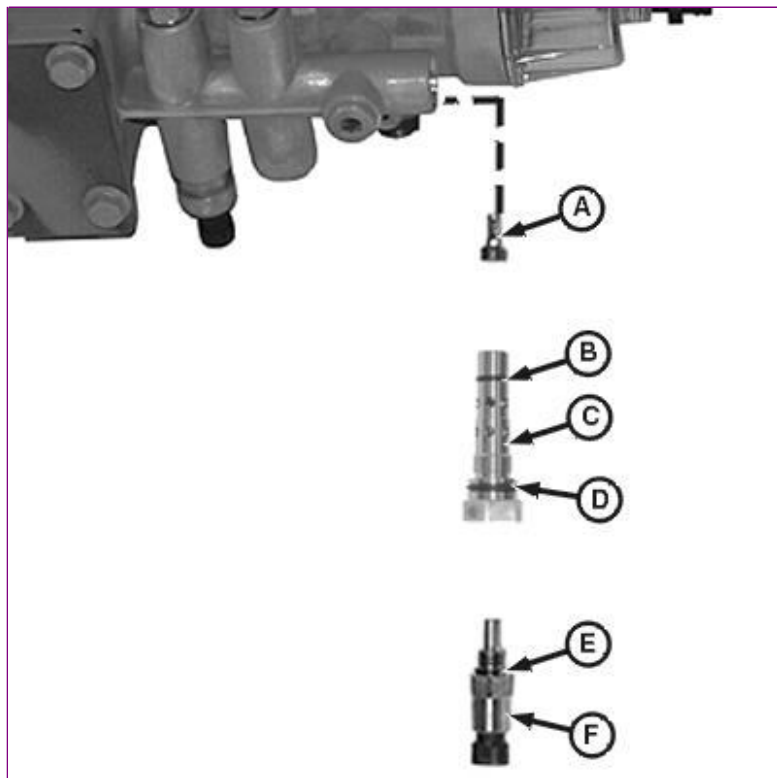


# CTM188 - PowerTech™ 10.5 L and 12.5 L Diesel Engines Level 6 Electronic Fuel Systems With Lucas EUIs

## Remove and Install High Pressure Regulating Valve

### Remove and Install High Pressure Regulating Valve



RG11168-UN: High Pressure Regulating Valve

#### LEGEND:

- A - Screen
- B - O-Ring
- C - High Pressure Regulating Valve
- D - O-Ring
- E - O-Ring
- F - Fuel Temperature Sensor

1. Close fuel shut-off valve, if equipped.

2. **NOTE:**

*On high fuel tank applications without fuel shut-off valve, fuel tank return line must be pinched before disconnecting, then plugged,*

Disconnect fuel tank return line from filter housing and drain fuel into clean container.

3. Open valve on water separator bowl and drain filter housing.

4. Remove fuel temperature sensor (F). See [REMOVE AND INSTALL FUEL TEMPERATURE SENSOR](#) in Group 110.

5. Remove high pressure regulating valve (C).

6. To remove screen (A), see [REMOVE AND INSTALL 100 MICRON INTERNAL FILTER HOUSING SCREEN INSERT](#) next in this Group.

7. **NOTE:**

*High pressure regulating valve is not repairable. Do not disassemble valve. If defective, replace entire assembly.*

Clean and inspect all parts. Replace all O-rings.

8. Install parts in reverse order.

If removed, install screen (A). See [REMOVE AND INSTALL 100 MICRON INTERNAL FILTER HOUSING SCREEN INSERT](#) next in this Group.

Tighten regulating valve to specifications.

<b>Item</b>	<b>Measurement</b>	<b>Specification</b>
High Pressure Regulating Valve-to-Filter Housing	Torque	14 N·m (124 lb-in.)

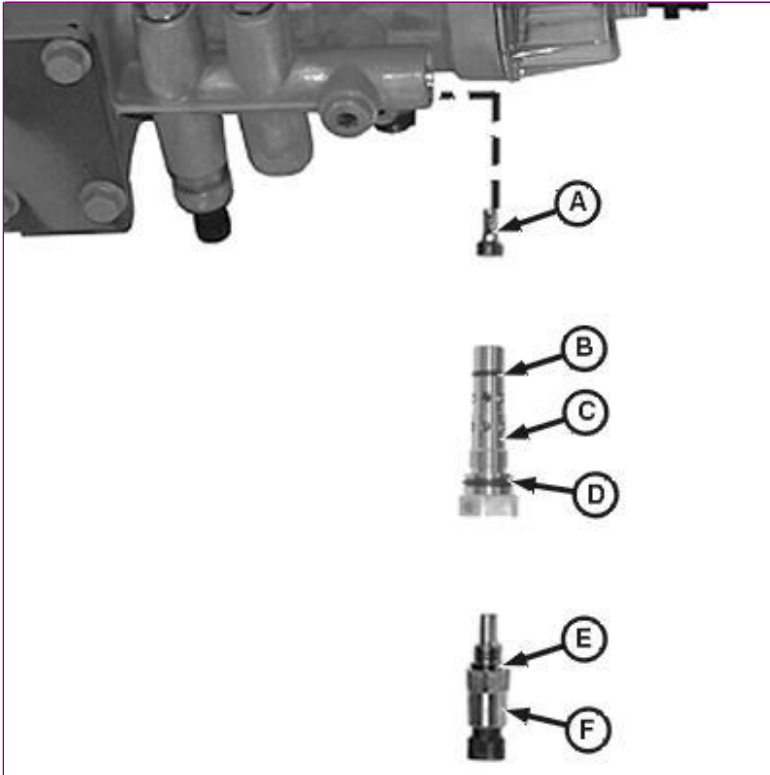
9. Install fuel temperature sensor (F). See [REMOVE AND INSTALL FUEL TEMPERATURE SENSOR](#) in Group 110.

