Series 400
6076
Diesel Engines
Serial Number
(500000-)

JOHN DEERE

COMPONENT TECHNICAL MANUAL

Series 400 6076 Diesel Engines Serial Number (500000-)

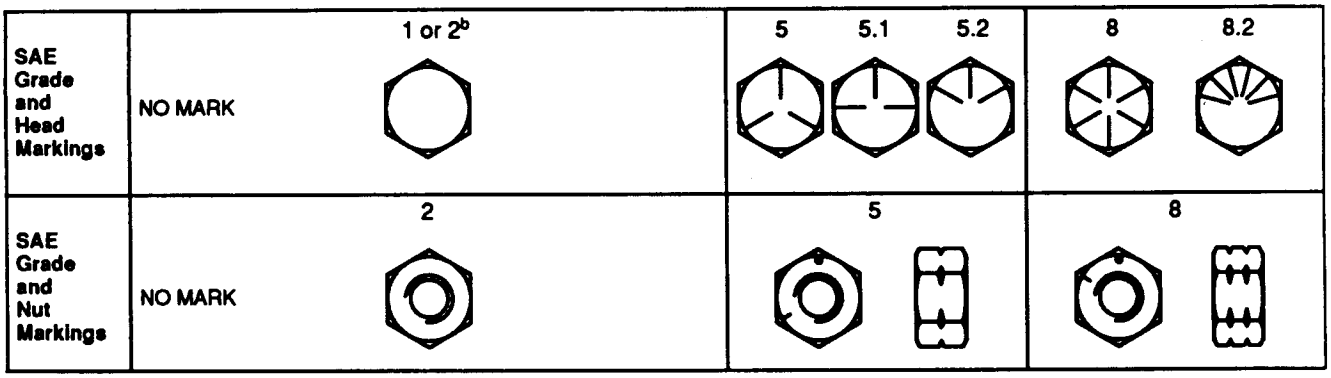
CTM42 (24MAR95) English

Deere Power Systems Group
CTM42 (24MAR95)

LITHO IN U.S.A.
ENGLISH

Continued on next page

UNIFIED INCH BOLT AND CAP SCREW TORQUE VALUES



TS1162 -19-04MAR91

Size	Grade 1				Grade 2[b]				Grade 5, 5.1, or 5.2				Grade 8 or 8.2			
	Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]		Lubricated[a]		Dry[a]	
	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft	N·m	lb-ft
1/4	3.7	2.8	4.7	3.5	6	4.5	7.5	5.5	9.5	7	12	9	13.5	10	17	12.5
5/16	7.7	5.5	10	7	12	9	15	11	20	15	25	18	28	21	35	26
3/8	14	10	17	13	22	16	27	20	35	26	44	33	50	36	63	46
7/16	22	16	28	20	35	26	44	32	55	41	70	52	80	58	100	75
1/2	33	25	42	31	53	39	67	50	85	63	110	80	120	90	150	115
9/16	48	36	60	45	75	56	95	70	125	90	155	115	175	130	225	160
5/8	67	50	85	62	105	78	135	100	170	125	215	160	240	175	300	225
3/4	120	87	150	110	190	140	240	175	300	225	375	280	425	310	550	400
7/8	190	140	240	175	190	140	240	175	490	360	625	450	700	500	875	650
1	290	210	360	270	290	210	360	270	725	540	925	675	1050	750	1300	975
1-1/8	400	300	510	375	400	300	510	375	900	675	1150	850	1450	1075	1850	1350
1-1/4	570	425	725	530	570	425	725	530	1300	950	1650	1200	2050	1500	2600	1950
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2150	1550	2700	2000	3400	2550
1-1/2	1000	725	1250	925	990	725	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

DO NOT use these values if a different torque value or tightening procedure is given for a specific application. Torque values listed are for general use only. Check tightness of fasteners periodically.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

Fasteners should be replaced with the same or higher grade. If higher grade fasteners are used, these should only be tightened to the strength of the original.

Make sure fasteners threads are clean and that you properly start thread engagement. This will prevent them from failing when tightening.

Tighten plastic insert or crimped steel-type lock nuts to approximately 50 percent of the dry torque shown in the chart, applied to the nut, not to the bolt head. Tighten toothed or serrated-type lock nuts to the full torque value.

[a] "Lubricated" means coated with a lubricant such as engine oil, or fasteners with phosphate and oil coatings. "Dry" means plain or zinc plated without any lubrication.

[b] Grade 2 applies for hex cap screws (not hex bolts) up to 152 mm (6-in.) long. Grade 1 applies for hex cap screws over 152 mm (6-in.) long, and for all other types of bolts and screws of any length.

DX,TORQ1 -19-20JUL94

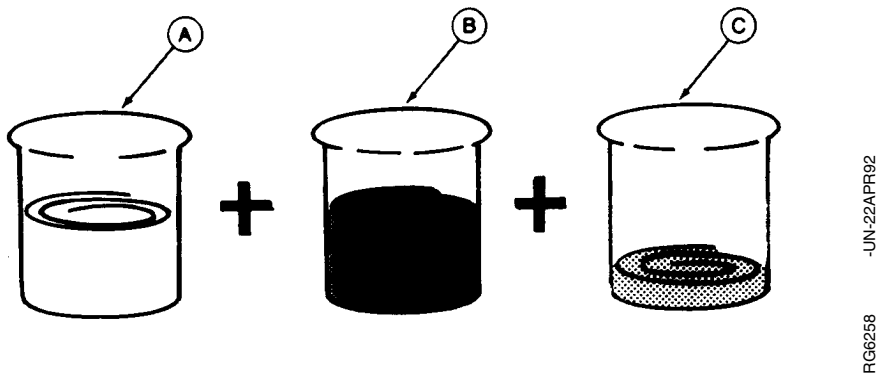
ALTERNATIVE AND SYNTHETIC LUBRICANTS

Conditions in certain geographical areas may require lubricant recommendations different from those printed in this manual. Some John Deere lubricants may not be available in your location. Consult your John Deere dealer to obtain information and recommendations.

Synthetic lubricants may be used if they meet the performance requirements listed in this manual.

DX,ALTER -19-01FEB94

ENGINE COOLANT REQUIREMENTS



A—Quality Water

B—Ethylene Glycol Concentrate (Antifreeze)

C—Supplemental Coolant Additives (SCA's)

Engine Coolant

To meet cooling system protection requirements, the coolant MUST consist of a 50/50 mixture of quality water and ethylene glycol concentrate (antifreeze). Supplemental coolant additives (SCA's) must be added to this mixture. Add 3% (by volume) TY16004 or TY16005 Liquid Coolant Conditioner. If an equivalent product is used, always follow the supplier's recommendations printed on the container. See ENGINE COOLANT SPECIFICATIONS, later in this section, for further definition.

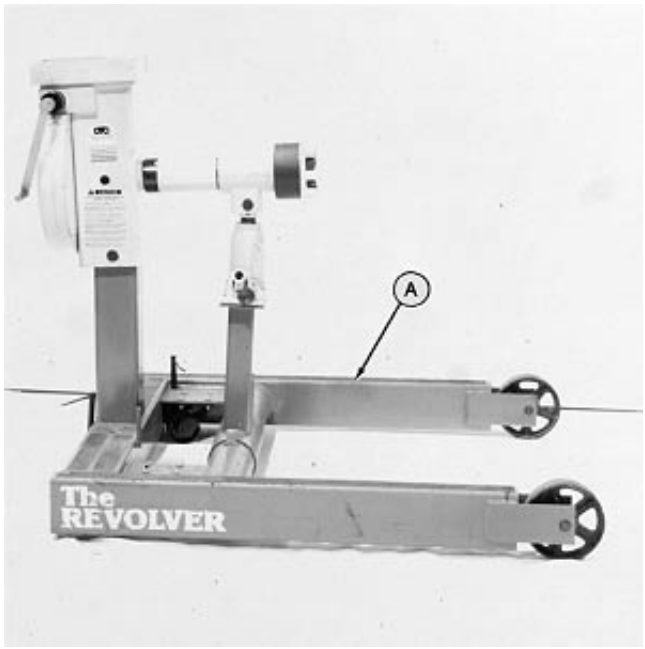
Makeup of the coolant between changes MUST consist of the same requirements as during a complete change. Performing a CoolScan analysis is the recommended method for determining the amount of quality water, ethylene glycol concentrate, and supplemental coolant additives that should be added.

IMPORTANT: Supplemental coolant additives MUST be added to the coolant solution. Ethylene glycol concentrate (antifreeze) DOES NOT contain chemical inhibitors needed to control liner pitting or erosion, rust, scale, and acidity.

RG,COOL1 -19-10OCT94

ENGINE REPAIR STAND

NOTE: Only the 2722 kg (6000 lb) heavy duty engine repair stand (A) No. D05223ST manufactured by Owatonna Tool Co., Owatonna, Minnesota is referenced in this manual. When any other repair stand is used, consult the manufacturer's instructions for mounting the engine.



RG4929 -UN-15DEC88

S11,2000,EM -19-08MAR94

SPECIAL OR ESSENTIAL TOOLS

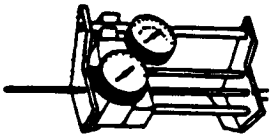
NOTE: Order tools according to information given in the U.S. SERVICE-GARD™ Catalog or in the European Microfiche Tool Catalog (MTC).

DX,TOOLS -19-05JUN91

RG5061 -UN-23AUG88

Spring Compression Tester D01168AA

Test valve spring compression.

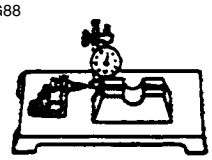


S53,D01168,AA -19-13MAR92

RG5062 -UN-23AUG88

Valve Inspection Center D05058ST

Check valves for out-of round.



S53,D05058,ST -19-02APR87

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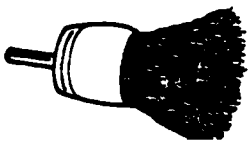
1

RG5063 -UN-23AUG88

End Brush D17024BR

Clean valve seat and bores.

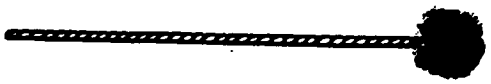


S53,D17024,BR -19-26JAN87

RG5099 -UN-23AUG88

Nozzle Thread Cleaning Brush D17030BR

Used to clean nozzle threads in cylinder head.



S53,D17030,BR -19-16FEB87

Dial Indicator . . . . . (English, in.) D17526CI
or (Metric, mm) D17527CI

Use with JDG451 to measure valve recess and cylinder liner height-to-cylinder block top deck.

RG6246 -UN-27MAR92

RG,D17526CI -19-29OCT92

RG5064 -UN-23AUG88

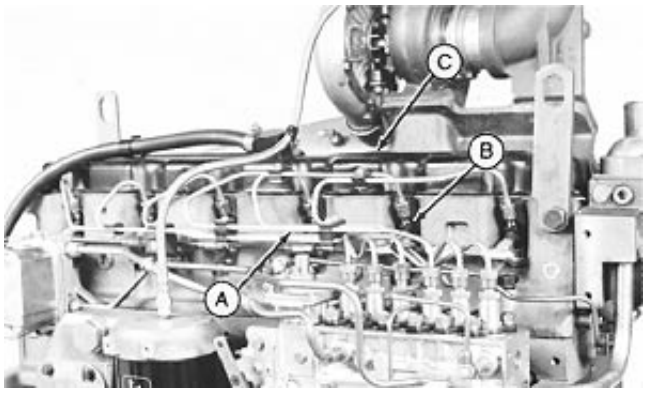
Valve Guide Knurler Kit JT05949

Knurl valve guides.

S53,D20002,WI -19-16SEP92

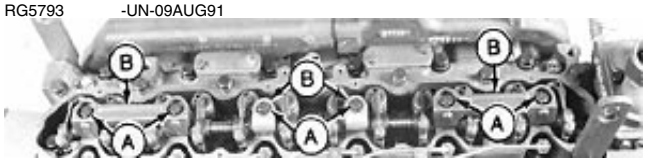
7. Remove fuel injection lines (A) and nozzles (B). (See Fuel System, Group 35.)

8. Remove rocker arm cover (C) and ventilator outlet hose assembly.



RG,CTM42,G5,7 -19-22AUG91

RG5793 -UN-09AUG91



9. Remove six cap screws (A) and remove all four clamps (B). Lift rocker arm assembly up and remove. Remove wear caps from valve stems.

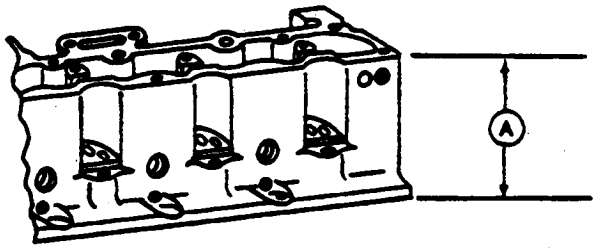
10. Remove all 12 push rods and identify for reassembly.

NOTE: Clean and inspect push rods as explained later in this group.

RG,CTM42,G5,8 -19-28OCT92

05
11

MEASURE CYLINDER HEAD THICKNESS



RG4421 -UN-23FEB89

Measure head thickness (A) from valve cover gasket rail-to-combustion face.

If cylinder head thickness is less than wear limit. DO NOT attempt to resurface. Install a new cylinder head.

NOTE: If necessary to resurface cylinder head, a MAXIMUM of 0.762 mm (0.030 in.) can be ground from new part dimension. Remove ONLY what is necessary to restore flatness.

IMPORTANT: After resurfacing, check flatness as described earlier and check surface finish on combustion face of head.

Check valve recess after grinding. (See MEASURE VALVE RECESS, earlier in this group.) Valve seat or valve face may be ground to bring this characteristic within specification.

CYLINDER HEAD SPECIFICATIONS

Thickness	155.45—155.71 mm (6.120—6.130 in.)
Wear Limit	154.69 mm (6.09 in.)
Combustion Face Surface Finish (AA)	0.015—0.0028 mm (60—110 micro-in.)
Maximum Wave Depth	0.008 mm (0.0003 in.)

