

## CTM125 - PowerTech™ 2.9 LDiesel Engines Install Valves

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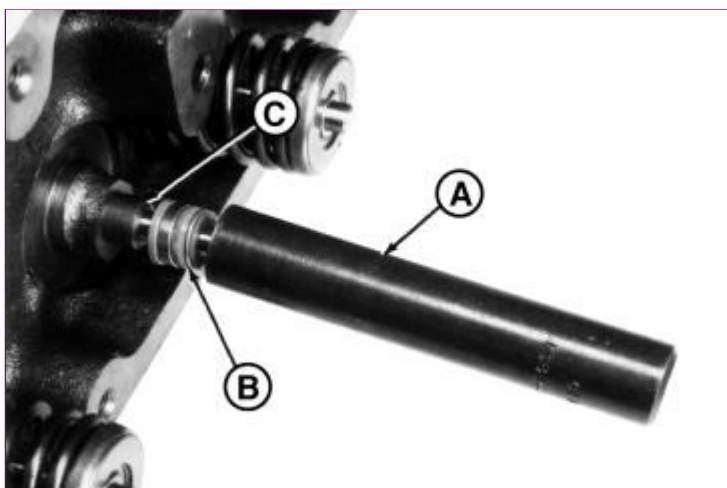
### Install Valves

1. Apply engine oil to valve stems and guides.
2. Insert valves in head (in same location as found during removal).

**NOTE:**

*Valves must move freely and seat properly.*

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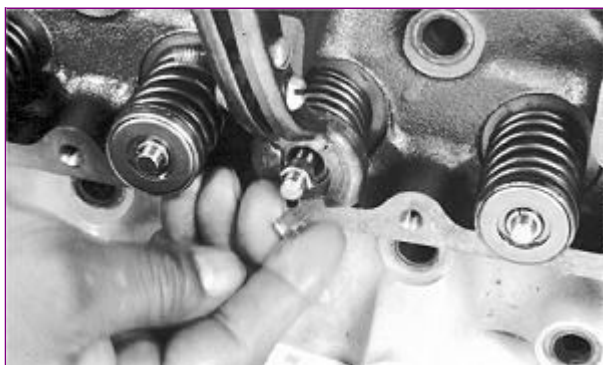
3. RG5654-UN: Slide Seal onto Valve Guide Tower

**LEGEND:**

- A - JDG678 Valve Stem Seal Installer
- B - Stem seal
- C - Valve guide tower

Using JDG678 Valve Stem Seal Installer (A), slide seal (B) over valve stem and onto valve guide tower (C).

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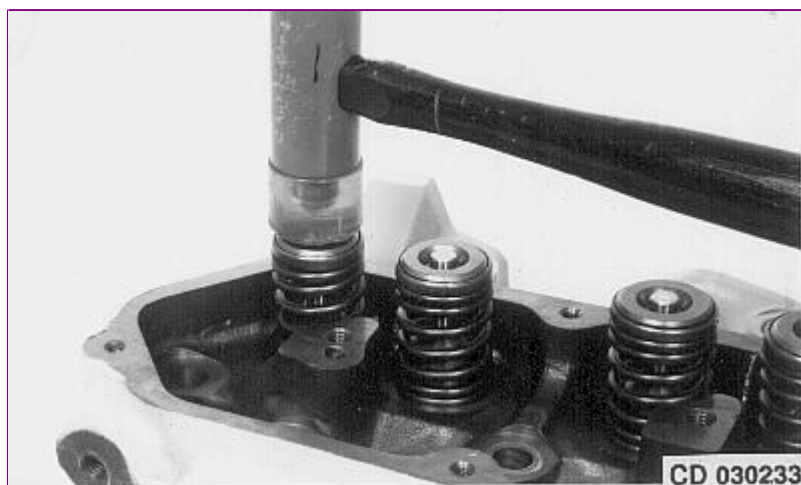


4. RG5655-UN: Install Valve Springs and Rotators

Install valve springs and rotators.

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5. Compress valve springs using JDE138 Valve Spring Compressor and install new keepers on valves.