10. Add fuel to filter housing between minimum and maximum marks on housing. Fuel can be added by throttling the fuel shut-off valve (if equipped), or by removing cover and adding fuel from a clean container.

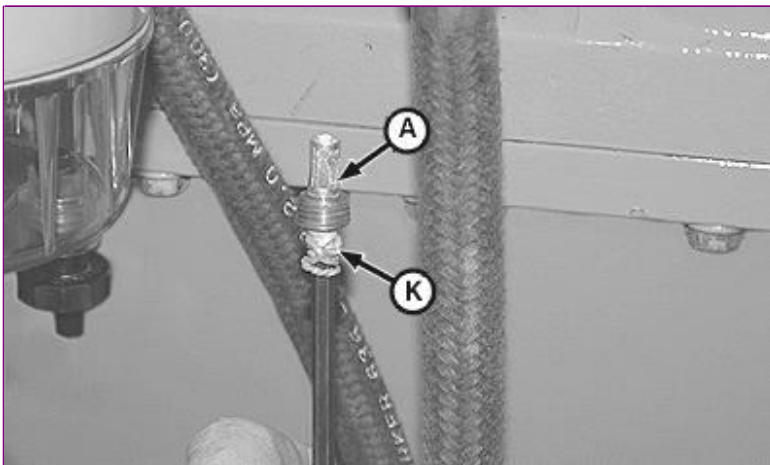
# CTM188 - PowerTech™ 10.5 L and 12.5 L Diesel Engines Level 6 Electronic Fuel Systems With Lucas EUIs

## Remove and Install 100 Micron Internal Filter Housing Screen Insert

### Remove and Install 100 Micron Internal Filter Housing Screen Insert



RG11168-UN: High Pressure Regulating Valve



RG10358-UN: Remove Screen

#### LEGEND:

- A - 100 Micron Screen
- B - O-Ring
- C - High Pressure Regulating Valve
- D - O-Ring
- E - O-Ring
- F - Fuel Temperature Sensor
- K - Allen Wrench with Rubber Band

1. Remove fuel temperature sensor (F). See [REMOVE AND INSTALL FUEL TEMPERATURE SENSOR](#) in Group 110.

Remove high pressure regulating valve (C). See [REMOVE AND INSTALL HIGH PRESSURE REGULATING VALVE](#) earlier in this Group.

2. **IMPORTANT:**

**If allen wrench is pushed too far into 10 micron screen during removal and installation, screen may be damaged. Tie a rubber band (K) approximately 10 mm (3/8 in.) from end of allen wrench, as shown, to prevent screen damage.**

*NOTE:*

*Screen is approximately 91 mm (3-5/8 in.) up in bore of filter housing. Use a long allen wrench.*

Attach a rubber band (K) on end of 5 mm allen wrench and remove 10 micron screen (A) from filter housing.

3. Clean and inspect screen.
4. Using allen wrench with rubber band, install screen in filter housing and tighten to the following specification.

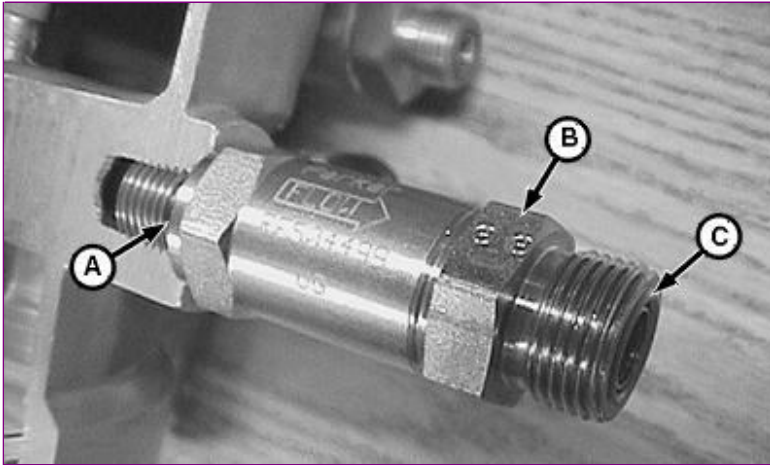
<b>Item</b>	<b>Measurement</b>	<b>Specification</b>
100 Micron Internal Filter Housing Screen	Torque	5 N·m (44 lb-in.)