S11,2005,KZ -19-14SEP94

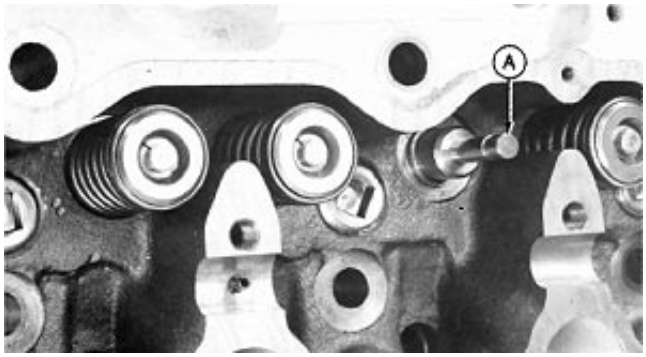
ASSEMBLE VALVE ASSEMBLY

1. Apply AR44402 Valve Stem Lubricant or clean engine oil to valve stems and guides.

NOTE: Exhaust valve stem shields will not seat on valve guide tower; they ride up and down with valve stem.

2. Install reconditioned or new valves (A) in head. If valves are reused, install in same location from which removed.

NOTE: Valves must move freely and seat properly.



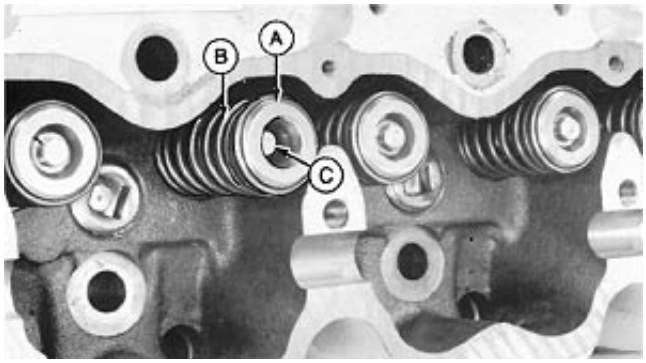
S11,0401,AK -19-28OCT92

NOTE: There is no top or bottom to valve springs; they may be installed either way.

3. Position valve springs (B). End of spring must be in machined counterbore of head. Do not mix valve springs. See INSPECT AND MEASURE VALVE SPRINGS, earlier in this group.

4. Install valve rotators (A) on springs and valves (C).

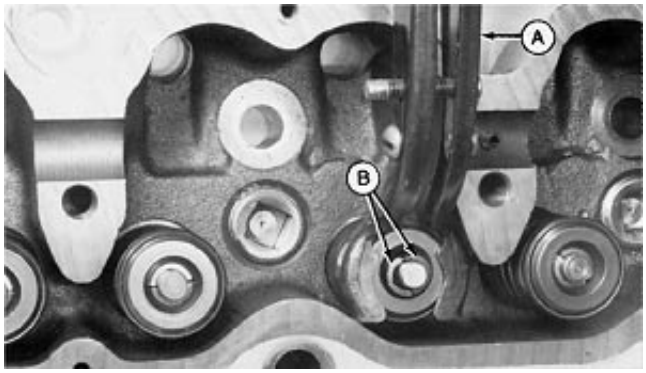
5. Install valve stem shields on exhaust valve stems.



RG,CTM42,G5,28 -19-28OCT92

6. Compress valve springs with JDE138 Valve Spring Compressor (A) and install retainer locks (B).

NOTE: Install wear caps just before installing rocker arm assembly.



RG,CTM42,G5,29 -19-28OCT92

11. Install water inlet (A) and water outlet (C) hoses. Tighten hose clamps securely.

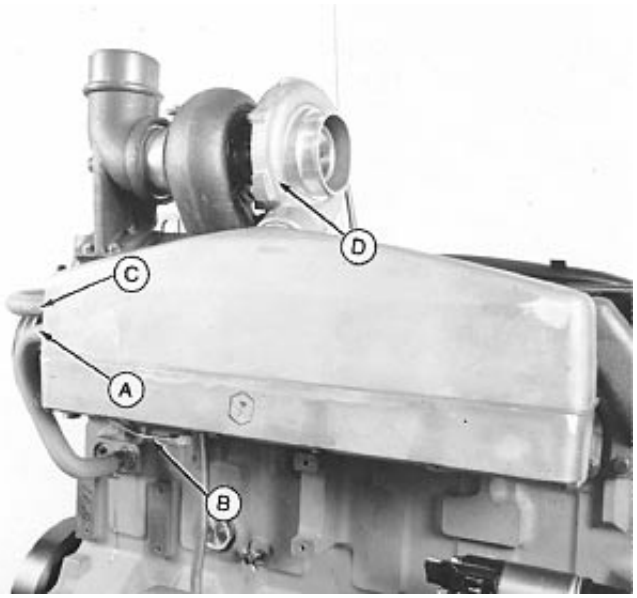
12. Install aneroid line (B), if equipped, and tighten securely.

13. Install turbocharger (D) with couplings. Tighten cap screws to 47 N·m (35 lb-ft). (See INSTALL TURBOCHARGER in Group 30.)

14. If engine oil was drained from crankcase, install new oil filter and fill with clean oil of correct grade and viscosity. (See DIESEL ENGINE OIL in Group 02.)

15. Fill cooling system with clean coolant. (See ENGINE COOLANT SPECIFICATIONS in Group 02.)

16. Perform engine break-in as outlined later in this group. (See PERFORM ENGINE BREAK-IN.)



RG5885 -UN-13AUG91

A—Water Inlet Hose
B—Aneroid Line
C—Water Outlet Tube and Hose
D—Turbocharger

RG,CTM42,G5,32 -19-28OCT92

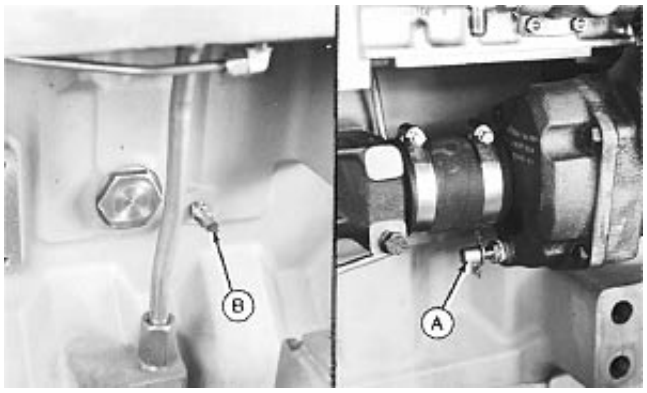
REMOVE PISTONS AND CONNECTING RODS

The engine does not always have to be removed from the machine to service the pistons and connecting rods. If engine is to be removed, see your Machine Technical Manual.

CAUTION: DO NOT drain engine coolant until the temperature is below operating temperature. Then slowly loosen water pump drain valve (A) and block drain valve (B) to relieve any pressure.

IMPORTANT: Both water pump drain valve and block drain valve must be opened to completely drain both sides of the engine.

1. Drain all coolant and engine oil.



RG5836 -UN-28AUG91

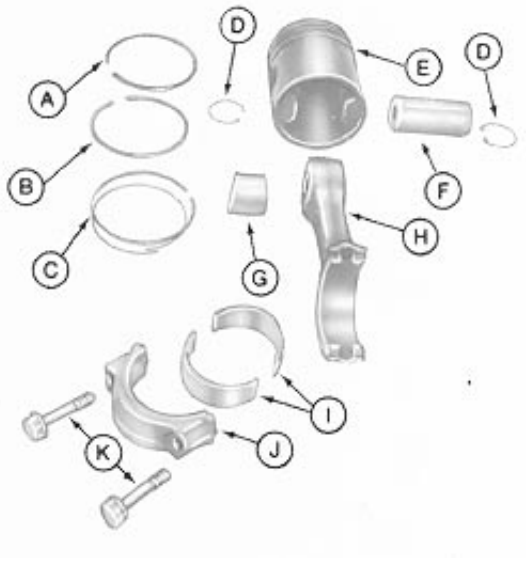
RG,CTM42,G10,19-19-29OCT92

NOTE: If engine is to be completely disassembled, follow DISASSEMBLY SEQUENCE in Group 04.

2. Remove cylinder head. (See REMOVE CYLINDER HEAD in Group 05.)

3. Remove oil pan and oil pump. (See REMOVE ENGINE OIL PUMP in Group 20.)

A—#1 Keystone Compression Ring
B—#2 Keystone Compression Ring
C—Oil Control Ring with Expander
D—Snap Ring (2 used)
E—Piston
F—Piston Pin
G—Piston Pin Bushing
H—Connecting Rod
I—Bearings
J—Connecting Rod Cap
K—Special Cap Screw



RG3657 -UN-13DEC88

RG,CTM42,G10,30-19-14FEB95

VISUALLY INSPECT CYLINDER LINERS

IMPORTANT: If pitting has occurred, check condition of coolant.

1. Inspect exterior length of liner for pitting (A). Check packing step for erosion (B). If pitting or erosion is observed, measure the depth of pits and erosion with a fine wire or needle.

Replace piston and liner if:

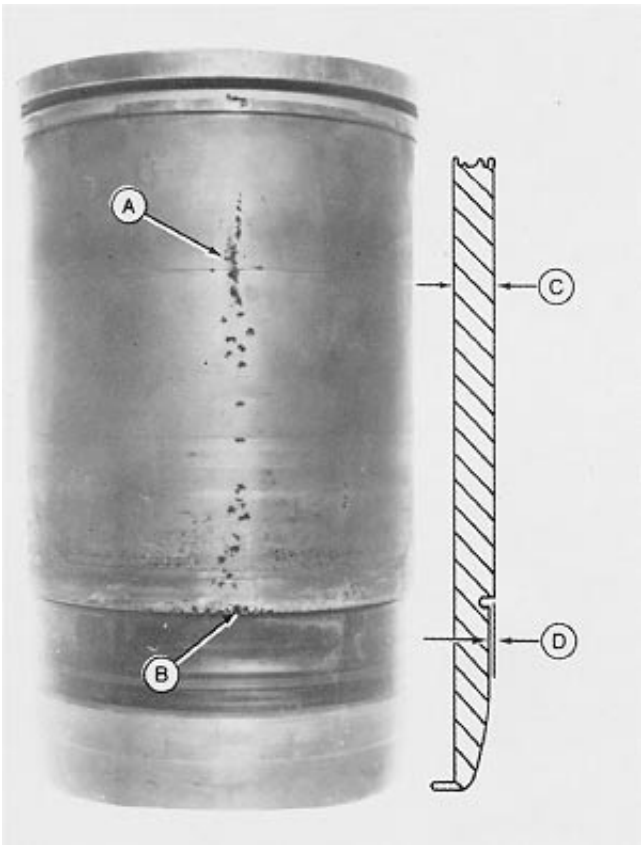
—Pitting depth is one-half liner thickness (C) or more.

—Erosion depth is one-half packing step (D) or more.

CYLINDER LINER SPECIFICATIONS

Cylinder Liner Thickness	6.05—6.15 mm (0.238—0.242 in.)
Packing Step Dimension	1.45—1.55 mm (0.057—0.061 in.)

NOTE: Liners are reusable if the depth of pits or erosion is less than one-half the amount specified. When installing these liners, rotate 90˚ from original position. The liners should be deglazed and ring sets installed on pistons.



RG4643 -UN-13DEC88

A—Liner Pitting
B—Liner Erosion
C—Liner Thickness
D—Packing Step

RG,CTM42,G10,34-19-22JUL94

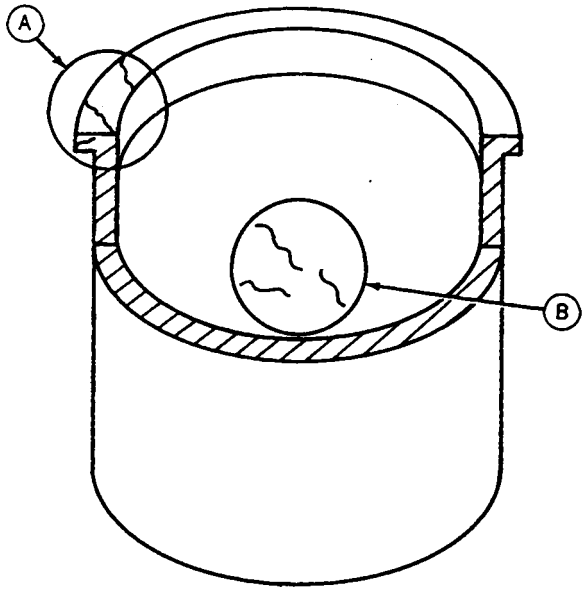
2. Visually examine liner ID. Replace piston and liner if:

— The crosshatch honing pattern is not visible immediately below the top ring turn-around area.

— Liners are pitted or contain deep vertical scratches that can be detected by the fingernail.

3. Carefully examine liner for signs of fatigue, such as fine cracks in the flange area (A) and cracks in the ring travel area (B).

NOTE: Inspect block for cracks or erosion in the O-ring packing areas. See INSPECT AND CLEAN CYLINDER BLOCK, later in this group.



RG1188 -UN-13DEC88

(Exaggerated defects)

RG,CTM61,G10,14-19-22JUL94

COMPLETE DISASSEMBLY OF CYLINDER BLOCK (IF REQUIRED)

If complete inspection and "Hot Tank" cleaning of cylinder block is required, refer to the appropriate group for removal of all external and internal mounted components listed below:

1. Remove crankshaft and pulley if not previously removed. (Group 15)

2. Remove all remaining lubrication system components. (Group 20) Remove starting motor.

3. Remove water pump and all remaining cooling system components. (Group 25)

4. Remove timing gear train and camshaft. (Group 16)

5. Remove fuel injection pump and fuel filter assembly. (Group 35)

6. If necessary to "Hot Tank" the block, remove oil gallery plugs, water gallery plugs, piston cooling orifices and the engine serial number plate. (See REMOVE AND CLEAN PISTON COOLING ORIFICES, later in this group.)