CD30233-UN: Compress Valve Springs

**NOTE:**

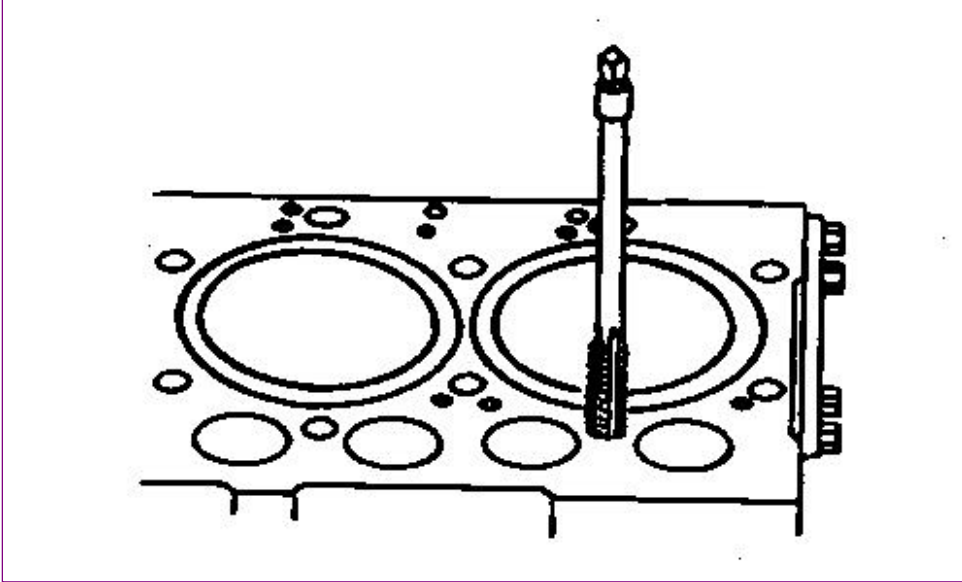
*After having installed the valves, strike end of each valve three times with a soft mallet to ensure proper positioning of the keepers.*

# CTM125 - PowerTech™ 2.9 LDiesel Engines

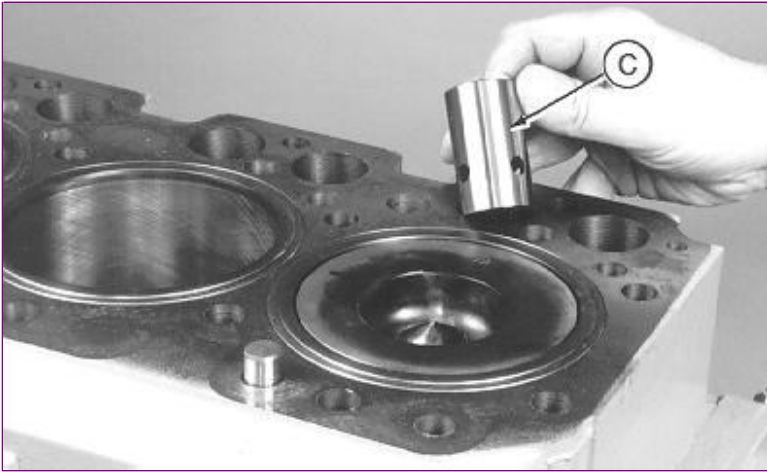
## Install Cylinder Head

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### Install Cylinder Head



RG4718-UN: Install Cylinder Head



CD30693-UN: Cam Follower

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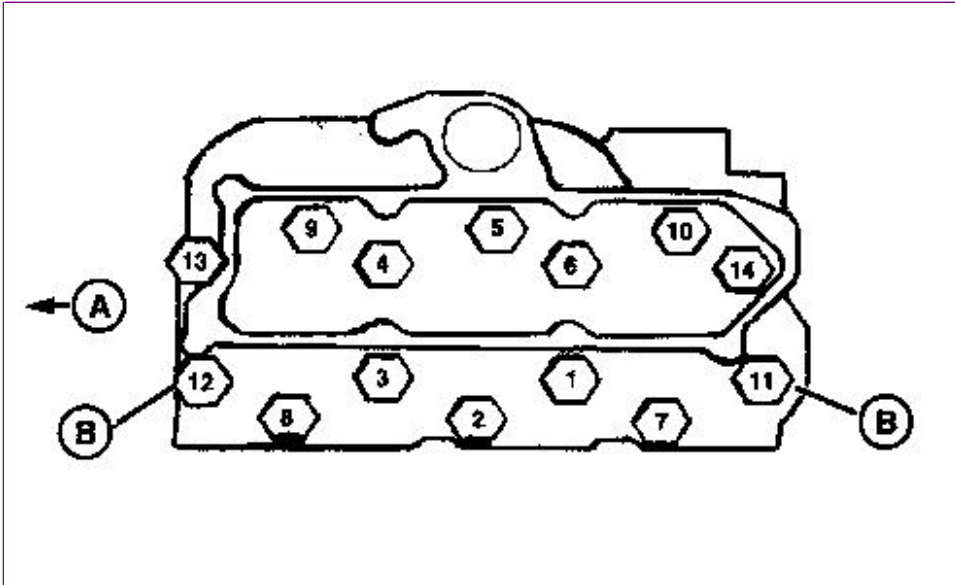
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CD30543-UN: Locating Holes

