

TM1837 - 27ZTS Excavator Remove and Install Fuel Injection Pump

Remove and Install Fuel Injection Pump

 **CAUTION:**

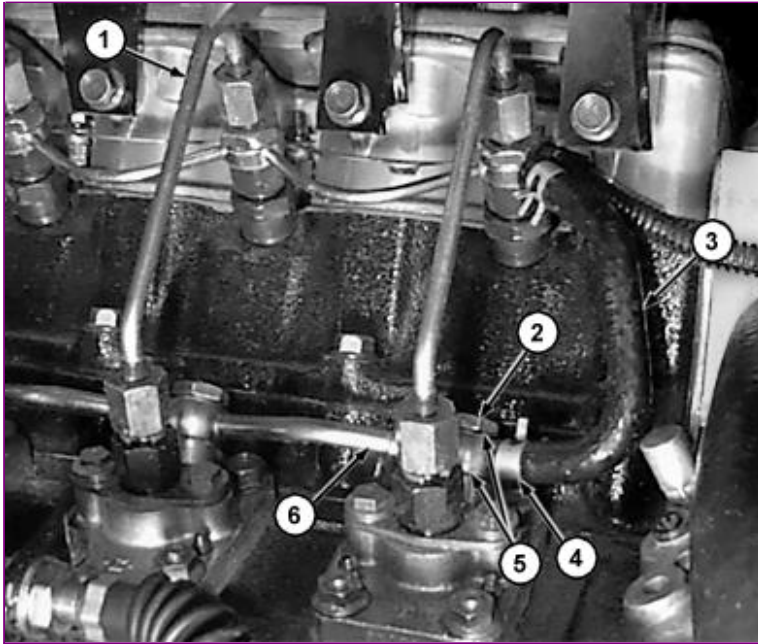


X9811-UN: High-Pressure Fluid

Escaping diesel fuel under pressure can have sufficient force to penetrate the skin, causing serious injury. Before disconnecting lines, be sure to relieve pressure. Before applying pressure to the system, be sure ALL connections are tight and lines, pipes and hoses are not damaged. Keep hands and body away from pinholes and nozzles which eject fluid under pressure. Use a piece of cardboard or wood, rather than hands, to search for suspected leaks.

If ANY fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury or gangrene may result. Doctors unfamiliar with this type of injury may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.

Any time the fuel system has been opened up for service (lines disconnected or filters removed), it will be necessary to bleed air from the system. (See [Bleed Fuel System](#) in this group.)



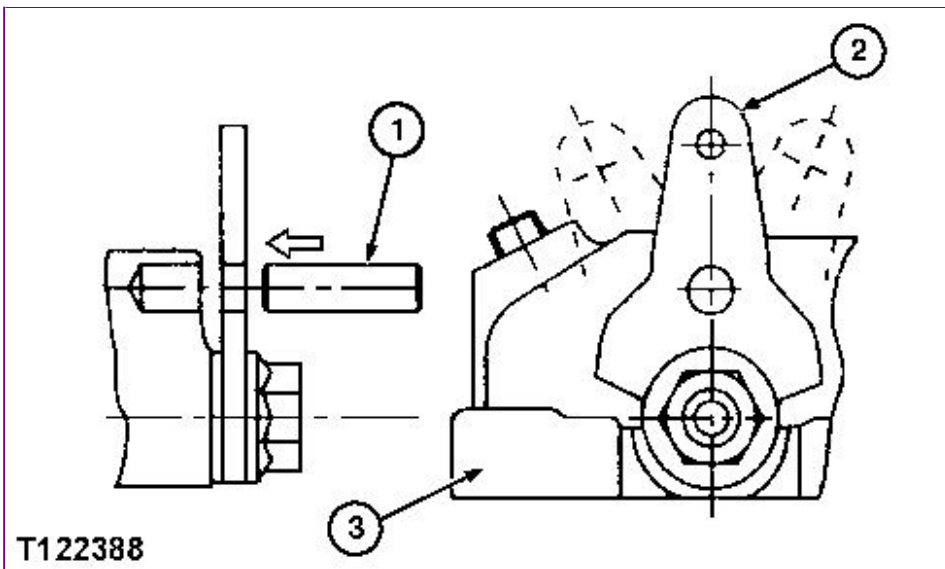
1. T123181-UN: Injection Pump Injection and Supply Lines

LEGEND:

- 1 - Injection Line
- 2 - Cap Screw (4 used)
- 3 - Hose
- 4 - Clamp
- 5 - Washer (8 used)
- 6 - Supply Line

Remove fuel injection line (1).

2. Remove clamp (4) and hose (3).
3. Remove cap screws (2) and washers (5).
4. Remove fuel supply line (6).

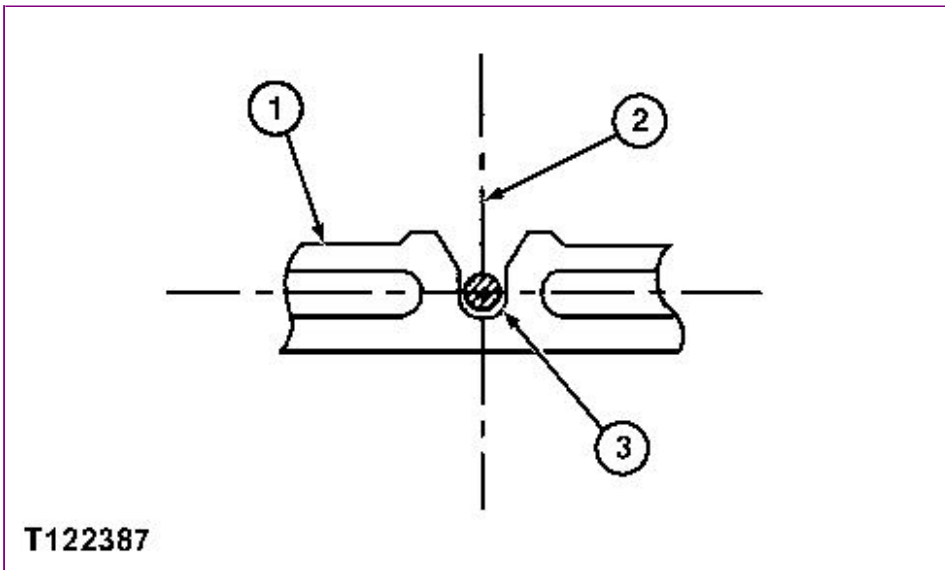


5. T122388
T122388-UN: Align Fuel Cut-Off Lever-to-Governor Cover

LEGEND:

- 1 - Pin
- 2 - Lever
- 3 - Cover

Align hole of fuel cut-off lever (2) with hole of governor cover (3) and insert pin (1) into hole.