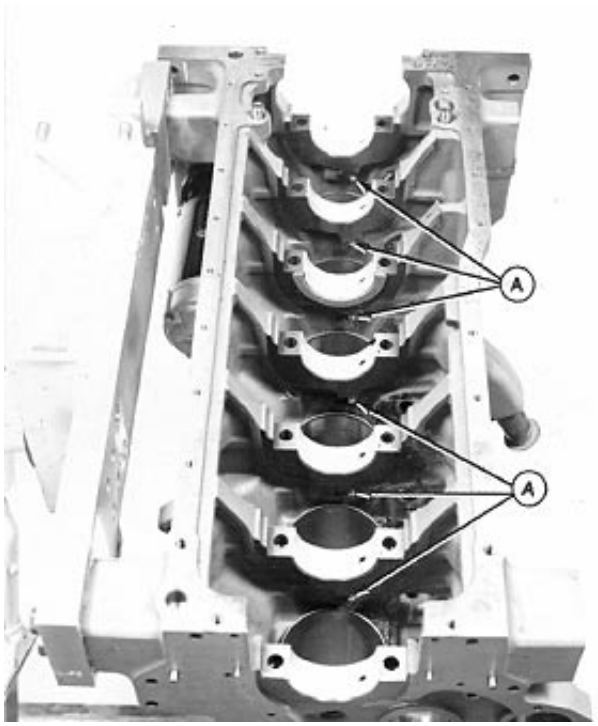
RG,CTM42,G10,6 -19-22JUL94

REMOVE AND CLEAN PISTON COOLING ORIFICES

1. Remove all six piston cooling orifices (A) and inspect each cooling orifice to make sure it is not plugged or damaged.

2. Use a soft wire and compressed air to clean orifice. Replace, if condition is questionable.

IMPORTANT: A piston cooling orifice failure could cause damage to pistons, piston pins, rod pin bushings, and liners. If a piston cooling orifice is left out, low or no oil pressure will result.



RG5811 -UN-12AUG91

RG,CTM42,G10,7 -19-29OCT92

4. Finish seating cylinder liners using a clean, hardwood block and hammer.

5. Gently tap hardwood block over top of cylinder liner with mallet.

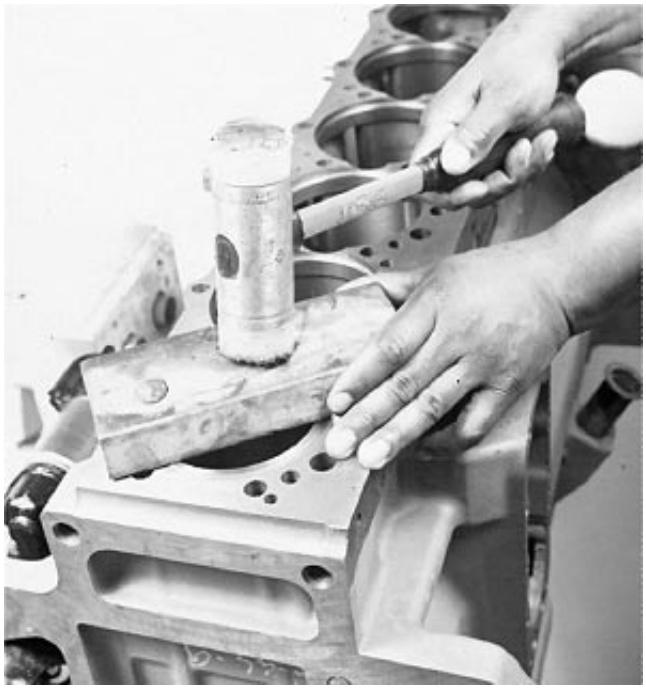
NOTE: Cylinder liner will protrude over top of cylinder block more than normal due to uncompressed packings and O-rings.

IMPORTANT: If you suspect that a packing may have sheared or displaced liner installation, remove liner and packing assembly. If no damage is found, check packing and O-rings for proper position. Re-soap packings and reinstall liner assembly.

6. Hold liners in place with large flat washers and cap screws. Turn cap screws snug but do not tighten.

7. Clean cylinder liner bores with waterless hand cleaner after installation. Wipe dry with clean towels.

8. Apply clean engine oil to liner bores immediately to prevent corrosion.



RG5815 -UN-12AUG91

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39

RG,CTM42,G10,13-19-14FEB95

OTHER MATERIAL

Name	Use
LOCTITE 242 (TY9370) Thread Lock and Sealer	Coat threads of flywheel mounting cap screws.
LOCTITE 515 (TY6304) Flexible Sealant (General Purpose)	Coat trimmed flywheel housing-to-cylinder block gasket.
LOCTITE 609 (TY15969) Retaining Compound	Coat OD of crankshaft flange for installation of rear oil seal/wear sleeve.
PLASTIGAGE	Check main bearing-to-crankshaft journal oil clearance during engine disassembly.
Brake Kleen or Ignition Cleaner and Drier	Remove sealant from crankshaft flange.

S11,2015,EE -19-11OCT94

15
5

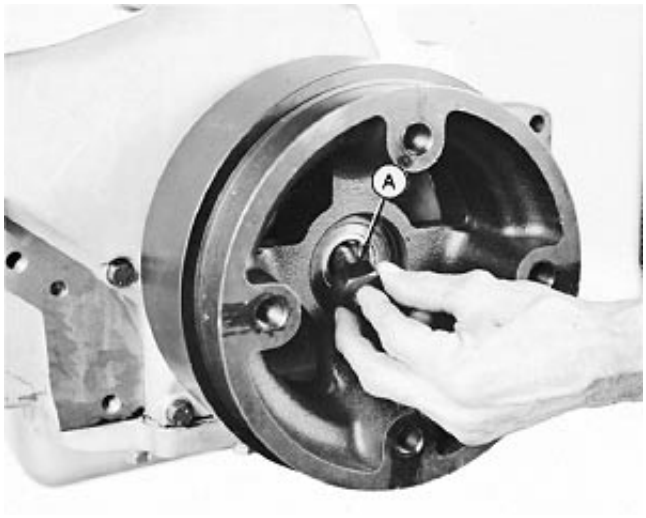
IMPORTANT: DO NOT use a jaw-type puller to remove vibration damper. Damage could result to the damper. Never apply thrust on outer ring of damper. Do not drop or hammer on damper.

NOTE: On some applications, it may be necessary to remove the pulley from the damper before pulling damper from crankshaft flange.

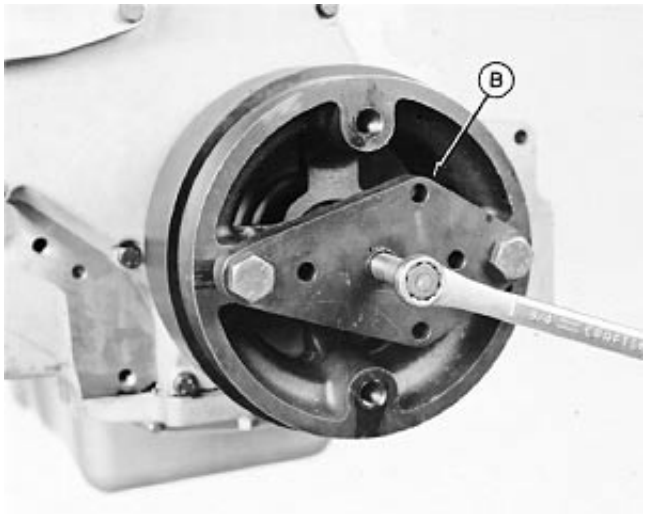
3. Remove pulley and damper from crankshaft using D01207AA(OTC518) Puller Set (upper photo).

On certain applications, it may be necessary to use JDG721 Hub Puller (B) and JDG787 Thread Protector (A) (lower photos) to remove damper pulley.


RG5765 -UN-06AUG91



RG6469 -UN-26OCT92



RG6470 -UN-26OCT92

RG,CTM42,G15,33-19-16AUG94

REPLACE REAR OIL SEAL HOUSING (6076HRW33, 34, AND 35 ENGINES)—ENGINE INSTALLED IN VEHICLE

6076HRW33, 34, and 35 Engines used in 8100, 8200, and 8300 tractors are equipped with front frame/oil sump, refer to TM1575 (8100, 8200, 8300, and 8400 Tractors—Repair) for access to front frame/oil sump-to-engine block cap screws.

IMPORTANT: Remove rear oil seal housing (A) for replacement purposes only, it is not necessary to remove seal housing for rear seal and wear sleeve replacement.

To Remove Rear Oil Seal Housing:

NOTE: Refer to TM1575 for access to rear crankshaft seal housing area.

1. Remove flywheel cover.

2. Remove transmission input shaft coupler bolts and pry coupler rearward.

NOTE: Use a set screw to separate damper from flywheel, if necesssary.

3. Remove torsional damper from flywheel.

4. Remove flywheel from right side of tractor.

5. Back out all front frame/oil sump-to-engine block cap screws 9.5 mm (0.38 in.)

6. Slowly lift engine block assembly approximately 6.4 mm (0.25 in.) using safety approved lifting equipment.

IMPORTANT: The rear oil seal housing must not be "dragged" horizontally while in contact with front frame/oil sump gasket. Doing so may damage gasket sealing bead.

7. Remove rear oil seal housing (A).

8. Remove rear wear sleeve from crankshaft flange with JDG790 Wear Sleeve Puller Kit as detailed earlier in this group. Clean flange with emery cloth.

To Install Rear Oil Seal Housing:

1. Install rear oil seal housing and check runout. (See INSTALL CRANKSHAFT REAR OIL SEAL HOUSING and CHECK OIL SEAL HOUSING RUNOUT, later in this group.)

2. Carefully lower engine onto locating dowels of front frame/oil sump.

3. Tighten front frame/oil sump cap screws as detailed in Group 20, Lubrication System of this manual (See TIGHTEN CAP SCREWS ON FRONT FRAME/OIL SUMP) or TM1575.

4. Install a new rear oil seal and wear sleeve assembly. (See INSTALL CRANKSHAFT REAR OIL SEAL AND WEAR SLEEVE, WITHOUT ENGINE DISASSEMBLY, earlier in this group.)

5. Install flywheel. (See INSTALL FLYWHEEL, later in this group.)

6. Install torsional damper onto flywheel. (See TM1575.)

7. Pull transmission input shaft coupler forward, install cap screws and tighten to specified torque. (See TM1575.)

8. Install flywheel cover. (See TM1575.)

9. Start engine and chack for leaks.

RG,CTM42,G15,48-19-21MAR95

CRANKSHAFT GRINDING GUIDELINES—CONTINUED

4. Cool the crankshaft while grinding by using coolant generously. DO NOT crowd the grinding wheel into the work.

IMPORTANT: Grind crankshaft with journals turning counterclockwise, as viewed from the front end of crankshaft. Lap or polish journals in opposite direction of grinding.

5. Polish or lap the ground surfaces to the specified finish to prevent excessive wear of the journals. (See CRANKSHAFT GRINDING SPECIFICATIONS, later in this group.)

NOTE: Production crankshafts are induction hardened and shotpeened at the factory. Field shotpeening is not recommended due to the equipment required and part geometry.

6. If the thrust surfaces of the crankshaft are worn or grooved excessively, regrind and polish. Maintain the specified radius between each thrust surface and the bearing journal. An oversize thrust washer set containing one standard washer and two 0.18 mm (0.007 in.) oversize washers is available. (See THRUST BEARING NEW PART SPECIFICATIONS, later in this group.)

NOTE: When thrust surfaces are reground and an oversize washer is used, crankshaft end play specification must be maintained to within 0.038—0.380 mm (0.0015—0.0150 in.) (See CHECK CRANKSHAFT END PLAY, earlier in this group.)

7. Stone the edge of all oil holes in the journal surfaces smooth to provide a radius of approximately 1.50 mm (0.060 in.).

8. When finished grinding, inspect the crankshaft for cracks with the Florescent Magnetic Particle method, or similar method.

9. De-magnetize the crankshaft.

10. Thoroughly clean the crankshaft and oil passages with solvent. Dry with compressed air.

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S11,2015,HD -19-08MAR94

CHECK OIL SEAL HOUSING RUNOUT

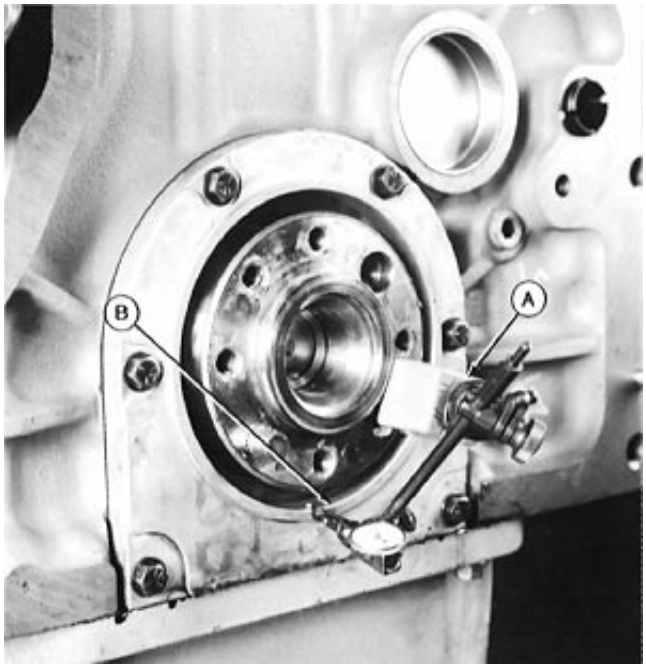
IMPORTANT: On service "short block" assemblies, rear oil seal housing runout is preset at the factory. Do not remove housing from block.

1. Position magnetic base dial indicator (A) on end of crankshaft flange as shown. Preset dial indicator tip on ID of oil seal housing bore (B).

2. Zero dial indicator and rotate crankshaft one full revolution, observe full indicator movement. The maximum oil seal housing bore runout is 0.15 mm (0.006 in.).

If runout exceeds specification, loosen cap screws and adjust housing to obtain an acceptable runout while keeping bottom of seal housing flush with oil pan mating surface.