**LEGEND:**

- A - Front of engine
- B - Guide stud locations
- C - Cam follower

1. Clean tapped holes in cylinder block using JDG680 Tap (or any 1/2-13 UNC-2A tap). Use compressed air to remove debris or any fluids from cap screw holes.

2. **IMPORTANT:**

**Insure that cam followers (C) are present before cylinder head installation.**

Install new cylinder head gasket dry (without sealant)

3. **IMPORTANT:**

**Without guide studs, the Viton O-ring attached to cylinder head gasket (at rocker arm lube oil passage) could be damaged when repositioning cylinder head on engine block to align cap screw holes.**

Install two guide studs in cylinder block at locating holes (B).

4. Position cylinder head over guide studs and lower into place on cylinder block.

5. **NOTE:**

*Always use new cap screws to install cylinder head.*

Dip new cap screws entirely in clean engine oil.

6. Remove guide studs and install cap screws in all open bores.

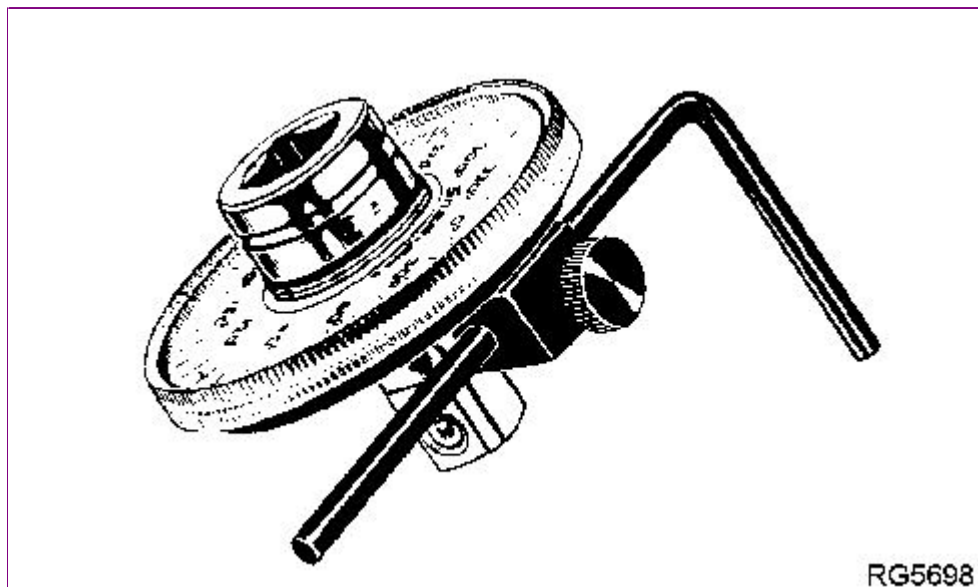
7. Tighten cap screws in sequence to the torque specified, beginning with No. 1, then **torque turn** to specified angle. Use JD-307 Torque Wrench Adapter if necessary.

