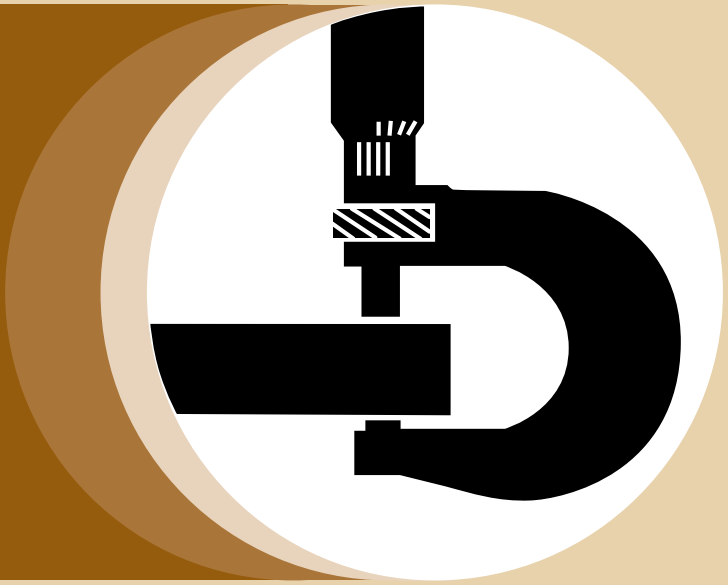
Series 300
3179, 4239, 6359, 4276, and 6414 Diesel Engines

COMPONENT TECHNICAL MANUAL



Deere Power Systems Group
CTM4 (28OCT95)
LITHO IN U.S.A.
ENGLISH

JOHN DEERE

DEERE POWER

Continued on next page

USE PROPER TOOLS

Use tools appropriate to the work. Makeshift tools and procedures can create safety hazards.

Use power tools only to loosen threaded parts and fasteners.

For loosening and tightening hardware, use the correct size tools. DO NOT use U.S. measurement tools on metric fasteners. Avoid bodily injury caused by slipping wrenches.

Use only service parts meeting John Deere specifications.

TS779 -UN-08NOV89

DX,REPAIR -19-04JUN90

DISPOSE OF WASTE PROPERLY

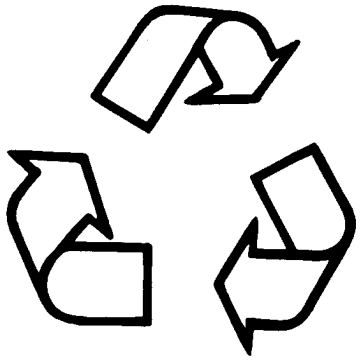
Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

Do not pour waste onto the ground, down a drain, or into any water source.

Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.

Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your John Deere dealer.



TS1133 -UN-26NOV90

DX,DRAIN -19-03MAR93

ENGINE APPLICATION CHART—CONTINUED

• John Deere Agricultural Equipment—Continued

Machine Model No.	Engine Model	Engine Serial No.
Mexico		
2535P	4239DP-02	
2735	4239DP-01	
Waterloo (Tractor)		
3055	6359DL011	
4050	CD6359TR001	
WINDROWERS		
Ottumwa Works		
2360	CD4239DE002	
2360	CD4239DW-01	
2360	CD4239DW001	
3430	CD4239DE-01	
3430	CD4239DE001	
3430	T04239DE001	
3830	CD4239TE-01	
3830	CD4239TE001	
3830	T04239TE001	

JOHN DEERE INDUSTRIAL EQUIPMENT

Machine Model No.	Engine Model	Engine Serial No.
BACKHOE-LOADERS		
210C	T04239DT002	
210C Series I	T04239DT006	
310C	T04239DT003	
	T04239TT004*	
410C	T04276DT003	
	T04276TT005*	
415B	CD4239DCD03	
510B	T04276DT003	
	T04276TT005*	
510C	T04276TT010	
515B	CD4239TCD02	
610B	T04276TT010	
610C	T04276TT014	
710B	T06359TT001	
710C	T06359TT002	

**Turbocharged for altitude compensation*

S11,2000,DT434 -19-22SEP95

GREASE

Use grease based on the expected air temperature range during the service interval.

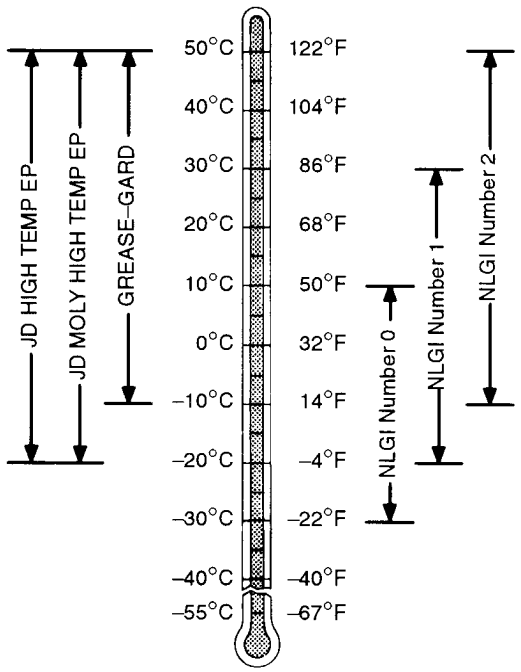
The following greases are preferred:

- John Deere MOLY HIGH TEMPERATURE EP GREASE
- John Deere HIGH TEMPERATURE EP GREASE
- John Deere GREASE-GARD™

Other greases may be used if they meet one of the following:

- SAE Multipurpose EP Grease with a maximum of 5% molybdenum disulfide
- SAE Multipurpose EP Grease

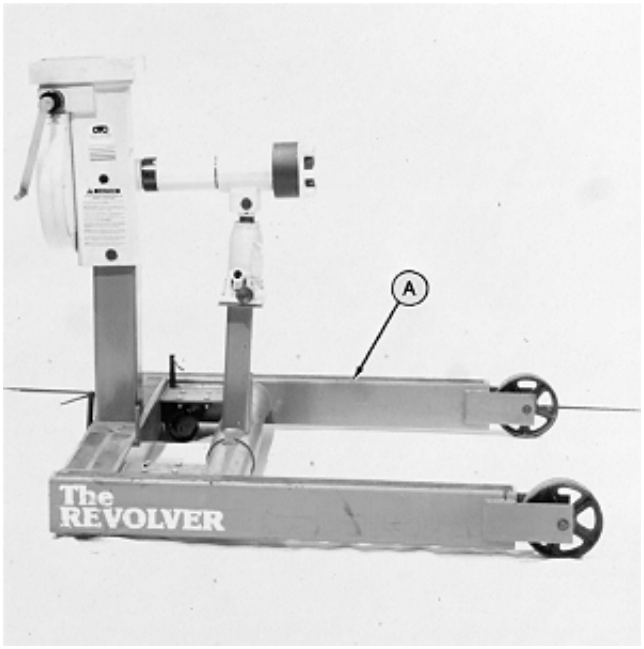
Greases meeting Military Specification MIL-G-10924F may be used as arctic grease.



DX,GREA1 -19-02NOV94

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

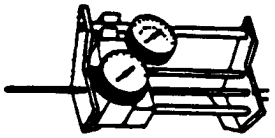
NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or in the European Microfiche Tool Catalog (MTC).

DX,TOOLS -19-20JUL95

RG5061 -UN-23AUG88

Spring Compression Tester D01168AA

Test valve spring compression.



S53,D01168,AA -19-13MAR92

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

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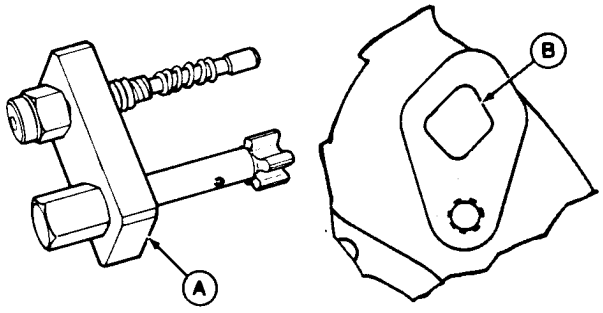
RG,D17526CI -19-29OCT92

Flywheel Turning Tool (A) JD281A

Used on engines with 142 tooth flywheel ring gear and a diamond shaped tool guide bore (B) in flywheel housing. Tool has it's own spring loaded timing pin which threads into flywheel housing.



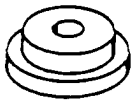
RG6252 -UN-22JUL92

RG,JD281A -19-17JUL92

RG5066 -UN-23AUG88

Intake Valve Insert Installing Adapter JD287

Used with JDE7 Pilot to install intake valve inserts.

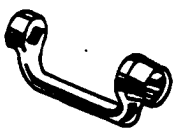


S53,JD287 -19-04MAR87

RG5085 -UN-23AUG88

Torque Wrench Adapter JD307

Use with standard torque wrench to tighten head bolts under rocker arm assembly.



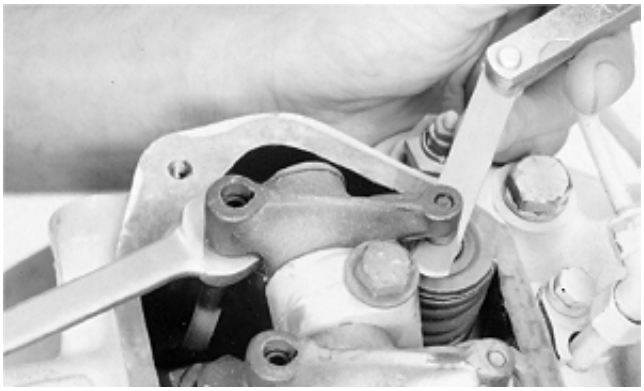
S53,JD307 -19-04MAR87

3. Rotate engine flywheel in running direction (clockwise viewed from water pump) with the appropriate flywheel turning tool until JDE81-4 Timing Pin engages timing hole in flywheel. Some engines are equipped with flywheel housings which do not allow use of an engine rotation tool.

If the rocker arms for No.1 cylinder are loose, the engine is at No. 1 “TDC-Compression.”

VALVE CLEARANCE SPECIFICATIONS

Intake Valve	0.35 mm (0.014 in.)
Exhaust Valve	0.45 mm (0.018 in.)



T81224 -UN-07NOV88

S55,2005,E -19-22SEP95

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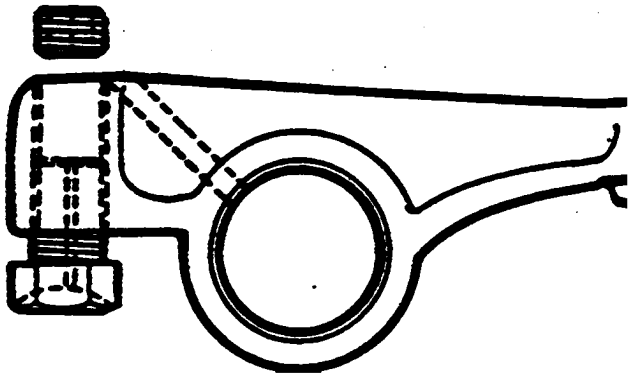
If valve clearance is not within specification, tighten set screw to 10 N·m (7 lb-ft.) after adjustment is made. Make sure set screw does not restrict lube oil passages in rocker arm. All other applications are designed with a slight screw thread interference, therefore, set screws are not required.