3. Recheck oil seal housing bore runout. If runout still exceeds specification, oil seal housing bore is possibly distorted and should be replaced. See INSTALL CRANKSHAFT REAR OIL SEAL HOUSING, earlier in this group.



RG5751 -UN-05AUG91

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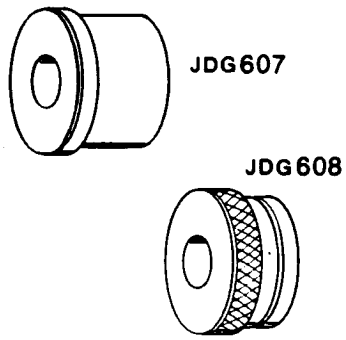
S11,2515,AK -19-16AUG94

Camshaft Bushing Adapter Set JDG606

Used with JDG405 Camshaft Bushing Service Set and D01299AA Slide Hammer to service camshaft bushings. JDG606 consists of JDG607 Driver and JDG608 Pilot.



RG5337 -UN-28AUG91

S53,JDG606 -19-09SEP91

SERVICE EQUIPMENT AND TOOLS

NOTE: Order tools from the U.S. SERVICEGARD™ Catalog or from the European Microfiche Tool Catalog (MTC). Some tools may be available from a local supplier.

Name	Use
D01207AA Puller Kit	Used to remove vibration damper.
D01045AA Bushing, Bearing, and Seal Driver Master Set	Used to install front oil seal in timing gear cover.

RG,CTM42,G16,4 -19-10SEP91

OTHER MATERIAL

Name	Use
High Temperature Grease (TY6333 OR TY6347)	Lubricate camshaft lobes and thrust washers before camshaft installation.
FEL-PRO® C-670 Molybdenum Disulfide Paste	Lubricate camshaft nose to provide lubrication to aid in camshaft gear installation.
PERMATEX AVIATION (Form-A-Gasket No.3) (TY6299)	Lubricate camshaft bore steel cap plug.

RG,CTM42,G16,1 -19-29OCT92

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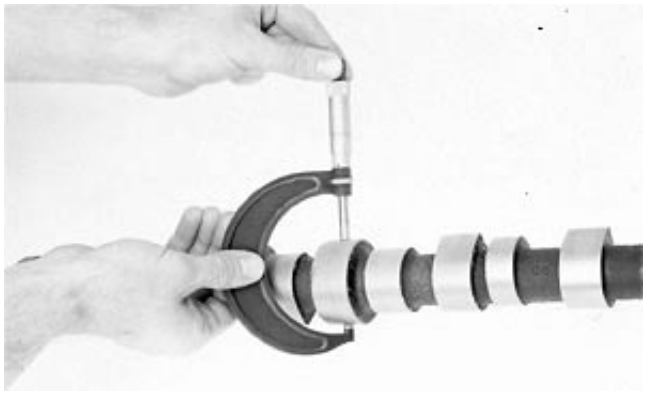
3

MEASURE CAMSHAFT JOURNAL OD AND BUSHING ID



1. Measure each camshaft journal OD. If camshaft journal OD is not within specification, install a new camshaft.

2. Measure each camshaft bushing ID when installed in cylinder block.

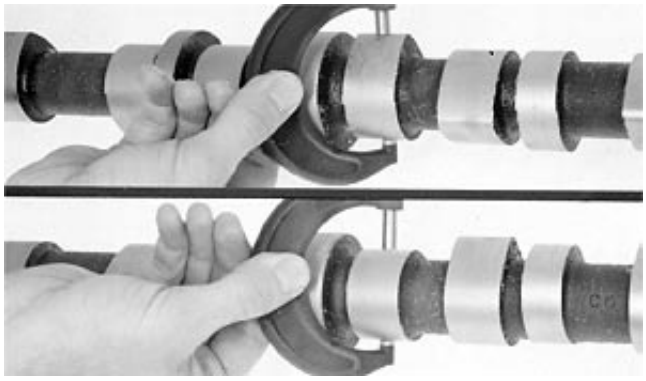
Compare measurements with specs given below. Replace camshaft and bushings as needed.

CAMSHAFT JOURNAL AND BUSHING SPECIFICATIONS

Camshaft Journal Diameter (NEW)	66.987—67.013 mm (2.6373—2.6383 in.)
Camshaft Bushing ID (NEW)	67.076—67.102 mm (2.6408—2.6418 in.)

RG,CTM42,G16,21-19-15SEP94

MEASURE CAMSHAFT LOBE LIFT



1. Measure each camshaft lobe at its highest point and at its narrowest point. Subtract narrowest dimension from highest dimension to find camshaft lobe lift.

If camshaft lobe lift is not within the wear specification on any one lobe, install a new camshaft.

CAM LOBE LIFT NEW PART SPECIFICATION

Intake Lobe Lift	7.69—7.79 mm (0.303—0.307 in.)
Wear Limit	7.19 mm (0.283 in.)
Exhaust Lobe Lift	8.25—8.35 mm (0.325—0.329 in.)
Wear Limit	7.75 mm (0.305 in.)

RG,CTM42,G16,22-19-16AUG94

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OTHER MATERIAL

Name	Use
PERMATEX AVIATION (Form-A-Gasket No. 3) (TY6299)	To seal gasket surfaces on oil pan.
LOCTITE 242 Thread Lock and Sealer (TY9370 or T43512)	Oil filter adapter threads
LOCTITE 592 Pipe Sealant with TEFLON (TY9374/TY9375)	To seal oil pan elbow drain fitting.
High Temperature Grease (TY6343 or TY6347)	To lubricate oil pump components.

RG,CTM42,G20,1 -19-16AUG94

LUBRICATION SYSTEM SPECIFICATIONS

ITEM	SPECIFICATION
Oil Filter Bypass Valve Operating Pressure	210 kPa (2.1 bar) (30 psi)
Oil Pressure Regulating Valve Spring:	
Compressed Length	43.0 mm @ 66—74 N (1.69 in. @ 15—17 lb-force)
Free Length	85.0 mm (3.35 in.)
Oil Filter Bypass Valve Spring:	
Compressed Length	30.0 mm @ 64—78 N (1.18 in. @ 14—18 lb-force)
Free Length	44.0 mm (1.73 in.)
Oil Cooler Bypass Valve Spring:	
Compressed Length	30.0 mm @ 64—78 N (1.18 in. @ 14—18 lb-force)
Free Length	44.0 mm (1.73 in.)
Oil Pump:	
Crankshaft Gear-to-Oil Pump Drive Gear Minimum Backlash	0.08 mm (0.003 in.)
Pump Gear Backlash	0.33—2.00 mm (0.013—0.079 in.)
Oil Pump Drive Gear-to-Crankshaft Throw Minimum Clearance	0.38 mm (0.015 in.)
Maximum Drive Shaft End Play	0.15 mm (0.006 in.)
Maximum Drive Shaft Side Movement	0.17 mm (0.0065 in.)

RG,CTM42,G20,2 -19-07JUN93

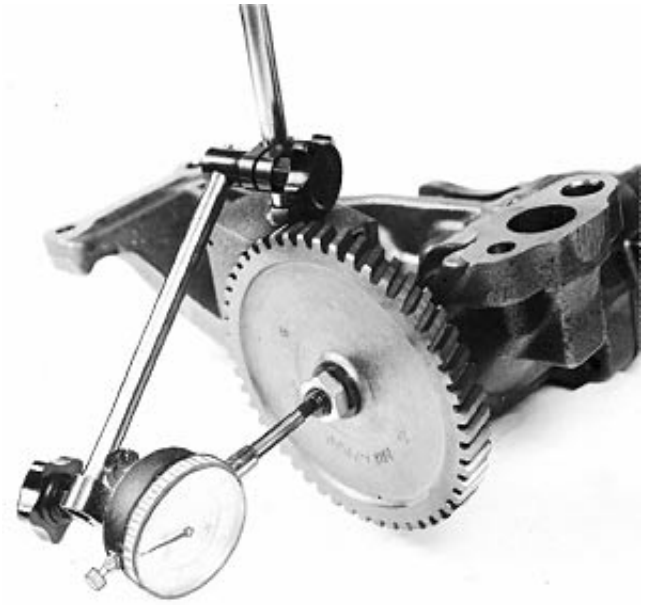
CHECK DRIVE SHAFT END PLAY

1. Mount dial indicator with indicator plunger resting against end of pump drive shaft.

2. Move shaft toward and away from indicator.

If end play exceeds 0.15 mm (0.006 in.), there is excessive wear on pump cover and/or wear on end of pump drive gear.

Replace oil pump if end play exceeds 0.15 mm (0.006 in.).



RG5916 -UN-16AUG91

RG,CTM42,G20,19-19-09OCT92

CHECK DRIVE SHAFT SIDE MOVEMENT

1. Mount dial indicator with indicator plunger resting on one of the hex nut flats.

2. Move shaft from side-to-side.

If shaft side movement exceeds 0.17 mm (0.0065 in.), there is excessive wear on drive shaft bushing and/or drive shaft.

Replace oil pump if shaft side movement exceeds 0.17 mm (0.0065 in.).

RG5917 -UN-16AUG91

RG,CTM42,G20,20-19-09OCT92

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11

COOLING SYSTEM SPECIFICATIONS—CONTINUED

TORQUES

Water Pump-to-Cylinder Block Cap Screw	27 N·m (20 lb-ft)
Water Manifold-to-Cylinder Head—Cast Iron	61 N·m (45 lb-ft)
—Aluminum	20 N·m (15 lb-ft)
Thermostat Cover-to-Water Manifold—Cast Iron	47 N·m (35 lb-ft)
—Aluminum	20 N·m (15 lb-ft)
Water Pump Cover-to-Water Pump Housing	30 N·m (22 lb-ft)
Water Pump Drain Valve-to-Water Pump Cover	27 N·m (20 lb-ft)
Water Inlet Manifold Elbow-to-Cylinder Block	30 N·m (22 lb-ft)
Fan-to-Fan Hub or Pulley*	40 N·m (30 lb-ft)
Fan Drive Assembly-to-Support Plate (Heavy Duty Adjustable Fan Drive)	80 N·m (60 lb-ft)
Fan Spacer and Pulley-to-Hub	47 N·m (35 lb-ft)
Fan Pulley Mounted Injection Pump Drive Gear Cover	27 N·m (20 lb-ft)

** Applies only to fans provided by the John Deere factory. See equipment manufacturers recommendations for torque specifications on OEM supplied fans.*

RG,CTM42,G25,2 -19-17MAR95

SERVICE EQUIPMENT AND TOOLS

NOTE: Order tools from your SERVICE-GARD™ Catalog. Some tools may be available from a local supplier.

Name	Use
D01045AA Bushing, Bearing and Seal Driver Set	Remove and install seals.
D01217AA Bearing Pulling Attachment	Support gear during removal.
D01206AA Gear and Pulley Puller	Remove gear from water pump shaft.

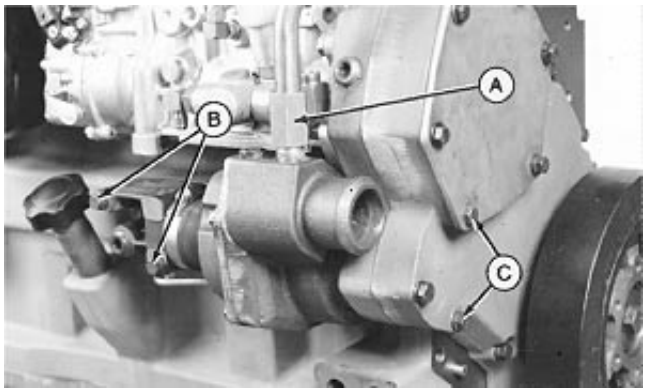
RG,CTM42,G25,38-19-06APR94

2. Remove fitting (A) and water bypass tube.

3. Remove water inlet manifold elbow cap screws (B) and water pump mounting cap screws (C).

NOTE: Oil dipstick may have to be removed to provide clearance for water pump removal. Rotate water pump inlet downward and lift inlet manifold elbow up between block and dipstick tube while sliding water pump to the rear. Some applications may be different.

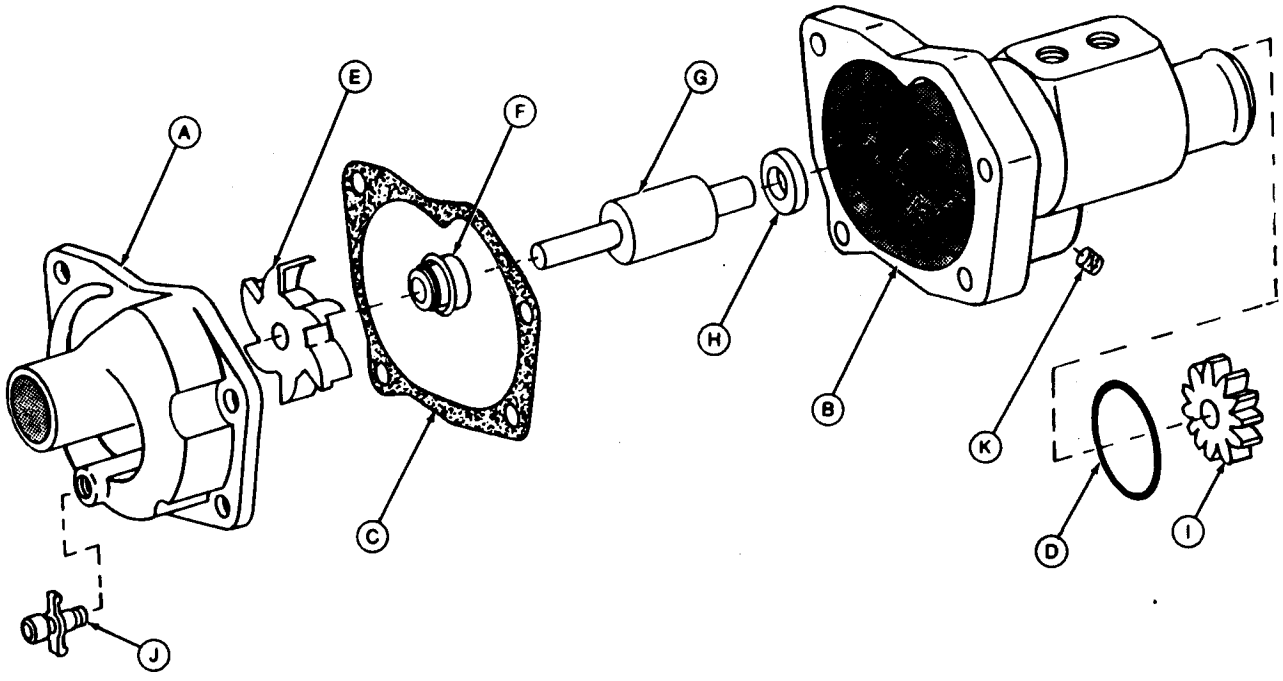
4. Slide water pump nose out of cylinder block flange bore. Remove O-ring.