6. T122387-UN: Center Control Link Pin Groove

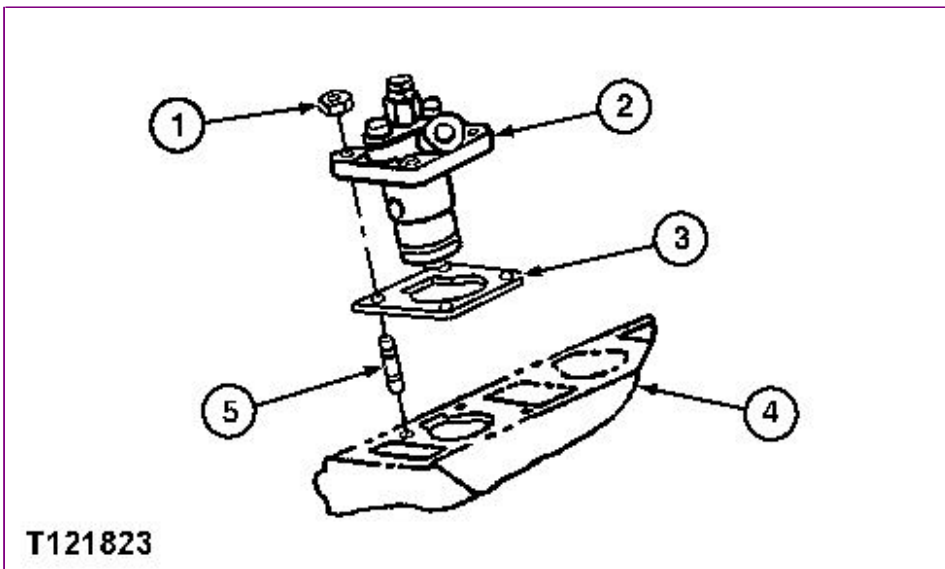
LEGEND:

- 1 - Control Link
- 2 - Injection Pump Center Position
- 3 - Pin

Check to see if pin groove of control link (1) is at center of injection pump (2).

NOTE:

Mark each pump to aid in assembly. Do not reuse shim; replace with same thickness.



7. T121823-UN: Remove and Install Injection Pump

LEGEND:

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- 1 - Nut (4 used)
- 2 - Injection Pump
- 3 - Shim
- 4 - Clamp

Remove nuts (1), injection pump (2), and shim (3).

NOTE:

For injection pump repair and testing, have an authorized ADS diesel injection repair station perform the work. Unauthorized repairs made to the fuel injection pump will void warranty.

- 8. Install new shim (3) with same thickness as removed.
- 9. Install injection pump (2) making sure that rack pin is in groove of control rack before tightening injection pump.

| Item | Measurement | Specification |
|-----------------------|-------------|--------------------|
| Fuel Injection | | |
| Pump Cap Screw | Torque | 28 N·m (252 lb-ft) |

- 10. Remove rack pin from fuel cut-off lever. Confirm lever moves smoothly.
- 11. Install fuel supply line, washers, cap screw and tighten.

| Item | Measurement | Specification |
|----------------------------|-------------|---------------------|
| Fuel Injection | | |
| Fuel Supply Line Cap Screw | Torque | 24 N·m (212 lb-in.) |

- 12. Install hose and clamp.
- 13. Install fuel injection line and tighten nut.

| Item | Measurement | Specification |
|-----------------------|-------------|---------------------|
| Fuel Injection | | |
| Line Nut | Torque | 24 N·m (212 lb-in.) |

- 14. [Bleed fuel system.](#) (See procedure in this group.)

TM1837 - 27ZTS Excavator Repair Fuel Injection Pump

Repair Fuel Injection Pump

IMPORTANT:

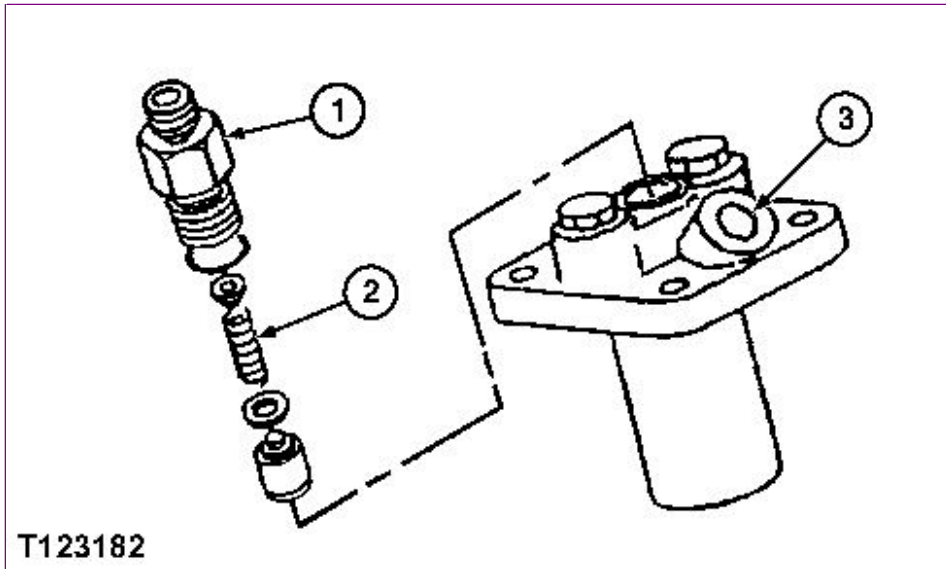
Do not disassemble the fuel injection pump further than necessary for installing available repair parts—not even for cleaning.

Be sure that all identification numbers are legible so that pump is set to the correct specification for its intended application.

For injection pump repair and testing, have an authorized ADS diesel injection repair station perform the work. Unauthorized repairs made to the fuel injection pumps will void warranty.