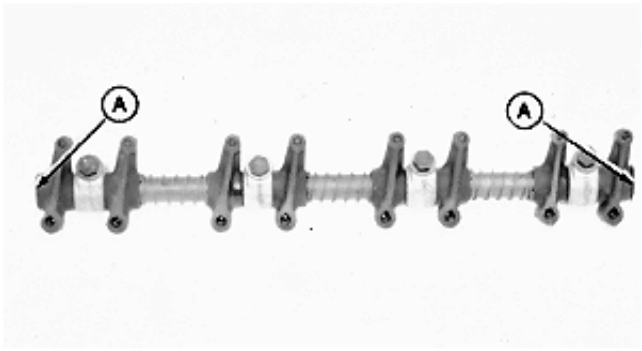
Refer to the appropriate procedure for your engine application and adjust valve clearance, as directed in the following modules.



RG5102 -UN-06DEC88

S55,2005,F -19-24JUL95

ASSEMBLE ROCKER ARMS ON SHAFT



1. Lubricate O.D. of shaft, bores of rocker arms, and rocker arm supports with clean engine oil.

IMPORTANT: Make sure during assembly that the main oil supply bore on the rocker arm shaft faces toward the flywheel end.

2. Slide spring, rocker arms, and rocker arm support on shaft. Assemble in the same relationship they were in before disassembly.

3. Install bowed washers (A) and end plugs on shaft. End plugs must be firmly seated against end of shaft.

S11,2005,KJ -19-22JUN95

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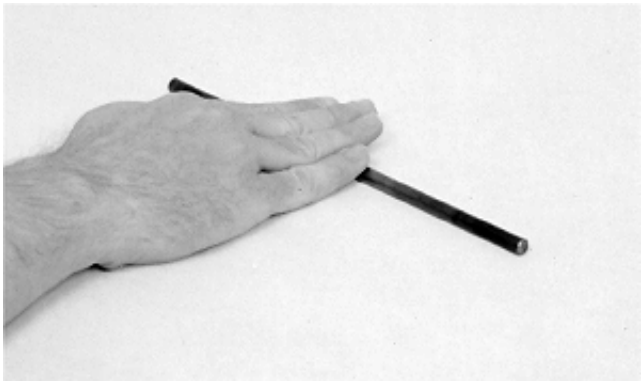
CLEAN AND INSPECT PUSH RODS



1. Clean push rods with solvent and compressed air.

NOTE: Flaired end of push rod should extend off edge of flat surface.

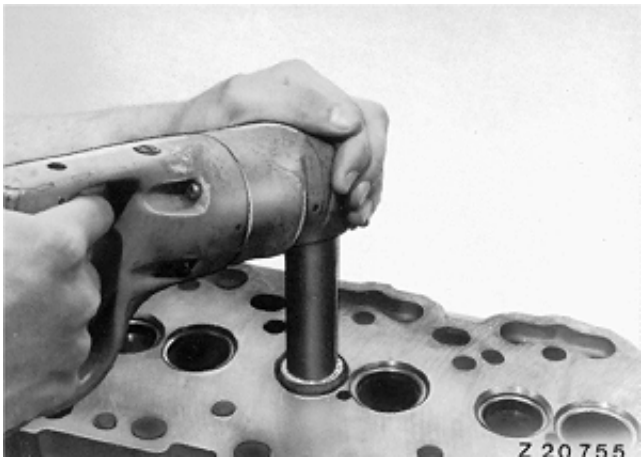
2. Check push rods for straightness by rolling on a flat surface.

3. Inspect contact ends for wear and damage.

4. Replace defective push rods.

S11,2005,JN -19-01NOV95

GRIND VALVE SEATS



-UN-25MAY89
Z20755

IMPORTANT: Grind valve seats to obtain correct valve recess. (See CHECK VALVE RECESS IN CYLINDER HEAD earlier in this group.) Be sure valve guide bores are clean before grinding valve seats. (See CLEAN VALVE GUIDES earlier in this group.)

ALWAYS keep work area clean when grinding valve seats. Use JT05893 Heavy Duty Seat Grinder Set to grind valve seats.

1. If valve seats need grinding, do not grind too long. Only a few seconds are required to recondition the average valve seat. Avoid tendency to grind off too much.

2. Do not use too much pressure. While grinding, support the weight of the driver to avoid excessive pressure on the stone. Grind valve seats at the following angles:

VALVE SEAT ANGLES

Engine	Intake Valve Seat	Exhaust Valve Seat*
3179D	45°	45°
3179T	30°	45°
4239D	45°	45°
4239T,A	30°	45°
4276D	45°	45°
4276T	30°	45°
6414D	30°	45°
6414T	30°	45°
6359D	45°	45°
6359T	30°	45°
6359A	30°	45°

** Except 4276TT-08, 4276TT012, 4276TT018, 4276TT021, 6414TT-04, 6414TT-06, 6414TT-07, 6414TT-09, 6414TT009, 6414TT-10, 6414TT010, 6414TCP03, 6414DTW14, and 6414TDW14 Engines which have a valve seat angle of 30.0°.*

S11,2005,KD -19-24JUL95

INSTALL CYLINDER HEAD

IMPORTANT: ALWAYS thoroughly inspect cylinder head gasket for possible manufacturing imperfections. Do not use any gasket that does not pass inspection.

Be sure cylinder head and block are clean, dry, and free of any oil.

NOTE: Verify that all camshaft followers are installed in their respective bore prior to installing cylinder head.

1. Place the correct new cylinder head gasket on cylinder block. Do not use sealant; install dry.

A cylinder head gasket with a fire ring diameter of 120 mm (4.724 in.) can be used with previous liner having a fire ring diameter of 119 mm (4.685 in.) and with new liner having a fire ring diameter of 120 mm (4.724 in.). However, the cylinder head gasket with a fire ring diameter of 119 mm (4.685 in.) can not be used with 120 mm (4.724 in.) liners. Check to make sure that head gasket fire rings do not interfere with liner fire dam step (upper most portion on top of liner).

Only 120 mm (4.724 in.) diameter cylinder head gaskets may be used on the following engines:

Saran—
- 3179 Engine Serial No. (CD665598—)
- 4239 Engine Serial No. (CD679662—)
- 6359 Engine Serial No. (CD664757—)

Dubuque—
- 4239, Engine Serial No. (T0100001—)
- 6359, Engine Serial No. (T0100001—)
- 4276, Engine Serial No. (T0137128—)
- 6414, Engine Serial No. (T0137165—)

RG,CTM4,DY086 -19-11AUG95

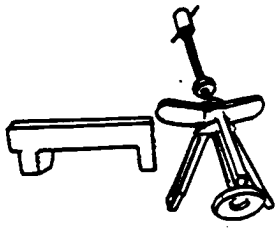
SPECIAL OR ESSENTIAL TOOLS

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

DX,TOOLS -19-20JUL95

Cylinder Liner Puller . . . . . D01062AA, or D01073AA, or KCD10001

Used to remove and install cylinder liners.



RG5019 -UN-23AUG88

S53,D01073,AA -19-03APR90

RG5074 -UN-23AUG88

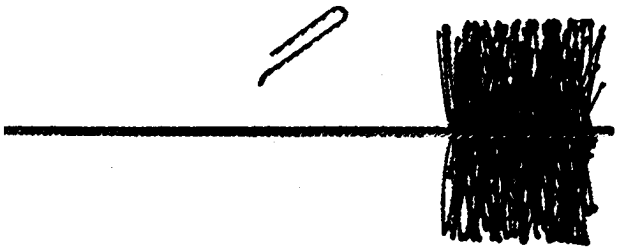
Flexible Cylinder Hone D17004BR

Hone cylinder liners.

S53,D17004,BR -19-03APR90

O-Ring Groove Cleaning Brush D17015BR

Clean cylinder liner O-ring groove in block.



RG5075 -UN-23AUG88

S53,D17015,BR -19-25MAR91

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.

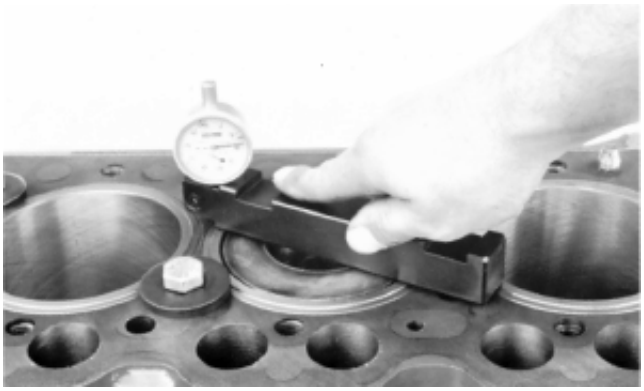
RG6246 -UN-27MAR92

RG,D17526CI -19-29OCT92

REMOVE CYLINDER LINERS

IMPORTANT: Cap screws and washers must be tight to achieve an accurate liner height reading.

1. Using D17526CI (or D17527CI) Dial Indicator and JDG451 Gauge (or KJD10123 Gauge), measure each liner in four places, approximately at 1, 5, 7 and 11 O'clock positions as viewed from the rear of the engine (flywheel end). Record all measurements.



CYLINDER LINER HEIGHT SPECIFICATIONS

Liner height
above block . . . . . 0.010—0.100 mm (0.0004—0.0039 in.)

Maximum permissible difference between
readings within one cylinder or
between adjacent cylinders . . . . . 0.05 mm (0.002 in.)

NOTE: If liner height is less than minimum specified, ONE LINER SHIM ONLY may be installed on bottom of liner flange. Two sizes of shims are available:

—Part No. CD15466 - 0.05 mm (0.002 in.) thick
—Part No. R65833 - 0.10 mm (0.004 in.) thick

10
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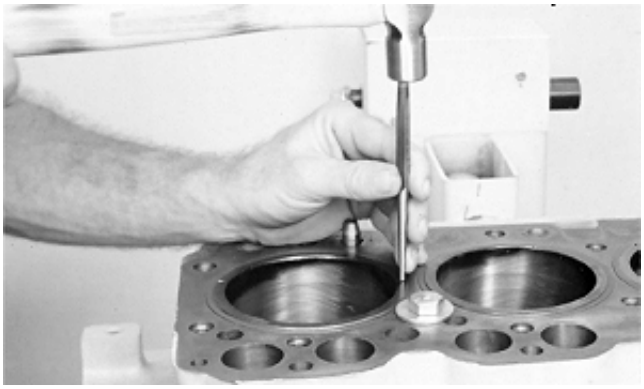
S11,2010,FZ -19-22SEP95

2. Remove cap screws and washers securing liners to cylinder block.

3. Number cylinder liners and pistons. Stamp front of liner to assure correct assembly. Do not stamp liner flange; stamp on fire dam only.