-UN-13AUG91
RG5837

RG,CTM42,G25,12-19-29OCT92

DISASSEMBLE ENGINE WATER PUMP



-UN-13AUG91
RG5847

A—Cover
B—Housing
C—Gasket
D—O-Ring
E—Impeller
F—Seal (Water Pump)
G—Bearing
H—Seal (Oil)
I—Drive Gear
J—Drain Valve
K—Weep Hole Filters (2 used)

RG,CTM42,G25,13-19-23FEB93

INSTALL COOLANT HEATER—IF EQUIPPED

CAUTION: To avoid shock or hazardous operation, always use a three-wire heavy-duty electrical cord equipped with three-wire connectors. If a two-to-three contact adapter is used at the wall receptacle, always connect green wire to a good ground. Keep electrical connectors clean to prevent arcing.

Only plug coolant heater into electrical power if heating element is immersed in coolant. Sheath could burst and result in personal injury.

NOTE: The heater element (A) cannot be repaired. If defective, replace with a new one.

1. Lubricate O-ring (B) with clean engine oil and install onto groove of flange nut (D). Install gasket (C) onto heater element and install element into flange nut.

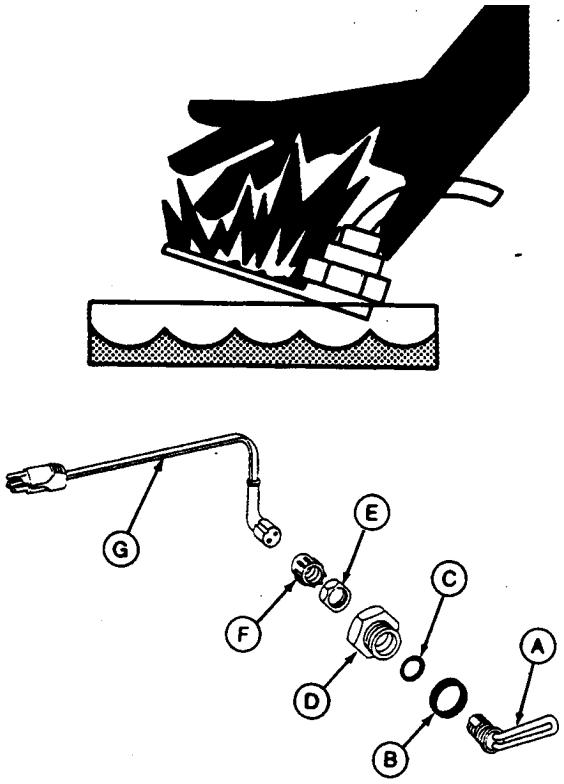
2. Install nut (E) onto threads of heater element finger tight only.

3. Install assembly into threaded heater hole in block. While holding heater element in the upward, vertical position, tighten flange nut to 68 N·m (50 lb-ft) making sure O-ring seals against block.

IMPORTANT: HEATER element must remain in upright vertical position after installation. Heater element may be damaged if it touches internal walls of block.

4. Hold assembly so that flats on threaded end of heater element are vertical. Tighten nut to 34 N·m (25 lb-ft).

5. Install wiring lead (G) or dust cap (F) when wiring lead is not being used.



TS210 -UN-23AUG88

RG5275 -UN-14DEC88

A—Heating Element
B—O-Ring
C—Gasket
D—Flange Nut Adapter
E—Nut
F—Cap
G—Wiring Lead

RG,CTM42,G25,30-19-05MAY93

TURBINE HOUSING OUTLET DEFECTS

Problem	Possible Cause	Suggested Remedy
Turbine Wheel Rub	Bearing failure.	Determine if engine and/or operator contributed to lack of lubrication, contaminated lubrication, excessive temperature, or debris generating engine failure in progress. Correct as required.
	Manufacturing defect.	Correct as required (this group).
Foreign Object Damage	Internal engine failure.	Inspect and repair engine as required.
	Objects left in intake system.	Disassemble and inspect air intake system, (this group).
	Leaking air intake system.	Correct as required, (this group).
Oil and/or Excessive Carbon	Internal engine failure.	Verified by oil in turbine housing. Correct as required.
	Turbine seal failure.	Inspect for excessive heat from overfueling and/or restricted air intake.
	Prolonged periods of low RPM engine idling.	Verify with operator to run engine under load or a higher RPM. (Operator's Manual.) joints.
	Restricted oil drain line.	Inspect and clear oil drain line as required.

EXTERNAL CENTER HOUSING AND JOINT DEFECTS

Leaks from Casting	Defective casting.	Replace turbocharger, (this group).
	Defective gasket.	Verify that leaks are not occurring at gasket joints.
Leaks from Joints	Loose attaching screws.	Tighten to specifications in CTM, (this group).
	Defective gasket.	Inspect and repair as required.

INTERNAL CENTER HOUSING DEFECTS

Excessive Carbon Build up in Housing or on Shaft	Hot engine shut-down.	Review proper operation with operator as shown in Operator's manual.
	Excessive operating temperature.	Restricted air intake; Overfueling or Mistimed engine
	Restricted oil drain line.	Inspect and clean oil drain lines as required.
	Operating engine at high speeds and loads immediately after start-up.	Idle engine for a few minutes to allow oil to reach bearings before applying heavy loads.

S11,3005,JG -19-28SEP94

REPLACE CENTER HOUSING ASSEMBLY AND ASSEMBLE TURBOCHARGER

NOTE: Center housing and rotating assembly is serviced as a complete assembly; individual internal parts are not available.

1. Carefully transfer the scribed marks from the original center housing (C) to the replacement assembly, if necessary. Use the same procedure for the turbine housing (E) and compressor housing (A), if they are also being replaced.

2. Lay turbine housing on it's side and install center housing assembly (C) into turbine housing (E). Align scribed reference marks (scribed during disassembly) on turbine housing and center housing.

3. Apply a coat of PT569 NEVER-SEEZ Compound to cap screws. Install clamps (D), lock plates (if equipped), and cap screws. Tighten cap screws to specification. Bend lock plates up against head of cap screws.

TURBOCHARGER CAP SCREW TORQUE SPECIFICATIONS

Garrett/AiResearch	
Turbine Housing-to-Center Housing	15.8—19.2 N·m (140—170 lb-in.)
Compressor Housing-to-Backplate	15.3—18.7 N·m (135—165 lb-in.)
Schwitzer	
Turbine Housing-to-Center Housing	7—8 N·m (60—70 lb-in.)
Compressor Housing-to-Backplate	7—8 N·m (60—70 lb—in.)

4. Position compressor housing (A) onto center housing assembly (C). Align scribed reference marks (scribed during disassembly) on compressor housing and center housing.

5. Apply a coat of PT569 NEVER-SEEZ Compound to cap screws. Install clamps (B), lock plates (if equipped), and cap screws. Tighten cap screws to specification.

IMPORTANT: DO NOT spin the rotor assembly with compressed air. Damage to bearings can occur when using compressed air.

6. After assembly, spin rotating assembly by hand to check for binding and wheel rub. If either condition exists, disassemble turbocharger and determine the cause.

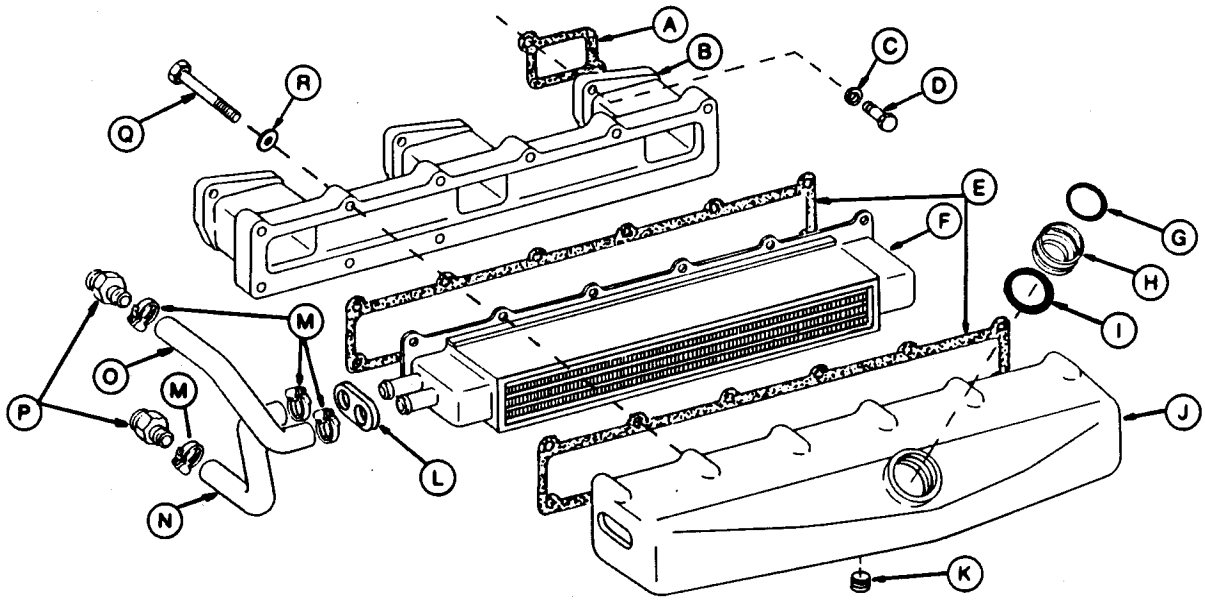
7. Prelube turbocharger bearings with clean engine oil before putting turbocharger into service.

RG5857 -UN-13AUG91

A—Compressor Housing
B—Clamp Plates
C—Center Housing Assembly
D—Clamp Plates
E—Turbine Housing

RG,CTM42,G30,33-19-29OCT92

ASSEMBLE AND INSTALL HORIZONTALLY-MOUNTED AFTERCOOLER ASSEMBLY (6076A ENGINES)



RG6489 -UN-26OCT92

A—Gasket (3 Used)
B—Intake Manifold
C—Washer (6 Used)
D—Cap Screw (6 Used)
E—Gasket (2 Used)
F—Aftercooler Core
G—O-Ring
H—Intake Coupler
I—O-Ring
J—Aftercooler Cover
K—Pipe Plug
L—End Seal
M—Clamps (4 Used)
N—Hose
O—Hose
P—Nipple (2 Used)
Q—Cap Screw (12 Used)
R—Washer (12 Used)

IMPORTANT: Improperly seated or crimped aftercooler end seal can result in loss of power and possible engine damage. Make sure end seal is properly seated.

1. Install aftercooler end seal on coolant tubes.

IMPORTANT: Debris left in intake manifold can cause engine damage. Make sure that inside of manifold is clean before assembly.

2. Position aftercooler core into intake manifold using new gaskets.

3. Install JDG683 Sealing Ring Compression Tool onto aftercooler coolant tubes with cross bar across slot.

4. Tighten tool until intake manifold cover cap screw holes are aligned with holes in gaskets, aftercooler, and intake manifold. Use guide studs as needed to hold alignment.

5. Apply PT569 NEVER-SEEZ Compound to all aftercooler cover-to-intake cap screws. Tighten cap screws to 34 N·m (25 lb-ft). Remove seal compression tool.

6. Apply multi-purpose grease to turbocharger compressor O-ring and install turbocharger onto aftercooler cover.

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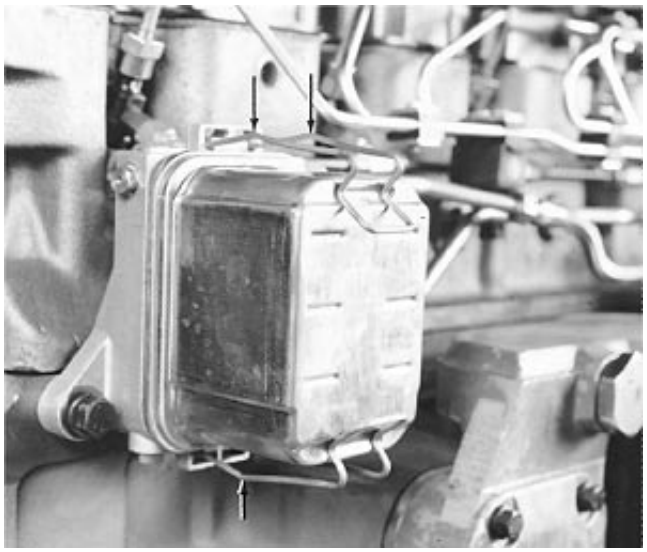
RG,CTM42,G30,57-19-16AUG94

4. Install fuel filter onto guide pins on fuel filter base. Hold filter firmly against base.

5. Secure bottom retaining spring first, then secure top retaining spring.

6. Install drain plug, shown installed. Tighten bleed plug and drain plug securely. Do not overtighten.

7. Open fuel shut-off valve and bleed fuel system. (See BLEED THE FUEL SYSTEM, in Group 115.)



RG,CTM42,G35,3 -19-03OCT92

REPLACE FUEL CHECK VALVE

IMPORTANT: Remove fuel check valve only for replacement purposes, since O-ring seals tightly in bore, removal usually damages check valve assembly.

