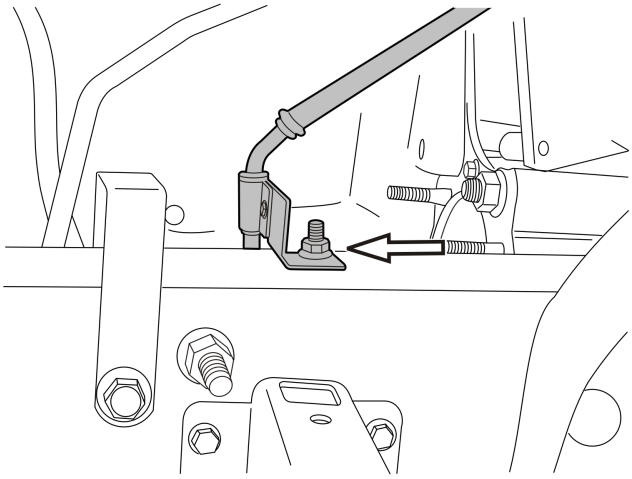
W2005106

56
Cut the injector harness cable ties and disconnect the injector and VEB harness connectors.



W2005360

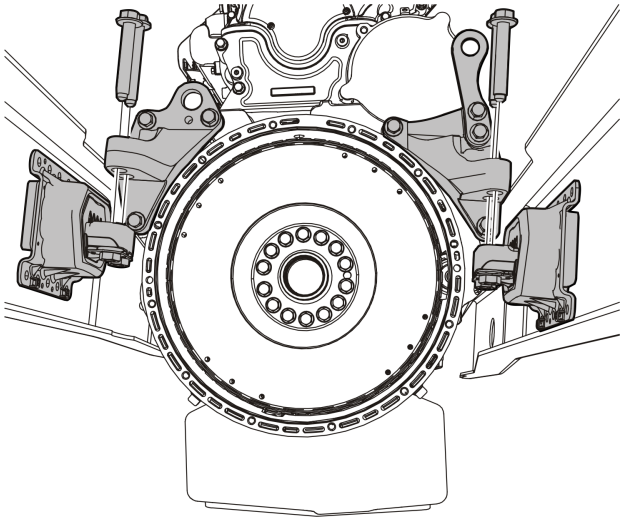
57
Remove the injector harness pass-thru connection, then pull the harness back through the cylinder head port to allow the engine harness box to be pulled away from the engine block enough to allow installation of the left-side engine support tool.



W2005364

58
Remove the air conditioning (A/C) line bracket mounted to the top left side frame rail. Also, remove the fuel line clamps mounted to the rear of the left side of the cylinder block. Both of these require removal to allow access for the left-side engine support tool.

59
Position a hydraulic jack under the rear of the flywheel housing with sufficient capacity to support the rear of the engine.



W2005365

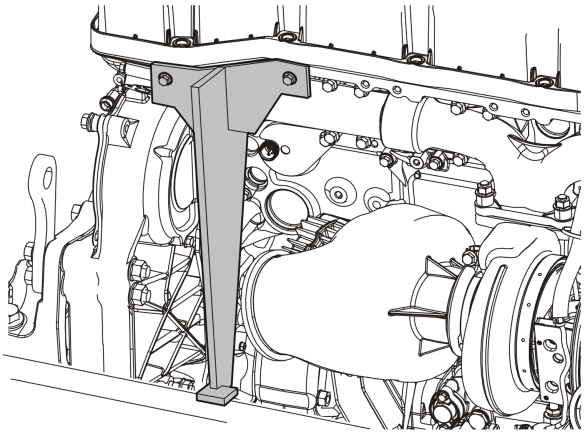
60
Remove the large engine mount-to-frame mounting bolts from both sides of the rear of the engine.

61
Raise the rear of the engine approximately 25.4 mm (1 in.) over the rear engine mounts.

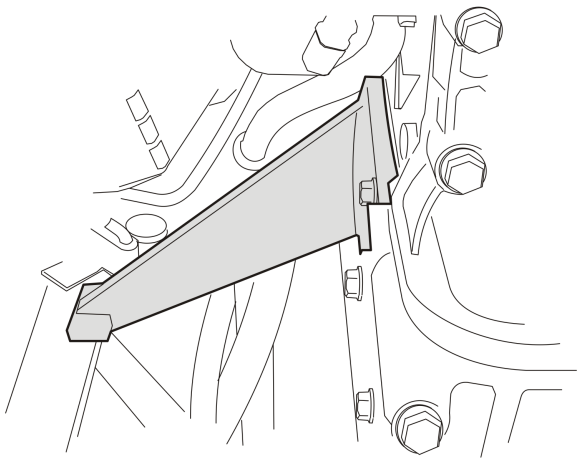
62
Position the right-side engine support tool 9990181-2 onto the right rear corner of the cylinder head and install the two bolts as indicated. Ensure the support tool foot will contact the upper portion of the frame.

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

9990181-2



W2005363

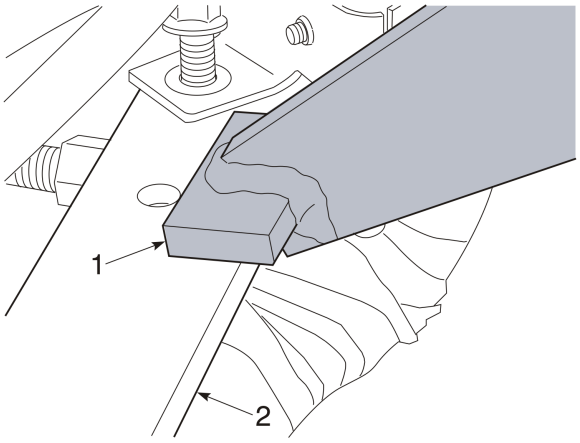


W2005362

63
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



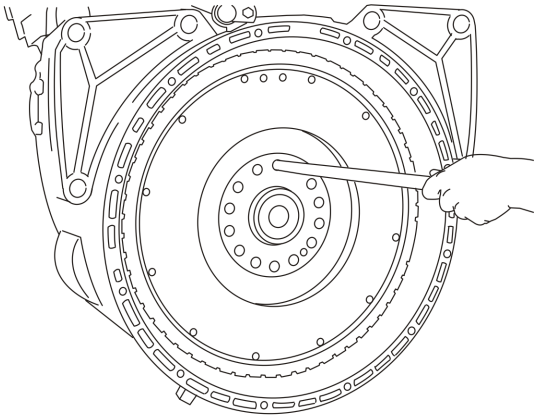
W2005370

1-Engine Support Tool Pad
2-Left Side Frame Rail

64
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.

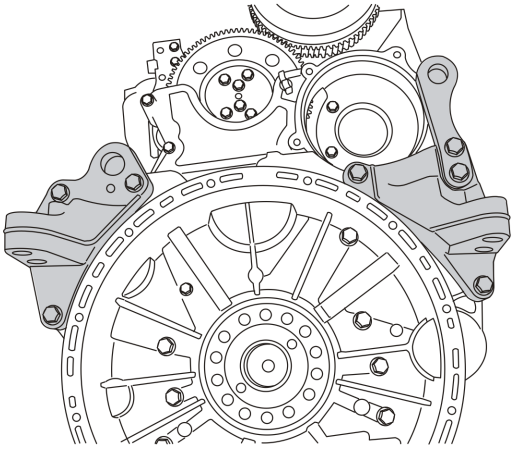
Note: Before lowering the engine, ensure that the EPG housing is positioned in a way that it will not be pinched between the frame and the engine block.

65
With the engine block supported, remove both frame-mounted engine mounts located at either side of the frame rail of the vehicle.



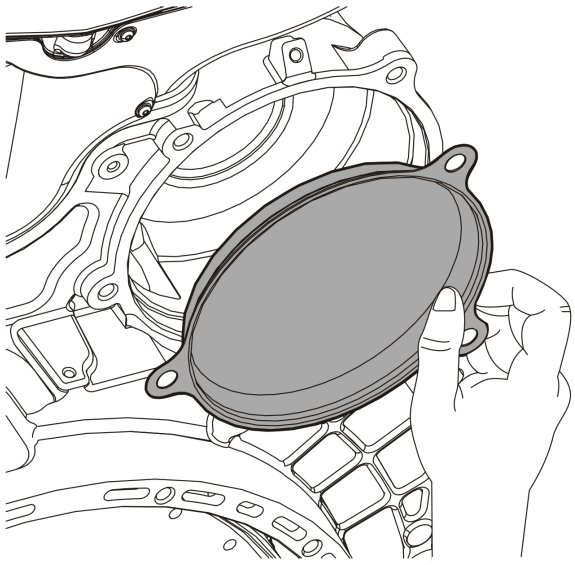
W2005379

66
Remove the flywheel bolts and washers. Next, using a pry bar, tip the flywheel away from the crankshaft and remove the flywheel from the rear of the engine.