IMPORTANT: Each cylinder liner must be reinstalled in cylinder bore from which it was removed. ALWAYS keep matched pistons and liners together.



S11,2010,GA -19-29JUN95

2. Check second and third ring grooves using a new piston ring and a feeler gauge.

Replace piston if clearance exceeds specification.

PISTON RING-TO-GROOVE SPECIFICATIONS

Maximum piston ring-to-groove clearance with new piston ring (second and third ring grooves) . . . . . 0.20 mm (0.008 in.)

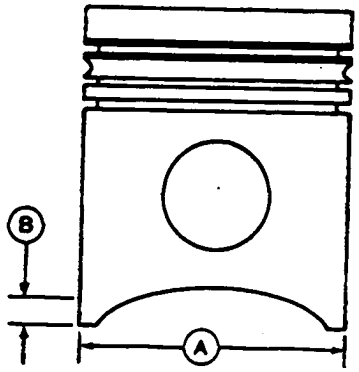
RG5625 -UN-28MAR90

CTM8,GR10,21 -19-22SEP95

MEASURE PISTON SKIRT

1. Measure piston skirt (A) 90° to piston pin bore and 19 mm (0.74 in.) from bottom of piston (B). Record measurement.

2. Measure cylinder liner as directed later in this group and compare with piston measurement.



RG4748 -UN-13DEC88

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PISTON SKIRT DIAMETER SPECIFICATIONS

Bottom of skirt 19 mm (0.74 in.) from bottom of piston:
All Naturally Aspirated Engines and
All Dubuque Engines . . . . . 106.38—106.40 mm (4.188—4.189 in.)

Turbocharged Saran Engines:
Serial No. (—CD599999) . . . . . 106.32—106.34 mm (4.186—4.187 in.)
Serial No. (CD600000—) . . . . . 106.38—106.40 mm (4.188—4.189 in.)

S11,2010,GM -19-01NOV95

3. Inspect piston pin bushing for damage or excessive wear. Lubrication hole must be open.

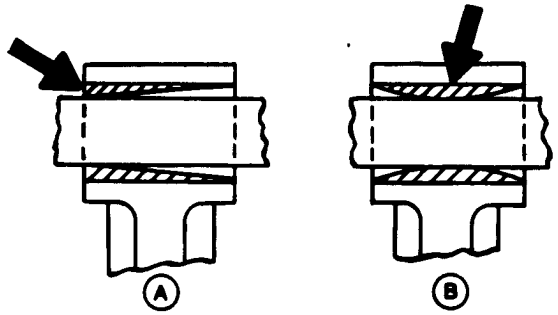
4. Compare pin bushing ID with pin OD for specified oil clearance.

5. 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 BUSHING ID SPECIFICATIONS

ID of New Piston Pin Bushing (Installed):

Small Pin	34.950—34.976 mm (1.3760—1.3770 in.)
Wear Limit	35.026 mm (1.3790 in.)
Large Pin	41.300—41.326 mm (1.6260—1.6270 in.)
Wear Limit	41.376 mm (1.6290 in.)
Pin-to-Bushing Clearance	0.020—0.056 mm (0.0007—0.0022 in.)
Wear Limit	0.102 mm (0.0040 in.)



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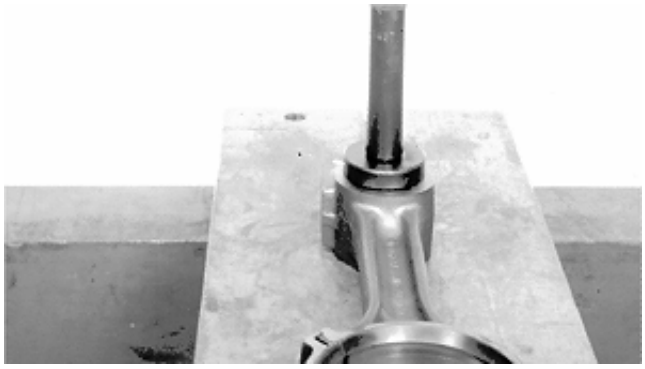
S11,2010,GZ -19-22SEP95

REMOVE PISTON PIN BUSHING

Push bushing out of connecting rod using JD286 Driver (for large pin) or JDE88 Driver (for small pin).



S11,2010,HA -19-29JUN95

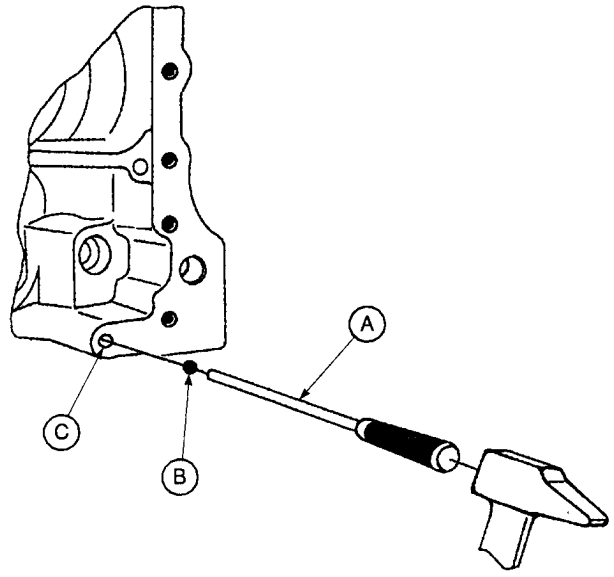
INSTALL STEEL BALL IN OIL PASSAGE OF SERVICE CYLINDER BLOCK

NOTE: On Saran-built 3- and 6-cylinder engines, when using a service cylinder block, install a steel ball (provided with cylinder block) in oil passage to prevent engine seizure. On Dubuque-built engines, the steel ball is already installed in block.

1. Install steel ball (B) in oil passage (C).

2. Using a driver (A), push steel ball into the main oil gallery (E). The distance between oil pan rail and top of ball is approximately 54 mm (2.16 in.) (F).

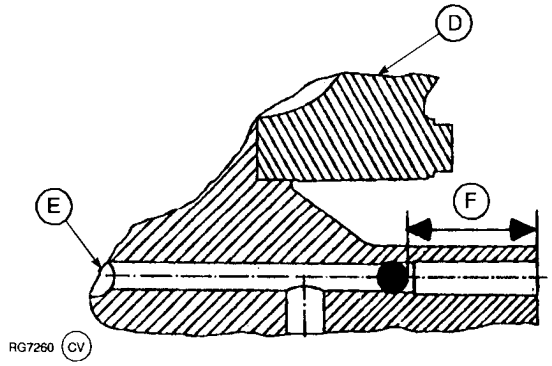
A—Driver
B—Steel Ball
C—Oil Passage
D—Main Bearing Cap
E—Main Oil Gallery
F—54.0 mm (2.16 in.)



RG7259 (CV)

-UN-20JUL95

RG7259



RG7260 (CV)

-UN-20JUL95

RG7260

RG,CTM4,DW719 -19-22SEP95

SPECIAL OR ESSENTIAL TOOLS

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

DX,TOOLS -19-20JUL95

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

Use with JDG451 to measure vibration damper and flywheel housing face runout, crankshaft end play, and flywheel face flatness.

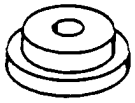
RG6246 -UN-27MAR92

RG,D17526CI,1 -19-22JUL95

RG5066 -UN-23AUG88

Seal Driver JD250

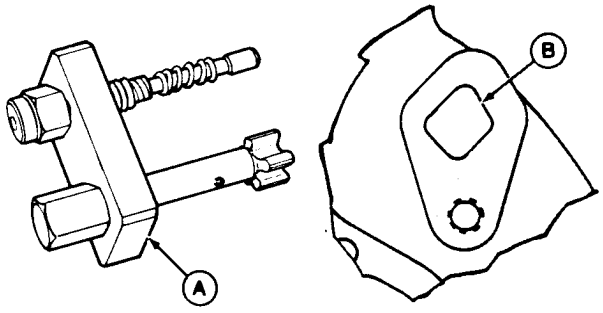
Install front oil seal in timing gear cover. Use with JDG537 Driver Handle.



JD250 -19-03APR90

Flywheel Turning Tool (A) JD281A

Used on engines with 142 tooth flywheel ring gear and a diamond shaped tool guide bore (B) in flywheel housing. Tool has it's own spring loaded timing pin which threads into flywheel housing.



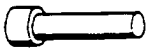
RG6252 -UN-22JUL92

RG,JD281A -19-17JUL92

RG5068 -UN-23AUG88

Timing Pin JDE81-4

Lock engine at TDC when installing injection pump or timing valve train. Use with JDG820, JDE81-1, or JDE83 Flywheel Turning Tool.



RG,JDE814 -19-03JAN95

5. Check vibration damper wobble using a dial indicator.

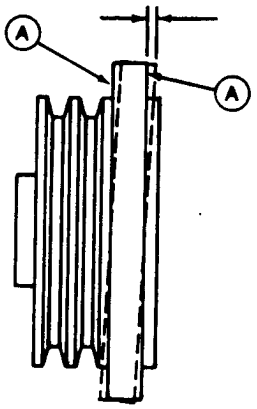
Measure wobble at the outer edges of damper face (A).

6. Rotate crankshaft one complete revolution using engine rotation tool, and note total dial indicator movement. Compare readings with specifications below.

DAMPER PULLEY WOBBLE SPECIFICATION

Outer Ring (Maximum) . . . . . 1.50 mm (0.060 in.)

Vibration Damper or Pulley:
Maximum Wobble . . . . . 0.5 mm (0.02 in.)



RG5679 -UN-30MAY90

S11,2015,EH -19-22JUL95

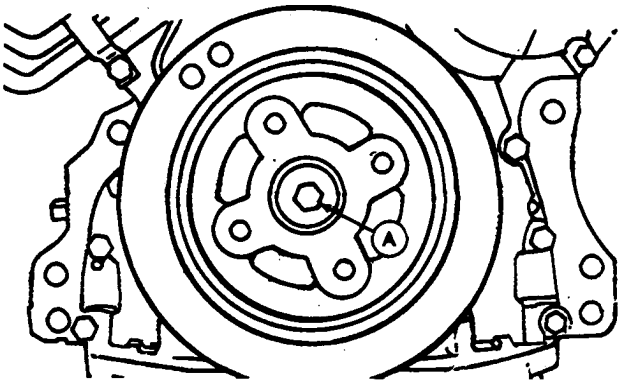
REMOVE PULLEY OR VIBRATION DAMPER PULLEY

IMPORTANT: Never apply thrust on outer ring of damper. Do not drop or hammer on damper.