1. Drain and remove fuel filter (A) as described earlier in this group.

2. Remove fuel filter inlet line (B), (shown removed).

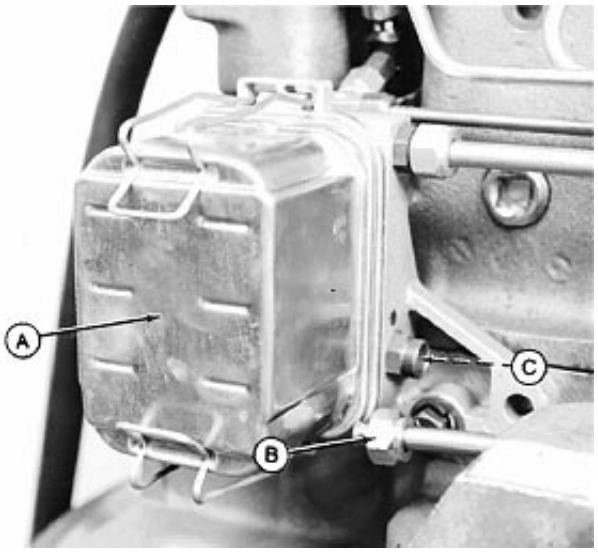
3. Inspect and clean fuel filter base as described later in this group.

4. Remove check valve adapter housing (C) from fuel filter base, and discard.

5. Install new check valve assembly and tighten securely.

6. Install fuel inlet line and tighten connection 17 N·m (13 lb-ft)(150 in-lb) maximum. DO NOT overtighten.

7. Install fuel filter and bleed fuel system. (See BLEED THE FUEL SYSTEM, in Group 115.)

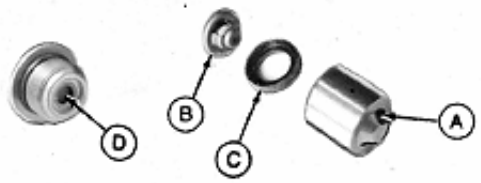


RG,CTM42,G35,4 -19-17MAR95

6. Push inlet valve (B) and seal (C) out of plunger (A) by poking rounded end of a small pin through closed end of plunger.

NOTE: The outlet valve is located in outlet valve fitting (D) and is not removable from fitting.

A—Plunger
B—Inlet Valve Seal
C—Inlet Valve
D—Outlet Valve and Fitting



-UN-28AUG91
RG5913

RG,CTM42,G35,65-19-03OCT92

INSPECT AND REPAIR MECHANICAL (FLAT PLUNGER) FUEL SUPPLY PUMP—ROBERT BOSCH

1. Inspect supply pump housing (C) for cracks and wear. Be sure plunger bore is not worn or scored. Check condition of threads for inlet and outlet fittings, hand primer pump, and spindle guide plug (H).

2. Inspect spindle (I) for wear, scoring on OD, and burrs. Check lands that contact plunger and fuel pump cam lobe to be sure they are flat and undamaged. Remove any deposits with a suitable solvent.

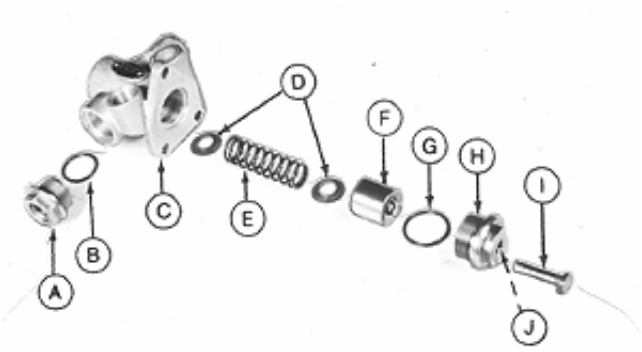
3. Inspect plunger (F) for burrs and pits. Remove any deposits with a suitable solvent.

4. Inspect spring (E) and wear plates (D) for cracks, distortion, and wear.

5. Inspect inlet valve and seal (not shown) for wear, cracks, and broken or missing spring.

6. Inspect outlet valve and fitting (A) for wear, cracks, broken or missing spring, or damaged threads.

If any of the above parts are damaged, worn, or defective, replace as necessary.



-UN-28AUG91
RG5912

A—Outlet Valve Fitting
B—O-Ring
C—Supply Pump Housing
D—Spring Wear Plates
E—Spring
F—Plunger Assembly
G—O-Ring
H—Spindle Guide Plug
I—Spindle
J—O-Ring

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RG,CTM42,G35,66-19-14FEB95

NOTE: Remove alternator at this time if not previously removed.

5. Remove injection pump drive gear cover (shown removed), remove and discard all gasket material.

NOTE: In some situations JDG886 Injection Pump Timing Pin cannot be installed.

6. Install JDG886 Injection Pump Timing Pin through injection pump drive gear into injection pump hub until it bottoms. In some instances it may be necessary to rotate the pump drive hub slightly to get the pin installed.

7. Remove injection pump drive gear cap screws.

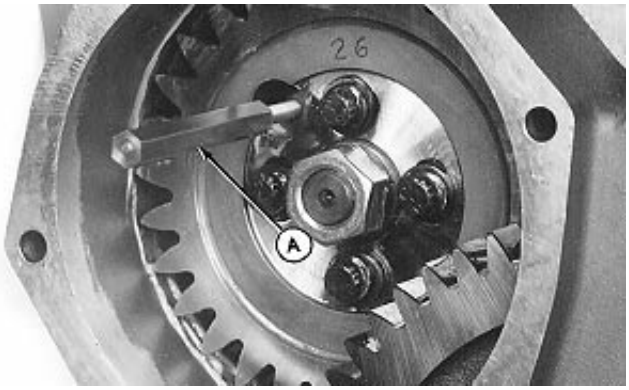
8. Disconnect injection pump lube line (B) from cylinder block fitting. Remove oil filter (C).

9. On standard governor pumps, remove fuel shutoff solenoid (not shown) from oil filter housing. (See REMOVE AND INSTALL FUEL SHUTOFF SOLENOID, earlier in this group.)

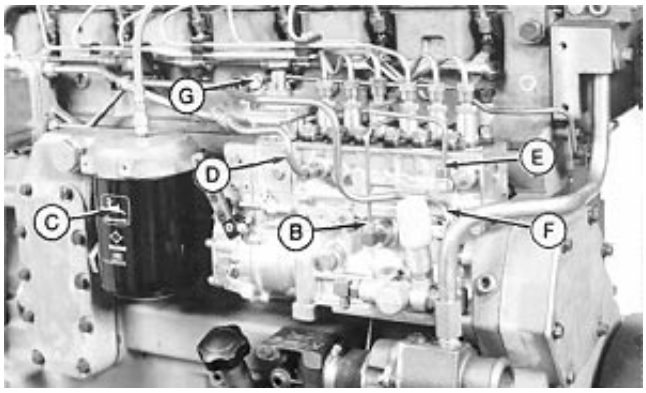
10. Remove fuel inlet line (D). Remove fuel leak-off line (E).

11. Disconnect fuel supply pump lines (F). Photo shows only one line.

12. Disconnect aneroid line (G), if equipped.



RG7283 -UN-07FEB95

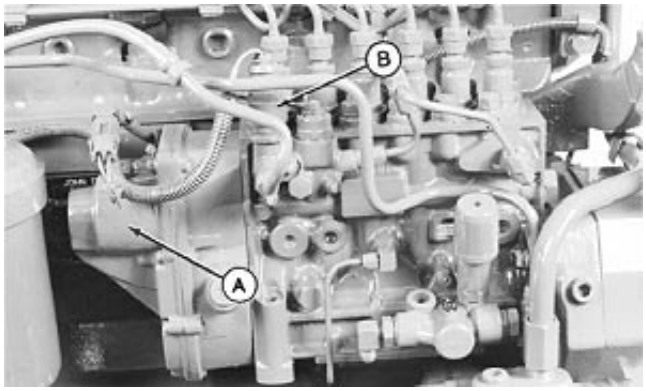


RG5875 -UN-19AUG91

A—JDG886 Injection Pump Timing Pin
B—Injection Pump Lube Line
C—Oil Filter
D—Fuel Inlet Line
E—Leak-Off Line
F—Fuel Supply Pump Lines
G—Aneroid Line

RG,CTM42,G35,18-19-14FEB95

NOTE: For injection pumps equipped with electronic governors (A), disconnect wiring harness at governor and shut-off solenoid (B). Protect connectors on wiring harness while pump is disconnected so debris does not enter connector ends.



RG5876 -UN-19AUG91

RG,CTM42,G35,19-19-10SEP91

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REMOVE FUEL INJECTION NOZZLES

General Nozzle Service Precautions:

1. Thoroughly clean area around injection pump and nozzles, including all line connections, using compressed air.

2. Cap or plug all fuel lines as they are disconnected to prevent dirt and debris from entering fuel system. Debris in fuel system can plug injectors and cause engine damage.

• On In-Line Injection Pumps:

3. Disconnect injection lines from injection pump using JDF22 Crowsfoot Wrench.

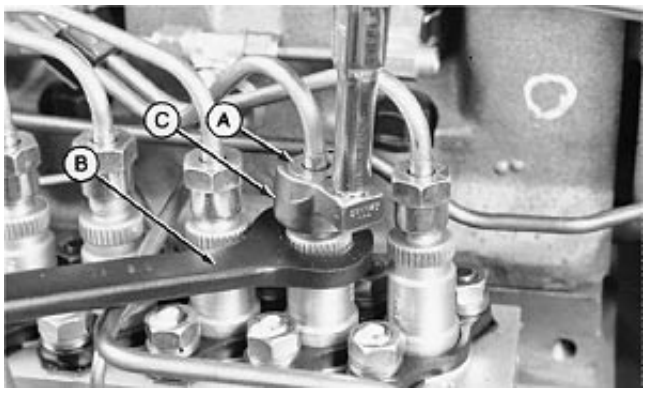
IMPORTANT: On "P" injection pumps, JDE90 Serrated Wrench (Robert Bosch) (B) and 22 mm Open End Wrench (Nippondenso) must be used to keep delivery valve fittings stationary while loosening line nuts. If a delivery valve and barrel housing rotates while loosening or tightening a fuel line nut, injection pump delivery will be altered. Pump must be recalibrated on a test stand.

4. Remove fuel injection line nuts (A).

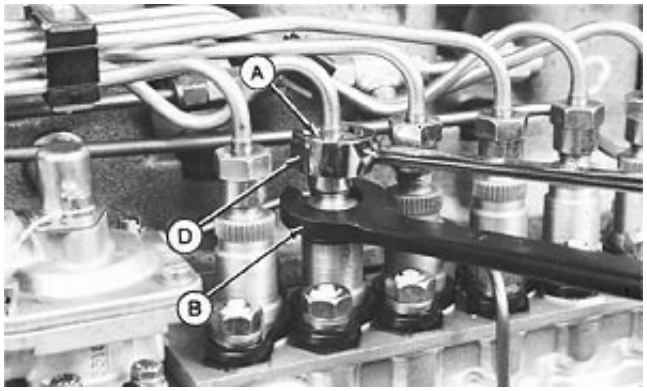
On Robert Bosch "P" injection pumps use JDE90 Serrated Wrench with either JDF22 Crowsfoot Wrench (C) or a standard 3/4 in. Line Wrench (D).

On Nippondenso "P" injection pumps, use a 22 mm Open End Wrench with either JDF22 Crowsfoot Wrench or equivalent crowsfoot wrench mentioned above.

On "A" injection pumps, use either JDF22 Crowsfoot Wrench or an equivalent crowsfoot wrench.



RG5877 -UN-19AUG91



RG5878 -UN-19AUG91

A—Fuel Injection Line Nuts
B—JDE90 Serrated Wrench
C—JDF22 Crowsfoot Wrench
D—3/4 in. Line Wrench

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37

RG,CTM42,G35,96-19-28OCT92

DISASSEMBLE FUEL INJECTION NOZZLE

General Nozzle Repair Notes:

NOTE: Disassembly of nozzles is not recommended unless servicing is indicated by nozzle operation and testing.

• Since dirt and water are the worst contaminants in fuel injection system, working area, tools and cleaning materials must be kept spotlessly clean. Whenever possible, work in an isolated, dust-free area.

• Cover workbench with clean paper before disassembly of injection nozzles.

• As parts are disassembled, place them in a pan of clean diesel fuel and leave there until needed. Do not permit parts to strike each other.

• Use a separate pan of clean diesel fuel for washing parts before assembly.

S11,0408,AR -19-08APR94

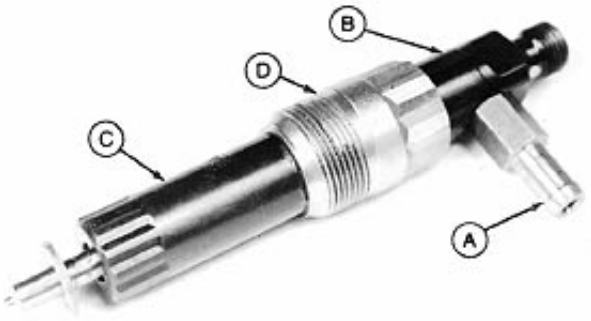
NOTE: Bosch KDEL and Nippondenso KDAL injection nozzles are metric units. Only metric tools should be used.

1. Use a 11 mm box or open-end wrench and unscrew leak-off connector (A) (if not removed previously) out of nozzle holder (B).

2. Clamp flats of nozzle holder in a soft jawed vise. Remove nozzle retaining nut (C) from nozzle holder using a 12-point 19mm wrench.

3. Slip gland nut (D) off nozzle holder.

NOTE: Bosch nozzles have a snap ring and O-ring at top of gland nut that must be removed before gland nut can be removed. After removing gland nut, lower snap ring can be removed.

