VOLVO
Volvo Trucks North America
Greensboro, NC USA

Service Bulletin Trucks

This service bulletin replaces bulletin 237-49, dated 9.2013.

Date	Group	No.	Release	Page
6.2016	**237**	**49**	**09**	1(14)

Engine Injector, Replacement (Flat)

This information covers flat engine injector replacement for VOLVO D11, D12, D13 and D16 engines.

Contents

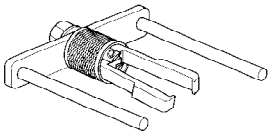
Note: Information is subject to change without notice.
Illustrations are used as reference only and can differ slightly from the actual engine version. However, key components addressed in this information are represented as accurately as possible.

Tools

Special Tools

For information on ordering special tools, please refer to the special tools information, Function Group 08.

9996956
D11 and D12 Flywheel Turning Tool

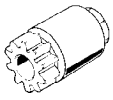


J48922
Heavy-Duty Injector Puller

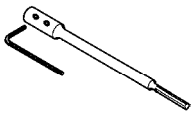
9998511
Lever

9998249
Protection Sleeve

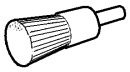
9998251
Protective Plug



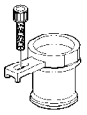
88800014
D13 and D16 Flywheel Turning Tool



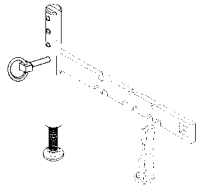
J42885-1
Handle



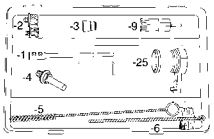
J42885-9
Flat Injector Tube Cleaning Brush



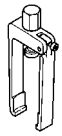
J42885-25
Fuel Bore Protector



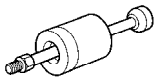
J41989
Valve Spring Compressor



J42885
Flat Injector Tube Bore Brush Set



9990006
Puller



9990013
Slide Hammer

Service Procedures

2374-03-02-03
Engine Injector, Replacement (Flat)

You must read and understand the precautions and guidelines in Service Information, Function Group 20, “Engine Safety Practices” 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: 9996956, 9998249, 9998251, 9998511, J42885, J41989, J48922, 88800014, 9990006, 9990013

Removal

CAUTION

Conical and copper injectors and sleeves should not be mixed in the same engine. The same type of injector and sleeve must be used in all six cylinders. Mixing sleeves can result in damage to the engine.

1
Secure the vehicle for service by parking it on a flat level surface, applying the parking brake, chocking the rear wheels, and placing the transmission in neutral or park.

2
Disconnect all cables from the negative (ground) battery terminals to prevent personal injury from electrical shock and prevent damage to electrical components.

3
Clean around the fuel supply line fitting on the filter housing. Loosen the fuel line at the filter housing to allow fuel to drain from the cylinder head. Allow the fuel to drain into a suitable container.

4
Remove the valve cover from the engine. Refer to Function Group 211 for service procedures.

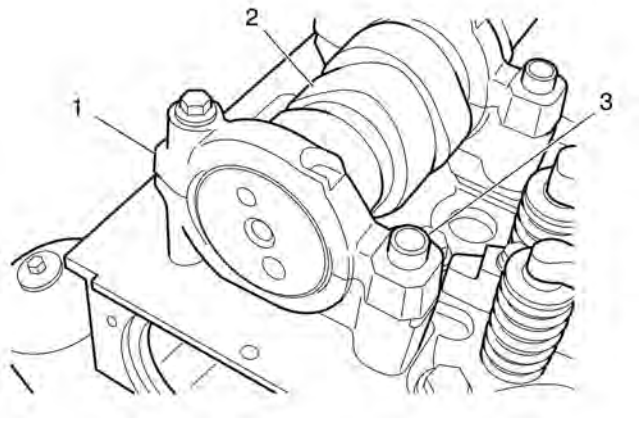
Note: Rotate the valve cover as needed, to clear the camshaft gear and damper.