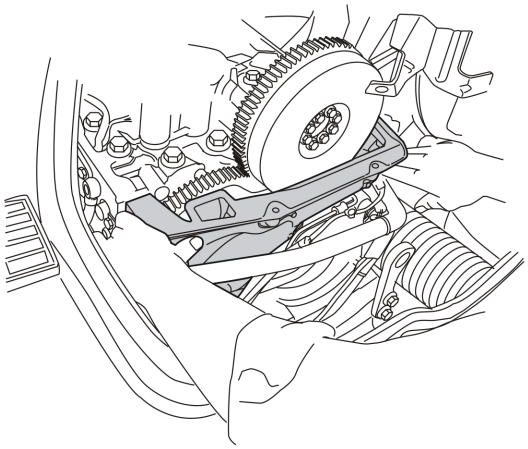
W2005369

67
Remove the rear engine mounting brackets from the flywheel housing.



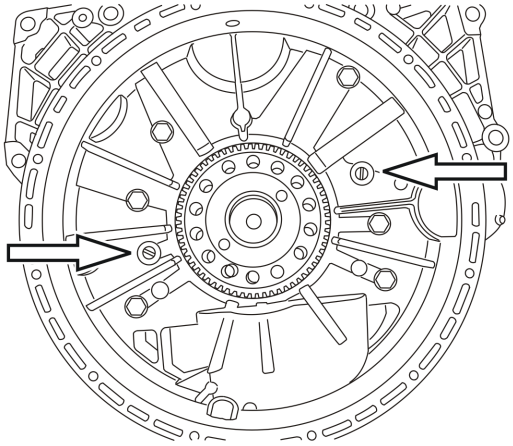
W2005368

68
For engines **not** equipped with rear engine power take-off, remove the access cover for the PTO opening.



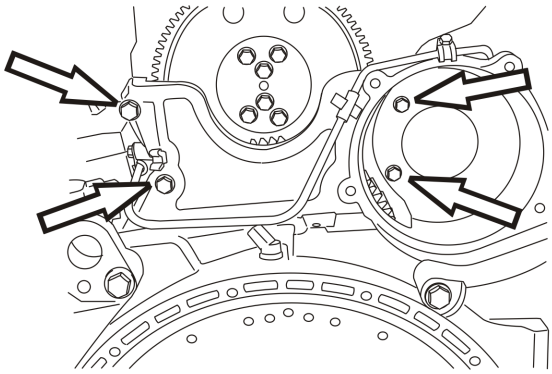
W2005371

69
Remove the timing gear cover located above the flywheel housing at the back of the cylinder head.



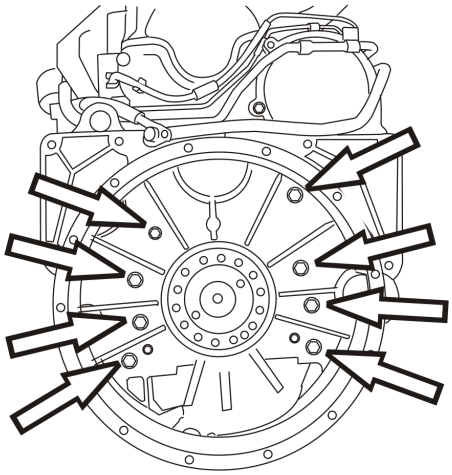
W2005372

70
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-bladed screwdriver.



W2005375

71
Remove the flywheel housing upper bolts. Note that two of the bolts are hidden inside the rear engine power take-off opening.



W2005376

72
Remove the remaining flywheel housing bolts.

73
Remove the flywheel housing using slide hammer 9994030 alternately on the left- and right-hand sides.

9994030

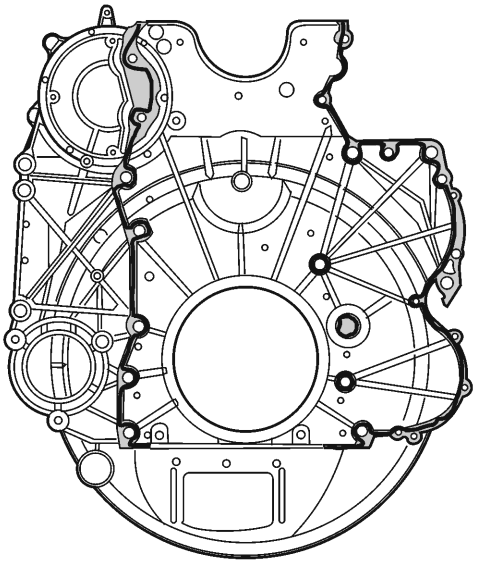
74
Carefully remove the old sealant from the cylinder block and the flywheel housing.

75
Carefully tap the old crankshaft seal out of the flywheel housing.

76
Carefully clean the contact surface on the block and flywheel housing.

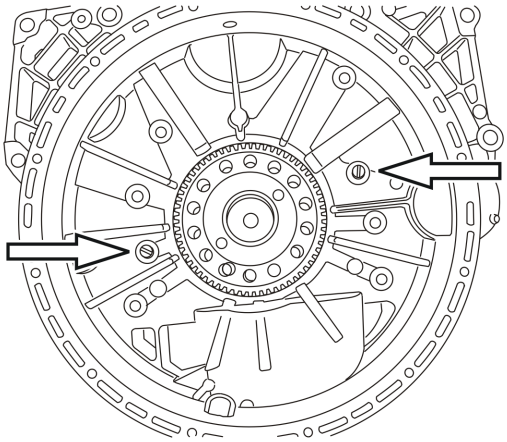
Note: The contact surface should be clean and dry.

Installation



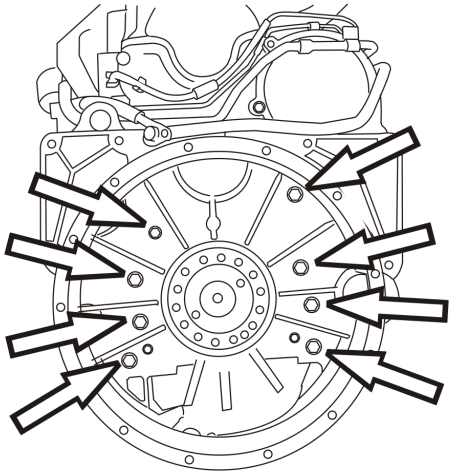
W2005250

1
Evenly apply a two mm (0.080 in.) bead of Volvo silicone (part no. 1161231-4) 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.

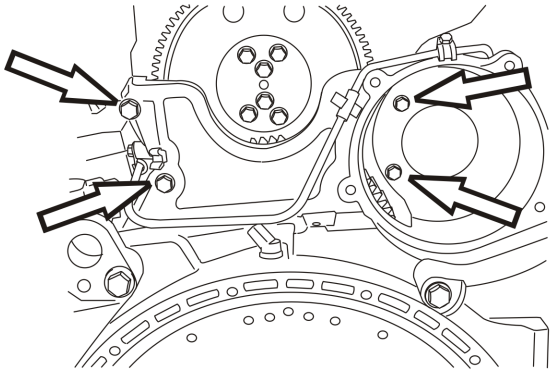


W2005373

2
Position the flywheel housing over the two alignment bolts that were installed into the rear of the block at housing removal.



05376



W2005375

3

Install the flywheel 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.

4

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

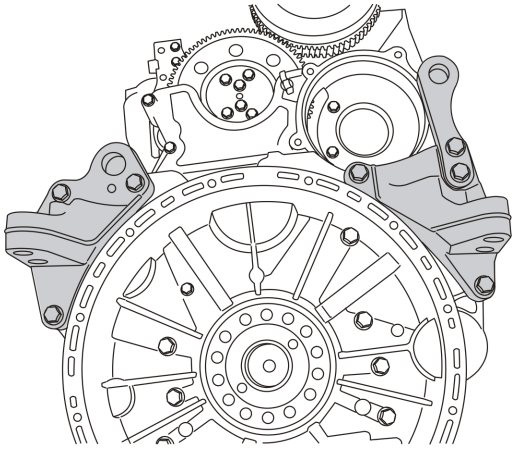
- Tighten all M14 bolts 160 ± 20 Nm (118 ± 15 ft-lb).
- Tighten all M10 bolts 48 ± 8 Nm (36 ± 6 ft-lb).
- Tighten all M8 bolts 24 ± 4 Nm (18 ± 3 ft-lb).

M14 = 160 ± 20 Nm (118 ± 15 ft-lb)
M10 = 48 ± 8 Nm (36 ± 6 ft-lb)
M8 = 24 ± 4 Nm (18 ± 3 ft-lb)

5

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

9992000, 9998238



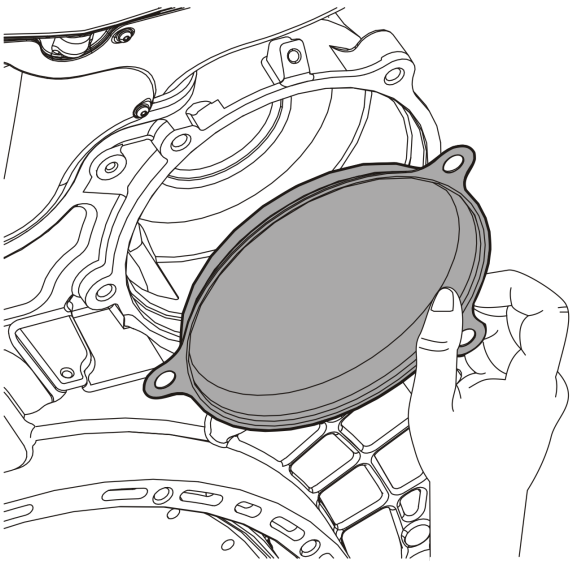
W2005369

6
Install both the engine mounting brackets onto the rear of the flywheel housing. Torque-tighten the engine mounting bolts to specification of 275 ± 45 Nm (203 ± 33 ft-lb).

275 ± 45 Nm (203 ± 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 ± 30 Nm (148 ± 22 ft-lb).