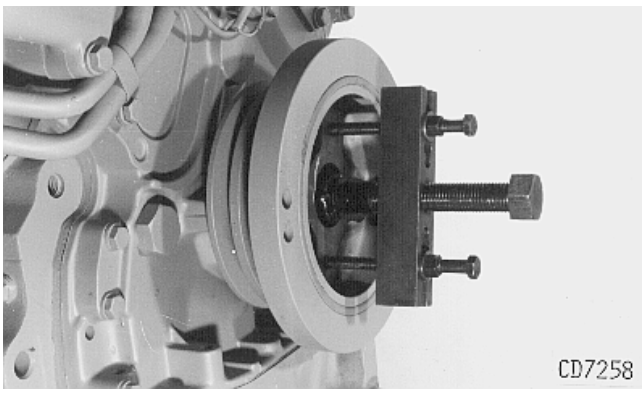
1. Remove pulley or damper pulley cap screw (A).

NOTE: The V-belt pulley used on engines without a vibration damper attaches to engine same as damper pulley shown.

2. Using JDG410 Puller or other suitable puller, remove damper pulley from crankshaft.



RG5113 -UN-14DEC88



CD7258 -UN-23MAY95

S11,2015,EI -19-22JUN95

CHECK FLYWHEEL FACE FLATNESS

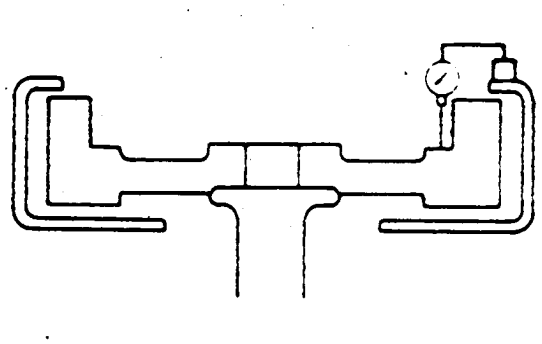
1. Mount dial indicator base on flywheel housing. Position pointer to contact driving ring mounting surface. Do not allow pointer to contact driving ring mounting holes.

IMPORTANT: Maintain constant end pressure on crankshaft to hold shaft against thrust bearing when measuring flywheel face runout.

2. Rotate flywheel by turning crankshaft. Read total indicator movement. Resurface flywheel face or replace as required.

FLYWHEEL FACE FLATNESS SPECIFICATION

Maximum variation	0.23 mm (0.009 in.)
Maximum variation per 25 mm (1.0 in.) of travel	0.013 mm (0.0005 in.)



R22213 -UN-14DEC88

RG,CTM8,GR15,45-19-22JUL92

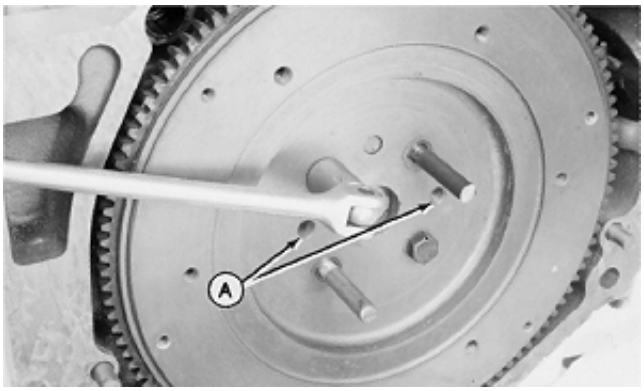
15
21

REMOVE FLYWHEEL

1. Remove two cap screws and install guide studs in their place (shown installed). Remove the other cap screws and install them into the tapped holes (A), to push flywheel off crankshaft.

CAUTION: Flywheel is heavy. Plan a proper lifting procedures to avoid personal injury.

2. Remove flywheel.



T90586 -UN-07NOV88

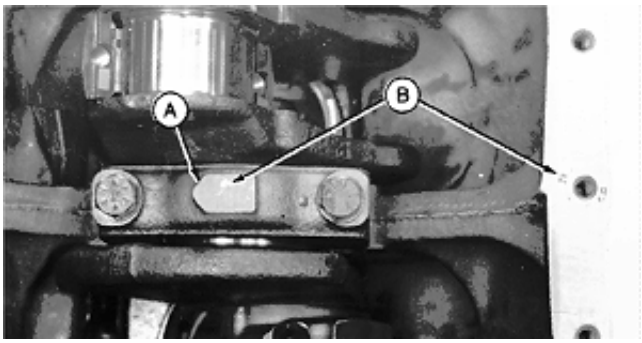
RG,CTM4,DY092 -19-22JUN95

NOTE: When crankshaft is to be removed, leave front and rear main bearing caps installed until all connecting rod caps have been removed.

4. Check main bearing caps for arrows (A, cast in main bearing cap) and numbers (B) stamped on cap and oil pan rail. Arrow points toward camshaft side of engine and away from number stamped on pan rail.

If there are no numbers, stamp corresponding numbers on cap and oil pan rail to assure correct placement of bearing caps during reassembly.

5. Remove main bearing caps. Visually inspect condition of bearing inserts as bearing caps are removed. Keep caps and inserts together and in correct order.



T88558 -UN-14OCT88

CTM8,GR15,25 -19-27AUG92

CHECK MAIN BEARING CLEARANCE

1. Place a strip of PLASTIGAGE in the center of the main bearing cap about three-fourths of the width of the bearing.

2. Use clean engine oil on PLASTIGAGE to prevent smearing.

3. Install cap and tighten cap screws to specified torque.

MAIN BEARING CAP SCREW TORQUE SPECIFICATIONS

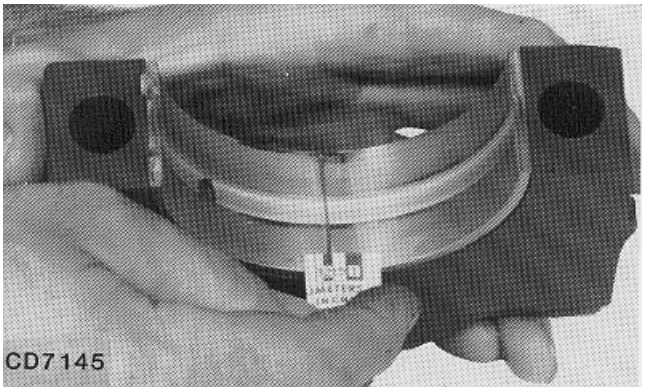
All Dubuque- and Saran-Built Engines
(Serial No. —CD979057) . . . . . 115 N·m (85 lb-ft)
Saran-Built Engines
(Serial No. CD979058—) . . . . . 135 N·m (100 lb-ft)

4. Remove cap and compare width of PLASTIGAGE with scale provided to determine clearance.

NOTE: The use of PLASTIGAGE will determine wear (crankshaft-to-bearing oil clearance), but will not determine condition of either bearing or journal.

MAIN BEARING CLEARANCE SPECIFICATIONS

Main Bearing-to-Journal Clearance . . . . . 0.025—0.102 mm (0.0009—0.0040 in.)



CD7145 -UN-23MAY95

15
31

S11,2015,FD -19-22SEP95

3. Install bearing caps (without bearings) in cylinder block. Tighten cap screws to specified torque.

MAIN BEARING CAP SCREW TORQUE SPECIFICATIONS

All Dubuque-Built and Saran-Built Engines
(Serial No. —CD979057) . . . . . 115 N·m (85 lb-ft)

Saran-Built Engines
(Serial No. CD979058—) . . . . . 135 N·m (100 lb-ft)

4. Measure ID of bearing cap bores.

MAIN BEARING CAP BORE SPECIFICATIONS

Main Bearing Bore Without
Bearings . . . . . 84.455—84.480 mm (3.3249—3.3259 in.)

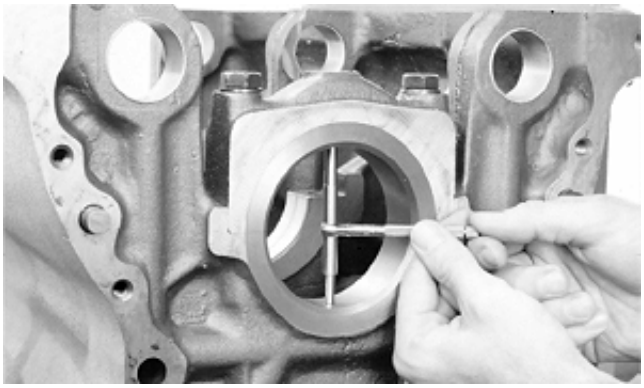
Main Bearing Bore Centerline-to-Top
Deck Distance (Minimum):
3179, 4239, 6359 Engines . . . . . 301.981 mm (11.8889 in.)
4276 and 6414 Engines . . . . . 337.871 mm (13.3019 in.)

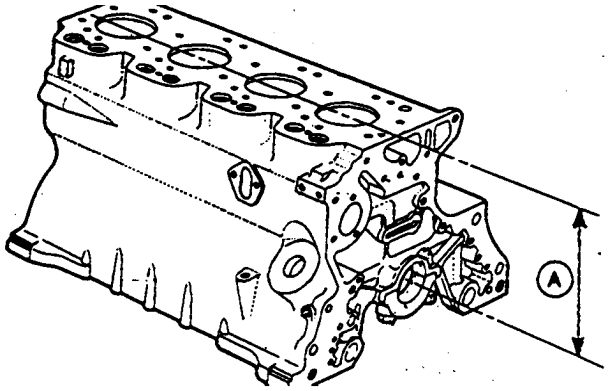
5. If bearing caps are damaged or bore is not within specification, install a new cap and line bore to specified size. See MEASURE ASSEMBLED ID OF BEARINGS AND OD OF CRANKSHAFT JOURNAL earlier in this group.

NOTE: Replacement bearing caps are supplied with unfinished bearing bore.

IMPORTANT: When cylinder block is line bored, the dimension (A) from centerline of main bearing bore to cylinder block top deck will be changed. Piston may contact cylinder head if this dimension is less than specified above.

Main bearing cap line boring should be done ONLY by experienced personnel on equipment capable of maintaining the bore specifications. After machining (3179, 4239, and 6359 Engines), the proper piston height selection (B or H) is required. (See Group 10.)


T81655 -UN-01NOV88



RG4788 -UN-14DEC88

15
41

RG,CTM4,DT444 -19-01NOV95

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
D15001NU Magnetic Follower Holder Kit	Hold cam followers when removing and installing camshaft.
JD247 Balancer Shaft Holding Tool	Hold balancer shaft while pressing gear on shaft.

S55,2000,MR -19-04APR90

OTHER MATERIALS

Name	Use
LOCTITE 242 (TY9370) Thread Lock and Sealer	Front plate studs and set screws, tachometer gear screw, gaskets, and front crankshaft oil seal (OD).
LOCTITE 515 (TY6304) Flexible Sealant (General Purpose)	Front plate gasket, oil filler neck gasket, and timing gear cover gasket.
TY6333 or TY6347 High Temperature Grease	Coat cam followers, camshaft lobes, journals, and bushings during installation. Coat idler gear, bushing, and shaft during installation. Coat internal splines of auxiliary output gear.