Note: Dependent upon chassis, engine cover may need to be removed for clearance to remove valve cover.

5
Remove the rocker arm shaft. Refer to Function Group 214 for service procedures.

> **CAUTION**
>
> The order of the rocker arm assembly must be maintained. Make certain the sets of four are kept together. Make certain the rocker arms are identified so they can be returned to their original positions on the shaft. Failure to heed this caution may result in severe engine damage.

6
Make sure the alignment sleeves remain in position on each bearing cap.

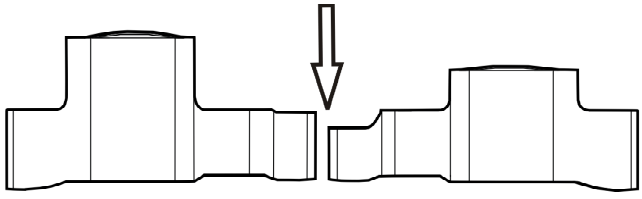


W2005514

1 Camshaft Bearing Cap
2 Camshaft
3 Alignment Sleeve

7
Mark the valve bridges so they can be installed in the same location during reassembly. Remove the valve bridges.

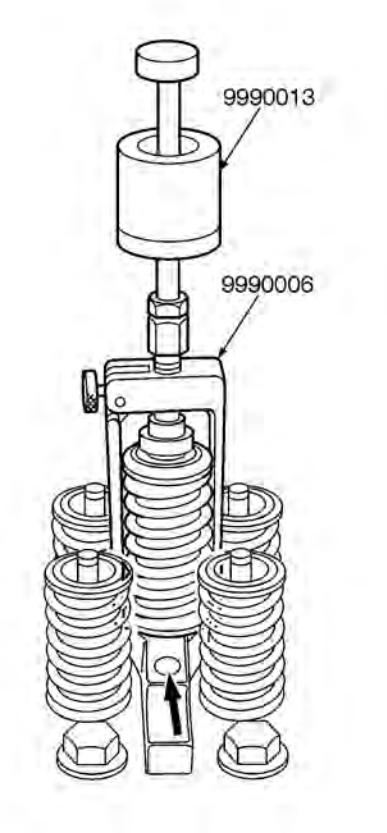
Note: Mark the location of the injectors for reinstallation. Injectors must be installed in the same cylinder as they were removed.



W2006625

Injector Hold Downs

8
Thoroughly clean around the injectors that are to be removed. Remove the injector hold down bolt. If the hold down has a recess in the yoke, proceed to Removal Step 9. If the hold down does NOT have a recess in the yoke, proceed to Removal Step 10.