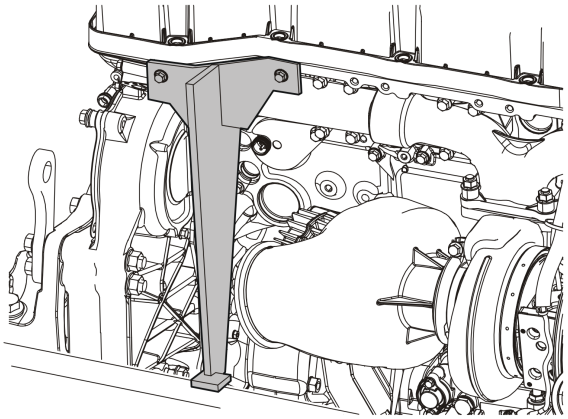
200 ± 30 Nm (148 ± 22 ft-lb)



W2005368

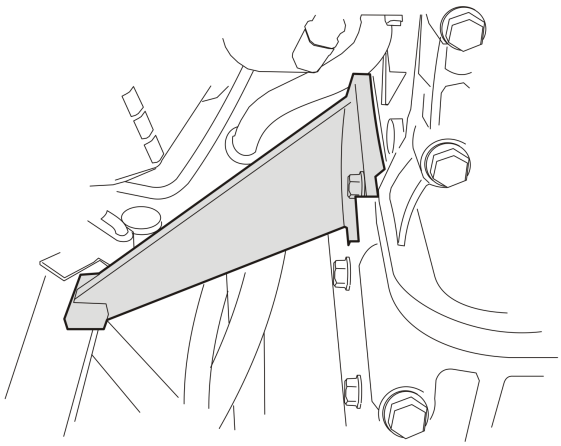
8
For engines **not** equipped with rear engine power take-off, install the access cover for the PTO opening.

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 in.) over the rear engine mounts. This action will remove the engine weight from the support tools.



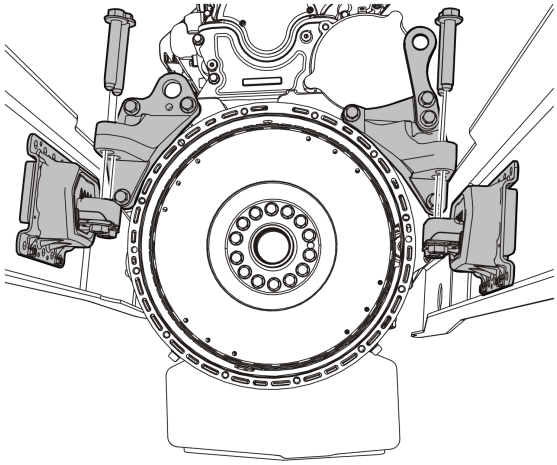
W2005363

10
Remove the bolts securing the right-hand rear engine support tool 9990181-2 and remove the tool.



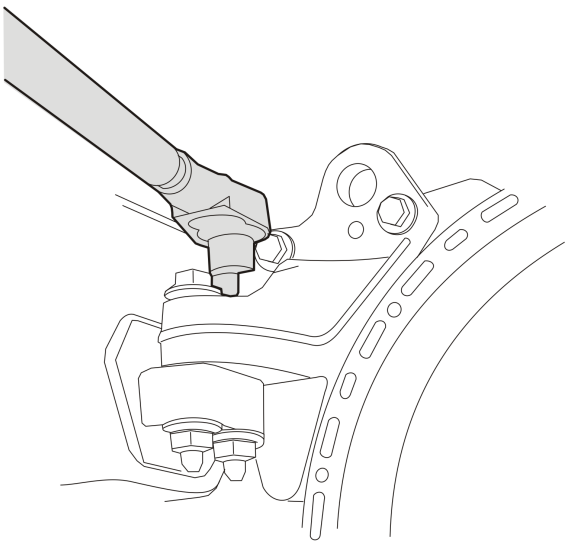
W2005362

11
Remove the bolts securing the left-hand rear engine support tool 9990181-1 and remove the tool.



W2005365

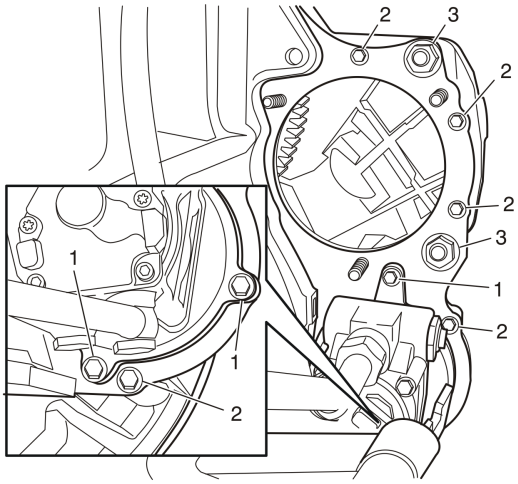
12
Lower the rear of the engine until the rear engine mounts are resting on the frame mounts and install the vertical rear engine support bolts. Hand-tighten the bolts snug using a socket and handle. Then, remove the jack used to support the rear of the engine.



W2005367

13
Torque-tighten the vertical rear engine support bolts to specification of 540 ± 90 Nm (398 ± 66 ft-lb).

540 ± 90 Nm (398 ± 66 ft-lb)



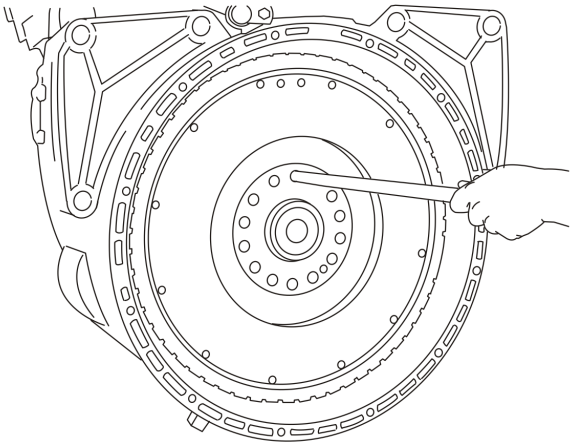
W2005380

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.

1-Power steering attaching bolts

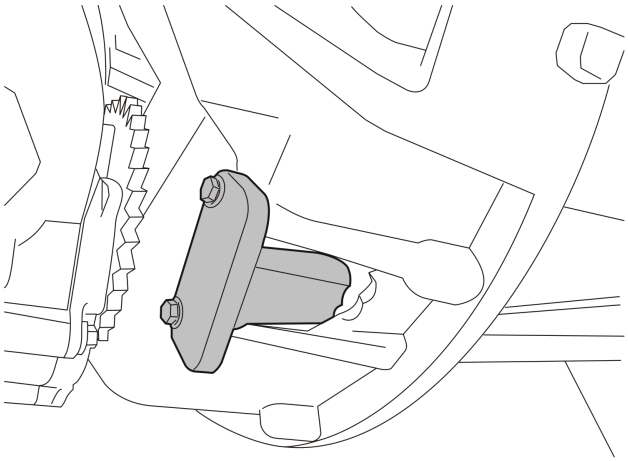
2-Timing gear plate to flywheel attaching bolts

3-Flywheel attaching bolt and nut



W2005379

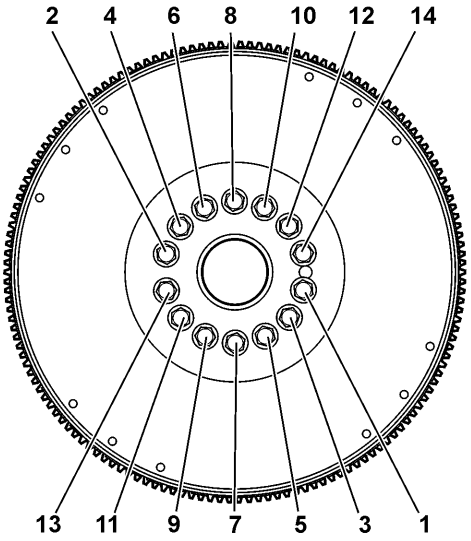
15
Carefully clean the flywheel and crankshaft contact surfaces, then position the flywheel on the crankshaft and hand-tighten the flywheel bolts snug.



W2005366

16
Remove the flywheel inspection cover from the bottom of the flywheel housing and install the flywheel blocking tool 85109131.

85109131



T2020550

17
Using the proper tightening sequence, torque-tighten the flywheel bolts as follows:

Step 1 60 ± 5 Nm (44 ± 4 ft-lb)

Step 2 Turn additional 120 ± 10 degree angle of tightening

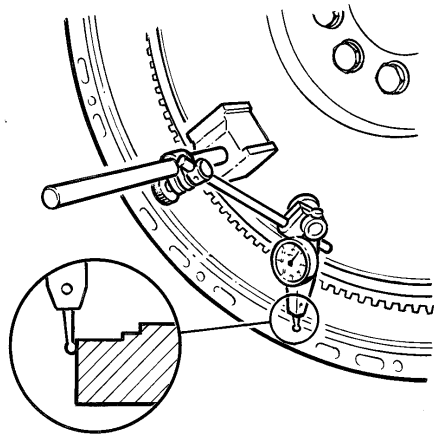
18
Remove the flywheel blocking tool.

85109131

19
Clean the flywheel and flywheel housing.

20
Attach dial indicator 9989876 to magnetic stand 9999696. Mount the magnetic stand on the flywheel with the probe of the dial indicator against the outer edge of the flywheel housing. Note the reading on the dial indicator. Move the dial indicator and magnetic stand to the opposite position on the flywheel and make the same measurement. The difference between the measurements must not exceed 0.1 mm (0.0039 in.).