TM1837 - 27ZTS Excavator Injection Timing Test and Adjustment

Injection Timing Test and Adjustment



T123182-UN: Remove Valve Holder from Injection Pump

LEGEND:

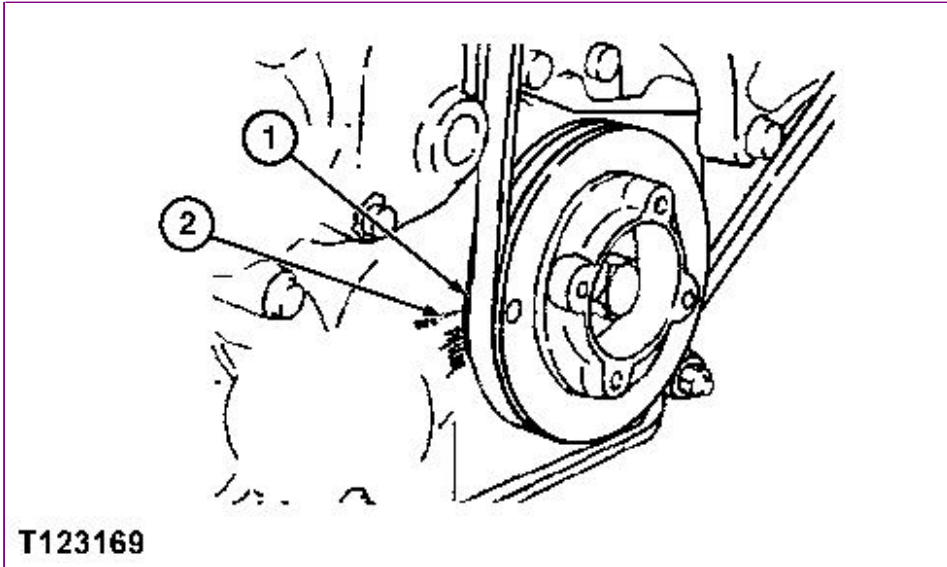
- 1 - Valve Holder
- 2 - Spring
- 3 - Injection Pump

1. Remove fuel injection line from No. 1 cylinder.
2. Remove valve holder (1) from injection pump and remove spring (2).
3. Install valve holder without spring into injection pump (3).
4. Slowly turn crankshaft pulley clockwise. At the same time continue to feed the fuel.

Stop turning crankshaft when fuel stops flowing out of No. 1 delivery valve holder.

NOTE:

This crank angle position is the starting point of injection.



5. T123169-UN: Groove Mark and TDC Mark

LEGEND:

- 1 - Groove Mark
- 2 - TDC Mark

Note position of groove mark (1) on crankshaft pulley with TDC mark (2) on timing gear case cover.

| Item | Measurement | Specification |
|-----------------------|-------------|---------------|
| Fuel Injection | | |
| Fuel Injection Pump | Timing | 19° BTDC |

6. Shim accordingly. Adjust timing with a shim between injection pump and cylinder block.
7. Remove valve holder and install spring.
8. Install valve holder and fuel injection line.

TM1837 - 27ZTS Excavator Remove and Install Fuel Injection Nozzle

Remove and Install Fuel Injection Nozzle

 **CAUTION:**



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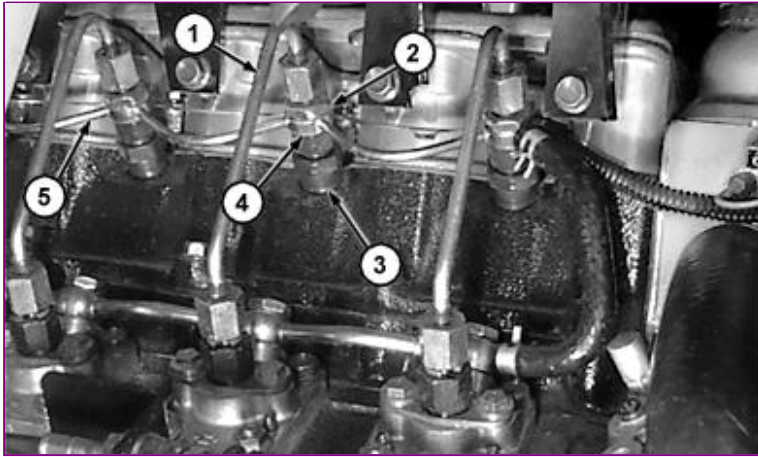
If ANY fluid is injected into the skin, it must be surgically removed within a few hours by a doctor familiar with this type of injury or gangrene may result. Doctors unfamiliar with this type of injury may call the Deere & Company Medical Department in Moline, Illinois, or other knowledgeable medical source.

Any time the fuel system has been opened up for service (lines disconnected or filters removed), it will be necessary to bleed air from the system. (See [Bleed Fuel System](#) in this group.)

IMPORTANT:

Before removal, thoroughly remove all dirt from the cylinder head around fuel injection nozzles. Clean with compressed air to prevent dirt from entering the cylinders. Plug the bore in the cylinder head after each nozzle has been removed. Cap fuel line openings as soon as they are disconnected.

Do not bend the fuel delivery lines, as this may affect their durability. When loosening the fuel pressure lines, hold male union of nozzle line stationary with a backup wrench.



1. T123164-UN: Remove Fuel Injection and Leak-Off Line

LEGEND:

- 1 - Fuel Injection Line (3 used)
- 2 - Nut (3 used)
- 3 - Nozzle (3 used)
- 4 - Washer (3 used)
- 5 - Fuel Leak-Off Line

Remove fuel injection line (1) from fuel injection nozzle and fuel injection pump using a backup wrench on nozzle connection.

NOTE:

When all fuel injection nozzles have been removed, disconnect leak-off line and remove as a complete assembly. For individual nozzle removal, remove only the section of leak-off line necessary for nozzle removal.

2. Remove nut (2) to remove fuel leak-off line (5). Line must be removed as an assembly. Remove washer (4).
3. Remove fuel injection nozzle (3). Protect opening to avoid contamination.
4. Repair or replace as necessary.

5. **IMPORTANT:**

Before installing injection nozzles, make sure nozzles are clean and free from oil or grease.

NOTE:

If nozzle bore in cylinder head must be cleaned, use a nozzle bore cleaning tool.