W2005170

9

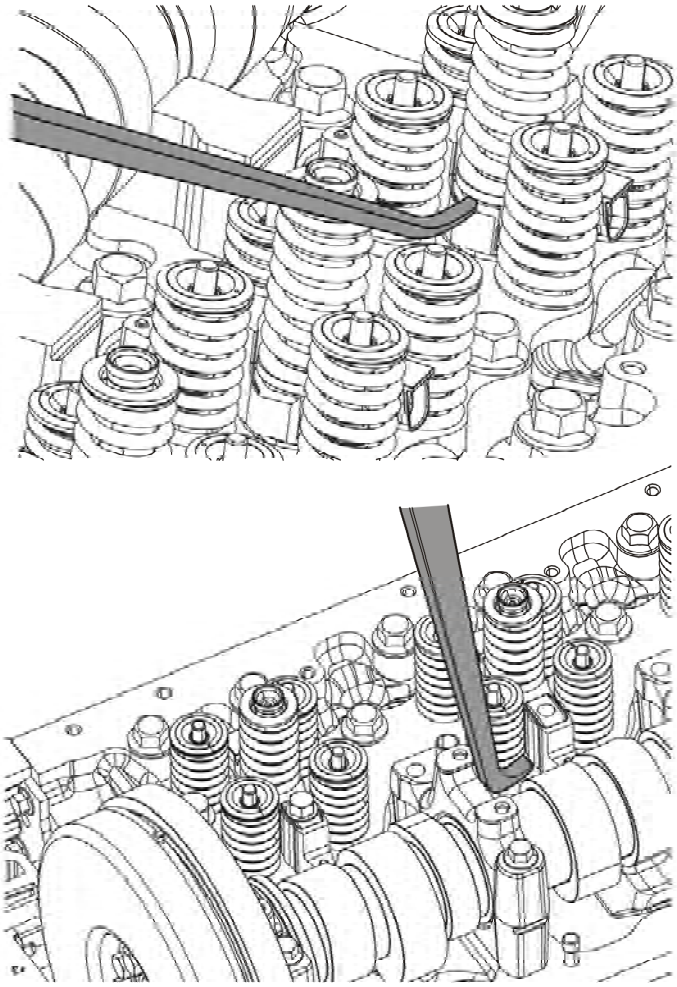
CAUTION

Do not use excessive force on the injector with the slide hammer. If the injector is stuck in the sleeve, the puller can be damaged by the slide hammer.

Install the puller onto the injector. Position the puller fork in the groove on the injector and lock the arm using the thumb screw on the side. Secure the puller by screwing down the screw toward the inner cup of the injector. Install the slide hammer. Use reasonable force with the slide hammer to pull the injector free from the cylinder head. If the injector can not be removed with the slide hammer and puller, proceed to Removal Step 15. If the injector can be removed with the slide hammer and puller, proceed to Removal Step 16.

Note: Use care when removing the injector because the injector hold down is not secure and could fall off if not held in place.

9990006, 9990013



W2006623

10

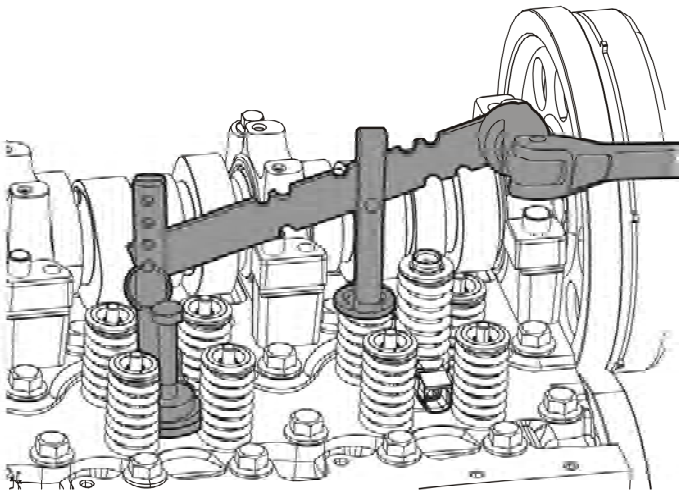
CAUTION

Do not use excessive force on the injector with the pry bar. If the injector is stuck in the sleeve, the pry bar can cause damage to engine components.

Use reasonable force with a pry bar under the hold down or injector lip to remove the injector. If the injector can not be removed with the pry bar, proceed to Removal Step 11. If the injector can be removed with the pry bar, proceed to Removal Step 14.

Note: Use care when removing the injector because the injector hold down is not secure and could fall off if not held in place.

9998511



W2006622

11

Install valve spring compressor in adjacent cylinder injector hold down bolt hole.

Note: Cover all oil passage holes in the cylinder head and gear train opening with shop towels.

J41989

12
Remove the shop towel from the gear train opening. Use special tool to turn the engine until the camshaft is at TDC. Depending on which injector is being removed, turn the engine from TDC to the appropriate camshaft mark, see table below. Confirm the piston is at the top of the cylinder by using a 40 cm (16 inch) piece of straight stiff wire in the injector hole of the companion cylinder.