0.1 mm (0.0039 in.)
9989876, 9999696

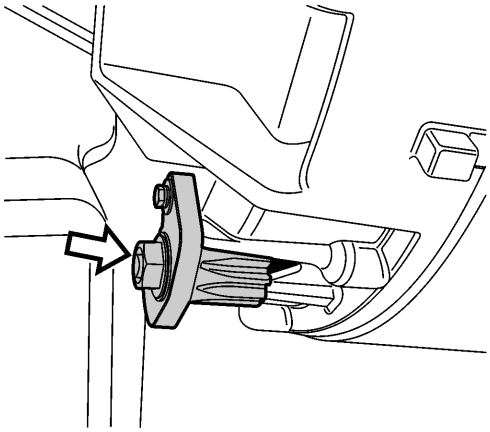


T2007171

Checking the Flywheel Housing Run-Out

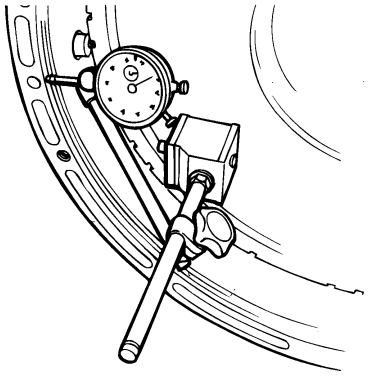
21
Assemble the flywheel turning tool as follows: Remove the snap ring and gear from tool 9996956. Assemble the gear from 9996956 into adapter tool 85108855 and install the snap ring. Lubricate the gear with engine oil or grease before attempting to turn the flywheel.

85108855, 9996956



W2005139

22
Install the flywheel turning tool (85108855 with gear 9996956).



T2006671

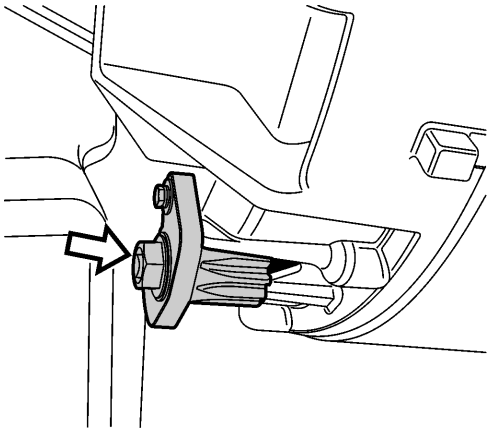
Checking the Flywheel Housing for Distortion

23

Mount magnetic stand 9999696 on the flywheel with the probe of dial indicator 9989876 against the inner edge of the flywheel housing. Rotate the flywheel and read off the dial indicator. The radial gap between the housing and the flywheel must not exceed 0.05 mm (0.0019 in.).

0.05 mm (0.0019 in.)
9999696, 9989876

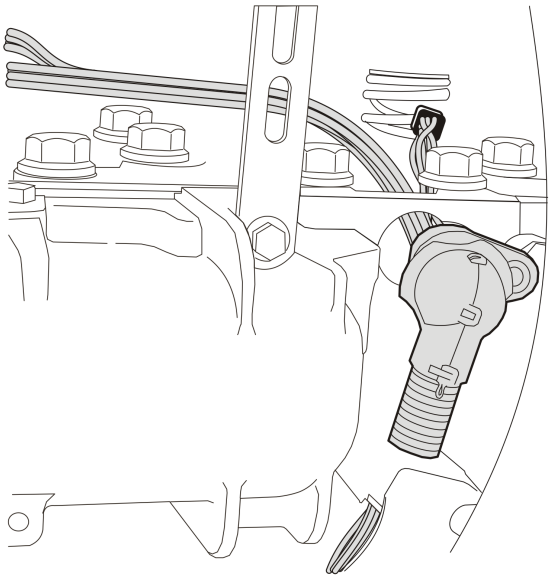
24
If any of these measurements are excessive, check the contact surface of the flywheel housing against the cylinder block. If no obstruction is found on the contact surface of the flywheel housing, the flywheel housing must be replaced as there is no adjustment available to the housing.



W2005139

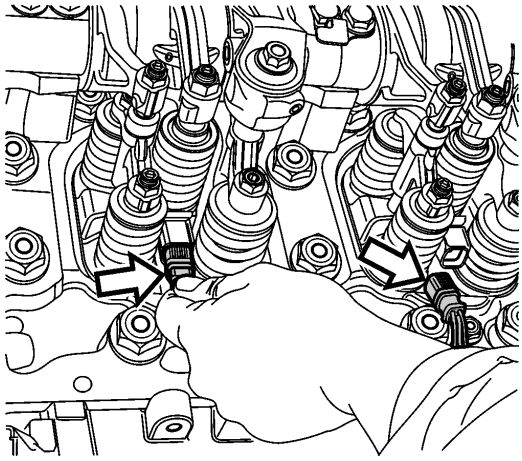
25
Allow flywheel turning tool 85108855 with gear 9996956 to remain at this time. Turning tool will be required to adjust the camshaft position sensor clearance in a later step.

85108855, 9996956



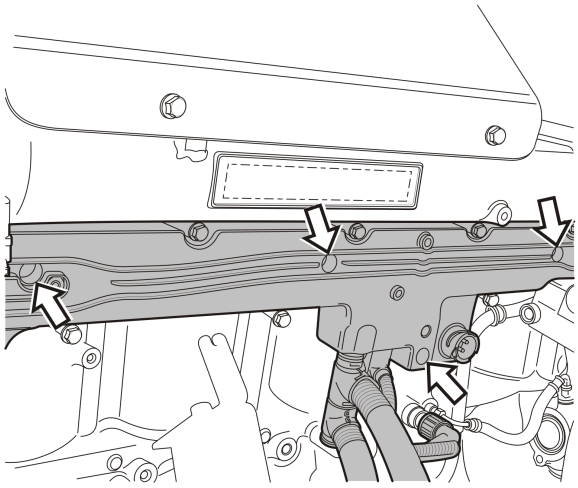
W2005360

26
Route the injector and VEB harness back into the appropriate positions in the head to allow harness connectors to connect with the injectors and VEB. Secure the harness pass-thru at the rear of the cylinder head.



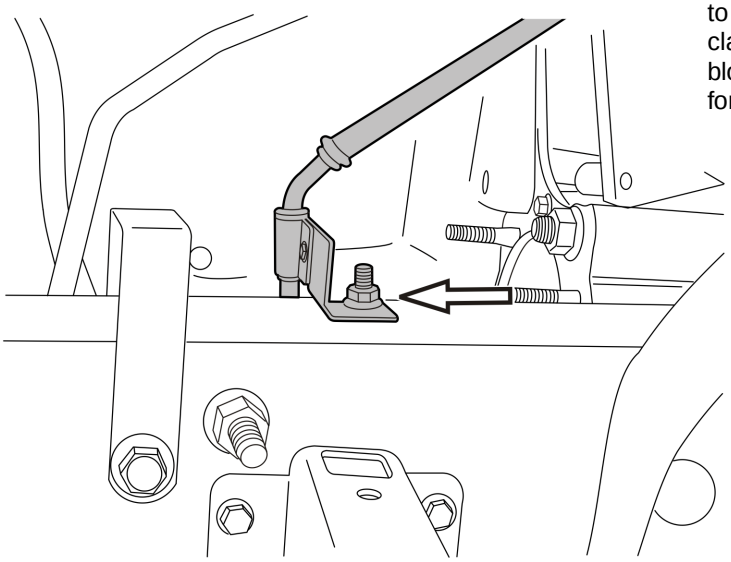
W2005106

27
Connect all injector connectors onto the appropriate injector and reconnect the VEB harness connector. Secure all injector and VEB harness locations with cable ties.



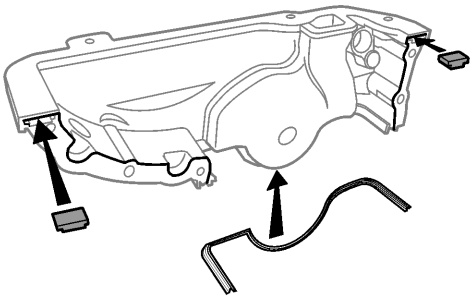
W2005361

28
Install and secure the engine harness box to the right side of the engine.



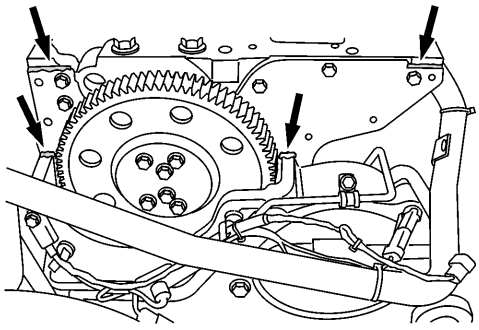
W2005364

29
Install the air conditioning (A/C) line bracket mounted to the top left side frame rail. Also, install the fuel line clamps mounted to the rear of the left side of the cylinder block. Both of these where removed to allow access for the left-side engine support tool.



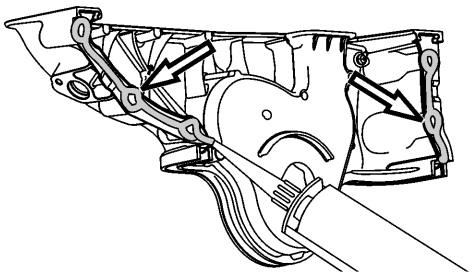
T2019475

30
Clean the sealing surface of the timing gear cover and replace the cover seals.



W2005102

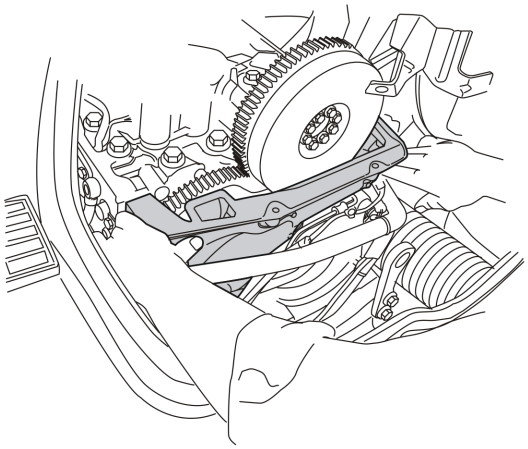
31
Apply sealant in the bottom corners where the timing gear plate and the flywheel housing meet. Also, apply sealant at the top of the timing gear plate (in the corner) next to the cylinder head.