Install injection nozzles (3) and tighten.

| Item | Measurement | Specification |
|-----------------------------|-------------|-------------------|
| Fuel Injection | | |
| Nozzle-to-Cylinder Head Nut | Torque | 49 N·m (36 lb-ft) |

6. Install washer (4) and leak-off line (5). Tighten nut (2).

| Item | Measurement | Specification |
|-----------------------|-------------|---------------------|
| Fuel Injection | | |
| Leak-Off Line Nut | Torque | 34 N·m (301 lb-in.) |

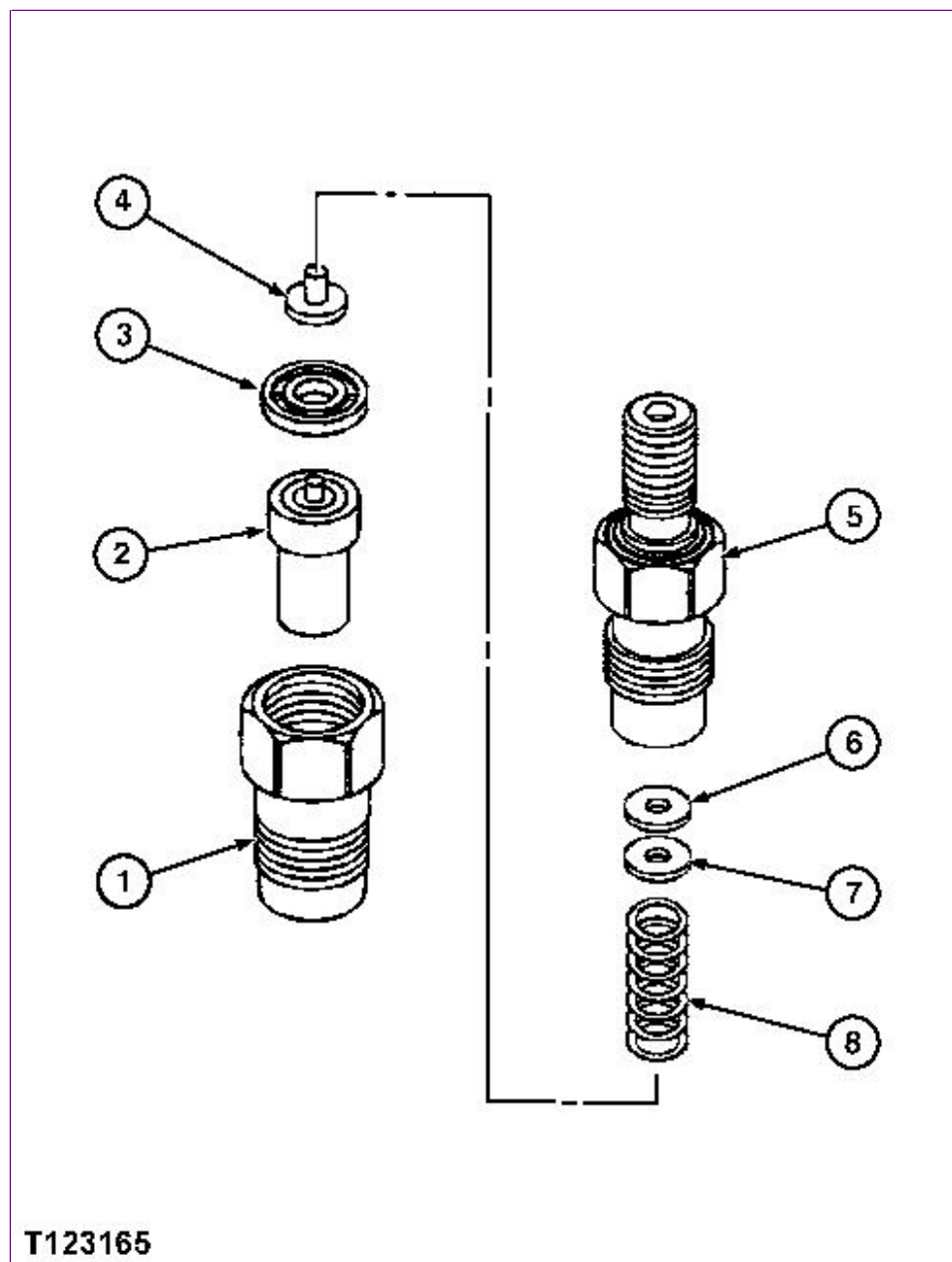
7. Install fuel injection line (1) using a backup wrench on nozzle connection.

| Item | Measurement | Specification |
|-----------------------|--------------------|----------------------|
| Fuel Injection | | |
| Line Nut | Torque | 24 N·m (212 lb-in.) |

8. [Bleed fuel system](#). (See procedure in this group.)

TM1837 - 27ZTS Excavator Disassemble and Assemble Fuel Injection Nozzle

Disassemble and Assemble Fuel Injection Nozzle



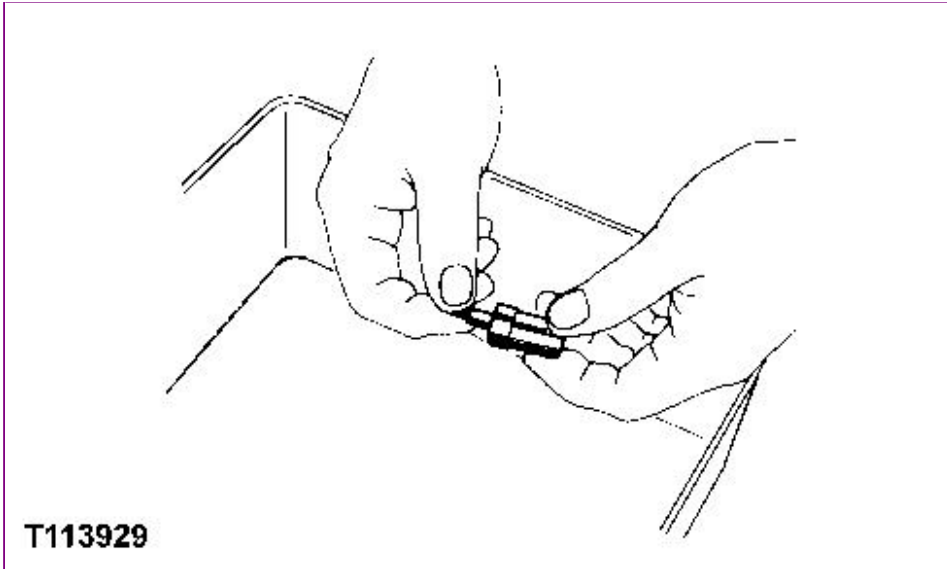
T123165

T123165-UN: Fuel Injection Nozzle

LEGEND:

- 1 - Retaining Nut
- 2 - Injection Nozzle
- 3 - Spring Spacer
- 4 - Push Rod
- 5 - Nozzle Assembly
- 6 - Shim
- 7 - Shim
- 8 - Nozzle Spring