D13 Engines with Engine Brake Camshaft Marks

Companion Cylinder	Camshaft Mark
1 and 6	TDC
2 and 5	Between 5E6 and 3E2
3 and 4	Between 3E2 and 6E4

D13 Engines without Engine Brake and All D11, D12 and D16 Engines Camshaft Marks

Companion Cylinder	Camshaft Mark
1 and 6	V3TDC
2 and 5	V6
3 and 4	V2

88800014, 9996956

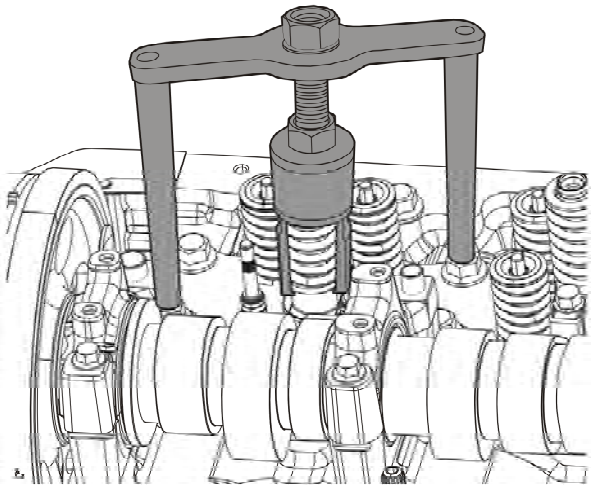
13

WARNING

Use protective goggles or injury to the eyes can occur.

Cover the gear train opening with a shop towel. Compress the intake valve spring and remove keepers and spring. Remove the injector hold down.

14
Position and compress intake valve spring and install keepers. Tap on the valve stem with a soft-faced mallet to make sure keepers are seated properly. Remove the compressor tool from the cylinder head.



W2006624

For clarity, the puller is shown on the cylinder head with the valve springs removed. If the valve springs were removed to remove the hold down, it is not necessary to install the springs before removing the injector. However, installing the springs protects the valve stems from damage during injector removal.

15

Install the puller onto the injector. Position the puller forks in the grooves on the injector. Secure the puller by sliding the lock collar down over the forks and secure with collar nut to hold the injector. Remove the injector, and hold down if not already removed, from the cylinder head using hand tools.

Note: Use care when removing the injector because the injector hold down is not secure and could fall off if not held in place.

CAUTION

If excessive combustion leakage has resulted in the sleeve being stuck-fast to the injector by carbon, the injector must be replaced. The condition is found when the injector is removed and the sleeve comes out with the injector.

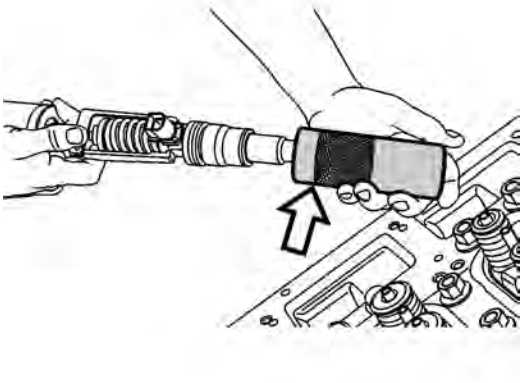
J48922

16

Remove and discard the injector nozzle gasket from the injector tip or copper sleeve bore.

Note: If an injector nozzle gasket had been used for the seal joint between the injector copper sleeve and the injector, discard the used gasket immediately after the injector is removed. A used gasket must not be reused. When the injector is removed, this gasket may come out attached to the injector or it may remain in the bottom of the injector sleeve.