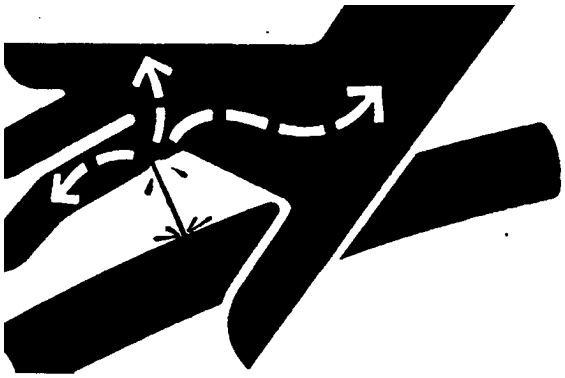


RG5884 -UN-19AUG91

A—Leak-Off Connector
B—Nozzle Holder
C—Nozzle Retaining Nut
D—Gland Nut

RG,CTM42,G35,50-19-03OCT92

ADJUST FUEL INJECTION NOZZLES



X9811 -UN-23AUG88

CAUTION: Nozzle tip should always be directed away from operator. Fuel from spray orifices can penetrate clothing and skin causing serious personal injury. Enclosing nozzle in a glass beaker is recommended.

Before applying pressure to nozzle tester, be sure all connections are tight, and fittings are not damaged. Fluid escaping from a very small hole can be almost invisible. 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 injury or gangrene may result.

1. Connect nozzle to nozzle tester, as directed earlier in this group.

2. Refer to PERFORM OPENING PRESSURE TEST, earlier in this group, to test opening pressure of nozzle. Adjust as needed.

3. Refer to PERFORM NOZZLE LEAKAGE TEST, earlier in this group, to test for leakage.

4. Refer to PERFORM CHATTER AND SPRAY PATTERN TEST, earlier in this group, to test nozzle overall operation.

S11,3010,OE -19-30SEP94

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ENGINE BREAK-IN GUIDELINES

Engine break-in should be performed when the following repair have been made:

• Main bearings, rod bearings, crankshaft, or any combination of these parts have been replaced.

• Pistons, rings, or liners have been replaced.

• Rear crankshaft oil seal and wear sleeve have been replaced. (Primary objective is to see if oil seal still leaks).

• Cylinder head has been removed. Check and reset valve clearance.

• Injection pump has been removed or critical adjustments have been made while it is on the engine. (Primary objective is to check power).

RG,CTM61,G105,2-19-29SEP94

GENERAL ENGINE DESCRIPTION

All 6076 Engines are vertical stroke, in-line, valve-in-head, 6-cylinder diesel engines. The cylinder firing order is 1-5-3-6-2-4.

On 6076 Engines, direct fuel injection is provided by an in-line injection pump and 21 mm injection nozzles mounted in cylinder head. The pump is driven by an intermediate gear in the timing gear train meshing with the camshaft gear.

The pump has an engine-driven camshaft which rotates at one-half engine speed. Roller cam followers, riding on the camshaft lobes, operate the plungers to supply high-pressure fuel through the delivery valves to the injection nozzles. A governor-operated control rack is connected to the control sleeves and plungers to regulate the quantity of fuel delivered to the engine.

All engines are turbocharged. Operated by exhaust gases, the turbocharger compresses intake air from air cleaner and routes it to each cylinder's combustion chamber.

An air-to-air aftercooler cools the turbocharger compressor discharge air by routing it through a heat exchanger (usually mounted in front of radiator) before it enters the intake manifold. The heat exchanger uses no liquid coolant, but relies on air flow to cool the charge air.

The camshaft and followers are made of chilled iron. The cam lobes are individually flame hardened to provide excellent wear characteristics. Spherically ground followers riding on tapered cam lobes help insure positive follower rotation.

Intake and exhaust valves are operated by cam followers, push rods, and rocker arm assembly. Cylinder heads have replaceable inserts and valves, and have positive rotators for both intake and exhaust valves.

The crankshaft is a one-piece, heat treated, dynamically balanced steel forging which rotates in replaceable two-piece main bearings. The rear thrust bearing has a flange on each side to reduce crankshaft deflection and to limit end play during high load operation.

Cylinder liners are of a wet sleeve, flanged, and centrifugally cast design. O-rings are used to seal the connection between cylinder block and liners. Liners are induction hardened and are individually replaceable.

Pistons are constructed of high-grade cast aluminum alloy and are cam ground. A double Ni-Resist ring carrier is cast integrally in the piston to greatly improve the life of the two ring grooves. A deep combustion chamber design provides maximum combustion efficiency. Pistons have a three ring combination. The top two rings are compression rings and the lower ring is an oil control ring.

The highly polished, hardened piston pins are fully-floating and held in position by means of snap rings. Spray jets (piston cooling orifices) in cylinder block direct pressure oil to lubricate piston pins and cool pistons.

Connecting rods are of forged steel and have replaceable bushing and bearing inserts. They are weight controlled (by machining) on both ends to minimize engine vibration.

The engine is supplied with lubricating oil by a spur gear pump driven off the rear of the crankshaft. Oil is conditioned in a housing located on the right side of the engine. Oil temperature is limited by an oil cooler and filtered by a full flow oil filter. Individual cooler and filter bypass valves protect the system and ensure engine lubrication during times of high restriction; such as cold starts. Oil pressure is controlled by a pressure regulating valve located before the gallery.

RG,CTM42,G1,5 -19-29OCT92

2. Obtain coolant and oil samples for further analysis.

3. Start and warm up engine if it can be safely operated. Examine all potential leakage areas again as outlined previously. Using appropriate test and measurement equipment, check for the following:

- White smoke, excessive raw fuel, or moisture in exhaust system.
- Rough, irregular exhaust sound, or misfiring.
- Air bubbles, gas entrainment in radiator or overflow tank.
- Loss of coolant from overflow.
- Excessive cooling system pressure.
- Coolant overheating.
- Low coolant flow.
- Loss of cab heating (air lock).

4. Shut engine down. Recheck crankcase, radiator, and overflow tank for any significant differences in fluid levels, viscosity, or appearance.

5. Compare your observations from above steps with the following diagnostic charts. If diagnostic evaluations and observations provide conclusive evidence of combustion gas, coolant, or oil leakage from head gasket joint, the cylinder head must be removed for inspection and repair of gasket joint components.

RG,CTM8,G105,11-19-29OCT92

Combustion Seal Leakage

Symptoms:

- Exhaust from head gasket crevice
- Air bubbles in radiator/overflow tank
- Coolant discharge from overflow tube
- Engine overheating
- Power loss
- Engine runs rough
- White exhaust smoke
- Loss of cab heat
- Gasket section dislodged, missing (blown)
- Coolant in cylinder
- Coolant in crankcase oil
- Low coolant level

Possible Causes:

- Insufficient liner standout
- Excessive liner standout differential between cylinders
- Low head bolt clamping loads
- Rough/damaged liner flange surface
- Cracked/deformed gasket combustion flange
- Out-of-flat/damaged/rough cylinder head surface
- Missing/mislocated gasket fire ring
- Block cracked in liner support area
- Excessive fuel delivery
- Advanced injection pump timing
- Hydraulic or mechanical disturbance of combustion seal

NOTE: Cracked cylinder head or liners may also allow combustion gas leakage into coolant.

RG,CTM8,G105,12-19-16SEP92

SPECIAL OR ESSENTIAL TOOLS

NOTE: Order tools according to information given in the U.S. SERVICE-GARD™ Catalog or in the European Microfiche Tool Catalog (MTC).

DX,TOOLS -19-05JUN91

A—JT03092 Gauge *

B—JT03017 Hose and Connector *

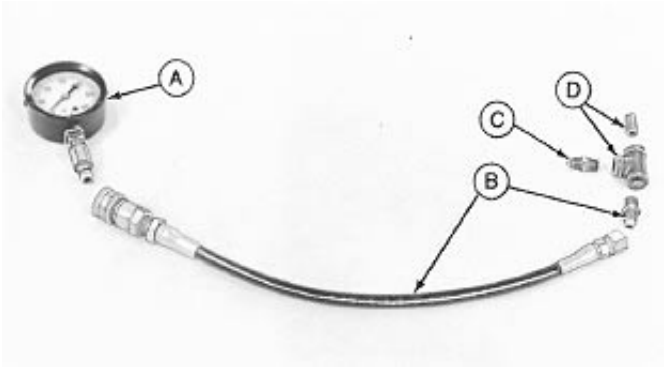
C—Connector

1/8 in. Pipe Nipple **1/4 in.—1/8 in. Pipe Reducer** **1/8 NPT-7/16-20 UNC Adapter**	**Used with above hose and gauge to check intake manifold pressure at aneroid.**

D—"T" Fitting

D—JT03104 Fitting*	**Used with above hose and gauge to check intake manifold pressure at aftercooler on 6076A Engines.**

*** Part of JT05412 Universal Pressure Test Kit**



R28266 -UN-15DEC88

S55,23005,A -19-16SEP94

SPECIAL OR ESSENTIAL TOOLS

NOTE: Order tools according to information given in the U.S. SERVICE-GARD™ Catalog or in the European Microfiche Tool Catalog (MTC).

DX,TOOLS -19-05JUN91

TIME TRAC® Kit .. JT07158

(FKM10429)

Used to perform the dynamic timing of engines.

- JT07158 Kit consists of the following:
  - 26932 Meter
  - Magnetic Pickup
  - Transducer Cable
  - 28037 SOI Clamp Assembly
  - 28062 Instruction Booklet
  - Specification Sheet
  - JT07155 9/16 in. SOI Sensor
  - 29361 Single Carton
  - 29361 6-Pack Carton
  - JDE81-4 Timing Pin
  - JDG793 Magnetic Pickup Adapter
  - 26924 Carry Case

- FKM10429 Kit consists of the following:
  - FKM10429-1 Meter
  - FKM10429-2 Timing Light
  - FKM10429-3 Transducer Cable
  - FKM10429-4 Sensor Clamp
  - FKM10429-5 6 mm Clamp-on Transducer
  - FKM10429-6 Sensor
  - FKM10429-7 Carrying Case
  - FKM10429-8 Instruction Manual

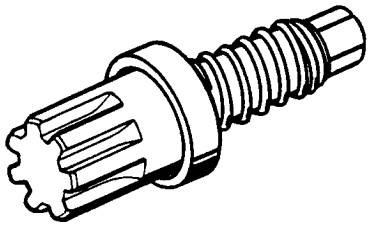
RG7246 -UN-09FEB95

TIME TRAC® is a registered trademark of Stanadyne Automotive Corp.

RG,JT07158 -19-18FEB95

Flywheel Turning Tool JDG820

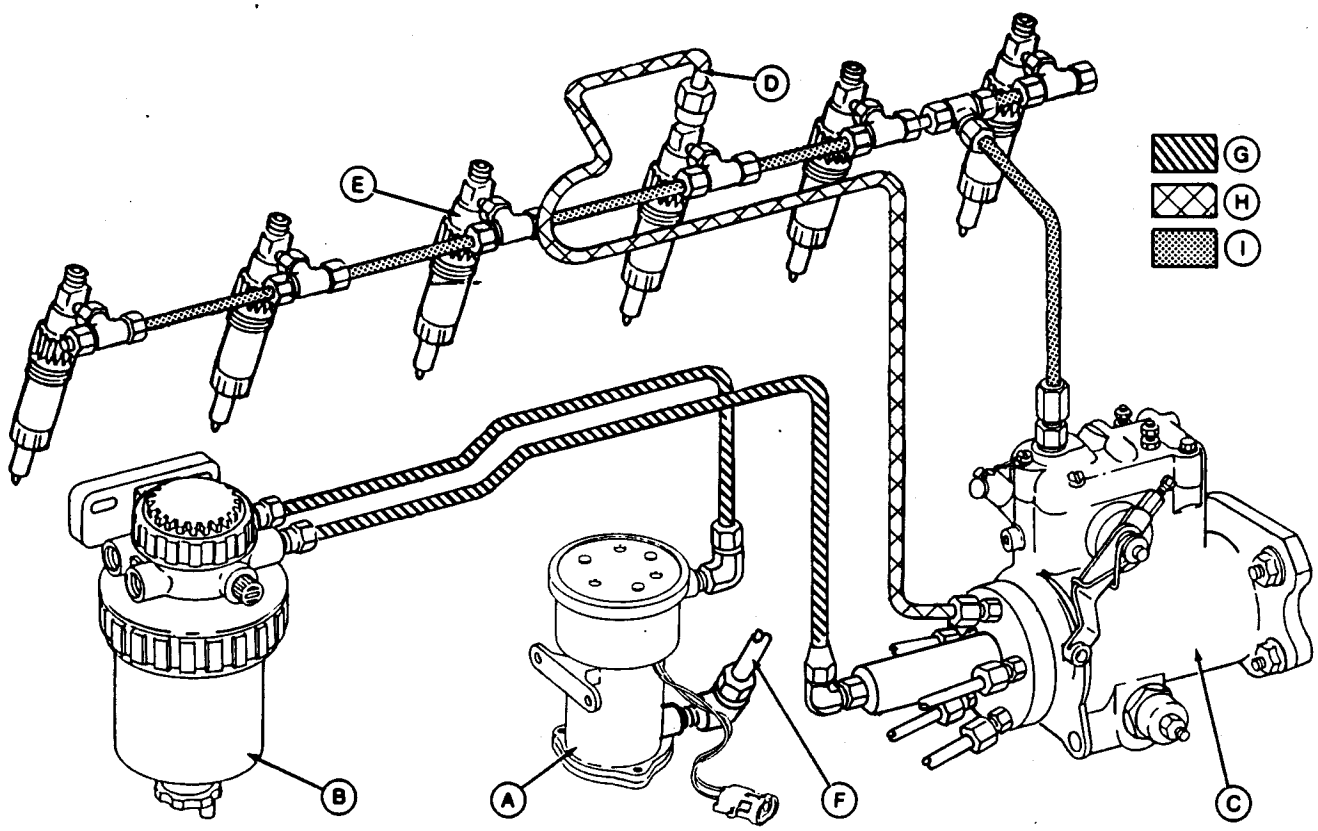
Used to rotate engine to check damper radial runout and time engine. JDE81-1 may be used also if JDG820 is not available.