1. Disassemble parts (1—8).

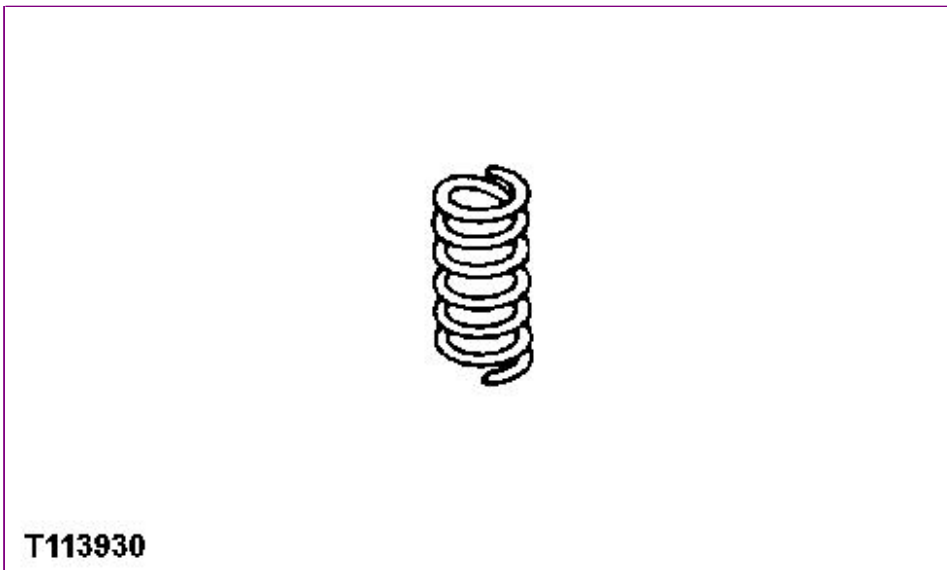


T113929

2. T113929-UN: Check Valve Fit in Body

Remove nozzle assembly from nozzle body. Keep parts separate to maintain proper needle valve-to-body combination.

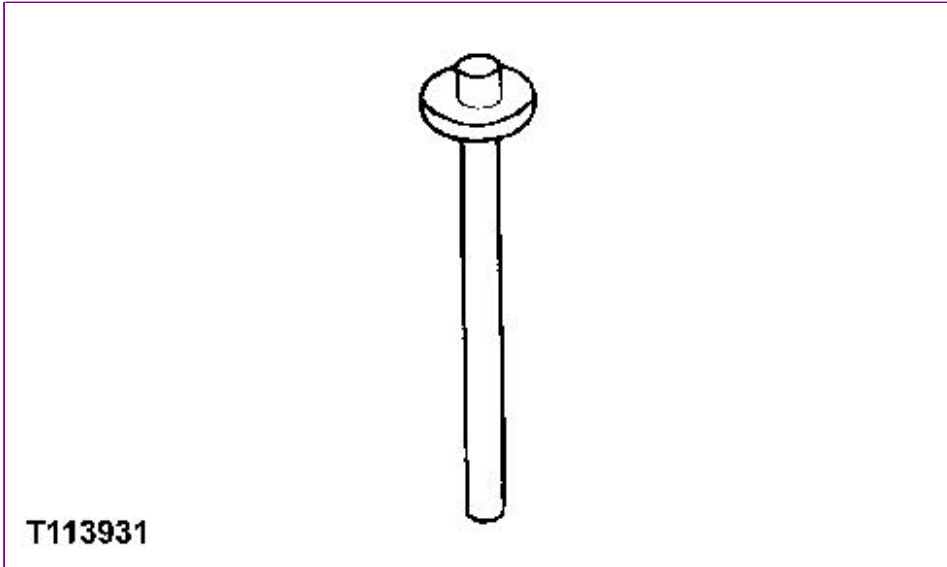
3. Check to see if valve moves smoothly in body. If not, repair or replace nozzle.



T113930

4. T113930-UN: Push Rod Spring

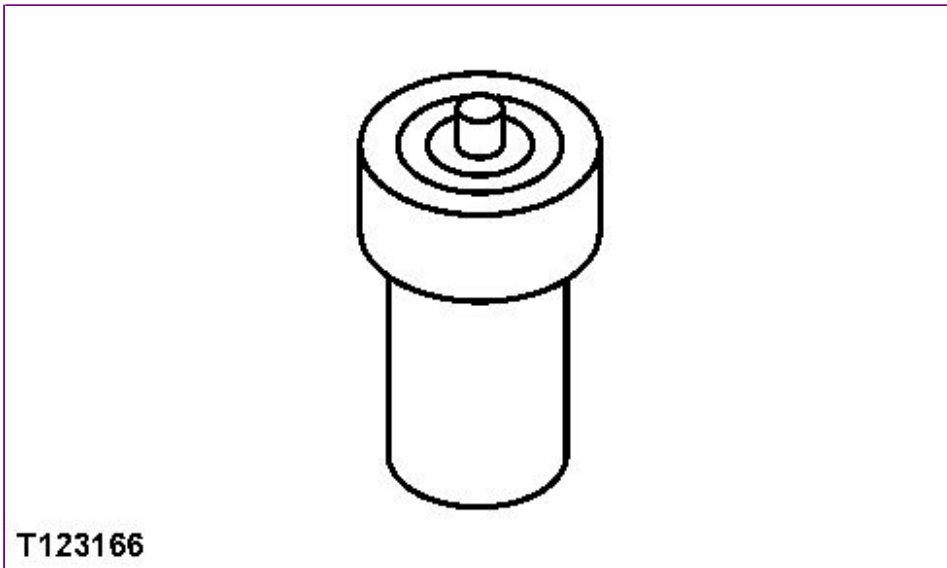
Check push rod spring for wear, weakness, and corrosion.



5. **T113931**
T113931-UN: Nozzle Holder Push Rod/Needle Valve

Check nozzle holder push rod curvature.

6. Check nozzle holder push rod and needle valve contact surfaces for excessive wear and poor contact.



7. **T123166**
T123166-UN: Injection Nozzle

Check injection nozzle needle valve, valve seat and injection nozzle hole for carbon deposits. If carbon deposits are present, replace injection nozzle and needle valve.

8. Hold nozzle body vertically.

Pull needle valve out about one-third away from nozzle body.

Release needle valve.

Check that needle valve falls back into nozzle body as far as valve seat.