W2005137

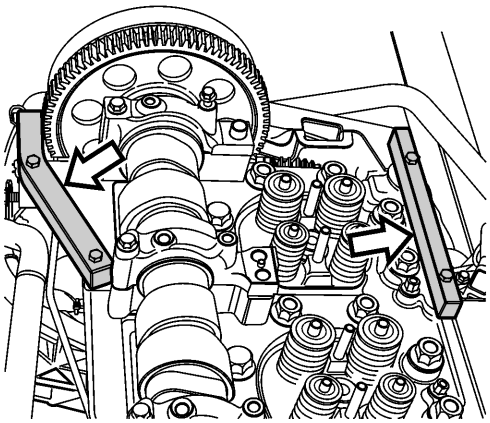
32
Apply a two mm (0.080 in.) bead of Volvo silicone (P/N 1161231-4) sealant to the mating surfaces of the timing gear cover.

Note: Timing gear cover must be installed within 20 minutes of applying sealant.



W2005371

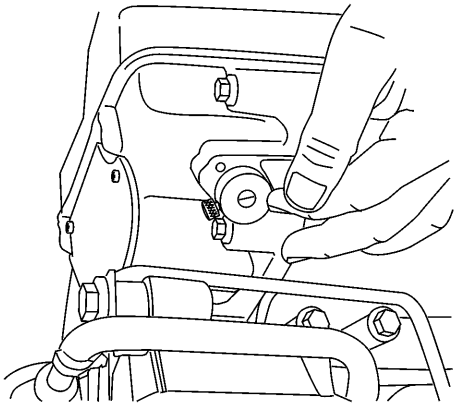
33
Position the timing gear cover, install the fasteners and loosely tighten.



W2005138

34
- Install the timing gear cover clamp tools and screw down the tools 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 cover clamp tools.

85109033A, 85109033B



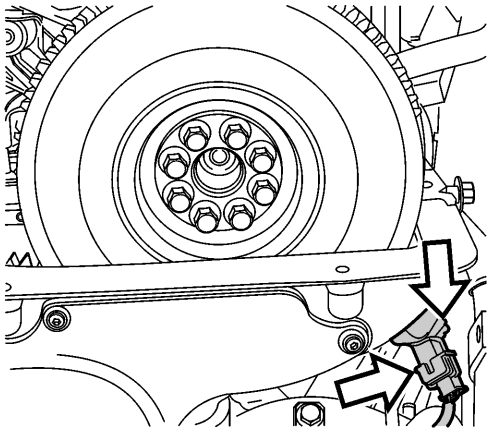
W2005068

35
Check for proper camshaft position sensor clearance using the sensor depth gauge to determine if shims are required for sensor depth. The camshaft position sensor clearance specification is 0.3–1.0 mm (0.0118–0.0393 in.).

1 Rotate the engine using the flywheel turning tool until a tooth of the camshaft toothed wheel is aligned with the sensor bore.
2 Insert the tool into the sensor bore until the outer part of the tool is fully seated against the cylinder head rear cover.
3 Loosen the thumb screw of the tool and push the inner part of the tool until it contacts a tooth of the toothed wheel.
4 Tighten the thumb screw to secure the inner part of the tool.
5 Carefully remove the tool from the camshaft sensor bore and observe the location of the steps between the inner and outer portions of the tool:

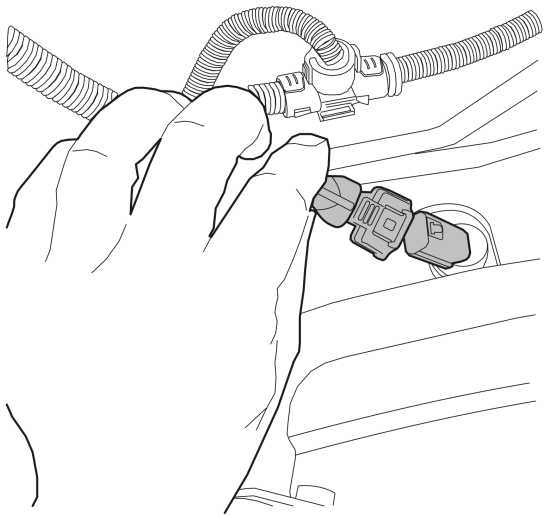
- Both steps below the surface of the tool = no shims required.
- One step below the surface of the tool = one shim required.
- Both steps above the surface of the tool = two shims required.

88800031



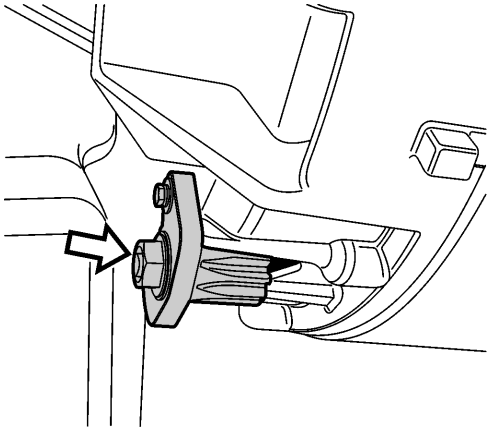
W2005104

36
Install the camshaft position sensor with the appropriate shim(s) and new O-ring, secure with a bolt and connect the harness connector.



W2005359

37
Install the flywheel position sensor in the flywheel housing using the same clearance and sensor depth gauge and procedure as used previously for the camshaft sensor.

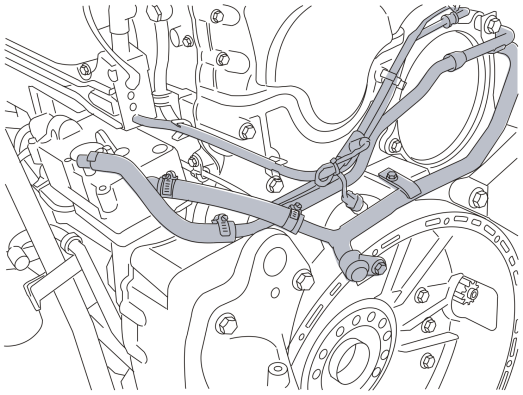


W2005139

38
Remove the flywheel turning tool (85108855 with gear 9996956), and reinstall the inspection cover.

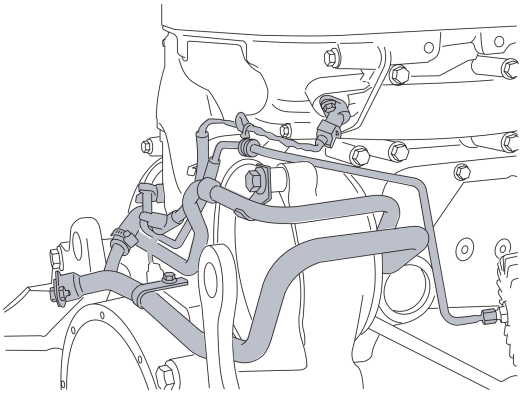
85108855 , 9996956

39



W2005377

Harnesses and Tubing (Right Side)



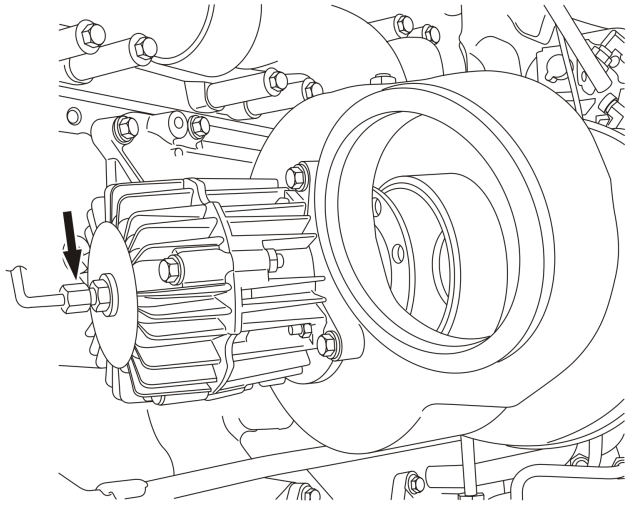
W2005378

Harnesses and Tubing (Left Side)

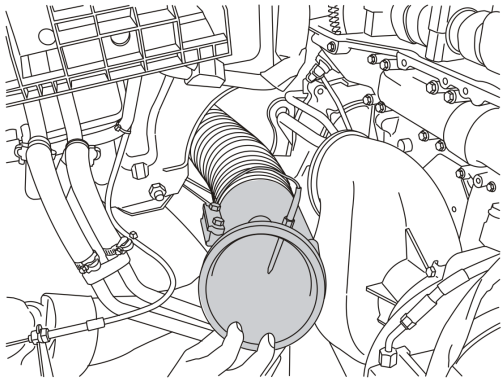
Install all tubing such as compressor coolant lines (hard pipes), EPG air governor signal line and electrical harnesses that cross over the rear of the flywheel housing. Reattach the tie straps to secure the electrical harnesses.

40

Connect the EPG air signal line to the fitting on the governor.