Item	Measurement	Specification
<b>Cylinder head bolts</b>		
1st step	Torque	100 N·m (75 lb-ft)

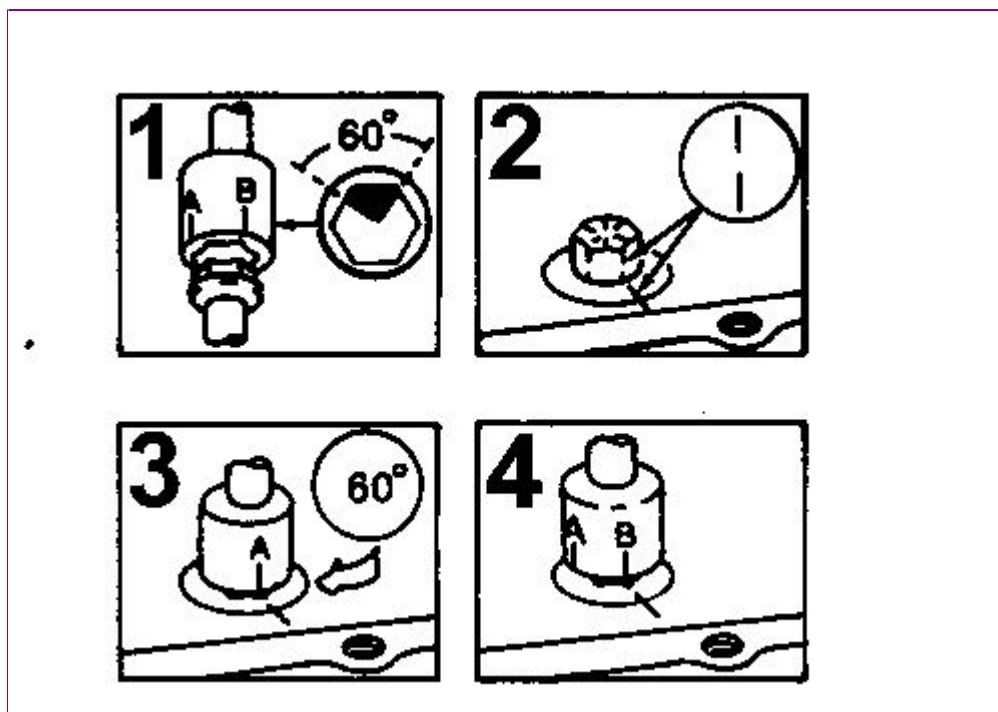
2nd step	Torque	150 N·m (110 lb-ft)
Recheck after 5 minutes	Torque	150 N·m (110 lb-ft)
Final step	Torque Turn	60° ± 10°

# CTM125 - PowerTech™ 2.9 LDiesel Engines Torque Turn Tightening Method

## Torque Turn Tightening Method



RG5698-UN: JT05993 Torque Angle Gauge



CD30797-UN: Line Scribe Torque Turn Method

### LEGEND:

- A - Reference mark
- B - 60° mark

After tightening cap screws to 150 N·m (110 lb-ft), use JT05993 Torque Angle Gauge or the line scribe method below to tighten each cap screw an additional 60° angle.

## Line scribe method:

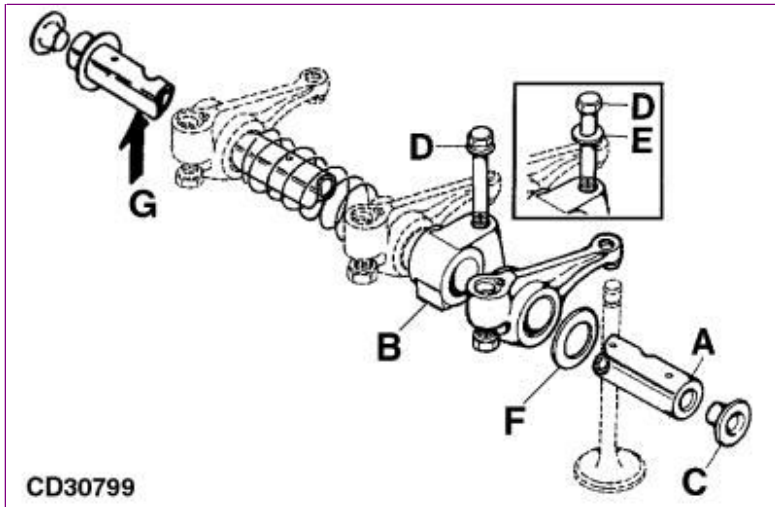
1. Make a mark on socket and make a second mark 60° counterclockwise from the first.
2. Make a mark on cylinder head next to each cap screw.
3. Place socket on cap screw so that first mark aligns with mark on cylinder head.
4. Tighten (in sequence) all cap screws until second mark on socket aligns with mark on cylinder head.