5. Install pressure regulating valve parts (B—D). See [REMOVE AND INSTALL HIGH PRESSURE REGULATING VALVE](#) earlier in this Group. Install fuel temperature sensor parts (E) and (F). See [REMOVE AND INSTALL FUEL TEMPERATURE SENSOR](#) in Group 110.

# CTM188 - PowerTech™ 10.5 L and 12.5 L Diesel Engines Level 6 Electronic Fuel Systems With Lucas EUIs

## Remove and Install Fuel Filter Check Valve

### Remove and Install Fuel Filter Check Valve



RG10307-UN: Fuel Filter Check Valve

#### LEGEND:

- A - O-Ring
- B - Check Valve
- C - O-Ring

1. Close fuel shut-off valve (if equipped).
2. Disconnect fuel line (shown disconnected) and remove check valve (B). Remove O-rings (A) and (C) from both ends of check valve.
3. Install check valve in filter housing and tighten to specifications.

Item	Measurement	Specification
Fuel Filter Check Valve to Fuel Filter Housing	Torque	33 N·m (24 lb-ft)

4. Connect fuel line and tighten to specifications.

Item	Measurement	Specification
Fuel Line-to-Fuel Filter Check Valve	Torque	24 N·m (18 lb-ft)

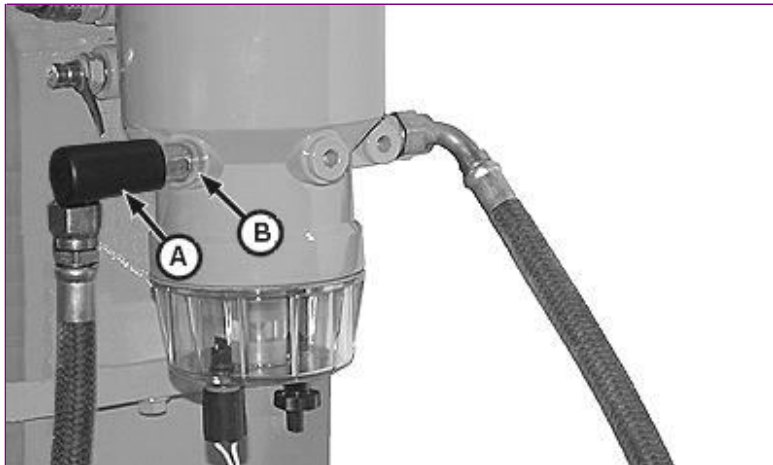
5. Open fuel shut-off valve.

# CTM188 - PowerTech™ 10.5 L and 12.5 L Diesel Engines Level 6 Electronic Fuel Systems With Lucas EUIs

## Remove and Install Primer Pump

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### Remove and Install Primer Pump



RG10360-UN: Primer Pump

#### LEGEND:

- A - Primer Pump
- B - Adapter

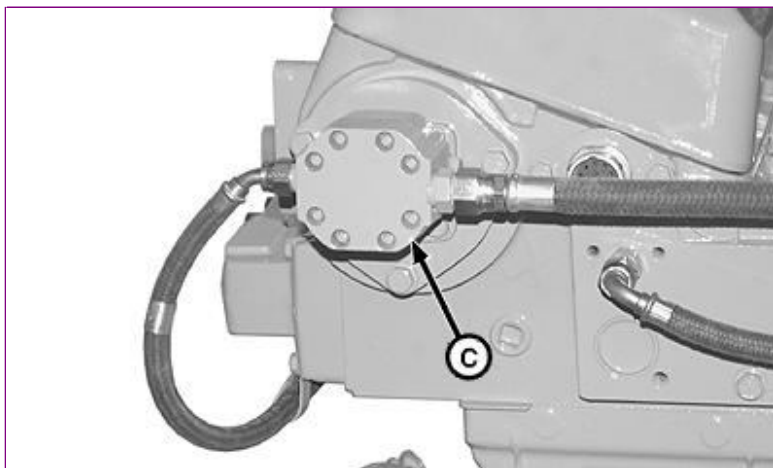
1. Remove primer pump (A).
2. If required, remove adapter (B).
3. Clean and inspect parts.
4. Install primer pump and adapter with new O-rings and tighten to specifications.

Item	Measurement	Specification
Fuel Primer (Single Rail Fuel System)	Torque	14 N·m (124 lb-in.)
Fuel Primer-to-Fuel Filter Housing Adapter (Single Rail Fuel System)	Torque	11 N·m (97 lb-in.)