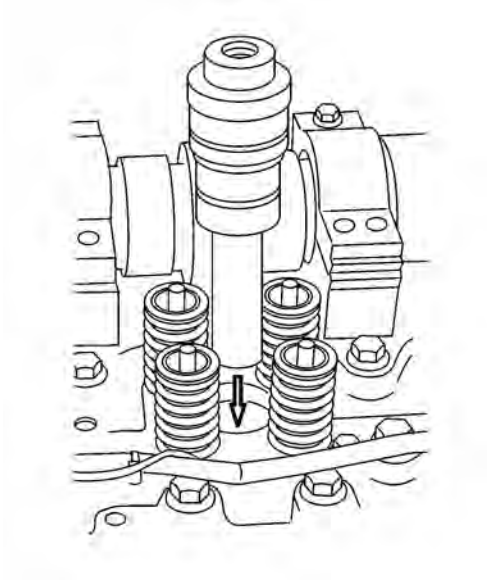
Note: If the nozzle gasket is attached to the injector, loosen it with gentle prying from a thin flat gasket scrapper blade. If the gasket is in the bottom of the injector sleeve, initially attempt to remove it with a magnet. If this is unsuccessful, use a standard flat blade screwdriver with a long thin shank and narrow width blade to loosen the gasket. Locate the blade in the recess between the outside of the gasket and the injector sleeve. Use the blade to apply force on the outside of the gasket at different locations around the gasket. Continue this until the gasket separates from the sleeve.



W2005112

17
Install the protective sleeve over the injector to prevent damage.

9998249



W2005172

18
Clean the protective plug and install it into the injector bore of the cylinder head to protect it from debris. Using compressed air, clean out the injector hold down bolt holes.

⚠ DANGER

Compressed air can cause serious personal injury. When using compressed air for cleaning, wear a protective face shield, protective clothing and protective shoes. Pressurized water could cause particles and/or hot water to be sprayed in your direction and cause personal injury. The maximum air pressure must be below 200 kPa (30 psi) for cleaning purposes.

⚠ CAUTION

It is very important to clean out injector yoke bolt holes. If fluid is not cleaned out, hydraulic lock can occur when tightening tools or injectors and can result in lack of low clamp load and cylinder head cracking at the injector yoke bolt hole.

Note: Make sure the protective plug is clean so it does not introduce dirt or contaminants into the engine.

9998251

Installation

1
Install the protective sleeve and clean the injector sleeve with the brushes in the kit.

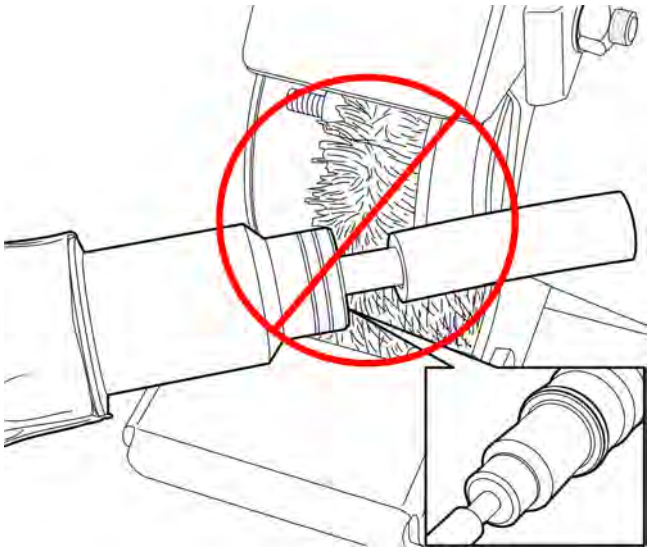
Note: After cleaning the sleeve, carefully inspect the inside surface of the sleeve, especially the bottom surface. Any remaining contamination is unacceptable and must be removed. Also, if there is any indication of a discrepancy that raises concern about suitability of the sleeve for reuse, replace it with a new sleeve.

J42885

2
To determine if the injector is suitable for reuse, the injector must be cleaned. Clean the cap nut seat surface of hard carbon deposits with a shop rag and diesel fuel. This is the only approved cleaning procedure.

CAUTION

Do not use a wire wheel to clean the cap nut seat surface. Only use a shop rag and diesel fuel to clean the cap nut seat surface.