### *NOTE:*

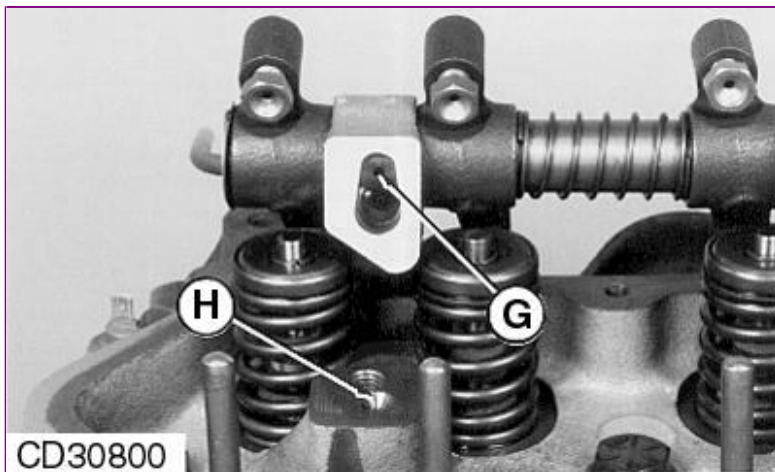
*The torque turn method eliminates the need to retorque the cylinder head bolts after the first hours of engine operation. However, valve clearance adjustment is still required.*

# CTM125 - PowerTech™ 2.9 LDiesel Engines Disassembling and Checking Rocker Arm Shaft

## Disassembling and Checking Rocker Arm Shaft



CD30799-UN: Checking rocker arm shaft (1)



CD30800-UN: Checking rocker arm shaft (2)

### LEGEND:

- A - Rocker arm shaft
- B - Support
- C - Plug
- D - Cap screw
- E - Washer
- F - Bowed washer
- G - Oil supply hole in rocker arm shaft
- H - Oil supply hole in cylinder head

1. Remove plugs (C) and bowed washers (F) from rocker arm shaft.
2. Slide springs, rocker arms and supports off rocker arm shaft, identifying their sequence for reassembly in the same order.
3. Clean all parts with solvent and dry with compressed air.
4. Check all parts for good condition.

Item	Measurement	Specification
<b>Rocker arm</b>		
Shaft	Diameter	19.99—20.02 mm (0.787—0.788 in.)
	Wear tolerance	19.94 mm (0.785 in.)
Bore	Diameter	20.07—20.12 mm (0.790—0.792 in.)
	Wear tolerance	20.17 mm (0.784 in.)
Spring	Load at 46 mm (1.81 in.) compressed length	18—27 N (4—6 lb.)

5. Replace parts as necessary.

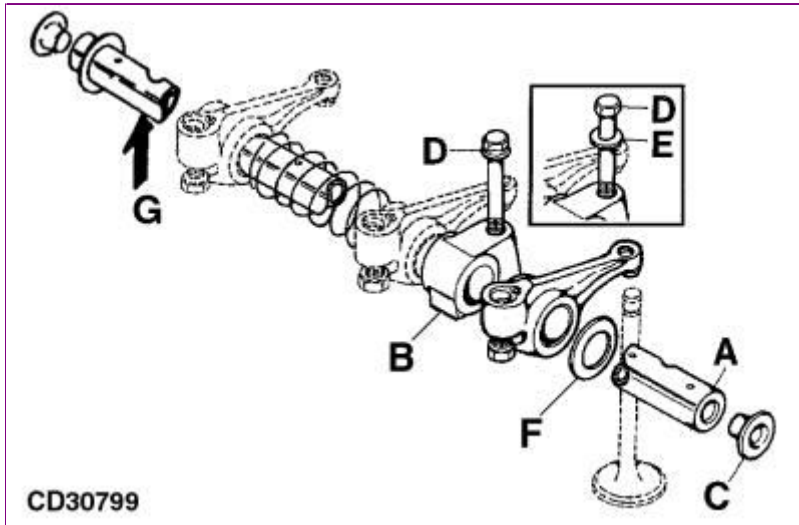
**NOTE:**

*If the rocker arm has been damaged by a valve failure, replace it together with the corresponding push rod, valve rotator and keepers.*