16
3

RG,CTM8,DX136 -19-06OCT94

REMOVE TIMING GEAR COVER

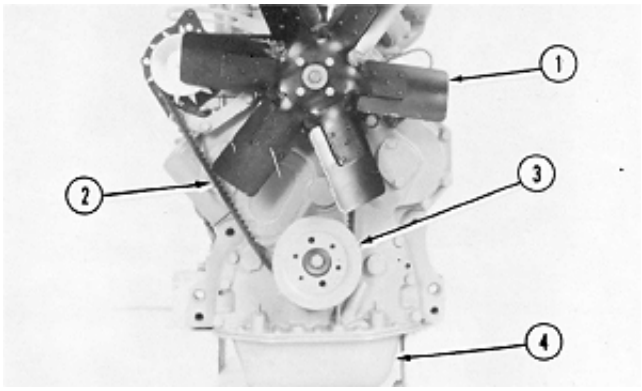
1. Drain oil from engine crankcase.

2. Remove fan (1), fan belt (2), and water pump. (See Group 25 - Cooling System.)

3. Remove alternator and alternator mounting bracket.

4. Remove crankshaft pulley or damper/pulley (3). (See Group 15 - Crankshaft, Main Bearings, and Flywheel.)

5. Remove oil pan (4). (See Group 20 - Lubrication System.)



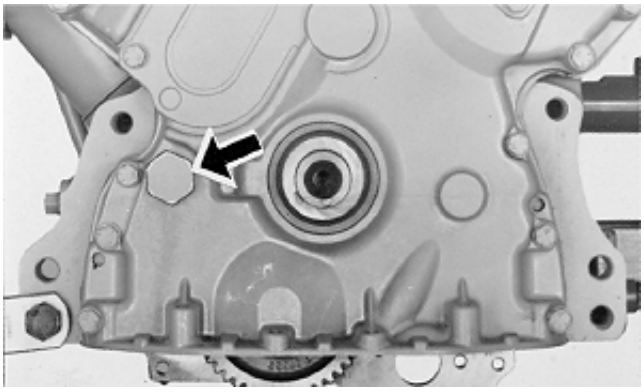
T79150 -UN-07NOV88

1—Fan
2—Fan Belt
3—Crankshaft Pulley or Damper/Pulley
4—Oil Pan

S11,2016,D -19-21SEP95

6. Unscrew the oil pressure regulating valve plug and remove spring and valve (3179, 4239, and 6359 Engines).

7. Remove timing gear cover-to-cylinder block cap screws. Remove cover.

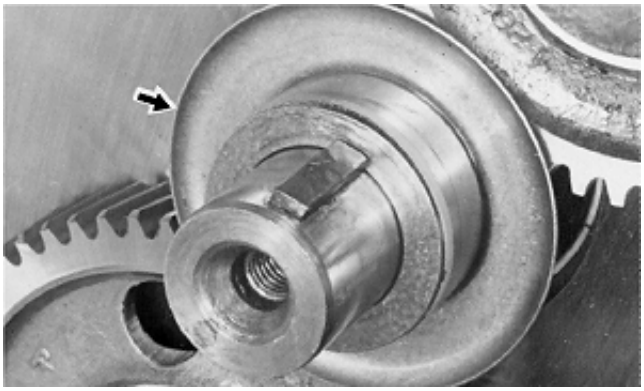


T70248 -UN-24FEB89

S11,2016,E -19-13JUL95

8. Remove oil deflector from crankshaft. On 6-cylinder engines, first remove wear sleeve and then remove oil deflector.

NOTE: Some 6-cylinder engines also use an O-ring with the wear sleeve.

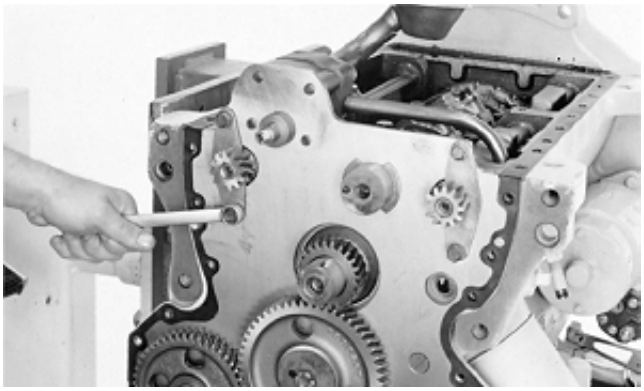


RG4923 -UN-06DEC88

S11,2016,F -19-26JUN95

REMOVE BALANCER SHAFTS—IF EQUIPPED (4-CYLINDER ENGINES)

Both Dubuque-built and Saran-built 4-cylinder engines are available without balancer shafts. Dubuque-built 4-cylinder engines without balancer shafts will have the balancer shaft bores machined in the cylinder block. However, the bushings will be installed so the oil holes do not align in the block. Saran-built 4-cylinder engines without balancer shafts will not have the balancer shaft oil holes drilled in block.


T82116 -UN-09NOV88

1. Remove lower idler gear and oil pump gear.

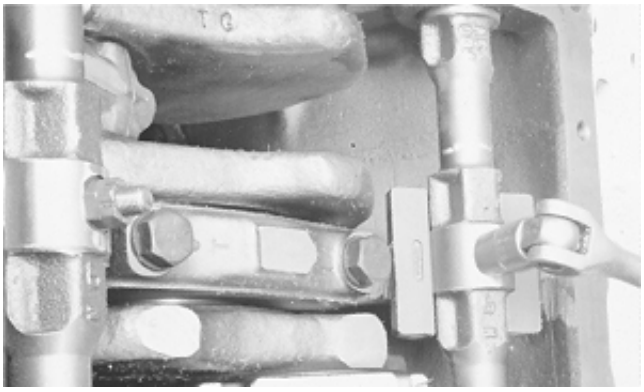
2. Remove cap screws from balancer shaft thrust plate.

CTM8,GR16,27 -19-12JAN95

IMPORTANT: Identify left and right balancer shafts for correct reassembly. Journals are lapped for one direction of rotation. Interchanging shaft locations could cause premature wear of shafts and bushings.

3. Remove balancer shaft weights (if equipped). Discard cap screws and nuts.

4. Remove balancer shafts.


T91157 -UN-09NOV88

RG,CTM8,GR16,48-19-04SEP92

16
23

3. Remove upper idler shaft and thrust washer by driving or pressing on shaft from block side of front plate.

S11,2016,AJ -19-26JUN95

CLEAN AND INSPECT FRONT PLATE

1. Clean front plate and inspect for damage.

S11,2016,AK -19-26JUN95

16
33

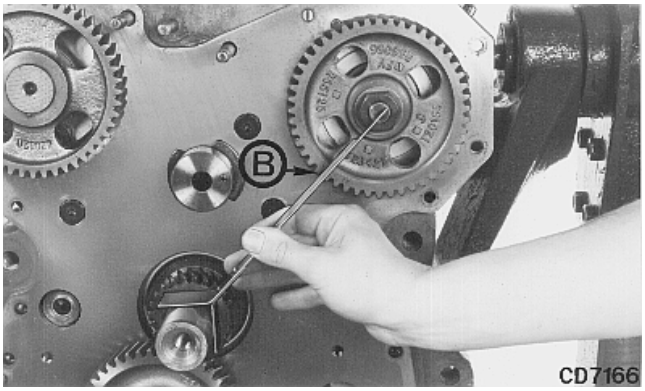
8. With JD254 Gear Timing Tool resting on nose of crankshaft and center of camshaft (as shown), turn camshaft until timing mark (A) aligns with timing tool.

9. Check injection pump gear timing with JD254 Gear Timing Tool resting on nose of crankshaft and center of injection pump shaft. Timing mark (B), with “3”, “4”, or “6” beside it, must align with timing tool (as shown).

IMPORTANT: Use the timing mark corresponding to the number of cylinders the engine has that is being timed.

NOTE: On 6-cylinder engines equipped with a Stanadyne Model DB2 or DB4 Injection Pump, use “6A” timing mark.

T88698 -UN-28OCT88



CD7166 -UN-03NOV94

RG,CTM8,DW650 -19-01NOV95

NOTE: If gear is equipped with cogs (A) for magnetic speed sensor, it must be installed with cogs facing away from the cylinder block and toward the gear cover. If installed incorrectly, no speed signal will be produced.

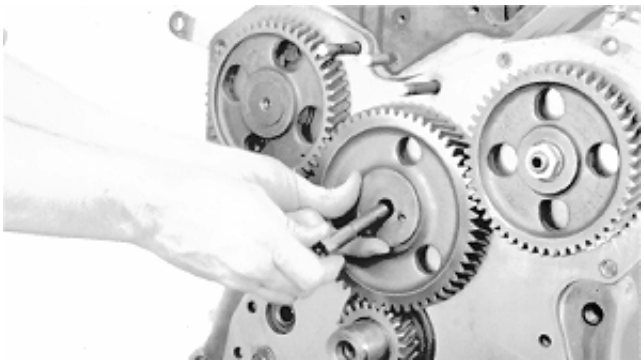
10. Lubricate upper idler gear bushing ID and shaft OD with TY6333 High-Temperature Grease. Install upper idler gear without turning camshaft gear or injection pump gear.

NOTE: On Saran Engines (868857CD—) containing the special washer, tighten idler gear cap screw to 110 N·m (81 lb-ft).

11. Install washer so hole and spring pin align. Install cap screw. Tighten cap screw to 100 N·m (75 lb-ft).

12. Recheck gear timing to make sure it is correct.

RG6333 -UN-03AUG92



T88700 -UN-09NOV88

S11,2016,BA -19-25SEP95

SPECIAL OR ESSENTIAL TOOLS

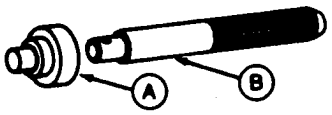
NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or in the European Microfiche Tool Catalog (MTC).

DX,TOOLS -19-20JUL95

RG5183 -UN-13SEP89

Bushing Driver (A) JD248A
Handle (B) . . . . . JDG536(OTC813)

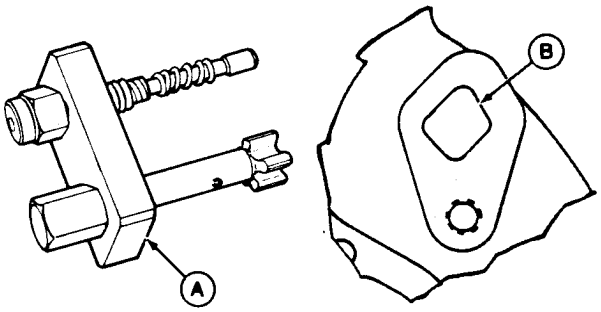
Install oil pressure relief valve bushing.



S53,JD248,A -19-04APR90

Flywheel Turning Tool (A) JD281A

Used on engines with 142 tooth flywheel ring gear and a diamond shaped tool guide bore (B) in flywheel housing. Tool has it's own spring loaded timing pin which threads into flywheel housing.