W2080152

DO NOT USE A WIRE WHEEL TO CLEAN INJECTORS

3
After cleaning, inspect the injector nozzle cap nut seat surface for pitting or related damage. If there is pitting or other damage, the injector and sleeve can not be reused. If there is no pitting on the seat surface, the injector and sleeve can be reused.**The injector must be reinstalled in the same cylinder from which it was removed.**

Note: Pitting on surfaces other than the cap nut seat surface does not effect the function of the injector and is acceptable.

4
Install new O-rings on the injector as follows:

- Upper ring — large diameter, violet
- Lower ring — small diameter, violet

5
Lubricate both sealing O-rings with clean engine oil.

Note: Clean engine oil is the only approved lubricant for the injector O-ring.

6

Preassemble the new injection nozzle NBR washer to the injector. Three small projections (grippers) on the inside diameter of this NBR washer provide the means to retain the gasket to the injector on assembly. Using hand force, push the NBR washer over the injector tip until it becomes fully seated against the bottom of the injector.

Note: Before installing the gasket, inspect it to ensure that it is the correct part. The correct gasket is identified by three small projections on the inside diameter and a gray coating over the entire gasket to enhance the ability to seal.

Note: This gasket must be installed dry. Do not use grease or any other materials to secure this gasket to the injector for installation.

7

CAUTION

Any oil which may have pooled in the bottom of the injector yoke screw hole must be cleaned from the hole to avoid hydraulic lock when the screw is installed and tightened. Hydraulic lock would result in a lack of clamp load and/or a cylinder head cracked at the screw hole.

CAUTION

The new long screw must be used with the 38 mm high yoke. If the shorter screw for the 28 mm high yoke is used with the 38 mm yoke, insufficient thread engagement in the cylinder head will result and the cylinder head threads will fail during screw tightening.

CAUTION

Do not mix tall (38mm) and short (28mm) hold downs in the same engine. Use either all tall or all short hold downs. Mixing tall and short hold downs in the same engine may result in engine damage.

Clean the injector hold down yoke and apply light coat of oil to the threads and underside of the head of a NEW bolt Slip the injector hold down and bolt onto the injector

8

Note: Replace the injector hold down fastener each time an injector is installed. The bolt cannot be reused and must be replaced.

Note: If available, use an electronic digital torque wrench for the tightening procedure

Center the injector between the valve springs and then push down on the injector using hand pressure to seat the O-rings. Clamp the injector in position with the injector hold down by tightening the injector hold down bolt. Tighten the injector hold down bolt using the following five step procedure:

CAUTION

Ensure the proper torque value is used for tightening your Injector hold down to prevent damage to the hold down and/or Injector hold down. Follow the torque tightening procedures below for tightening injector hold downs.

38 mm injector hold downs

1 Tighten 20 ± 5 Nm (15 ± 4 ft-lb).
2 Tighten 180 ±5 degrees angle of tightening.
3 Loosen the hold down bolt until torque is 10 to 15 Nm (7.0 to 11.0 ft-lb).

Note: This should be achieved by loosening with an angle of 100-110 degrees. Do not completely loosen the bolt to prevent components from moving after the previous seating process.

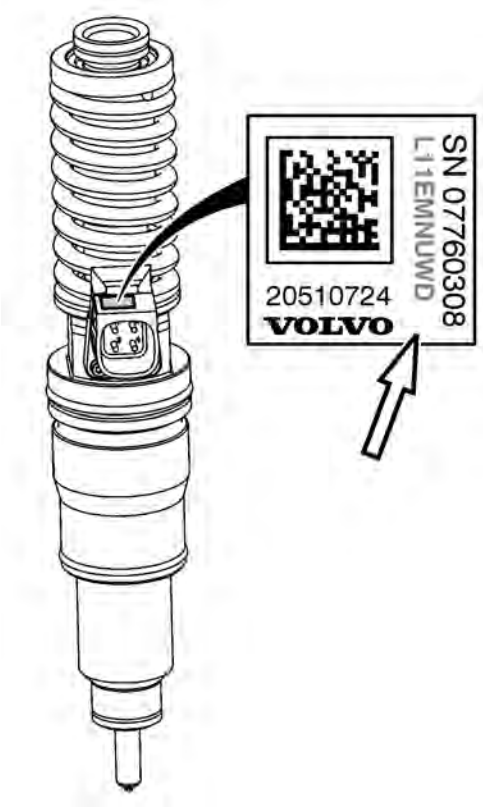
4 Tighten 20 ± 5 Nm (15 ± 4 ft-lb).
5 Tighten 90 ±5 degrees angle of tightening.