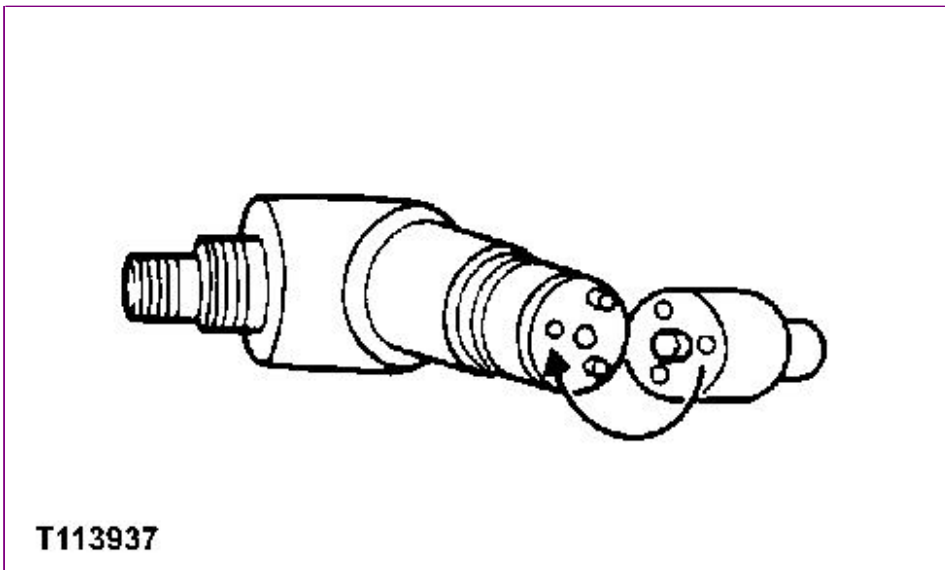
If needle valve does not fall back into nozzle body as far as valve seat, replace injection nozzle and needle valve.

9. **NOTE:**

There must be no oil on the contact surfaces of the injection nozzle and the injection nozzle holder.

Clean these contact surfaces with diesel fuel before installation.

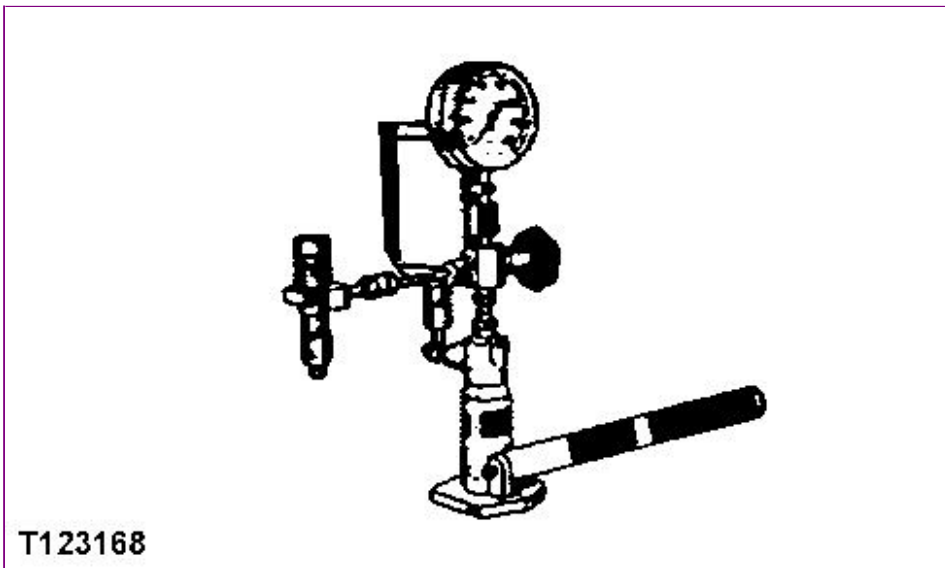
The nozzle dowel pin must be aligned with the dowel hole in nozzle holder body.



T113937-UN: Align Nozzle Dowel Pin to Holder Body

Install injection nozzle.

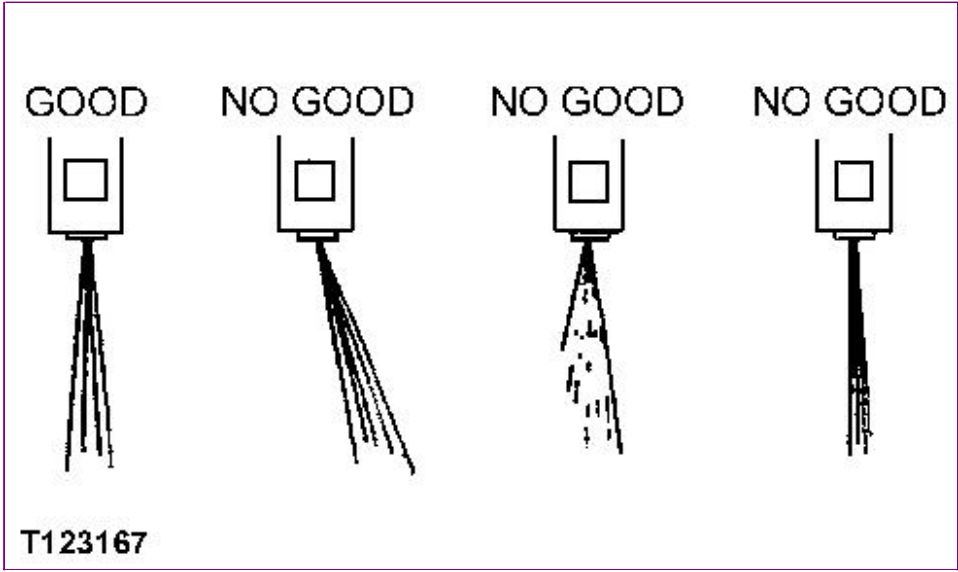
10. Install nozzle holder push rod, push rod spring, and nozzle adjusting screw.



11. T123168-UN: Adjust Pressure

Adjust injection starting pressure using 5-8840-9016-0 nozzle tester with shims.

| Item | Measurement | Specification |
|-----------------------|-------------|---------------------------------|
| Fuel Injection | | |
| Nozzle Starting | Pressure | 13 238 kPa (1920 psi) (132 bar) |



12.

T123167-19: Injector Nozzle Spray Conditions

Check spray condition of injection nozzle.

