POWERTECH™ 2.4L & 3.0L Diesel Engines

TECHNICAL MANUAL
2.4L & 3.0L Diesel Engines Component Technical Manual

CTM301 22SEP05 (ENGLISH)

For complete service information also see:

Alternators and Starting Motors CTM77
OEM Engine Accessories . . . . . CTM67 (English Only)

John Deere Power Systems
LITHO IN U.S.A.

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Handle Fluids Safely—Avoid Fires

When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; they can ignite and burn spontaneously.



TS227 –UN–23AUG88

DX,FLAME –19–29SEP98–1/1

Handle Starting Fluid Safely

Starting fluid is highly flammable.

Keep all sparks and flame away when using it. Keep starting fluid away from batteries and cables.

To prevent accidental discharge when storing the pressurized can, keep the cap on the container, and store in a cool, protected location.

Do not incinerate or puncture a starting fluid container.



TS1356 –UN–18MAR92

DX,FIRE3 –19–16APR92–1/1

Engine Disassembly Sequence

The following sequence is suggested when complete disassembly for overhaul is required. Refer to the appropriate repair group when removing individual engine components.

1. Mount engine on a safety approved repair stand.
2. Drain coolant and oil. Perform John Deere OILSCAN and COOLSCAN analysis. (Group 02)
3. Remove fan belt, fan, belt tensioner, and alternator. (Group 20)
4. Remove turbocharger (if equipped) and exhaust manifold. (Group 80)
5. Remove rocker arm cover and vent tube. If option code label is located on rocker arm cover, be careful not to damage label. (Group 20)
6. Remove oil cooler hoses and water pump. (Groups 60 and 70)
7. Remove dipstick, oil filter, oil cooler, and adapter housing (if equipped). (Group 60)
8. Remove fuel filter, fuel supply pump, and fuel line. (Group 90)
9. Remove starting motor. (Group 100)
10. Remove rocker arm assembly and push rods. Keep rods in order (Group 20). Check for bent push rods and condition of wear pad contact surfaces on rockers.
11. Remove Integrated Fuel System (IFS). (Group 90)
12. Remove cylinder head. Check piston-to-cylinder head clearance. (Group 20)
13. Remove cam followers. Keep followers in order. (Groups 20 and 90)
14. Remove flywheel and flywheel housing. (Group 40)
15. Remove oil pan. (Group 60)
16. Remove crankshaft pulley. (Group 40)
17. Remove timing gear cover. (Group 50)
18. Remove oil pressure regulating valve assembly. (Group 60)
19. Remove timing gears and camshaft. Perform wear checks. (Group 50)
20. Stamp cylinder number on connecting rod. Remove pistons and rods. (First, perform wear checks with PLASTIGAGE®.) (Group 30)
21. Remove crankshaft and main bearings. (First, perform wear checks with PLASTIGAGE®PLASTIGAGE.) (Group 40)
22. Remove piston cooling orifices. (Group 30)
23. Remove camshaft bushing. (Group 50)
24. Remove cylinder block plugs when block is to be put in a “hot tank”. (Group 30)
25. Clean cylinder bores with nylon brush. (Group 30)
26. Measure cylinder block. (Groups 30, 40, and 50)

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RG41183,0000044 –19–05MAR04–1/1

General OEM Engine Specifications—2.4 L Engines

NOTE: For John Deere vehicle engines, see Machine Technical Manual.

Item	Engine	
	4024TF270	4024TF220 (GenSet)
Number of Cylinders	4	4
Bore	86 mm (3.39 in.)	86 mm (3.39 in.)
Stroke	105 mm (4.13)	105 mm (4.13)
Displacement	2.4 L (149 cu. in.)	2.4 L (149 cu. in.)
Compression Ratio	18.01:1	18.01:1
Max. Crank Pressure	0.5 kPa (2 H_2O)	0.5 kPa (2 H_2O)
Governor Regulation	7—10 %	3—5 %
Oil Pressure At Rated Speed, Full Load (±15 psi)	345 kPa (50 psi)	345 kPa (50 psi)
Oil Pressure At Low Idle (Minimum)	105 kPa (15 psi)	105 kPa (15 psi)
Length	541 mm (21.3 in.)	541 mm (21.3 in.)
Width	514 mm (20.2 in.)	514 mm (20.2 in.)
Height	810 mm (31.9 in.)	810 mm (31.9 in.)
Weight	237 kg (522 lb)	237 kg (522 lb)

Engine models listed with numbers ending in “270” are standard industrial engines while engines with numbers ending in “220” are generator (standby) units. Engines with suffix “T” are turbocharged.