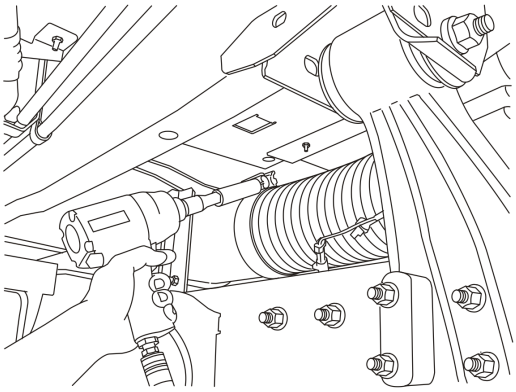


W2005173



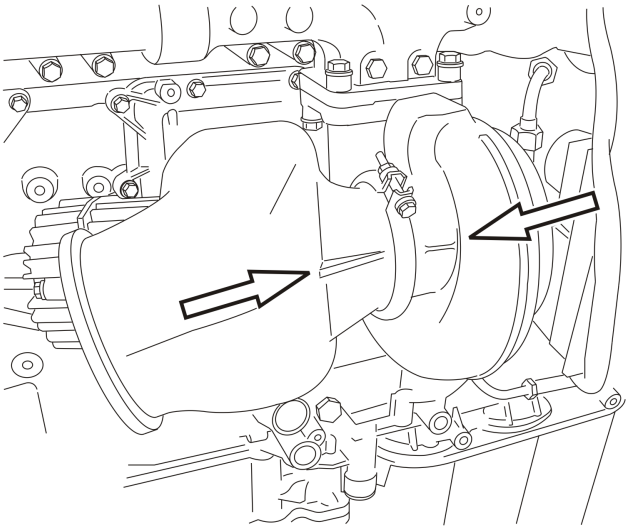
W2005374

41
Position the exhaust and flex pipe next to the left frame behind the EPG outlet. Align the flex pipe to the rigid exhaust pipe.



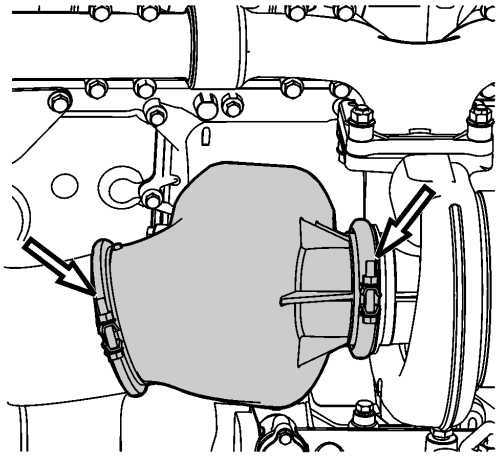
W2005390

42
Install the exhaust and flex pipe onto the rigid exhaust pipe. Position the clamp over the flex pipe and tighten the clamp securely.



W2005228

43
Reposition the EPG housing down toward the frame to allow the exhaust flex pipe to make a good connection. Align the mark on the turbine housing outlet with the reinforcing web on the EPG housing.

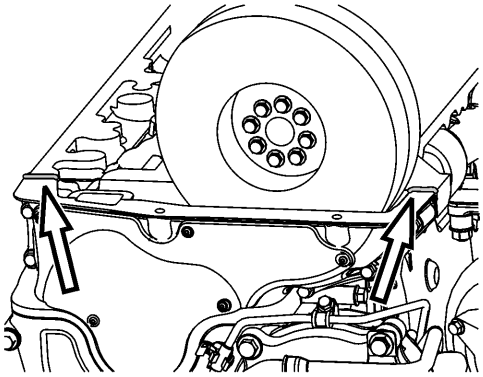


W2005012

44
Position the forward section of the exhaust flex pipe to connect to the EPG housing. Secure band clamps at the EPG housing-to-turbocharger and at the exhaust flex pipe connection. Tighten all clamp bolts securely.

45
Connect the wiring harness to the pyrometer and secure this harness and the sensor harnesses to the rear of the cylinder head.

46
Clean the valve cover contact surface on the cylinder head and the timing cover. All surfaces need to be completely free from any grease or oil residue.



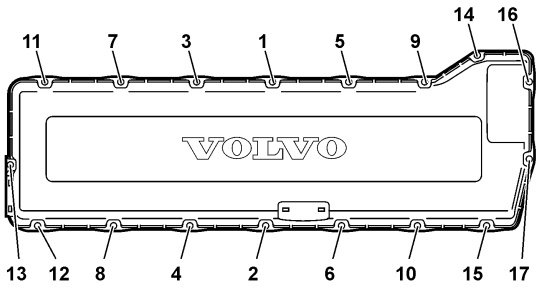
W2005157

47
Apply sealant to the area where the timing cover and the cylinder head meet. This parting line is on both sides of the cylinder head. Use Volvo sealant P/N 1161231-4, then carefully position the valve cover against the cylinder head, making sure that the seal remains properly seated.

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

48
Install the 17 spring-loaded attaching bolts in the valve cover.

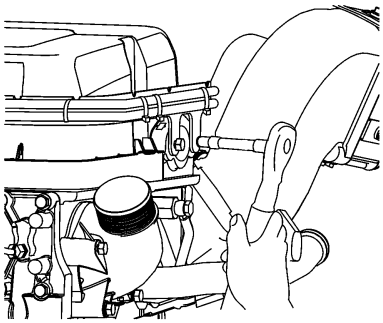
Note: The bolt spring provides even tension on the valve cover gasket.



T2020552

49
Using the proper tightening sequence, torque-tighten the valve cover bolts to 24 ± 3 Nm (18 ± 2 ft-lb).

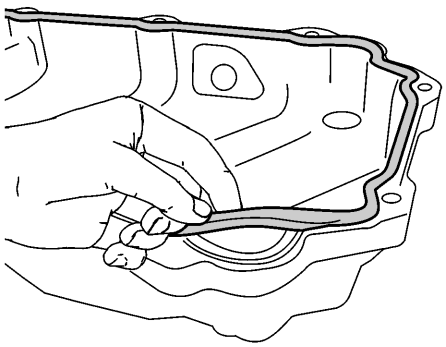
24 ± 3 Nm
(18 ± 2 ft-lb)



W2004679

50
Install the engine electrical wiring harness support bracket to the front of the valve cover. Tighten the bolts.

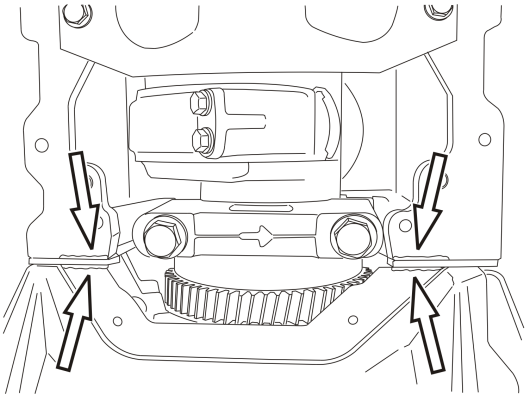
Note: Ensure the same bolts that were removed at disassembly are reinstalled in this bracket location. Damage to the valve cover will result if too long of bolts are installed.



W2004878

51
Remove the rubber gasket from the oil pan. Clean the gasket channel and sealing surface of the oil pan. The channel should be cleared of any dirt or debris and completely free of any grease residue.

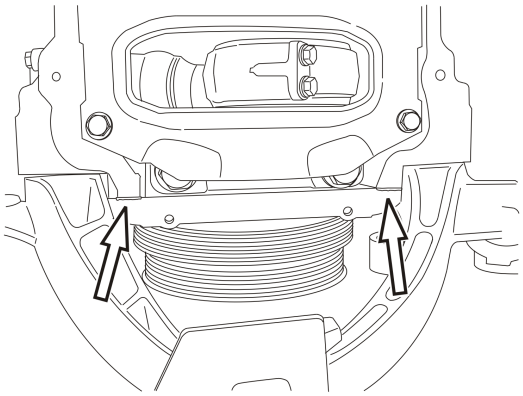
52
Clean the oil pan contact surface on the cylinder block, flywheel housing and front seal cover. All surfaces need to be completely free from any grease or oil residue.



W2005222

53
Place two beads of Volvo sealant (1161231-4) two mm (0.080 in.) wide at the seams between the flywheel housing and the timing gear mounting plate. Add an additional two beads of Volvo sealant (1161231-4) two mm (0.080 in.) wide at the seams between the timing gear mounting plate and the engine block.

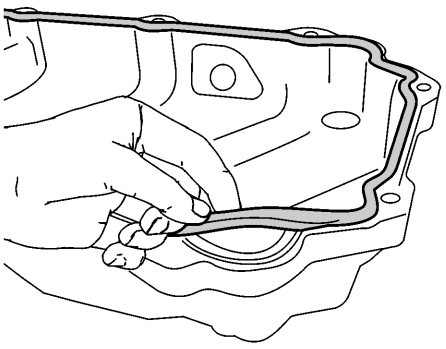
Note: Oil pan must be installed within 20 minutes of applying sealant to the parting line area.



W2005223

54
Place a two mm (0.080 in.) bead of Volvo sealant (1161231-4) to the seam between the front seal cover and the block.

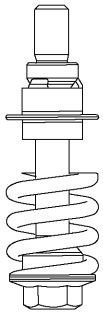
Note: Oil pan must be installed within 20 minutes of applying sealant to the parting line area.



W2004878

55
Position a new rubber gasket on the oil pan.

56
The oil pan mounting bolt assembly is constructed in a way that does not allow the washer and spring to release from the bolt shaft.



W2005443

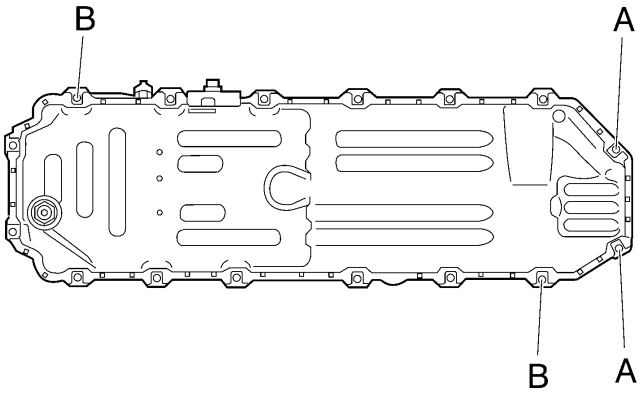
Oil pan bolt contains a permanent spring with washer.