TM1837 - 27ZTS Excavator

Bleed Fuel System

Bleed Fuel System

Turn starter switch to the on position.

This will allow the fuel pump to force feed fuel to the fuel pipe and the lead-off pipe. Air in the fuel system is automatically bled.

TM1837 - 27ZTS Excavator

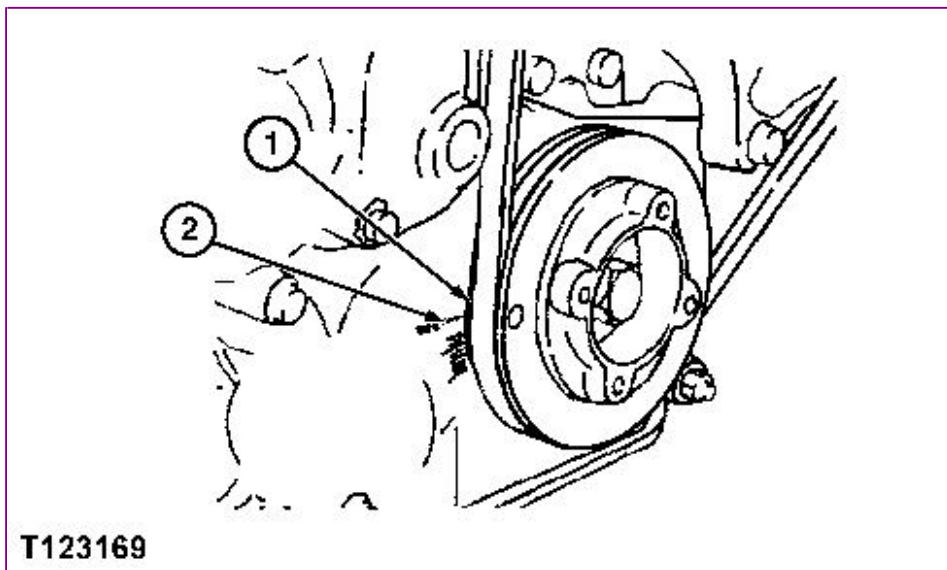
Engine Valve Clearance Adjustment

Engine Valve Clearance Adjustment

Summary

1. Perform measurement when engine is cold.
2. Before starting work, clean head cover mounting area to avoid contamination in engine.

Preparation



1. T123169-UN: Align TDC Mark on Crankshaft Pulley

LEGEND:

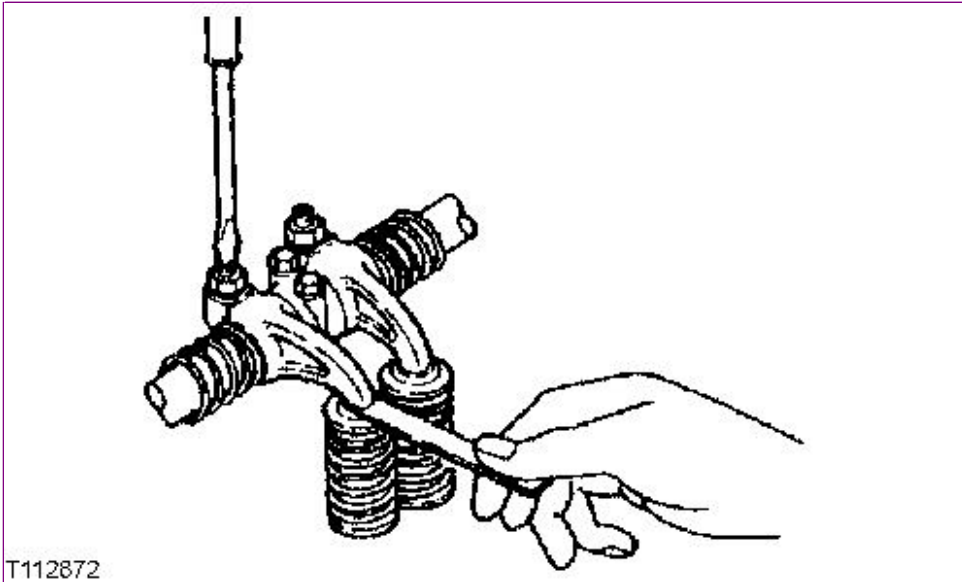
- 1 - TDC Mark
- 2 - Pointer

Locate top dead center (TDC) in compression stroke.

Align TDC (top dead center) mark (1) on crankshaft pulley with pointer (2) located on timing gear case as illustrated. Piston No. 1 or piston No. 3 is now positioned at the TDC in its compression stroke.

2. Remove head cover.
3. Check for play in the No. 1 intake and exhaust valve rocker arms. If the No. 1 cylinder intake and exhaust valve rocker arms have play, No. 1 piston is at TDC on the compression stroke. If the No. 1 cylinder intake and exhaust valve rocker arms are depressed, the No. 3 piston is at TDC on the compression stroke.
4. Start measurement from cylinder (No. 1 or No. 3) positioned at TDC in compression stroke.

Measurement



T112872

T112872-UN: Measure Rocker Arm-to-Valve Stem Clearance

1. Insert a feeler gauge into clearance between rocker arm and valve stem end to measure valve clearance.

NOTE:

The cylinders are aligned from No. 1 to No. 3 in order, as viewed from the fan side.

| Cylinder No. | 1 | | 2 | | 3 | |
|------------------------------------|---|---|---|---|---|---|
| Valve arrangement | I | E | I | E | I | E |
| No. 1 cylinder TDC for compression | ○ | ○ | ○ | | | ○ |
| No. 1 cylinder TDC for exhaust | | | | ⊙ | ⊙ | |

I ; Intake E ; Exhaust

T127228

- 2.

T127228-19: Valve Arrangement

Adjust the circle or double circle marked valves as shown, while the No. 1 or No. 3 cylinder is at TDC on compression stroke.