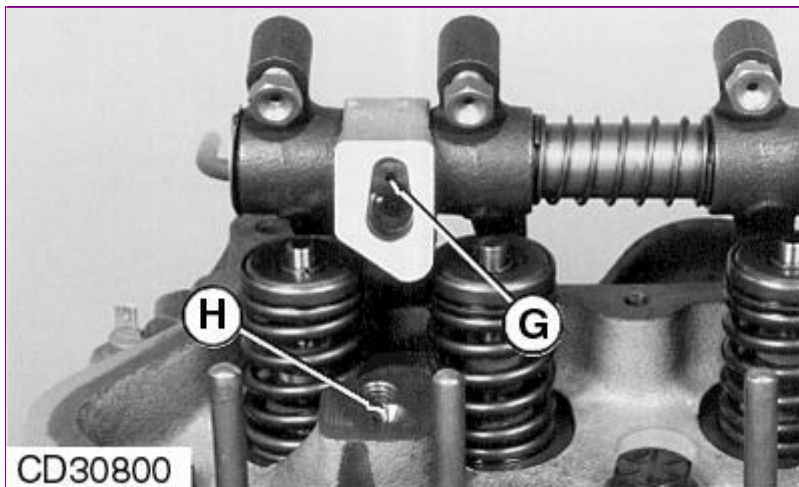
# CTM125 - PowerTech™ 2.9 LDiesel Engines

## Reassembling Rocker Arm Shaft

### Reassembling Rocker Arm Shaft



CD30799-UN: Checking rocker arm shaft (1)



CD30800-UN: Checking rocker arm shaft (2)

#### LEGEND:

- A - Rocker arm shaft
- B - Support
- C - Plug
- D - Cap screw
- E - Washer
- F - Bowed washer
- G - Oil supply hole in rocker arm shaft
- H - Oil supply hole in cylinder head

#### NOTE:

*Effective with following engine serial numbers, shaft (A) and cap screw (D) with washer (E) have been replaced by a new shaft and flanged head cap screws.*

*-: Engine SN for new rocker arm shaft*

**Saran engines**

394179CD (Non-Certified engines)

563950CD (Certified engines)

**Torreon engines**

22965PE

*These parts are not interchangeable except when using a conversion kit including shaft (A) + support (B) + plug (C) + R504813 flanged head cap screws (D). Refer to appropriate Parts Catalog for more details.*

*Some engines built after above engine serial numbers may have been assembled with the previous 19H3031 cap screws (non-flanged) and R42729 washers (E). In this case, when re-assembling this engine, use the R504813 flanged head cap screws (without washer).*

1. Lubricate shaft, bores of rocker arms and supports.
2. Slide springs, rocker arms and supports onto shaft. Assemble in the same order in which they were removed during disassembly.
3. **IMPORTANT:**

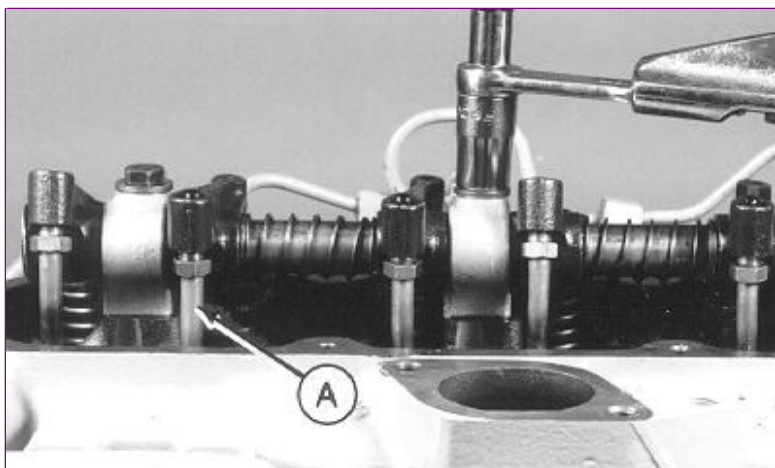
**The hole (G) in the shaft must be in line with the oil supply hole (H) of cylinder head.**

Install bowed washers (F) and new plugs (C) on shaft.