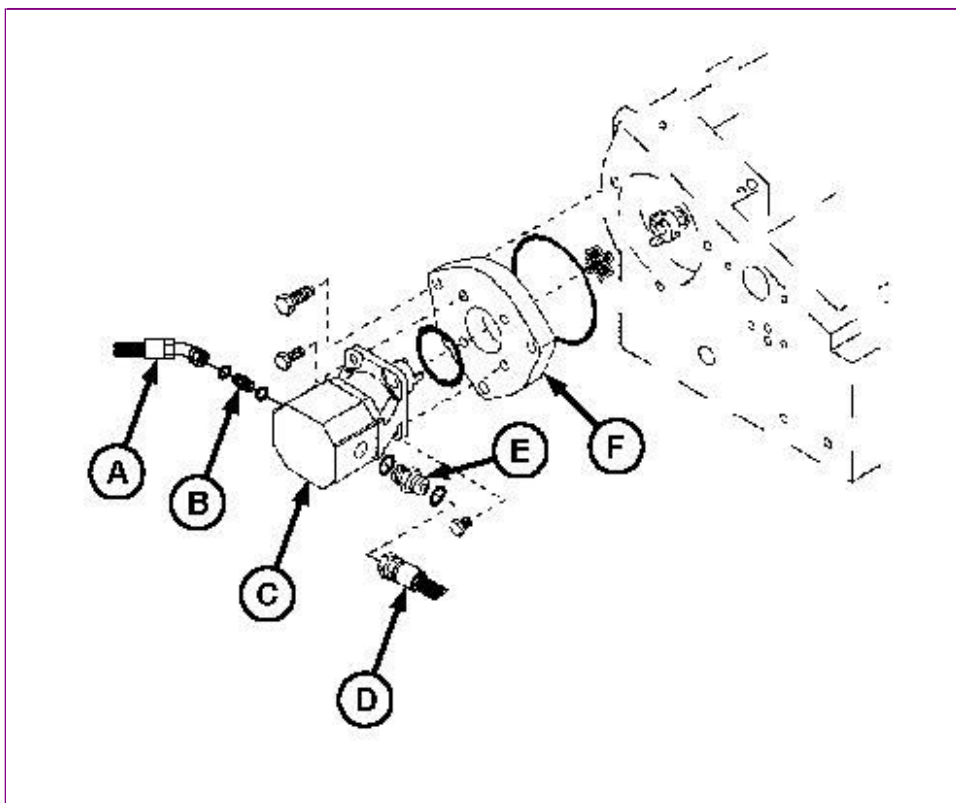
# CTM188 - PowerTech™ 10.5 L and 12.5 L Diesel Engines Level 6 Electronic Fuel Systems With Lucas EUIs

## Remove and Install Single Rail Fuel Supply Pump

### Remove and Install Single Rail Fuel Supply Pump



RG10289-UN: Fuel Supply Pump



RG10288-UN: Removing Fuel Supply Pump

#### LEGEND:

- A - Supply Pump Outlet Line
- B - Fitting
- C - Fuel Supply Pump
- D - Supply Pump Inlet Line
- E - Fitting
- F - Mounting Bracket

#### **IMPORTANT:**

Plug or cap all fuel system connections and passages as lines or components are removed to keep debris out using JDG998 Fuel System Cap Plug Kit.

## Remove Fuel Supply Pump

**NOTE:**

*Fuel flow through cylinder head may vary by engine application. Supply pump (A) may be mounted as shown with fuel entering the front left side of the cylinder head and exiting the back of the head. On some machine applications, the fuel supply pump is rotated 180° and the fuel lines on cylinder head are reversed, with fuel entering the back of the head and exiting the front left side of the head.*

*Add a reference mark (supply pump-to-cylinder head) and label fuel lines as they are disconnected, to ensure correct reinstallation of supply pump.*

1. Remove two fuel lines (A) and (D) connected to fuel supply pump. Cap all lines and fittings to keep debris out of fuel system.
2. Remove four cap screws securing supply pump to mounting bracket (F) and remove pump. Remove and discard O-ring.

3. **NOTE:**

*Fuel supply pump is not serviceable; replace pump if determined to be defective.*

Remove fittings (B) and (E) from pump and clean thoroughly if pump is to be replaced.

## Install Fuel Supply Pump

1. Inspect the fuel supply pump drive pin. If the pin is worn or is able to be rotated, replace the drive pin. See Replace Fuel Supply Pump Drive Pin in Section 02, Group 50 of CTM100.
2. Install fittings onto new pump using new O-rings. Tighten fittings securely.
3. Ensure that drive coupler set screw is tightened to specifications on supply pump drive shaft with end of shaft flush with coupler ID. Check drive coupler on camshaft drive pin also; adjust as needed.

Item	Measurement	Specification
Fuel Supply Pump and Camshaft Drive Coupler Set Screws	Torque	4 N·m (3 lb-ft)

4. Position new rubber spider (vibration absorber) on drive coupler. Position new O-ring on face of supply pump.
5. If removed, apply AR54749 Soap Lubricant to new O-ring on supply pump mounting bracket (F) and install. Tighten mounting bracket cap screws to specifications.

Item	Measurement	Specification
Fuel Supply Pump Mounting Bracket Cap Screws	Torque	50 N·m (37 lb-ft)

6. Install fuel supply pump with rubber spider properly meshed with coupler on rear of camshaft.
7. Install four cap screws and tighten to specifications.

Item	Measurement	Specification
Fuel Supply Pump-to-Bracket	Torque	25 N·m (18 lb-ft)

8. **IMPORTANT:**



**Before connecting ORFS fuel line fittings, be sure O-ring is correctly positioned in the groove of fitting. Tighten fitting ONLY to specified torque. DO NOT OVERTIGHTEN.**

Install two fuel lines and tighten to specifications.