3. Rotate crankshaft 360°. Align TDC mark with pointer. Then, continue measurement of other valves in same way.

Evaluation

Standard Valve Clearance:

| Item | Measurement | Specification |
|-----------------------------------|-------------|---------------|
| Engine Valve Clearance Adjustment | | |

Engine Intake and Exhaust
Standard Valve

Clearance

0.20 ± 0.05 mm (0.008 ± 0.002 in.)
with engine cold

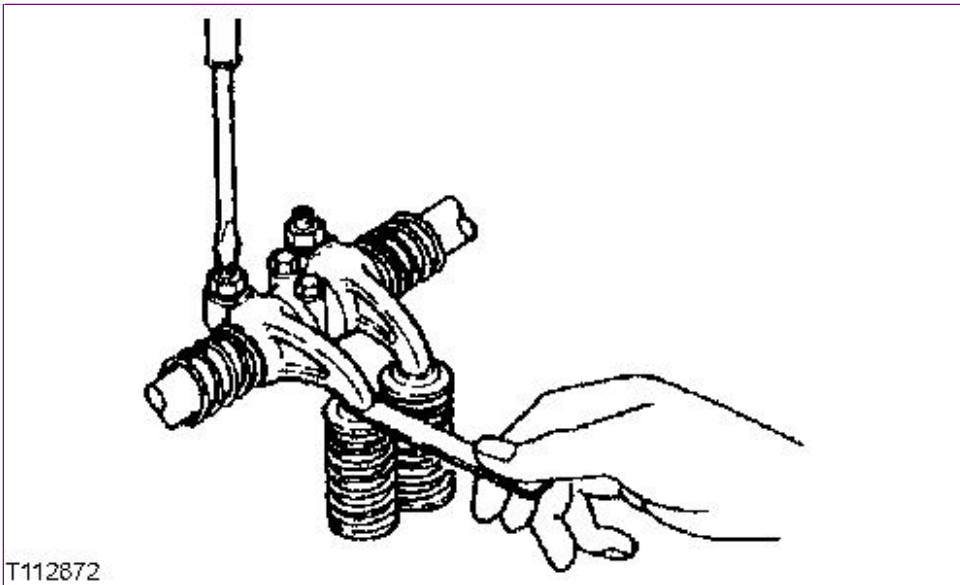
Place the No. 1 or No. 3 cylinder at TDC by turning the crankshaft until the TDC mark on the front cover aligns with the groove mark on the crankshaft pulley.

NOTE:

If the No. 1 cylinder intake and exhaust valve rocker arms have play, the No. 1 piston is at TDC on the compression stroke.

If the No. 1 cylinder intake and exhaust valve rocker arms are depressed, the No. 3 piston is at TDC on the compression stroke.

Adjustment



T112872

T112872-UN: Measure Rocker Arm-to-Valve Stem Clearance

If the measurement results are out of specification, adjust the valve clearance in the same order of measurement.

1. Loosen adjusting screw lock nuts for rocker arms.
2. Insert thickness gauge set at 0.20 mm (0.008 in.).

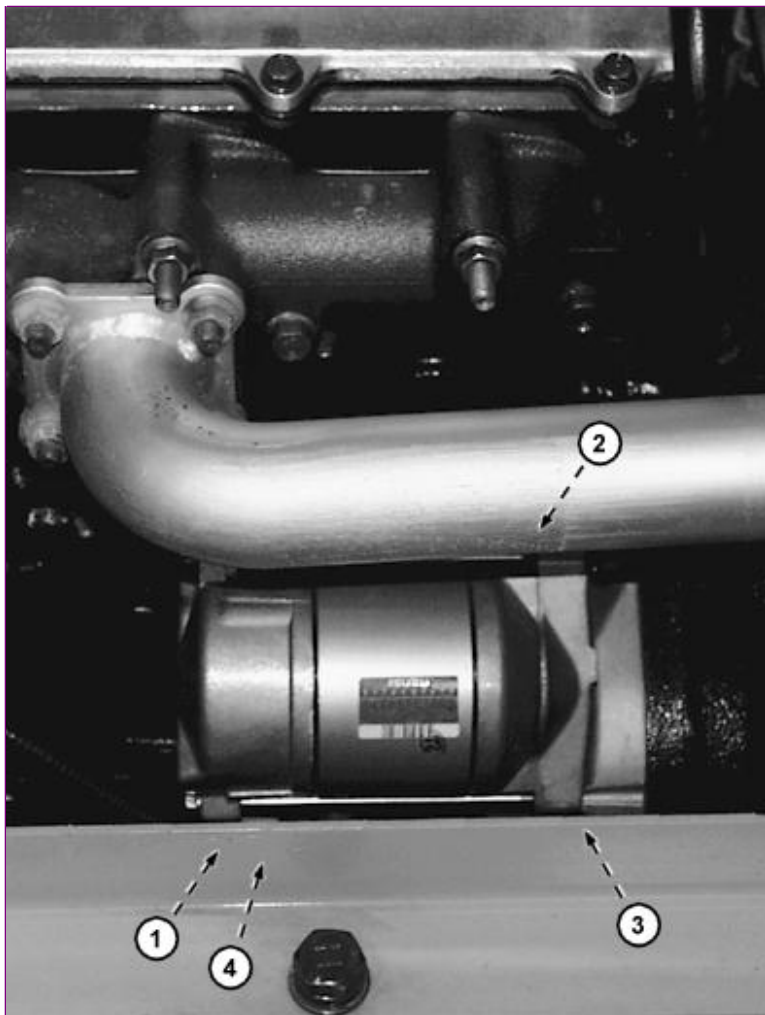
Adjust adjusting screws until slight drag can be felt on thickness gauge.

3. Tighten lock nuts securely.
4. Check valve clearance again after lock nuts are tightened.

| Item | Measurement | Specification |
|---|-------------|---|
| Engine Valve Clearance Adjustment | | |
| Engine Intake and Exhaust Standard Valve | Clearance | 0.20 ± 0.05 mm (0.008 ± 0.002 in.) with engine cold |

TM1837 - 27ZTS Excavator Remove and Install Starter

Remove and Install Starter



T125137-UN: Starter

LEGEND:

- 1 - Electrical Connector
- 2 - Nut
- 3 - Cap Screw
- 4 - Nut

IMPORTANT:

Always disconnect the negative (-) battery cables before removing starter or a short circuit could result.

1. Disconnect negative (-) battery cables.
2. [Remove seat.](#) (See procedure in Group 1821.)
3. [Remove seat base.](#) (See procedure in Group 1821.)
4. Disconnect electrical connector (1).
5. Remove nut (4). Remove battery cable.



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6. Remove cap screw (3).
7. Remove nut (2). Remove starter.
8. Replace parts as necessary.
9. Install starter. Tighten cap screw (3).

| Item | Measurement | Specification |
|---------------------------------------|-------------|---------------------|
| Starter | | |
| Starter-to-Flywheel Housing Cap Screw | Torque | 13 N·m (115 lb-in.) |

10. Connect wiring leads.
11. Connect negative (-) battery cables.

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