RG41183,000005B –19–19MAY04–1/1

About This Group of the Manual

This Group of the manual contains necessary information to diagnose some base engine, all lubrication system and all cooling system problems. This section is divided into two areas: diagnosing malfunctions and testing procedures. The diagnosing malfunction areas are further divided into the following headings, containing the following symptoms:

- **(L)** Diagnosing Lubrication System Malfunctions:
  - L1 - Excessive Oil Consumption
  - L2 - Engine Oil Pressure Low
  - L3 - Engine Oil Pressure High
- **(C)** Diagnosing Cooling System Malfunctions:
  - C1 - Coolant Temperature Above Normal
  - C2 - Coolant Temperature Below Normal
  - C3 - Coolant in Oil or Oil in Coolant

Procedures for diagnosing some of the above symptoms are formatted such that a test or repair is recommended, then, based on the results, another test or repair is recommended. Other symptoms are formatted in a symptom - problem - solution format. In these symptoms, the problems are arranged in the most likely or easiest to check first. Symptoms arranged in both formats refer to testing procedures in the second part of this section. The second part of this section contains the following testing procedures:

- Base Engine Testing Procedures:
  - Test Engine Compression Pressure
  - Test Engine Cranking Speed
  - Dynamometer Test
- Lubrications System Testing Procedures:
  - Engine Oil Consumption
  - Check Engine Oil Pressure
  - Check for Excessive Crankcase Pressure (Blow-By)
  - Check for Turbocharger Oil Seal Leak
- Cooling System Testing Procedures:
  - Inspect Thermostat and Test Opening Temperature
  - Pressure Test Cooling System and Radiator Cap
  - Check for Head Gasket Failures
  - Check and Service Cooling System
- Air Supply and Exhaust Systems Testing Procedures:
  - Check Air Intake System
  - Measure Intake Manifold Pressure (Turbo Boost)
  - Check for Intake and Exhaust Restrictions
  - Test for Intake Air Leaks
  - Check for Exhaust Leaks (Turbocharger Engines)
  - Test Turbocharger Wastegate
  - Test Air Filter Restriction Indicator Switch

RG40854,0000019 –19–14OCT02–1/1

About This Manual

The changes listed below update your CTM. **Discard CTM301 dated 28Sep04 and replace with this manual. Also refer to the following manuals.**

- CTM77—Alternators and Starting Motors
- CTM67—OEM Engine Accessories (English Only)

SECTION 02—Group 090 (Fuel System)

- Added fuel control rack measurement procedure
- Revised install and synchronize injection pumps procedure

SECTION 02—Group 090 (Fuel System)

- Added check engine power procedure
- Added adjust engine power procedure

SECTION 04—Group 160 (Fuel System)

- Added electronic controller diagnostic test procedures

SECTION 05—Group 170 (Repair Tools)

- Added tools

SECTION 05—Group 180 (Diagnostic Service Tools)

- Added electronic controller diagnostic tool

RG19661,0000028 –19–22SEP05–1/1

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002
12

Lubricant Storage

Your equipment can operate at top efficiency only when clean lubricants are used.

Use clean containers to handle all lubricants.

Whenever possible, store lubricants and containers in an area protected from dust, moisture, and other contamination. Store containers on their side to avoid water and dirt accumulation.

Make certain that all containers are properly marked to identify their contents.

Properly dispose of all old containers and any residual lubricant they may contain.