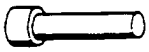
RG6252 -UN-22JUL92

RG,JD281A -19-17JUL92

RG5068 -UN-23AUG88

Timing Pin JDE81-4

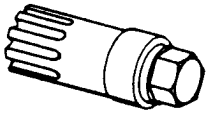
Lock engine at TDC when installing injection pump or timing valve train. Use with JDG820, JDE81-1, or JDE83 Flywheel Turning Tool.



RG,JDE814 -19-03JAN95

Flywheel Turning Tool JDE83

Used to rotate flywheel on engines with 142 tooth flywheel ring gear and a 26.5 mm (1.04 in.) ID flywheel housing guide bore diameter. Use with JDE81-4 Timing Pin.



RG6251 -UN-22JUL92

RG,JDE83 -19-17JUL92

ENGINE CRANKCASE OIL FILL QUANTITIES—CONTINUED

• JOHN DEERE INDUSTRIAL APPLICATIONS—CONTINUED

Machine Model No.	Engine Model	Engine Serial No.	Crankcase Oil Fill Quantity with Filter Change
MOTOR GRADERS			
570B	T06359DDW02		11.5 L (12.0 qt)
	T06359TDW02*		11.5 L (12.0 qt)
JD670	T06414TT003		19.0 L (20.0 qt)
670A	T06414TT003		19.0 L (20.0 qt)
	T06414TDW03		19.0 L (20.0 qt)
670B	T06414TDW03		19.0 L (20.0 qt)
672A	T06414TT003		19.0 L (20.0 qt)
	T06414TDW03		19.0 L (20.0 qt)
672B	T06414TDW13		19.0 L (20.0 qt)
SKIDDERS			
340D	T04276DT004		14.0 L (15.0 qt)
	T04276DDW04		14.0 L (15.0 qt)
440C	T04276TT002		14.0 L (15.0 qt)
440D	T04276TT007		14.0 L (15.0 qt)
	T04276TDW07		14.0 L (15.0 qt)
448D	T04276TT007		14.0 L (15.0 qt)
	T04276TDW07		14.0 L (15.0 qt)
540B	T04276TT004		14.0 L (15.0 qt)
540D	T04276TT008		14.0 L (15.0 qt)
	T04276TDW08		14.0 L (15.0 qt)
548D	T04276TT008		14.0 L (15.0 qt)
	T04276TDW08		14.0 L (15.0 qt)
640	T06414TT001		19.0 L (20.0 qt)
640D	T06414TT008		19.0 L (20.0 qt)
	T06414TDW08		19.0 L (20.0 qt)
648D	T06414TT008		19.0 L (20.0 qt)
	T06414TDW08		19.0 L (20.0 qt)
FELLER BUNCHER			
643	T06414TT015		19.0 L (20.0 qt)
693D	T06414TDW14		19.0 L (20.0 qt)
FORK LIFT			
482C	T04239DT002		8.5 L (9.0 qt)

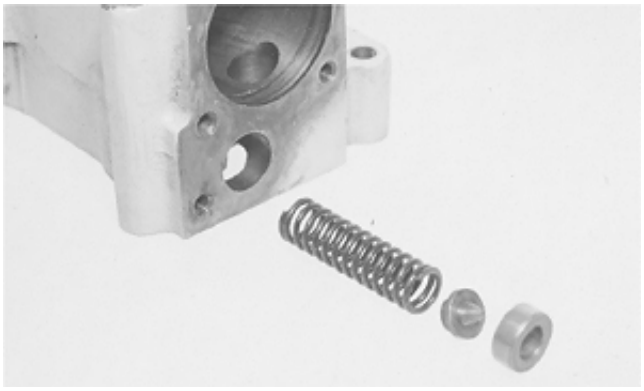
*Turbo for altitude compensation

S55,2000,MT1 -19-26JUL89

REMOVE AND INSTALL OIL COOLER/FILTER BYPASS VALVE (4276, 6414 ENGINES)

The oil cooler/filter bypass valve assembly is located in a bottom bore of oil cooler housing. The spring and valve are retained in housing by the pressed-in seat.

NOTE: Since the spring, valve and seat are not easily removed and seldom require replacement, these parts are not provided for service. The cooler housing provided for service includes the valve assembly.



S11,2020,GU -19-14JUL95

REMOVE AND INSTALL OIL PRESSURE REGULATING VALVE AND SEAT (3179, 4239, 6359 ENGINES)

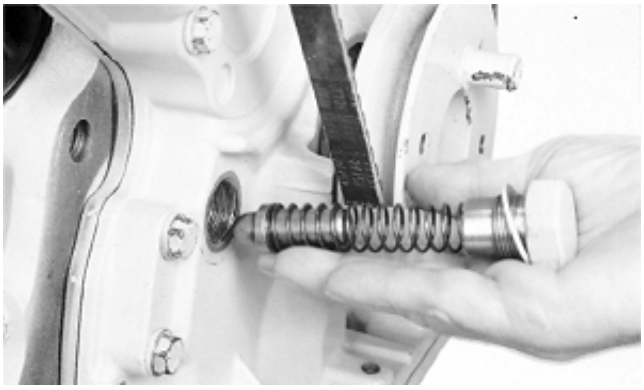
1. Remove oil pressure regulating valve plug.

S11,2020,HB -19-14JUL95

2. Remove oil pressure regulating valve and spring. Check valve cone for excessive wear and damaged sealing face.

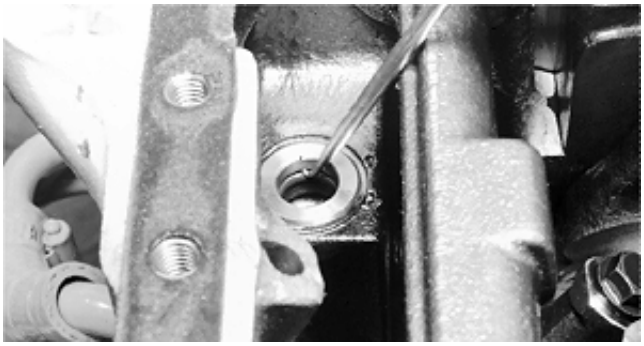
PRESSURE REGULATING VALVE SPRING SPECIFICATIONS

Spring Free Length	120 mm (4.72 in.)
Spring Tension at 42.5 mm (1.68 in.)	60—75 N (13.5—16.5 lb-force)



T49,0407,16 -19-18FEB95

INSTALL STANDARD CAPACITY OIL PUMP


T88931 -UN-09NOV88

NOTE: This procedure is for installing the oil pump with timing gear cover installed. If timing gear cover is removed from the engine, refer to INSTALL AND TIMING BALANCER SHAFT in Group 16 for 4-cylinder engines only.

1. On 4-cylinder engines with balancer shafts, lock No. 1 piston at TDC compression stroke.

2. Install a new O-ring in groove of cylinder block (for outlet tube).

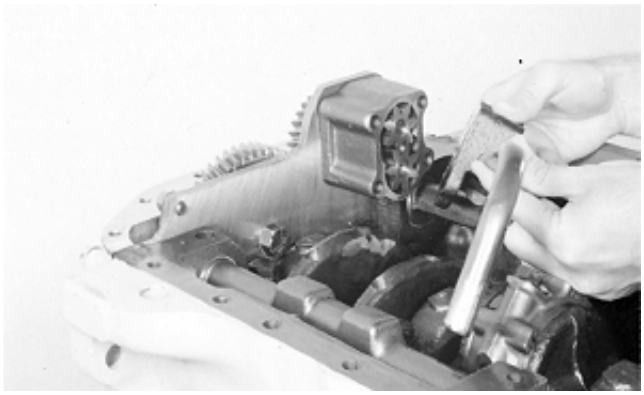
NOTE: The cylinder block O-ring is used on all Dubuque-built engines. On Saran-built engines, the O-ring is used on the following:

4239D and T Serial No. (CD574190—)
6359D, T, and A Serial No. (CD571540—)

3. Install a new O-ring on oil intake pickup tube.

S11,2020,FA -19-21SEP95

IMPORTANT: On 4-cylinder engines, the key slot in the balancer shafts must be at the 12 O'clock position (timing marks on both balancer shaft gears facing inboard toward crankshaft centerline), when No. 1 piston is at TDC compression stroke.


T81957 -UN-31OCT88

4. Install oil pump drive gear so it meshes with balancer shaft gear and idler gear WITHOUT altering the timing position of the balancer shaft.

5. While holding drive gear in place, install housing on front plate.

6. Install pump cover with outlet tube and pick-up tube.

RG,CTM4,DT458 -19-01NOV95

SPECIAL OR ESSENTIAL TOOLS

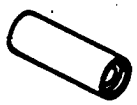
NOTE: Order tools according to information given in the U.S. SERVICEGARD™ Catalog or in the European Microfiche Tool Catalog (MTC).

DX,TOOLS -19-20JUL95

RG5132 -UN-23AUG88

Bearing Driver (4239T, 4276T, 6359D, T and A) JDE74
Bearing Driver (3179D, 4239D, 4276D) JD262A

Install water pump bearing.



S53,JDE74B -19-06MAR87

RG5109 -UN-23AUG88

Seal Remover JDG22

Remove oil seals.

S53,JDG22 -19-05APR90

RG5134 -UN-23AUG88

Belt Tension Gauge
Standard V-belts JDG529
Poly V-belts JT05975

Adjust fan belt tension.

S53,JDG529,B -19-19MAY92

RG5588 -UN-13SEP89

Belt Tension Gauge JDST28

Used with a straightedge to check fan belt tension (standard and poly V-belts).

S53,JDST28 -19-18FEB95

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
D01045AA—Bushing, Bearing, and Seal Driver Set	Remove inner seal in water pump housing (heavy-duty pump).
D01047AA—17-1/2 and 30-Ton Puller Set	Remove pulley from water pump shaft.
D01200AA—10-Ton Push-Puller	Remove impeller from water pump shaft.

RG,CTM4,DT523 -19-21SEP95

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1

REMOVE AND INSTALL THERMOSTAT HOUSING/WATER MANIFOLD

CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns. Do not drain coolant until the coolant temperature is below operating temperature. Always loosen cooling system filler cap, radiator cap, or drain valve slowly to relieve pressure.

TS281 -UN-23AUG88

1. Drain coolant.
2. Disconnect hoses.
3. Remove housing-to-cylinder head cap screws.
4. Remove housing (A) from cylinder head.

RG5643 -UN-02APR90

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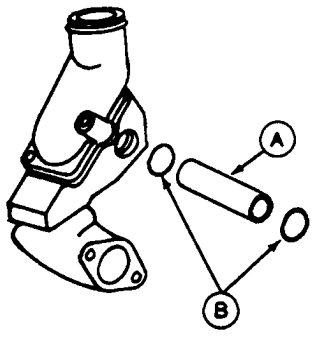
S11,2025,EZ -19-21SEP95

5. Remove housing-to-water pump tube (A), Option Code 2102. Remove O-rings (B) from housing and water pump.
6. Remove thermostat cover and thermostat(s).