28 mm injector hold downs

1 Tighten 20 ± 5 Nm (15 ± 4 ft-lb).
2 Tighten 180 ±5 degrees angle of tightening.
3 Loosen the hold down bolt until torque is 10 to 15 Nm (7.0 to 11.0 ft-lb).

Note: This should be achieved by loosening with an angle of 100-110 degrees. Do not completely loosen the bolt to prevent components from moving after the previous seating process.

4 Tighten 20 ± 5 Nm (15 ± 4 ft-lb).
5 Tighten 60 ±5 degrees angle of tightening.



W2004684

9
When replacing injectors, the engine control module (ECM) must be programmed with the new injector's trim codes. The code is printed on top of the injector electrical connector. The programming is performed using Tech Tool and is necessary to ensure that engine timing and emission levels are correct.

Note: Due to the ECM self learning capability, it is necessary to reset learned ECM parameters after servicing some engine related components. This allows the ECM to learn the new components behavior. After servicing is complete, perform the "Learned Data Reset" using Tech Tool. This is located in the Function Group 1 menu.

Note: If reinstalling an injector into the same location, reprogramming is not required.

10
Install the valve bridges onto the same cylinders as marked at disassembly. Lubricate the valve bridges and camshaft lobes with engine oil.

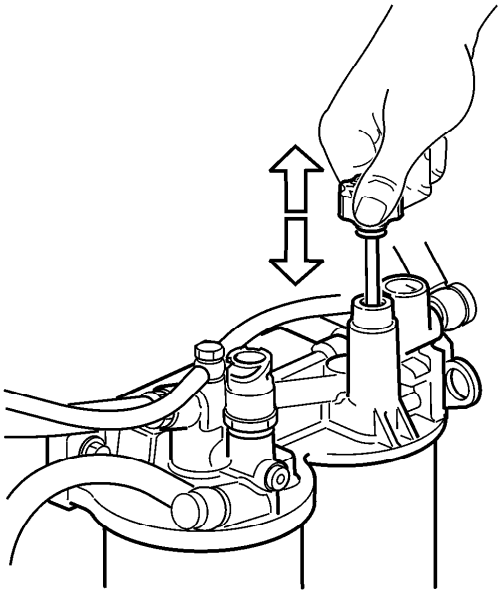
11
Install the rocker arm shaft. Refer to Function Group 214 for service procedures.

12
Adjust the inlet and exhaust valves and injectors. Refer to Function Group 214 for service procedures.

13
Install the valve cover on the cylinder head. Refer to Group 211 for service procedures.

14
Secure the fuel supply line fitting at the fuel filter housing (loosened earlier to drain fuel from the cylinder head). Clean any fuel that remains around the fitting. Always replace the fuel line seal washers.

15
Install all previously removed cables to the ground (negative) battery terminals.



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16
Prime the fuel system by pumping the hand priming pump on the fuel filter housing until resistance is felt indicating that the system is full of fuel.

17
Start the engine and run until the engine clears and runs without stumbling. This procedure might need to be repeated to get the fuel system completely free of air.

Note: If the engine does not start on the first attempt, prime the fuel system again. Engine priming might need to occur several times in order to get the engine to start.

18
Allow the engine to run at low idle for about 5 minutes. Check for any fuel leaks and correct as necessary.

Note: The engine speed should **not** be increased as any air pockets can be forced into the cylinder head which can result in the engine shutting off.