DX,LUBST –19–18MAR96–1/1

Grease

Use grease based on NLGI consistency numbers and the expected air temperature range during the service interval.

John Deere SD POLYUREA GREASE is preferred.

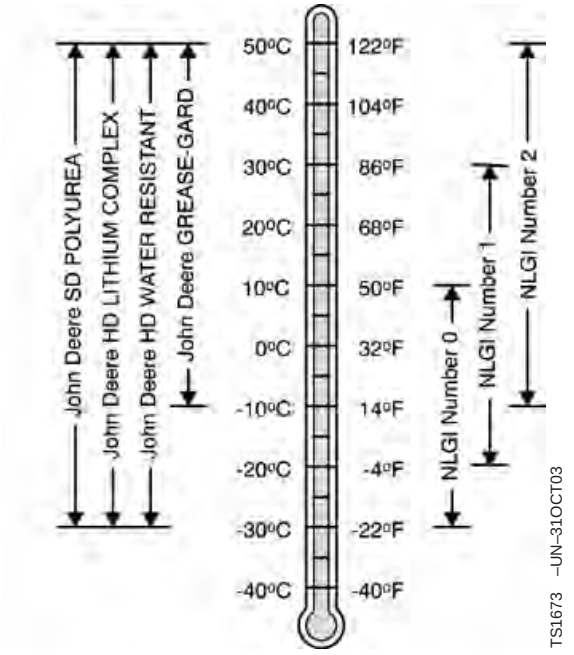
The following greases are also recommended

- John Deere HD LITHIUM COMPLEX GREASE
- John Deere HD WATER RESISTANT GREASE
- John Deere GREASE-GARD™

Other greases may be used if they meet the following:

NLGI Performance Classification GC-LB

IMPORTANT: Some types of grease thickeners are not compatible with others. Consult your grease supplier before mixing different types of grease



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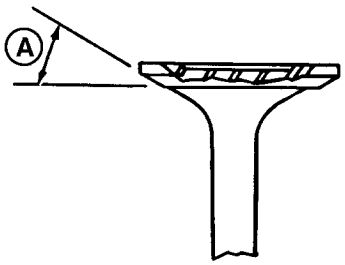
DX,GREA1 –19–07NOV03–1/1

Grind Valves

IMPORTANT: DO NOT nick valve head-to-stem radius when grinding valves. A nick could cause the valve to break. Break all sharp edges after grinding.

Reface serviceable valves to specified angle (A).

Specification	
Valves—Face Angle	29.25° ± 0.25°



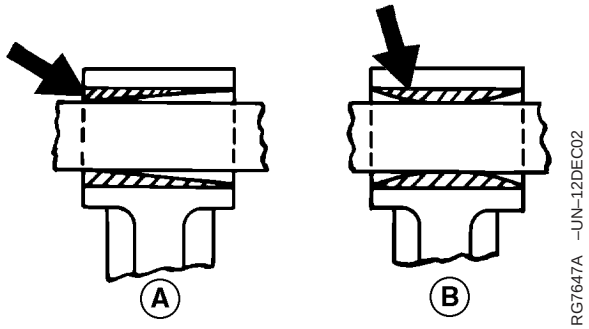
RG4755 –UN–31OCT97

Checking Valve Face Angle

A—Valve Face Angle

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7. Insert pin from either side of rod bushing. If pin is free on one end, but tight on the other, the bore could be tapered (A). If pin enters freely from both sides, but is tight in the center, bore is bell mouthed (B).



Piston Pin Wear Points in Connecting Rod

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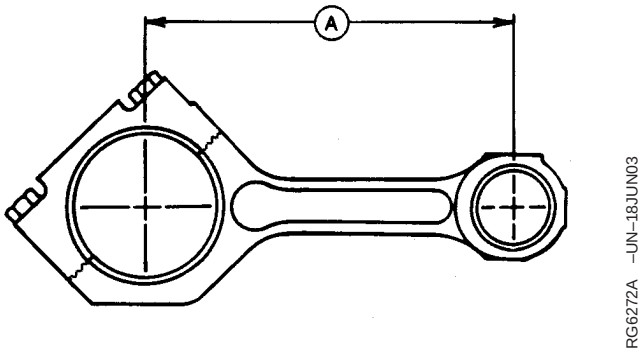
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Measure Rod Center-to-Center Bores

Measure rod center-to-center bores (A). Compare to specifications given below. Replace rod if necessary.