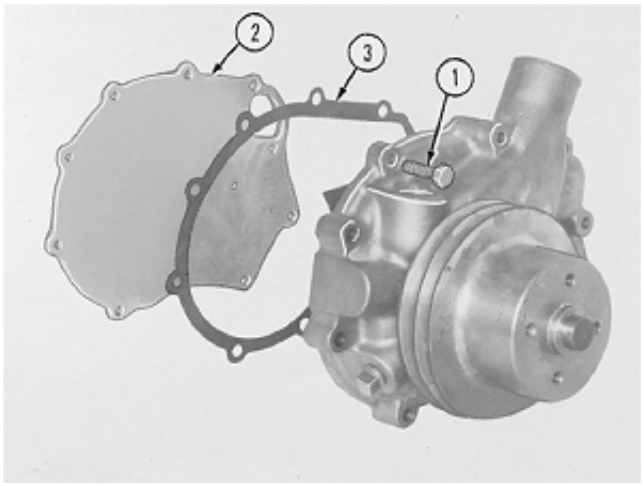


RG4792 -UN-14DEC88

S11,2025,FA -19-13JUL95

9. Install cover plate (2), using a new gasket (3). (Also install alternator adjusting strap.) Tighten cap screws (1) to 47 N·m (35 lb-ft).

10. Rotate pulley by hand. If impeller drags on cover plate, remove cover and recheck impeller position on shaft.



T70288 -UN-23FEB89

S11,2025,FL -19-13JUL95

INSTALL LOW FLOW (STANDARD DUTY) WATER PUMP

1. Place a new gasket between pump cover and cylinder block. Tighten cap screws (A) to 47 N·m (35 lb-ft).

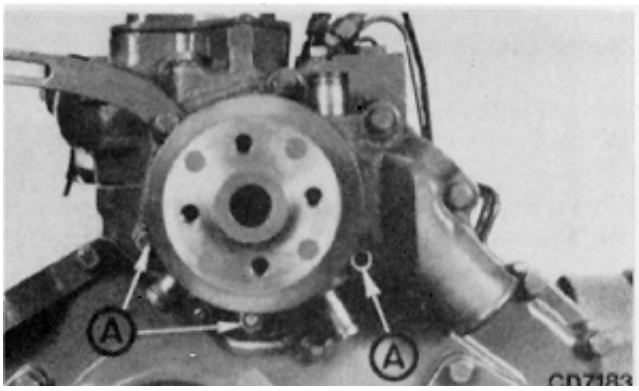
2. Install thermostat housing (if removed.).

3. Connect hoses and tighten hose clamps securely.

4. Install alternator (if removed) and fan belt(s). Adjust tension. (See COOLING SYSTEM SPECIFICATIONS at the beginning of this group.)

5. Fill cooling system with proper coolant. (See Group 02 - Fuels, Lubricants, and Coolant).

IMPORTANT: Air must be expelled from system when system is refilled. Loosen temperature sending unit fitting at rear of cylinder head or plug in thermostat housing to allow air to escape when filling system. Retighten fitting or plug when all the air has been expelled.



CD7183 -UN-23FEB89

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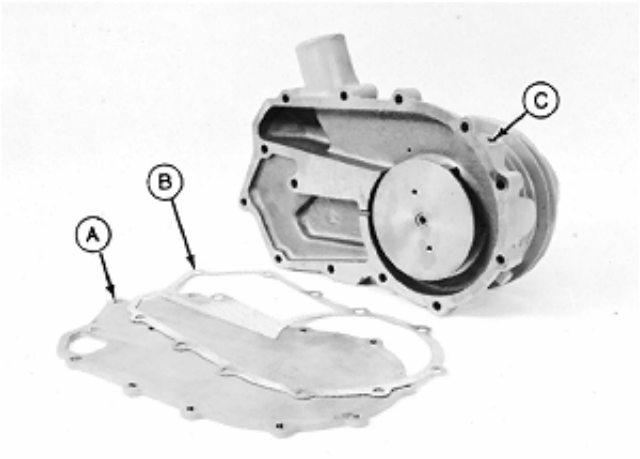
S11,2025,FM -19-13JUL95

14. Install a new gasket (B) and housing cover (A). Install cap screws and tighten to 47 N·m (35 lb-ft).

15. Install new O-ring in port (C, where used).



-UN-21AUG92
RG6413

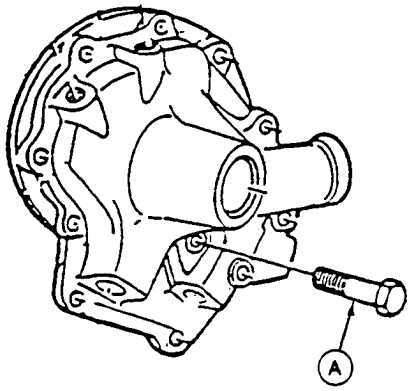
RG,CTM8,GR25,25-19-18AUG92

CHECKING WATER PUMP CAP SCREW PROTRUSION

NOTE: On Saran OEM Engines:

- *4239AF and 4238TF with option code 2004 or 2023*
- *6359DF and 6359TF with option code 2004, 2008 or 2023*

Cap screw (A) when used with service water pump, may interfere with cylinder block. As a result, coolant will leak from service water pump.



-UN-10DEC94
RG7263

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RG,CTM8,DX393 -19-13JUL95

• **Abnormally High Exhaust Temperatures**

A fifth cause of turbocharger damage is abnormally high exhaust temperatures. Elevated exhaust temperatures cause coking of oil which can lead to bearing failure. Extreme over-temperature operation can case wheel burst.

There are two basic causes of over-temperature. The first is restricted air flow and the second is overpowering the engine. In either case the engine has more fuel than available air for proper combustion, this overfueled condition leads to elevated exhaust temperatures.

Causes of restricted air flow can include damaged inlet piping, clogged air filters, excessive exhaust restriction, or operation at extreme altitudes. Overpowering generally is due to improper fuel delivery or injection timing. If overtemperature operation has been identified, an inspection of the air inlet and exhaust systems should be performed. Also, check the fuel delivery and timing.

RG,CTM8,G30,R2 -19-19AUG92

REMOVE TURBOCHARGER—4239T AND 6359T & A ENGINES (AIRESEARCH/GARRETT AND K.K.K.*)

CAUTION: After operating engine, allow exhaust system to cool before removal.

NOTE: Turbocharged engines will have either K.K.K. or AiResearch turbochargers. Removal and installation procedures are the same for both turbochargers, but, repair of two brands differ. Refer to the proper repair group when repairing the turbocharger.*

Thoroughly clean exterior of turbocharger and surrounding area to prevent entry of dirt into the air intake system during removal.

IMPORTANT: When cleaning turbocharger, do not spray directly into compressor cover or turbine housing. If turbocharger inspection is required, do not clean exterior prior to removal. Doing so may wash away evidence of a potential failure mode. See TURBOCHARGER SEVEN STEP INSPECTION later in this group.)

*Kuhnle, Kopp, and Kausch

S11,3005,IY -19-29JUN95

PERFORM AXIAL BEARING END PLAY TEST—AIRESEARCH/GARRETT

This test will give an indication of the condition of the axial bearing within the center housing and rotating assembly.

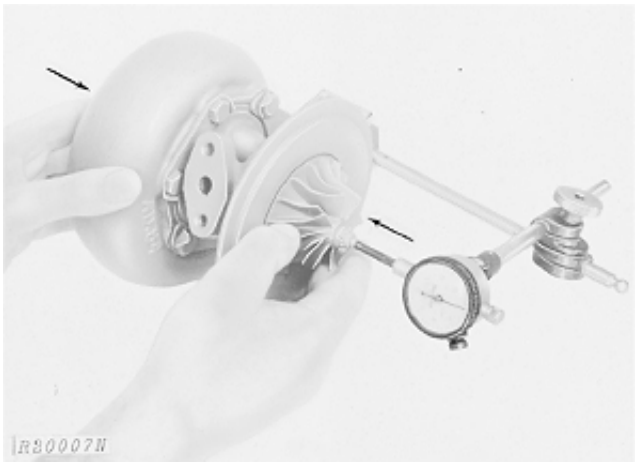
1. Mount magnetic base dial indicator so that indicator tip rests on end of shaft. Preload indicator tip and zero dial on indicator.

2. Move shaft axially back and forth by hand.

3. Observe and record total dial indicator reading.

The bearing end play specification is 0.025—0.09 mm (0.001—0.0035 in.) for TA25 Turbochargers used on 3179 engines and 0.025—0.102 mm (0.001—0.004 in.) for turbochargers used on all other engine applications.

If bearing end play is not within specification, replace center housing and rotating assembly. (See REPLACE CENTER HOUSING AND ROTATING ASSEMBLY for your model of turbocharger, later in this group.)



R20007N -UN-20DEC88

S11,3005,LA -19-29JUN95

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REMOVE AFTERCOOLER AND INTAKE MANIFOLD (6359A)

CAUTION: Do not drain engine coolant until the coolant temperature is below operating temperature. Next, open drain valve slowly to relieve any excess pressure.

1. Thoroughly clean exterior of turbocharger, intake manifold and adjacent areas to prevent entry of dirt into the engine when parts are removed.

2. Remove fuel filter and base (A).

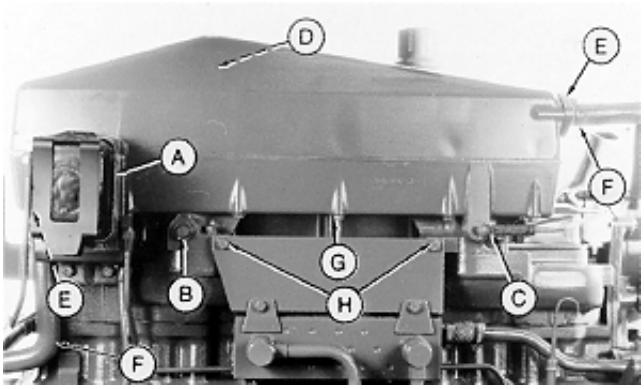
3. Remove oil cooler bracket attaching cap screws (H).