## CTM125 - PowerTech™ 2.9 LDiesel Engines Install Rocker Arm Assembly

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### Install Rocker Arm Assembly



CD30694-UN: Install Push Rods

1. Install push rods (A) in same location from which they were removed.

**NOTE:**

*Valve stem tips are specially hardened, wear caps are not required.*

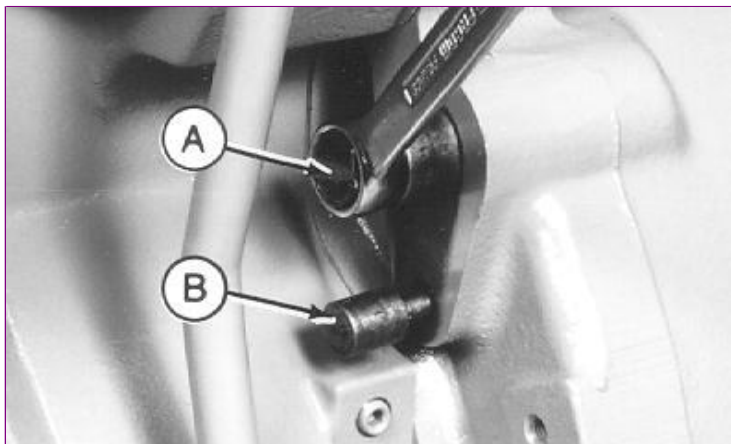
2. Position rocker arm assembly on engine.
3. Lubricate the rocker arms with engine oil.
4. Tighten attaching cap screws to specifications.

Item	Measurement	Specification
Rocker arm support cap screw	Torque	50 N·m (35 lb-ft)

## CTM125 - PowerTech™ 2.9 LDiesel Engines Valve Clearance

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### Valve Clearance



CD30544-UN: Flywheel Turning Tool and Timing Pin

The valve clearance must be adjusted when engine is cold.

Using JDE83 or JDG820 Flywheel Turning Tool (A), rotate engine flywheel in running direction (clockwise viewed from water pump) until No.1 piston (front) has reached top dead center (TDC) on compression stroke. Insert timing pin JDE81-4 or JDG1571 (B) into flywheel bore.

**NOTE:**

*When No. 1 piston is at TDC on compression stroke, valve springs of No. 1 cylinder are not under tension.*

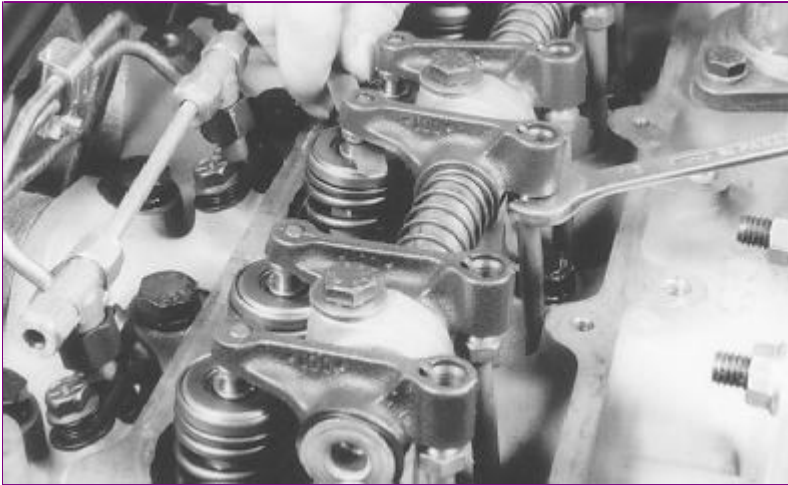
Item	Measurement	Specification
Intake Valve	Clearance	0.35 mm (0.014 in.)
Exhaust Valve	Clearance	0.45 mm (0.018 in.)

[Adjust valve clearance](#) as directed in the following block.

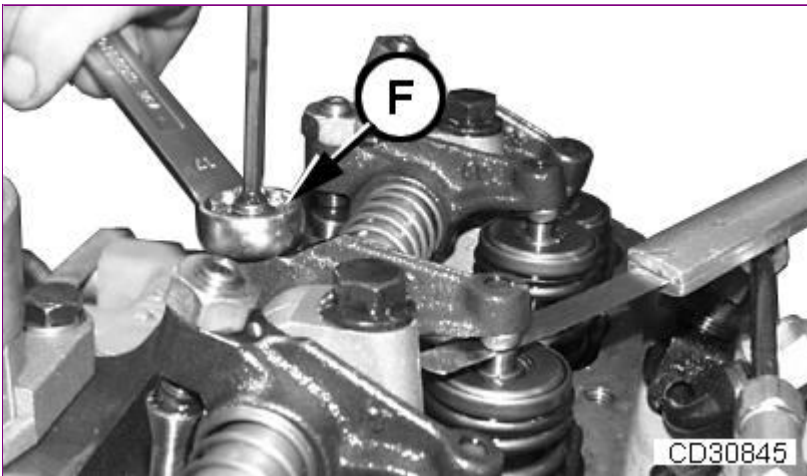
# CTM125 - PowerTech™ 2.9 LDiesel Engines Valve Adjustment Sequence