Specification	
Rod Bearing Bore-to-Piston Pin Bushing Bore (Center-to-Center)—Measurement	169.975 — 170.025 mm (6.692— 6.694 in.)

A—Center-to-Center Measurement



Measure Rod Center-to-Center Bores

RG41183,0000042 –19–05MAR04–1/1

Remove Crankshaft

1. Remove main bearing caps and connecting rod caps, as described earlier in this group.

CAUTION: Crankshaft is heavy. Plan a proper handling procedure to avoid injury. Do not use lifting sling on connecting rod or main journals.

2. Attach a lifting sling to crankshaft. Using proper lifting equipment, carefully raise crankshaft out of cylinder block.

3. Clean crankshaft, especially oil passages, using solvent and compressed air.

4. Place crankshaft on clean V-blocks.

5. If main bearing inserts are to be replaced, remove inserts from cylinder block. Otherwise, leave bearing inserts in block until assembled ID has been measured.



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Remove Crankshaft from Cylinder Block

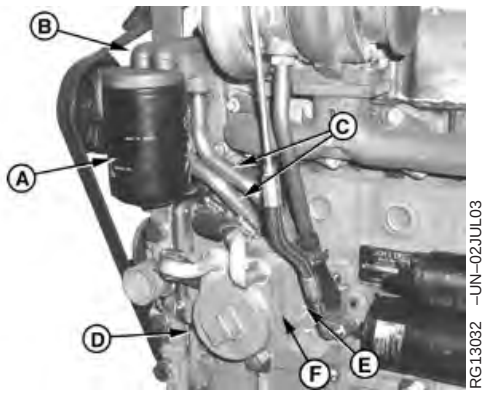
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Vertical Oil Filter

1. Install oil filter header (B) to cylinder head and tighten to specification.
2. Install idler pulley to oil filter header (B) and tighten to specification.
3. Install new O-rings into the bottom of the oil filter header and install header inlet and outlet lines (C).
4. Install new O-rings into oil cooler adapter (E). Install new seal between cylinder block and oil cooler adapter. Connect to the header inlet and outlet lines (C).
5. Install the oil cooler (F) to the oil cooler adapter (E). Insert the threaded nipple through the oil cooler and tighten to specification.
6. Connect coolant lines to the oil cooler adapter and tighten clamps.
7. Install the oil cooler cover (D) with a new seal and tighten to specification.
8. Apply a thin coating of clean engine oil to the oil filter gasket. Install oil filter until gasket contacts the oil filter header. Tighten oil filter (A) an additional 3/4 to 1-1/4 turns.

Specification

Oil Filter Header Cap Screw—Torque	34 N•m (25 lb-ft)
Idler Pulley Cap Screw—Torque	63 N•m (46 lb-ft)
Threaded Nipple—Torque	37 N•m (27 lb-ft)
Oil Cooler Cover Plate—Torque	37 N•m (27 lb-ft)



Vertical Oil Filter Configuration

A—Oil Filter
B—Oil Filter Header
C—Header Inlet and Outlet Lines
D—Oil Cooler Cover
E—Oil Cooler Adapter
F—Oil Cooler

RG41183,0000029 –19–01SEP04–2/2

Specification	
Turbocharger Oil Inlet Line (Turbocharger End)—Torque	19 N•m (14 lb-ft)
Turbocharger Oil Inlet Line (Block End)—Torque	16 N •m (12 lb-ft)

02
080
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6. If equipped, connect wastegate diaphragm hose.

7. Connect air intake and exhaust piping to turbocharger. Tighten all connections securely. (For vehicle engines, refer to machine Technical Manual.)