<b>Item</b>	<b>Measurement</b>	<b>Specification</b>
Fuel Line ORFS Fittings	Torque	24 N·m (18 lb-ft)

# CTM188 - PowerTech™ 10.5 L and 12.5 L Diesel Engines Level 6 Electronic Fuel Systems With Lucas EUIs

## Remove and Install Electronic Unit Injectors (Single Rail Fuel System)

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### Remove and Install Electronic Unit Injectors (Single Rail Fuel System)



RG8279-UN: Unit Injector Clamp Screws

#### LEGEND:

A - Clamp Cap Screws

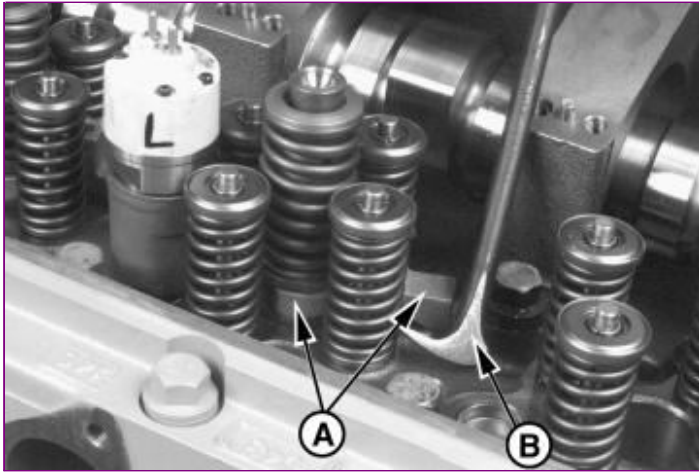
#### **IMPORTANT:**

Electronic unit injectors on dual rail fuel systems are different than injectors on single rail systems. Use the appropriate injector for engine/fuel system applications. Additionally, early single rail fuel systems for engines S.N. (— 29999) use different injectors than later single rail systems for engines S.N. (30000— ). Replace injector with the same type removed. DO NOT intermix injectors. See parts catalog for correct applications.

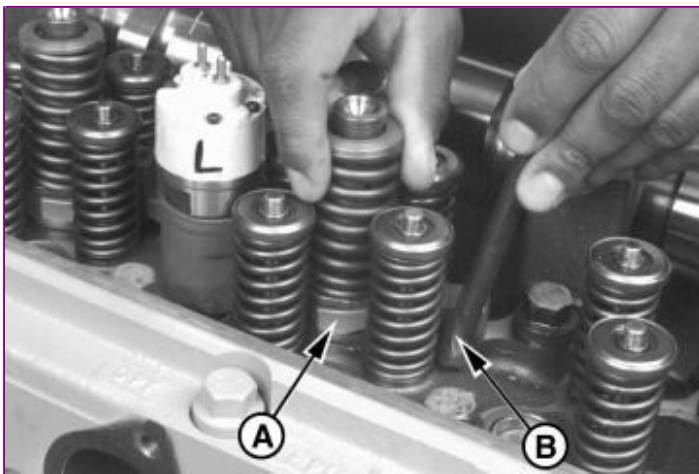
#### **IMPORTANT:**

Whenever EUI is replaced, sleeve in cylinder head must be replaced also. See [Replace Unit Injector Sleeve in Cylinder Head Using JDG981](#) in Section 02 Group 020 of Base Engine manual.

1. Remove rocker arm cover. See [REMOVE AND INSTALL ROCKER ARM COVER](#) in CTM100, Section 02, Group 020.
  2. Remove rocker arm shaft assembly. See [REMOVE ROCKER ARM ASSEMBLY](#) in CTM100, Section 02, Group 020.
  3. Disconnect fuel lines and drain fuel from lines and fuel rail in cylinder head.
- 
4. Reconnect lines (or install cap plugs from JDG998 Fuel System Cap Plug Kit) to keep debris out of fuel system.
  5. Remove injector hold-down clamp cap screws (A).
-



6. RG8280-UN: Position Prybar



RG8281-UN: Removing Unit Injector

LEGEND:

- A - Hold-Down Clamp
- B - Prybar

Pry upward on the injector hold-down clamp (A) against cylinder head using a prybar (B) as shown.

7. Remove injector and clamp from cylinder head. Label injector for installation in same cylinder location as removed.
8. Immediately plug injector bore with clean cap plug to keep debris out of fuel system.
9. Remove injector O-rings and discard.
10. Store injector in a clean, lint-free container.

## Install Electronic Unit Injectors

1. **NOTE:**

*If a failure of any valve train or injector component(s) was observed, ensure that all of the debris from the failed component(s) has been removed from the engine.*

Remove cap plug from injector bore in cylinder head. Clean entire sleeve using a clean, lint-free cloth wrapped around a wooden stick.