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## Valve Adjustment Sequence



CD30545-UN: Earlier design



CD30845-UN: later design



**Suggest:**

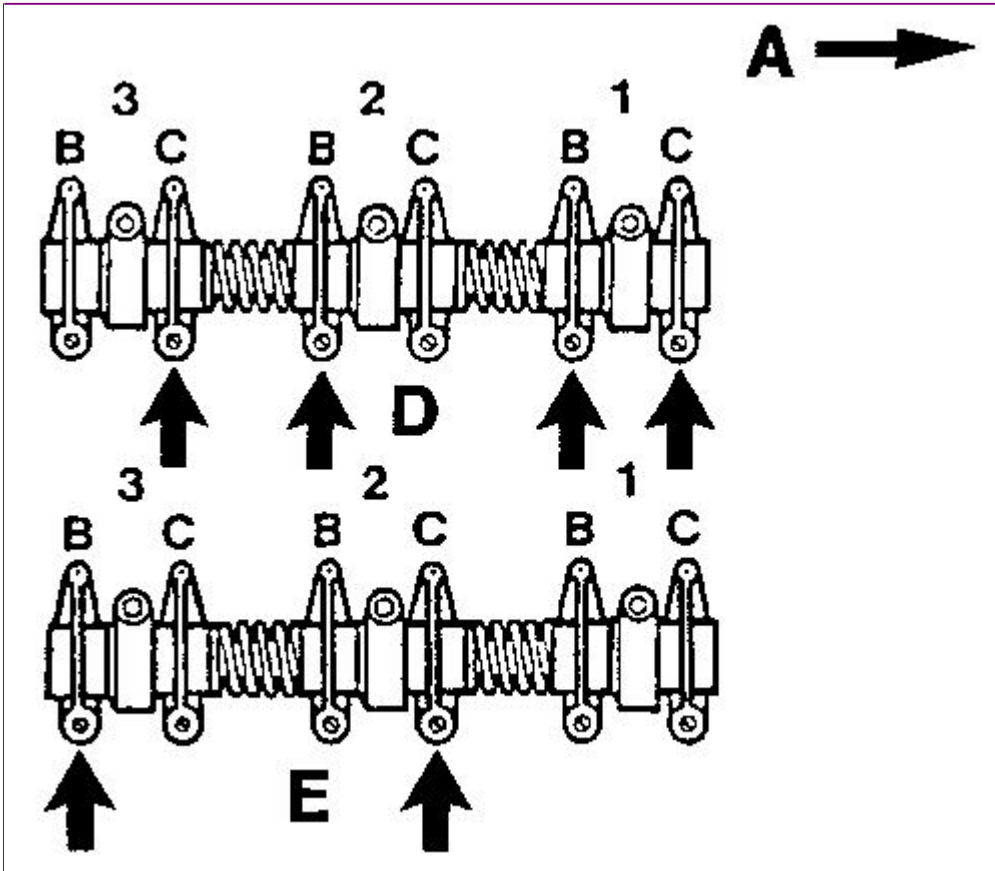
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CD30549-UN: Valve Adjustment

**LEGEND:**

- A - Front of engine
- B - Exhaust valve
- C - Intake valve
- D - No. 1 piston at TDC compression stroke
- E - No. 1 piston at TDC exhaust stroke
- F - Rocker arm adjustment screw jam nut

1. Adjust valve clearance on No. 1 and 2 exhaust valves and No. 1 and 3 intake valves.
2. Turn crankshaft 360° and reinsert timing pin.
3. Adjust valve clearance on No. 3 exhaust valve and No. 2 intake valve.

Item	Measurement	Specification
Valve clearance	Firing order	1-2-3
	Rocker arm adjustment screw jam nut (Later design)-Torque	30 N·m (25 lb-ft)

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