IMPORTANT: BEFORE STARTING an engine with a new or repaired turbocharger, crank the engine over (but do not start) for several seconds to allow engine oil to reach turbocharger bearings. DO NOT crank engine longer than 30 seconds at a time to avoid damaging starting motor.

8. Start and run engine at low idle while checking oil inlet and air piping connections for leaks.

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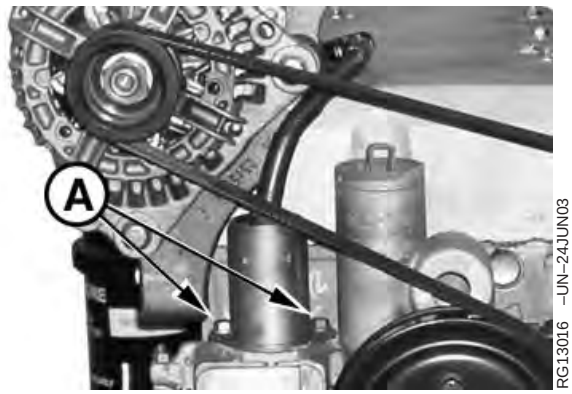
Remove and Install Fuel Shut-Off Solenoid

1. Disconnect wire harness connection from fuel shut-off solenoid.
2. Remove timing gear cover access cover. Carefully remove retaining ring from throttle shaft.
3. Remove cap screws (A) and remove solenoid. Clean sealant from mounting surface.
4. Apply a continuous 2—4 mm (0.08—0.16 in.) bead of PM710XX280 Silicone Sealant to mounting surface of solenoid and install solenoid by sliding it onto the throttle shaft.
5. Tighten solenoid cap screws to specification.

Specification

Fuel Shut-Off Solenoid—Torque ..... 15 N•m (11 lb-ft)

6. Carefully install solenoid retaining ring on throttle shaft.
7. Apply a continuous 2—4 mm (0.08—0.16 in.) bead of PM710XX280 Silicone Sealant to mounting surface of the access cover and assemble on timing gear cover.
8. Connect wire harness connector.



Fuel Shut-Off Solenoid

RG41183,0000041 –19–05MAR04–1/1

❺ **Pistons, Rings, Cylinder Bores Check**	At this point, the most likely cause of excessive oil consumption is one of the following failures in the pistons, rings, and/or cylinder bores or in the valve guides. Check the most likely items as needed. • Oil control rings worn or broken • Scored cylinder bores or pistons • Piston ring grooves excessively worn • Insufficient piston ring tension • Piston ring gaps not staggered • Cylinder bores glazed (insufficient load during engine break-in) • Worn valve guides or stems	Problem found with pistons, rings, and/or bores or valve guides. Repair problem as necessary. – – –1/1

❹ **Intake and Exhaust Restriction Check**	Check for intake and exhaust restrictions. See CHECK FOR INTAKE AND EXHAUST RESTRICTIONS in Section 04, Group 151 of this manual.	**No restrictions are found:** GO TO ❺ **Restrictions are found:** Repair or replace components as needed. – – –1/1
❺ **Compression Pressure Check**	Check compression pressure. See TEST ENGINE COMPRESSION PRESSURE in Section 04, Group 151 of this manual.	**Compression pressure is within specification:** No further analysis is necessary. **Compression pressure is not within specification:** GO TO ❻ – – –1/1
❻ **Pistons, Rings, Cylinder Bore Check**	At this point, the most likely cause of the low engine compression pressure is one of the following failures in the pistons, rings, and/or cylinder bore or in the valve guides. Check the most likely items as needed. • Oil control rings worn or broken • Scored cylinder bores or pistons • Piston ring grooves excessively worn • Piston rings sticking in ring grooves • Insufficient piston ring tension • Piston ring gaps not staggered • Cylinder bore glazed (insufficient load during engine break-in) • Worn valve guides or stems • Cylinder head may need reconditioning	**Problem found with pistons, rings, and/or cylinder bores or valve guides:** Repair problem as necessary. – – –1/1

Adjust Engine Power

If adjustment to engine power is necessary:

1. Shut off engine and position the throttle to the low speed position.

   Drill 1/8 in. hole in full load screw cup plug located on the right-hand side of the front cover and remove using JDG22 Seal Remover.