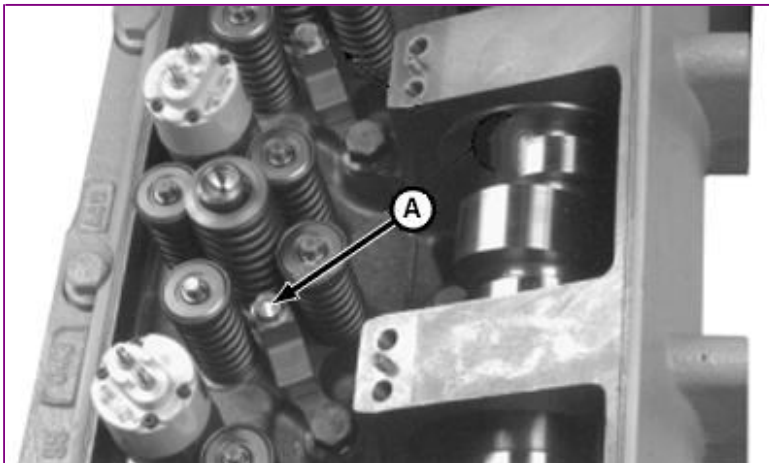
2. Install new O-rings on unit injector body. Lubricate O-rings with clean engine oil or AMOJELL lubricant.
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3. **IMPORTANT:**

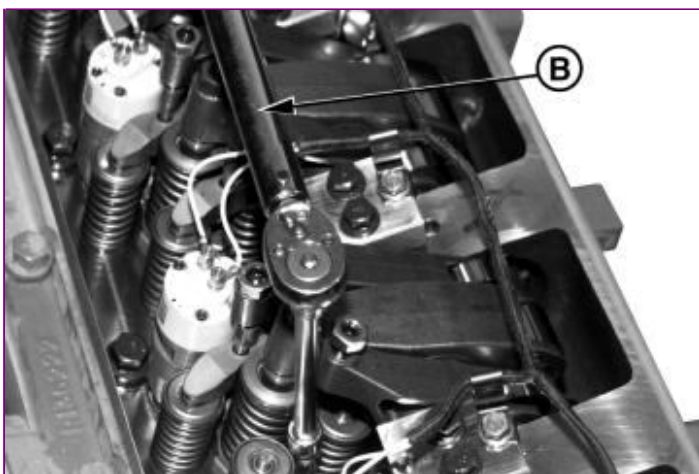
Press on top of injector plunger with palm of hand to properly seat O-rings and center injector between valve springs.

*NOTE:*

*New EUI hold-down clamp cap screws have pre-applied sealant.*



RG10249-UN: Injector Hold-Down Clamp Screws



RG9574-UN: Torque-Turn EUI

LEGEND:

- A - Clamp Cap Screw
- B - Ratchet Handle

Install unit injector with hold-down clamp into same cylinder as removed (solenoid outward toward exhaust manifold side of engine at equal distance between exhaust valve springs). Apply LOCTITE ® 242 Thread Lock and Sealer to **used** hold-down cap screw. Initially tighten cap screw to specifications.

Item	Measurement	Specification
Electronic Unit Injector Hold-Down Clamp Cap Screws	Initial Torque	20 N·m (177 lb-in.)

4. Mark head of cap screw (A) at twelve o'clock position (viewed from rear) using a paint stick.
5. Install 13 mm swivel socket on head of cap screw. Position ratchet handle (B) parallel with centerline of engine camshaft/crankshaft.

Torque-turn cap screw to the following specification.

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your reading. Please Click  
Here. Then Get COMPLETE  
MANUAL. NO WAITING**



**NOTE:**

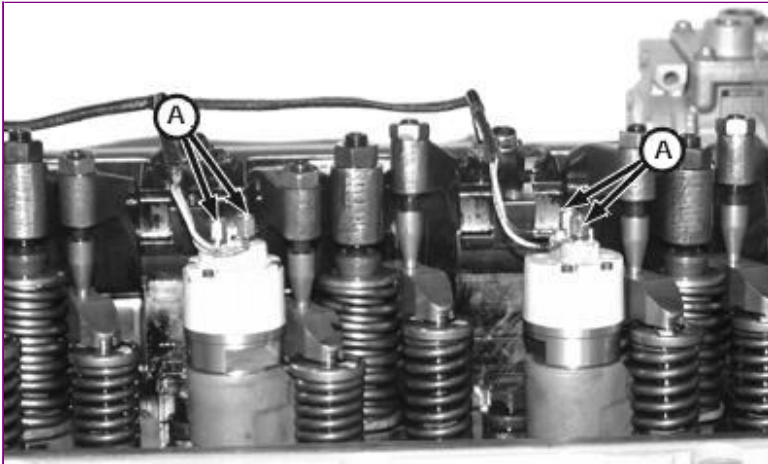
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document first and then  
click on it.**

Item	Measurement	Specification
Electronic Unit Injector Hold-Down Clamp Cap Screws	Torque-Turn	90° Additional Rotation

- Remove socket from head of cap screw and verify that mark has been tightened/turned 90° from its original position.

7. **IMPORTANT:**

**DO NOT use red or blue LOCTITE® on solenoid studs. Bonding strength is too high for small studs, making future removal impossible without twisting off stud.**



RG10294-UN: Wiring Terminal Nuts

**LEGEND:**

A - Retaining Nuts

Reconnect injector solenoid wiring leads onto solenoid studs. Apply LOCTITE® 222 Small Screw Thread Locker (PM38653) to studs and tighten retaining nuts (A) to specifications.