RG7056 -UN-10AUG94

RG,JDG820 -19-14FEB95

FUEL SYSTEM OPERATION—ROTARY FUEL INJECTION PUMP



A—Electric Fuel Supply Pump
B—Fuel Filter
C—Fuel Injection Pump
D—Injection Pressure Lines
E—Fuel Injection Nozzles
F—Fuel Inlet Line
G—Fuel Supply Pump Pressure
H—Fuel Injection Pump Pressure
I—Fuel Return (Leak-off) Line Pressure

The electric fuel supply pump (A) draws fuel from the tank and pressurizes it. This pressure permits the fuel to flow through the filter (B) and charge the transfer pump of the injection pump (C).

With the fuel injection pump charged with fuel by the fuel supply pump, the injection pump plungers pressurize the fuel to approximately 50 000 kPa (500 bar) (7255 psi). Injection pressure lines (D) are used to route this high pressure fuel to the fuel injection nozzles (E).

Fuel enters the injection nozzle at a pressure which easily overcomes the pressure required to open the nozzle valve. When the nozzle valve opens, fuel is forced out through the orifices in the nozzle tip and atomizes as it enters the combustion chamber.

Incorporated into the fuel system is a means of returning excess (or unused) fuel back to the fuel tank. Excess fuel comes from two sources:

1. Fuel Injection Pump: A quantity of fuel greater than that required by the engine is supplies to the fuel injection pump.

2. Fuel Injection Nozzles: A small amount of fuel seeps past the nozzle valve for lubrication purposes.

To get the excess fuel back to the tank, a return line from the injection pump is connected to the middle of the nozzle leak-off line. Fuel from both sources is then returned to the tank by a return pipe connected to the front end of the leak-off pipe.

RG,CTM42,115,33-19-28OCT92

• Test operation of suction side of pump:

1. Disconnect suction and discharge lines at pump.

2. Drain all fuel from pump by operating hand primer. Then reconnect suction line to pump.

3. Operate hand primer until fuel flows from pump outlet (discharge). Fuel should flow within 15—25 strokes. If not, the suction line may be obstructed or leaking air; (replace in-line filter when used).

NOTE: When operating hand primer, a moderate resistance should be felt. When only a slight resistance (or no resistance) occurs, replace hand primer or repair pump (valves may be defective).

If fuel does not flow, and if no leak or obstruction is found, pump is defective. Repair or replace pump. (See Group 35.)

• Test operation of discharge side of pump:

1. Suction line must be connected and discharge (pressure) line disconnected.

2. Tighten hand primer (Nippondenso only) and place injection pump fuel shut-off control in “STOP” position to prevent engine from starting.

3. Crank engine with starting motor. Fuel should flow from pump outlet within 10 seconds. If not, the suction line may be obstructed or leaking air; (replace in-line filter when used).

S11,23010,FJ -19-14FEB95

• Test pump output pressure while cranking engine:

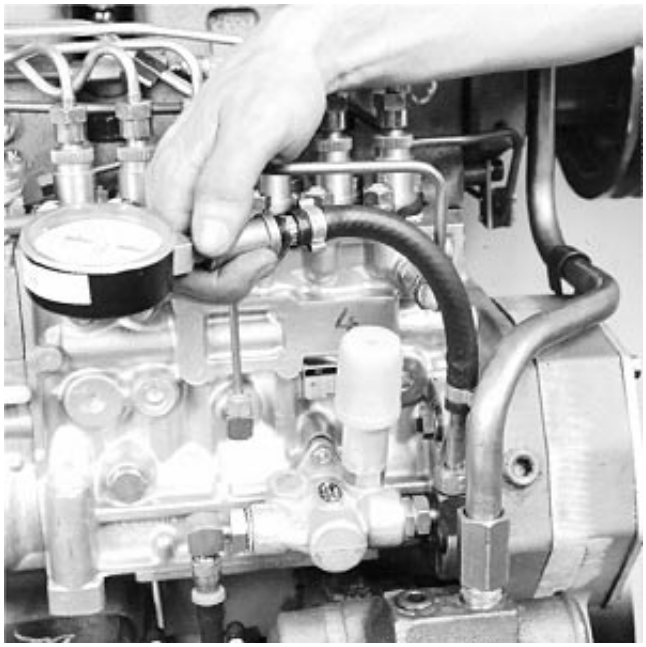
1. Connect a 0—400 kPa (0—4 bar) (0—60 psi) pressure gauge to one end of a pressure hose about 250—300 mm (10—12 in.) long. Connect other end of hose to pump outlet. All air must be out of system.

IMPORTANT: The starting motor must crank the engine at normal cranking speed. Use booster batteries if necessary.

2. Crank engine for 10 seconds with starting motor (approximately 300 engine rpm). Supply pump minimum outlet pressure should be 200 kPa (2.0 bar) (29.0 psi).

3. Compare measured output with the minimum pressure specifications.

If pressure is below the minimum specified and if no obstruction or leak is found, repair or replace the pump.



RG5927 -UN-19AUG91

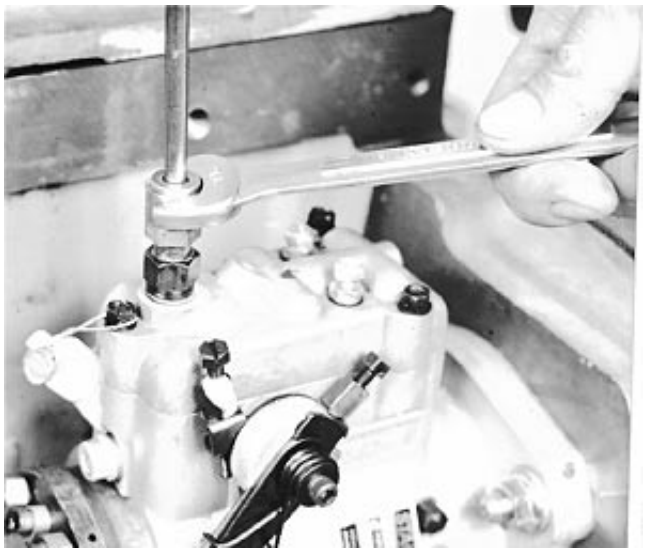
RG,CTM42,115,7 -19-17MAR95

C. At Fuel Injection Pump:

NOTE: This procedure is for engine applications with electric fuel supply pumps.

1. Loosen fuel return line at fuel injection pump.

2. Turn key switch “ON”. As soon as fuel flow is free from air bubbles, tighten fuel return line.



RG6483 -UN-26OCT92

RG,CTM42,G35,94-19-02NOV92

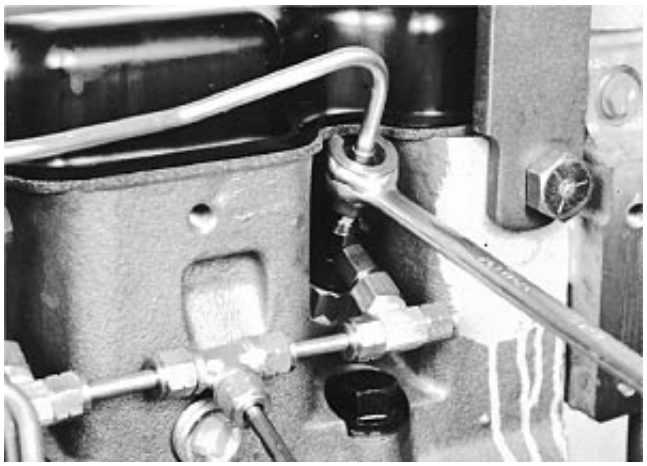
D. At Fuel Injection Nozzles:

1. Place throttle lever in fast idle position.

2. Using two open-end wrenches, loosen fuel line connection at No. 1 injection nozzle.

3. Crank engine with starting motor (but do not start engine), until fuel free from bubbles flows out of loosened connection. Retighten connection.

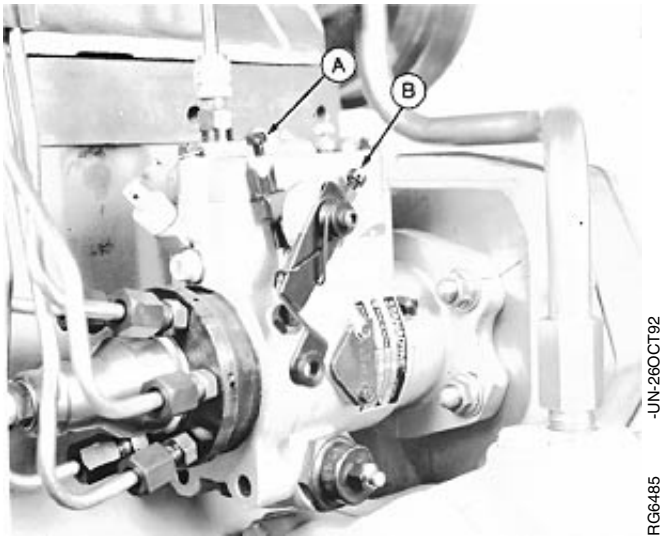
4. Repeat procedure for remaining injection nozzles (if necessary) until all air has been removed from fuel system.



RG6484 -UN-26OCT92

RG,CTM42,G35,95-19-28OCT92

CHECK AND ADJUST ENGINE SPEEDS ON ROTARY PUMP—STANADYNE DB4



A—Fast Idle Adjusting Screw

B—Slow Idle Adjusting Screw

NOTE: Before adjusting engine speed, make sure engine has reached its normal operating temperature.

• Check Slow and Fast Idle Speeds:

1. Start engine and run at 50% load and rated speed until engine reaches normal operating temperature.

2. Stop engine and disconnect speed control rod or cable from injection pump throttle lever.

3. Start engine and run at slow idle and no-load until engine stabilizes. Move injection pump throttle lever to slow idle position against adjusting screw stop.

4. Measure engine speed using a tachometer. Compare reading with specification.

Adjust slow idle speed if necessary as detailed below.

5. Move throttle lever to the fast idle position against adjusting screw stop.

6. Read and record engine speed using a tachometer. Compare readings with specifications.

IMPORTANT: If fast idle is not within specification, have an authorized diesel repair station, servicing dealer, or engine distributor adjust as necessary.

• Adjust Slow Idle Speed:

1. Hold pump throttle lever against slow idle stop.

2. Loosen slow idle adjusting screw lock nut. Turn adjusting screw clockwise to increase speed and counterclockwise to decrease speed.

RG,CTM42,115,32-19-14FEB95

CHANGE ENGINE RATED SPEED FROM 1800 RPM TO 1500 RPM AND ADJUST DROOP

1. Start engine and apply 50% load at rated speed until it reaches operating temperature. Remove cap nuts from adjusting screws before making adjustments.

2. When the engine has reached normal operating temperature, adjust fast idle (stop) screw (A) clockwise (CW) to 1500 rpm (50 Hz) with 100 % (full) load.

3. Remove load and back out the idle (bumper) spring screw (E), while observing the corresponding drop in engine rpm's until engine quits losing speed.

4. Screw in idle (bumper) spring screw until engine speed increases 5—10 rpm.

5. Check for specified no-load (frequency). If governor regulation is within 5—7% range, proceed to Step 8.

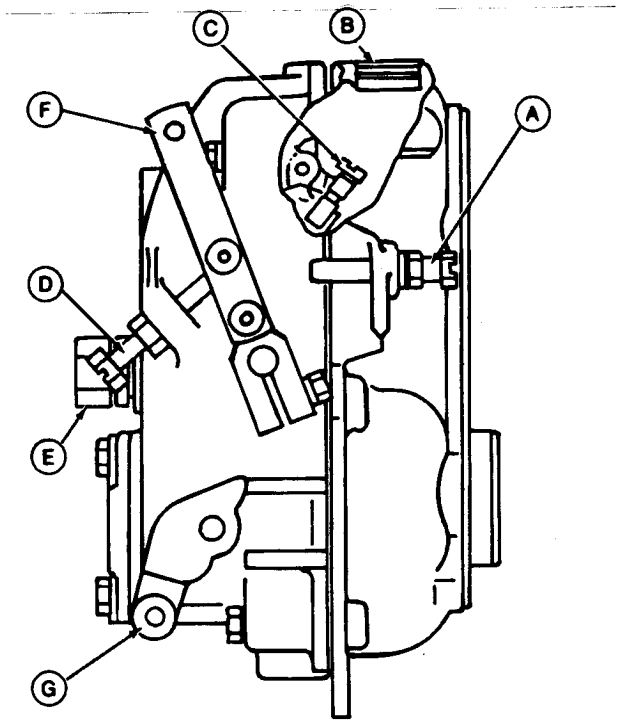
NOTE: A noticable click will occur at each 1/4 turn of droop adjusting screw. One click CW will increase no-load speed approximately 10 rpm, counter-clockwise (CCW) will reduce speed by 10 rpm. Maximum 24 clicks out, minimum 4 clicks out with final setting.

6. If governor regulation is above 7% or below 5%, stop engine and remove droop adjusting screw access plug (B, shown removed) from top of governor housing.

a. Back out slow idle (adjusting) screw (D) and and bumper screw. Pull back on throttle lever (F, toward rear of governor housing) by hand until the droop adjusting screw (C) inside housing can be adjusted through the access plug hole.
b. Screw the droop screw in (CW), counting the turns until screw bottoms out. Then, return screw to original setting.
c. Screw in the droop screw (CW) no more than 1/2 turn (two clicks) at a time to reduce governor droop. CCW no more than two clicks at a time to increase governor droop (to reduce governor sensitivity).
d. Replace access plug in top of governor housing. Start engine, apply full (100%) load, and readjust high idle adjusting screw until 1500 rpm (50 Hz) is obtained at the specified power.
e. Screw in idle (bumper) spring until engine speed increases 5—10 rpm.

7. Repeat Steps 6 (a—d) until governor regulation is within the 5—7% range.

Replace all cap nuts onto adjusting screws and tighten lock nuts securely.



RG5752 -UN-05AUG91

A—Fast Idle (Stop) Screw
B—Droop Adjusting Screw Access Plug Location
C—Droop Adjusting Screw
D—Slow Idle (Adjusting) Screw
E—Idle (Bumper) Spring
F—Throttle Lever
G—Mechanical Shutoff Lever

RG,GENSET4,3 -19-11FEB93