2. Loosen full load stop screw lock nut using JDG10038 Full Load Stop Screw Socket Wrench.

3. Insert a 1/4 in. drive extension and JDG1791 Socket Adapter through JDG10038 Full Load Stop Screw Socket Wrench.

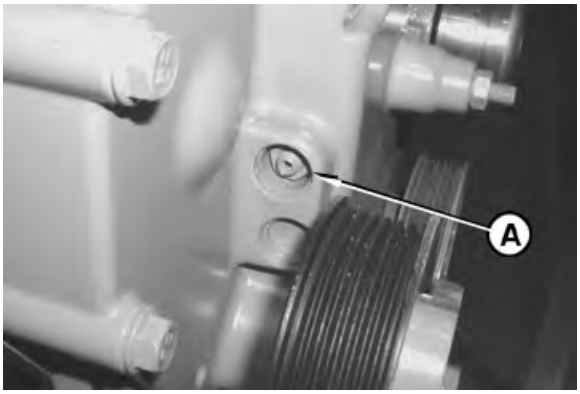
4. Adjust full load stop screw by turning 1/4 in. drive.

   - Decrease fuel delivery by turning counter-clockwise.
   - Increase fuel delivery by turning clockwise.

5. After adjusting the full load stop screw, hold the 1/4 in. drive to ensure the screw does not move and tighten the screw lock nut with JDG10038 Full Load Stop Screw Socket Wrench.

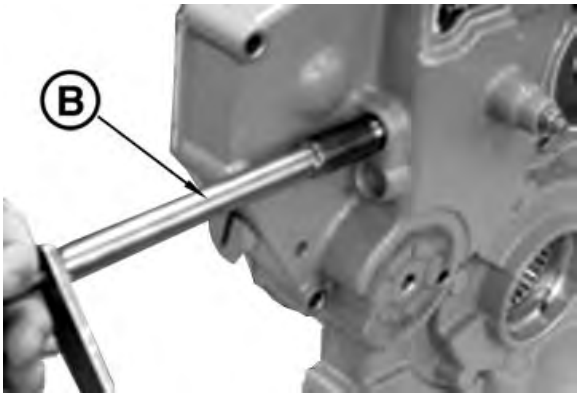
6. Start engine and verify engine is operating at the correct specifications. See “Check Engine Power” described earlier in this section.

7. Check throttle settings. Apply a bead of LOCTITE 277® on a new inverted cup plug and install in the timing gear cover.



RG14500 –UN–21SEP05

Full Load Stop Screw and Lock Nut



RG14501 –UN–21SEP05

Adjust Full Load Stop Screw

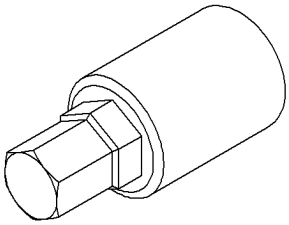
A—Full Load Stop Screw and Lock Nut
B—JDG10038 Full Load Stop Screw Socket Wrench

LOCTITE is a trademark of Loctite Corp.

RG19661,0000022 –19–22SEP05–1/1

Oil Filter Adapter Socket. JDG1702

Used to remove oil filter nipple, allowing the oil cooler to be removed.



RG13031 –UN–01JUL03

JDG1702

RG41183,000003E –19–29SEP04–3/8

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Dipstick Driver JDG1658

Install dipstick tube in block.



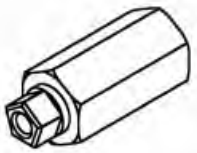
RG12997 –UN–19JUN03

JDG1658

RG41183,000003E –19–29SEP04–4/8

Cold Start Advance Plug Socket Adapter JDG1755

Use to remove and install tamper-proof cold advance plug



RG13756 –UN–28SEP04

JDG1755

Continued on next page

RG41183,000003E –19–29SEP04–5/8

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