Item	Measurement	Specification
Electronic Unit Injector Wiring Harness Connector Nuts	Torque	2 N·m (18 lb-in.)

- Install valve bridges, push tubes, and rocker arm assembly. Adjust valve stem-to-bridge clearances. See [INSTALL ROCKER ARM ASSEMBLY](#) in CTM100, Section 02, Group 020.
- If removed or loosened, tighten all harness and line clamps to specifications.

Item	Measurement	Specification
Fuel Line Clamps	Torque	5 N·m (44 lb-in.)
Electronic Unit Injector Harness-to-Shaft Clamps	Torque	35 N·m (26 lb-ft)
Electronic Unit Injector Wiring Connector Bracket-to-Rear of Head	Torque	25 N·m (18 lb-ft)

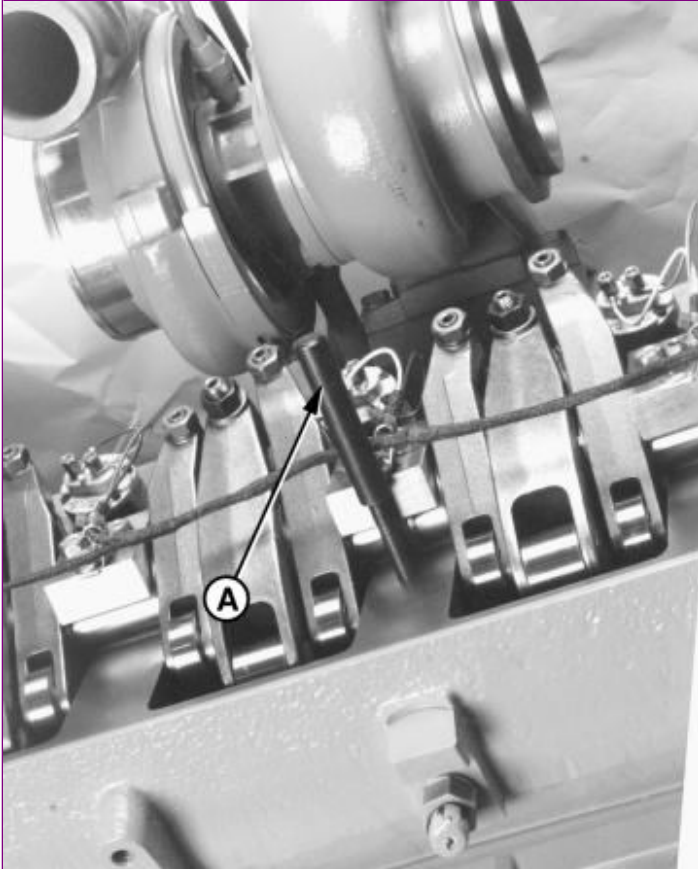
- Adjust electronic unit injector preload as detailed later in this Group.

# CTM188 - PowerTech™ 10.5 L and 12.5 L Diesel Engines Level 6 Electronic Fuel Systems With Lucas EUIs

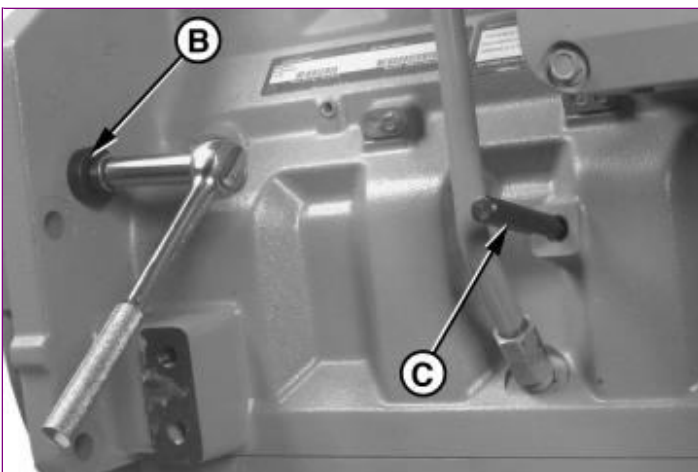
## Adjust Electronic Unit Injector Preload