57
With the aid of a **certified technician**, lift up the pan and attach it with the bolts marked **B** in the figure. Fit the other bolts, except those marked **A** in the figure, which are fitted last.

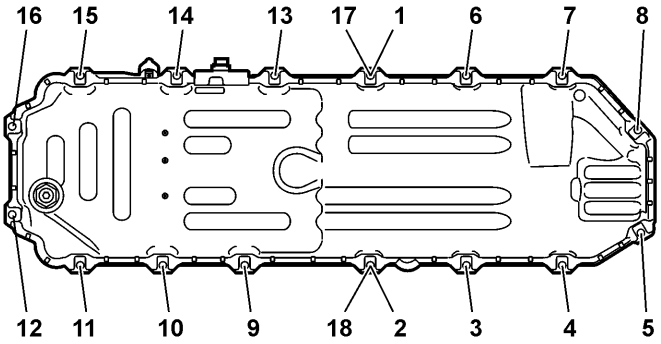
Note: The need for an additional certified technician is required to help install the oil pan to the engine.

Note: Press the pan toward its rearmost position before tightening the bolts.

Note: Use caution not to damage the oil pickup tube. Also, avoid contact between the oil pump gear and the pan gasket.



W2005226



T2020557

58
Note: Before tightening, make sure the gasket is located in the groove on the pan and is laying flat.

Torque-tighten the bolts to 24 ± 4 Nm (18 ± 3 ft-lb) in the sequence shown in the diagram.

24 ± 4 Nm
(18 ± 3 ft-lb)

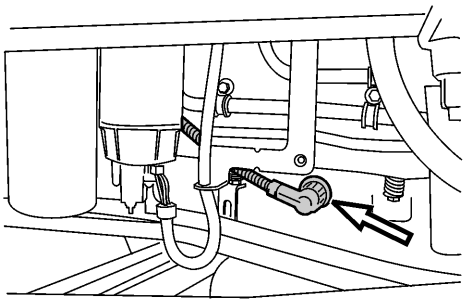
59
Install the drain plug.

Note: The new hex-head plug must **not** be fitted with a copper washer. It must always be fitted with the steel washer.

Torque-tighten to 60 ± 10 Nm (44 ± 7 ft-lb).

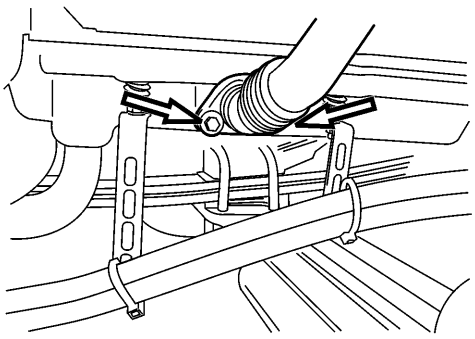
Note: Do **not** use an air impact ratchet or similar air tool.

60 ± 10 Nm
(44 ± 7 ft-lb)



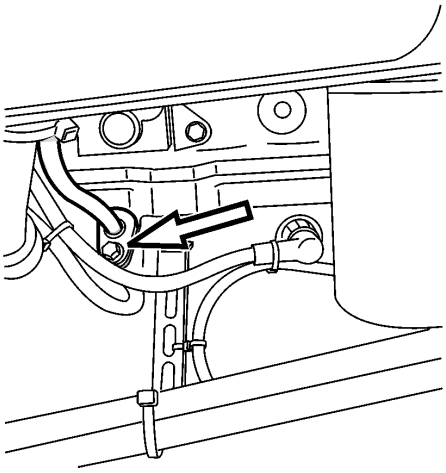
W2004876

60
Reconnect the oil level/temperature sensor connector, located on the side of the oil pan. Also, reconnect the oil heater connector, if equipped.



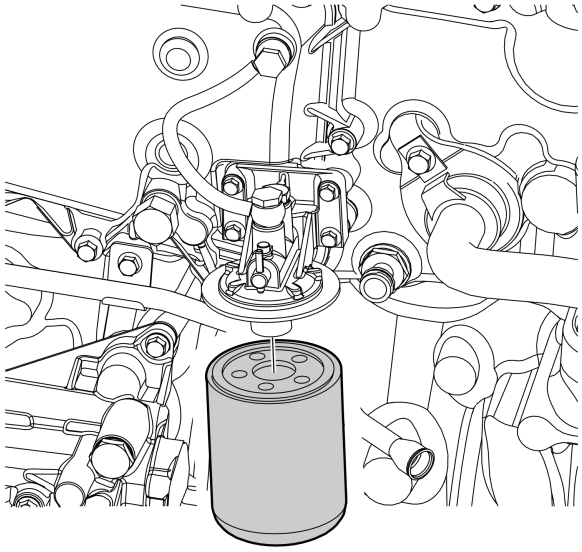
W2004884

61
Install a new fill tube O-ring and position the fill tube onto the side of the oil pan. Install the oil fill tube fasteners.



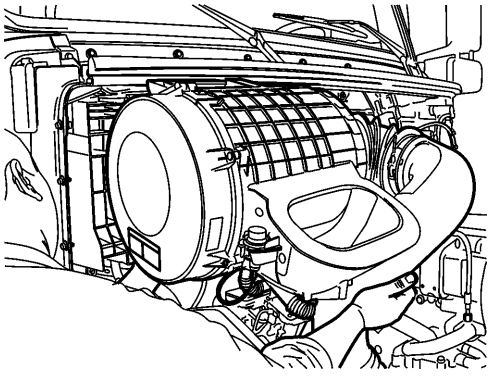
W2005086

62
Install a new O-ring on the dipstick tube, then install the dipstick tube and secure the fastener. Install the dipstick.



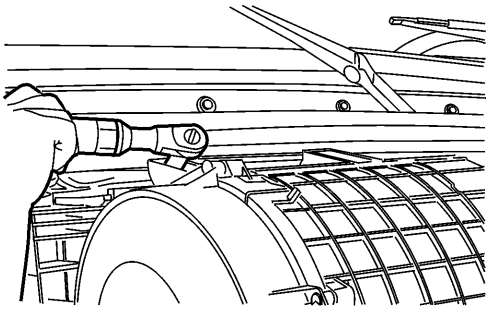
W2005429

63
Position the coolant conditioner filter onto the filter adapter and tighten until the filter seal contacts the adapter sealing surface. Tighten the filter and additional 3/4 turn. Check for coolant leaks at engine startup.



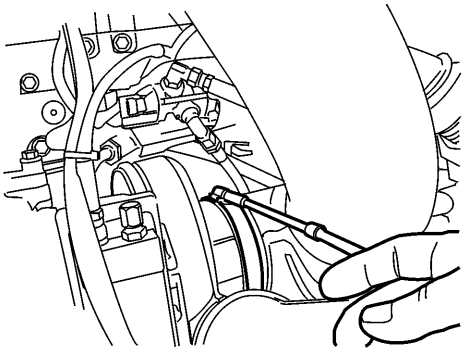
W2003859

64
Position the air filter housing (with the fresh air pipe attached) against the cab.

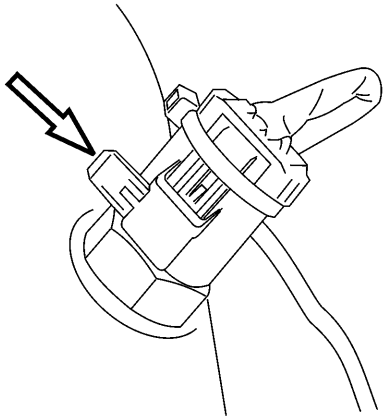


W2003858

65
Install the two bolts at the top of the air filter housing. Tighten the bolts.

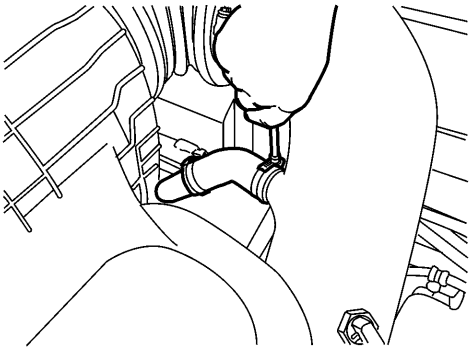


66
Install the main fresh air pipe to the turbocharger. Tighten the clamps.



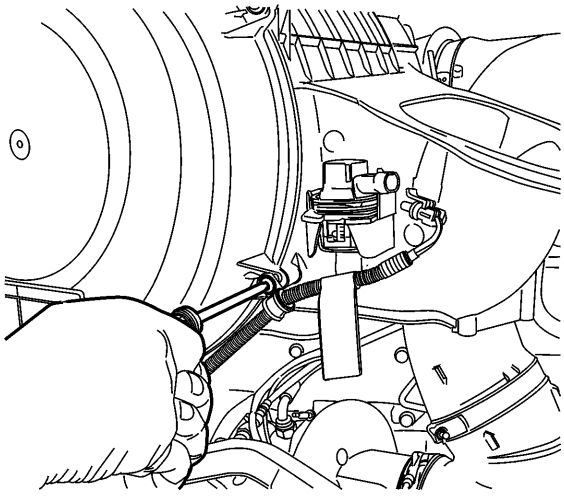
W2004720

67
Reattach the air temperature sensor harness connector to the sensor (located on the fresh air pipe). Push in the lock tab and install a new tie strap to secure the connector. Install the bolt and clamp to secure the sensor harness to the fresh air pipe.