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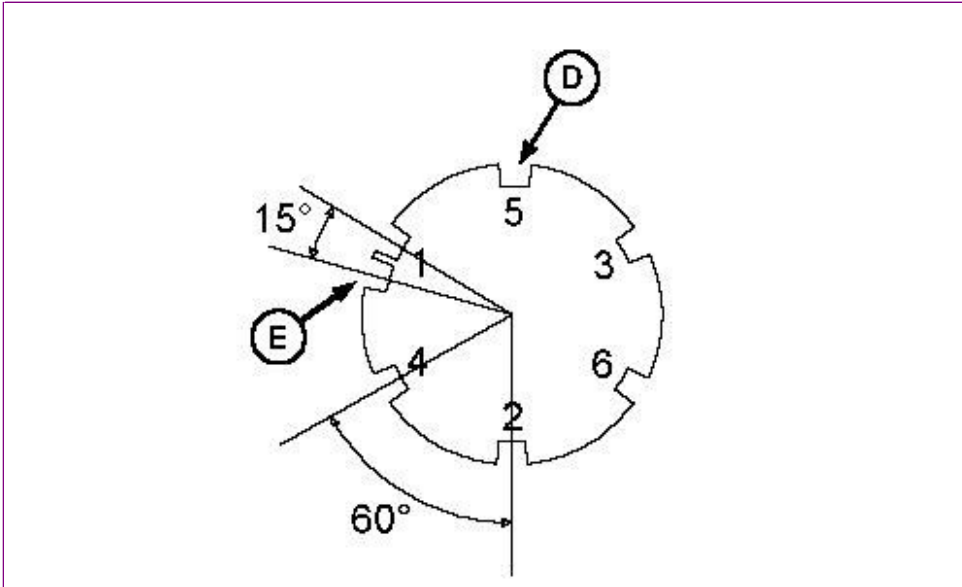
### Adjust Electronic Unit Injector Preload



RG8228A-UN: JDG971 Timing Pin in Camshaft



RG8227D-UN: JDG971 Timing Pin in Crankshaft



RG11165-UN: Camshaft Timing Slot

**LEGEND:**

- A - JDG971 Timing Pin
- B - JDG820 Flywheel Turning Tool
- C - JDG971 Timing Pin
- D - Single Timing Slot
- E - Double Timing Slot

1. Remove plug from cylinder block and install JDG820 Flywheel Turning Tool (B).

2. **IMPORTANT:**

**Timing pin MUST BE installed in slot of camshaft first. Then install second timing pin in crankshaft slot by carefully rocking flywheel back and forth.**

Rotate engine flywheel in running direction (counterclockwise as viewed from rear) until JDG971 Timing Pin (A) engages single timing slot (D) in camshaft. The proper timing slot can be found by viewing camshaft timing lobe through camshaft timing pin bore while rotating engine. The double timing slot (E) will be at approximately 11 o'clock (viewed from rear of engine) when pin is installed in slot (D). This ensures that engine is locked at TDC of No. 1 cylinder's compression stroke. Intake and exhaust rocker arms on No. 1 cylinder should be loose.

3. Remove threaded plug from crankshaft timing hole below oil cooler and filter housing assembly.

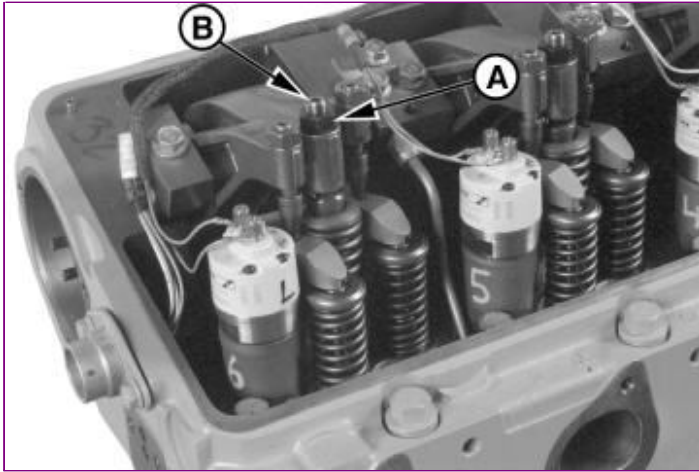
4. **IMPORTANT:**

**DO NOT insert timing pin full depth into cylinder block crankshaft timing hole when rotating engine flywheel until double slot on camshaft timing lobe is at approximately 11 o'clock (viewed from rear of engine) to avoid crankshaft counterweight bending timing pin.**

Slightly move engine flywheel back and forth with turning tool until a second JDG971 Timing Pin (C) can be installed in slot in crankshaft. This ensures that camshaft and crankshaft are in sync (properly timed).

If timing pin does not enter crankshaft timing slot, crankshaft is not properly timed with camshaft. Crankshaft MUST BE timed to camshaft. See [Check And Adjust Camshaft-To-Crankshaft Timing](#) in the Base Engine manual.





5. RG8270-UN: Unit Injector Adjusting Screw

**LEGEND:**

- A - Lock Nut
- B - Adjusting Screws

Loosen lock nut (A) and loosen cylinders Nos. 3, 5, and 6 injector rocker arm adjusting screws (B) to relieve tension.

6. Slowly tighten adjusting screw until rocker arm roller contacts camshaft lobe at 0.0 clearance.
7. Tighten adjusting screw an additional 1/2 turn (180°) to preload injector. Tighten adjusting screw lock nut to specifications while holding adjusting screw stationary.

Item	Measurement	Specification
Electronic Unit Injector Adjusting Screw Lock Nut	Torque	65 N·m (48 lb-ft)

8. Remove both timing lock pins, rotate crankshaft one full revolution (360°) and pin crankshaft only. Engine will now be locked at No. 6 TDC.
9. Set injector preload on cylinders Nos. 1, 2, and 4.
10. Install plug in timing pin hole in block and tighten to specifications.

Item	Measurement	Specification
Timing Pin Plug in Cylinder Block	Torque	33 N·m (24 lb-ft)