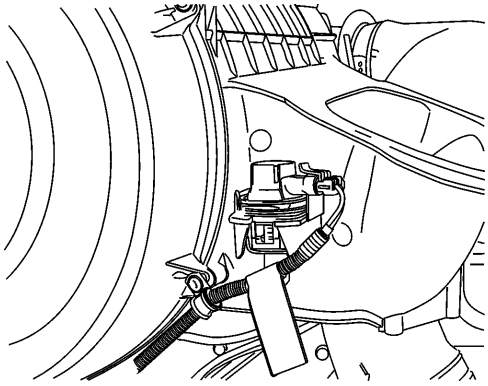
W2004719

68
Install the fresh air pipe to the air compressor tube.



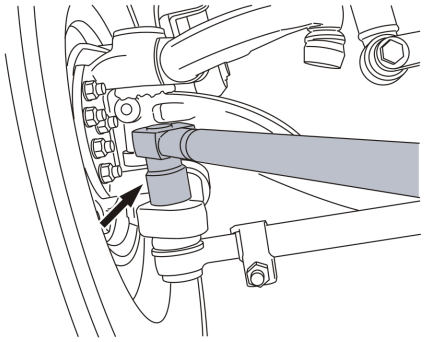
W2003861

69
Install the wiring harness clamps to the air filter housing.



W2004249

70
Connect the air restriction gauge wiring harness.



W2005190

71
If previously removed, reconnect the tie rod into the left-side steering knuckle and torque-tighten the locknut to 200 ± 30 Nm (148 ± 22 ft-lb). Insert the cotter pin and lock in place.

200 ± 30 Nm
(148 ± 22 ft-lb)

72
Refill the engine with the specified quality of oil to the full level on the dipstick.

73
Install and secure the air compressor to the left side of the engine. Torque the air compressor nuts to 85 ± 8 Nm (63 ± 6 ft-lb).

85 ± 8 Nm
(63 ± 6 ft-lb)

74
Connect the coolant lines, oil supply line and air governor signal line to the air compressor. Connect the fresh air pipe to the top of the air compressor.

75
Fill the cooling system with the recommended coolant using the coolant extractor.

DBT2V700

76
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 60 ± 5 Nm (44 ± 4 ft-lb).

60 ± 5 Nm
(44 ± 4 ft-lb)

77
Reinstall the power take-off assembly and power take-off driveshaft, if equipped. Refer to Service information, group 43.

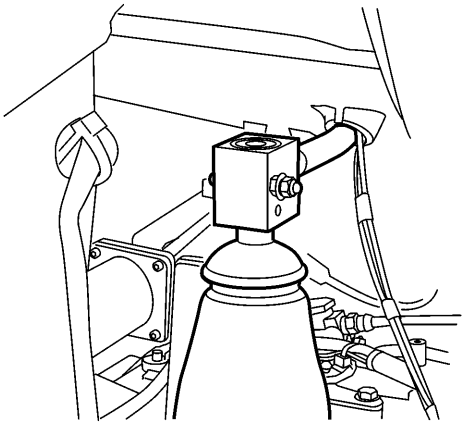
78
Install the clutch and pressure plate assembly onto the flywheel. Torque-tighten the clutch-to-flywheel bolts to 65 Nm (48 ft-lb). Ensure the caging bolts are removed from the clutch/pressure plate assembly.

65 Nm
(48 ft-lb)

79
Using a transmission jack, position the transmission onto the flywheel housing at the rear of the engine. Install the transmission bolts and torque-tighten the transmission-to-engine bolts to 70 Nm (52 ft-lb).

70 Nm
(52 ft-lb)

80
Install the front section of the drive line.

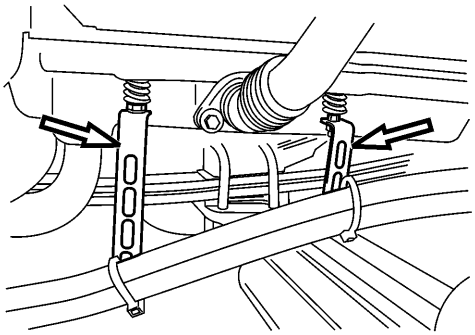


W2004755

81
Connect the shift lever to the gear tower and connect all air lines to the transmission.

82
Route the battery cables and transmission cooler lines and secure under the flywheel housing.

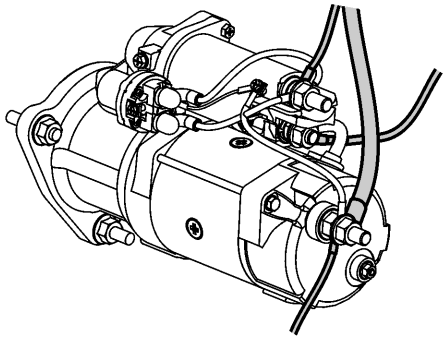
83
Connect the oil cooler lines to the transmission.



W2004874

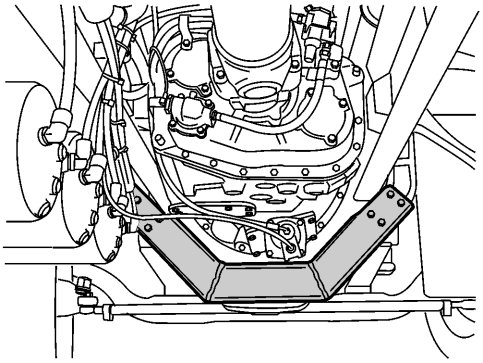
84
Position the transmission cooler brackets onto the oil pan fasteners as marked at disassembly, and then install the cooler line bracket nuts.

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



W2004714

85
Install the starter motor wiring harness per the markings on the wires made at disassembly. Tighten the harness nuts securely.



W2004715

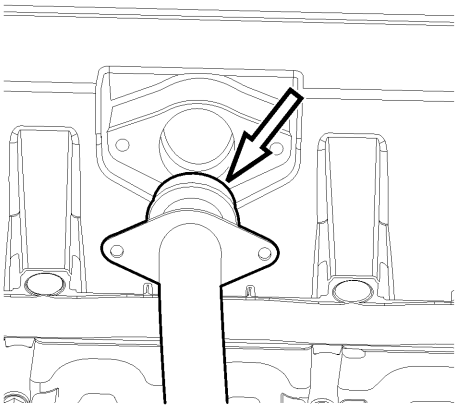
86
Install the frame under-slung crossmember located under the transmission.

87
Connect and secure wire harness and connect transmission temperature sensor at the transmission.

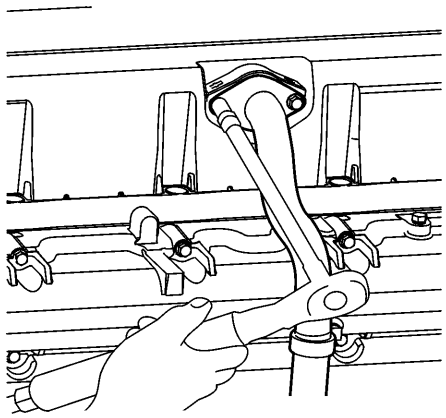
88
Reconnect the block heater and secure the harness.

89
Connect the main air line (hard pipe) to the air compressor and secure line with clamp.

90
Install a new breather tube O-ring and position the breather tube against the side of the valve cover.



W2004681



W2004680

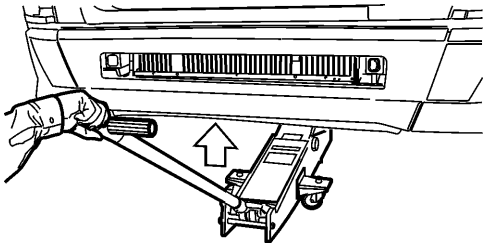
91
Connect the breather tube to the side of the valve cover. Tighten the bolts. Also, reconnect the A/C line bracket.

Note: Ensure the same bolts that were removed at disassembly are reinstalled in this breather tube location. Damage to the valve cover will result if too long of a bolt is installed.

92
Connect the interface harness to the engine harness box.

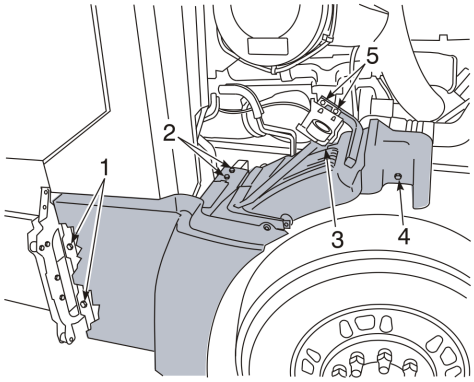
93
Secure the main air line (hard pipe) to the bracket at the flywheel housing, then connect the flexible air line.

94
Reconnect and secure the wiring harness to the APCS.



W2003873

95
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.



W2005189

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

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

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

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

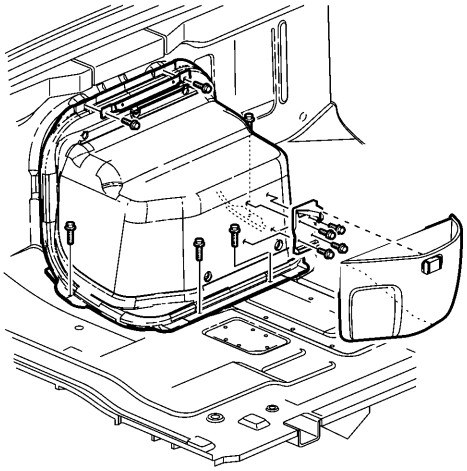
5-Two (2) splash guard bolts [upper brace]

96
Install both the left and right splash guards and the fender extenders as an assembly.

97
Reconnect the electrical power to the vehicle by turning on the main switch or by reconnecting the batteries.

98
Start the engine and check the oil pressure. Run the engine up to operating temperature and check for oil leaks. Also, check for coolant and air leaks. Check the coolant level and refill as necessary.

99
Install the outer section of the engine cover (includes waste basket and center dash trim panel).



W2004750