4. Disconnect thermostat line (B) and injection pump aneroid control line (C).

5. Remove turbocharger adapter plate (D) cap screws at rear of intake manifold.

6. Disconnect aftercooler front and rear adapter plates (E). Then remove clamps and hoses (F).

7. Remove intake manifold-to-cover cap screws (G) with washers.



RG4813 -UN-23AUG89

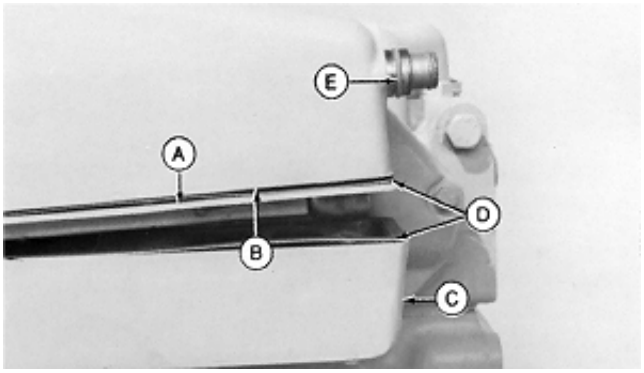
A—Fuel Filter
B—Thermostat Line
C—Aneroid Control Line
D—Turbocharger Adapter Plate
E—Aftercooler Adapter Plates
F—Hoses
G—Intake Manifold-to-Intake Manifold Cover Cap Screws
H—Oil Cooler Bracket Cap Screws

S11,3005,LH -19-22SEP95

8. Carefully lift aftercooler (A) with intake manifold cover (B) from intake manifold (C).

9. Remove and discard gaskets (D) and O-rings (E).

10. Remove all intake manifold-to-cylinder head cap screws and remove intake manifold.



RG3947 -UN-20DEC88

A—Aftercooler
B—Intake Manifold Cover
C—Intake Manifold
D—Gaskets
E—O-Ring (2 used)

RG,CTM4,DW802 -19-22SEP95

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FUEL SYSTEM SPECIFICATIONS—CONTINUED

TORQUES

Fuel Injection Pumps:
- Pump drive gear-to-pump shaft, hex. nut:
  - Roto Diesel/Lucas CAV (three screw hub) . . . . . 30—35 N·m (22—25 lb-ft)
  - Roto Diesel/Lucas CAV (solid drive shaft) . . . . . 85 N·m (63 lb-ft)
  - Stanadyne (Model DB4) . . . . . 195 N·m (145 lb-ft)
  - Stanadyne (Model DB2):
    - With 8 mm (0.315 in.) thick retaining nut (chrome finish) . . . . . 60 N·m (45 lb-ft)
    - With 10 mm (0.393 in.) thick retaining nut (black finish) . . . . . 195 N·m (145 lb-ft)
  - Stanadyne (Model JDB) . . . . . 60 N·m (45 lb-ft)
  - Stanadyne (Model DM4) . . . . . 195 N·m (145 lb-ft)
- Injection pump-to-front plate hex-nuts . . . . . 27 N·m (20 lb-ft)

Drive gear nut cover plate cap screws . . . . . 47 N·m (35 lb-ft)

Fuel lines-to-injection pump and nozzles:
- Roto Diesel/Lucas CAV:
  - With Banjo Fittings . . . . . 34 N·m (25 lb-ft)
  - With Axial Outlet Fittings . . . . . 34 N·m (25 lb-ft)
- Stanadyne (Model JDB) . . . . . 34 N·m (25 lb-ft)
- Stanadyne (Models DB2, DB4 and DM4) . . . . . 34 N·m (25 lb-ft)

Fuel supply line-to-injection pump . . . . . 30 N·m (22 lb-ft)

Fuel return line-to-injection pump . . . . . 16 N·m (12 lb-ft)

Pump drive gear access cover . . . . . 24 N·m (18 lb-ft)

Injection pump inspection cover plate:
- Roto Diesel/Lucas CAV (all models) . . . . . 3.5 N·m (2.5 lb-ft) (30 lb-in.)

Drive gear access plate:
- Stanadyne (all models) . . . . . 2 N·m (1.5 lb-ft) (18 lb-in.)

Shut-off solenoid valve:
- Roto Diesel/Lucas CAV (all models) . . . . . 15—20 N·m (11—15 lb-ft)

Adjusting screw lock nut for slow and fast idle speeds . . . . . 5 N·m (3.5 lb-ft) (42 lb-in.)

Aneroid bracket-to-injection pump cover . . . . . 5 N·m (3.5 lb-ft) (42 lb-in.)

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S11,3010,LJ -19-01NOV95

REMOVE ROTO DIESEL/LUCAS CAV FUEL INJECTION PUMP

IMPORTANT: NEVER steam clean or pour cold water on a fuel injection pump while it is running or while the pump is warm. Doing so may cause seizure of internal rotating pump parts.

1. Clean the fuel injection pump, lines and area around the pump with cleaning solvent or a steam cleaner.

2. Disconnect shut-off cable and speed control linkage, if equipped. Disconnect electrical connection to shut-off solenoid or throttle positioning solenoid, if equipped. Tag electrical wires for correct reassembly.

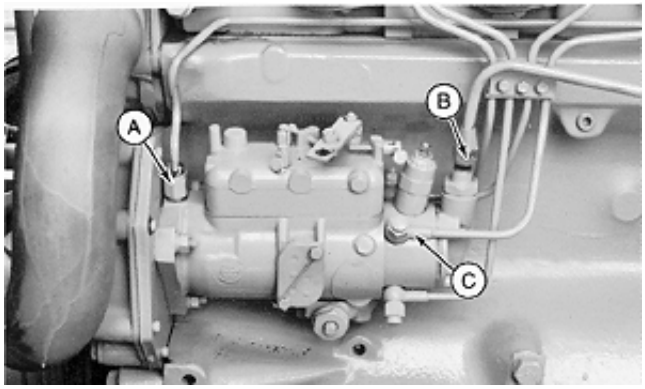
3. Disconnect fuel return line (A) and fuel supply line (B).

NOTE: On early injection pumps the injection lines (with banjo fittings, shown) are secured to the pump with hex fitting assemblies called pressurizing valves. Current injection pumps have pressurizing valves installed in the pump head with axial outlet fittings for easier assembly and improved joint sealing.

IMPORTANT: On current injection pumps with axial outlet fittings, use a back-up wrench when removing fuel lines to prevent possible leaks upon reassembly.

4. Disconnect fuel injection lines (C).

5. Cap or plug all open connections on pump and fuel lines. Do not use fibrous material.



CD6375 -UN-11JUL89

S11,3010,LS -19-14JUL95

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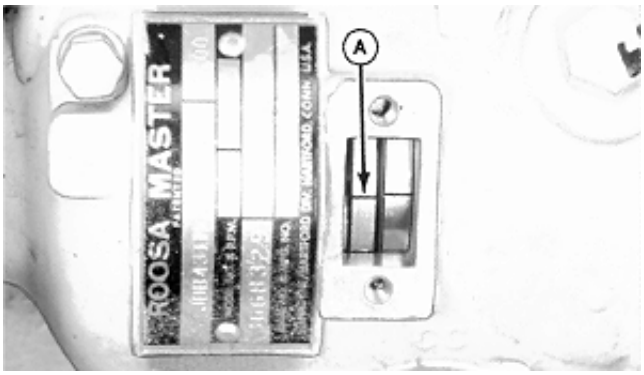
REMOVE STANADYNE INJECTION PUMP—MODEL JDB AND DB2 WITH NON-RETAINED DRIVE SHAFT



T87483 -UN-09NOV88

IMPORTANT: Never steam clean or pour cold water on a fuel injection pump while the pump is running or while it is warm. Doing so may cause seizure to internal rotating pump parts.

1. Clean the fuel injection pump, lines and area around the pump with cleaning solvent or a steam cleaner.

2. Use appropriate flywheel turning tool to rotate crankshaft to position No. 1 piston at TDC on compression stroke. On JDB and early DB2 pumps, the timing marks on governor weight retainer and cam ring must align (A). At this position, timing pin should enter hole in flywheel to lock engine at TDC.

On later DB2 pumps, if timing mark is not clearly visible on front plate, scribe a visible reference timing mark as accurately as possible in-line with mark on pump flange. Use this mark for timing pump when reinstalled on engine.

NOTE: The injection pump can be removed without engine being at No. 1 TDC. However, setting engine at No.1 "TDC" aids pump installation if the pump position is not changed.

S11,3010,MF -19-29JUN95

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• Using JDG670A Injection Pump Drive Gear Puller:

1. Attach JDG670A Drive Gear Puller (A) to injection pump drive gear as shown.

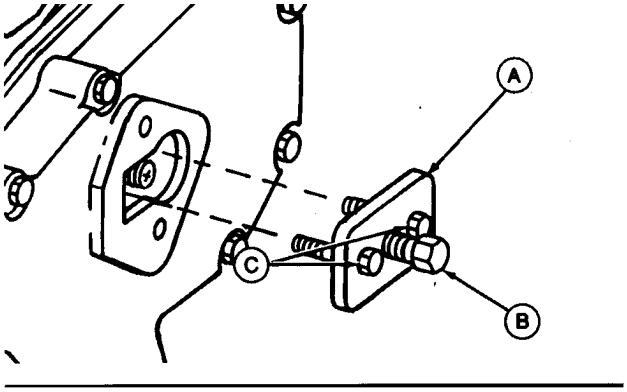
NOTE: Replace 6 mm Grade 12.9 cap screws (C) as needed.

2. Evenly tighten the two 6 mm, Grade 12.9 screws (threaded in drive gear) and snugly tighten center forcing screw (B) against end of pump shaft.

IMPORTANT: On engines equipped with crankshaft gear-driven auxiliary drive options, DO NOT remove puller from gear after pump shaft is free from gear. The drive gear will move inside timing gear cover and may become disengaged from camshaft gear causing the gear to be one or more teeth out of time.

Once gear is free from shaft, remove center forcing screw from puller and tighten the two 6 mm screws into gear on puller until gear is pulled against timing gear cover. Leave puller attached until injection pump is reinstalled on engine.

3. Tighten center forcing screw until pump drive gear is free from tapered shaft. Remove JDG670A Puller and screws from drive gear.



RG,CTM4,DT442 -19-14JUL95

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TRANSFER FUEL INJECTION PUMP TIMING MARK ONTO REPLACEMENT FRONT PLATE

IMPORTANT: Replacement front plates do not have an injection pump timing mark. It is extremely important that the timing be accurately transferred from original front plate to the replacement plate in the exact location for correct injection pump timing.

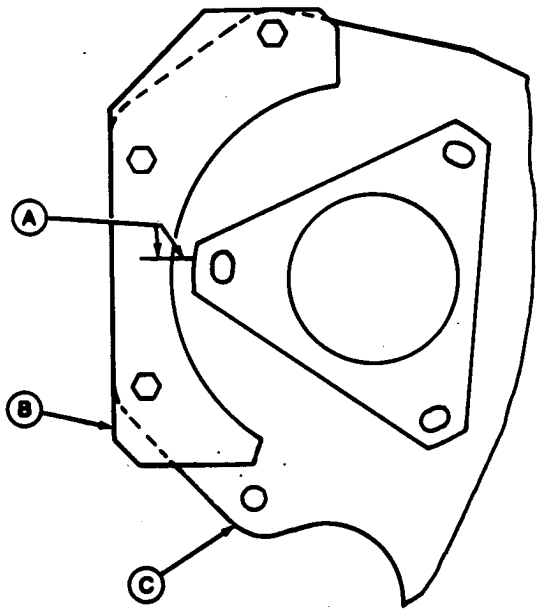
1. Position DFRG2 Aluminum Template (B) onto original front plate (C) as shown. (See Group 199, Dealer Fabricated Tools for manufacturing detail.) Install and tighten three 3/8-16 cap screws securely.

2. Transfer injection pump timing mark (A) from previous front plate onto template using a fine tip marker and straightedge. Remove template from front plate being replaced.

3. Attach template (with timing mark) to new replacement front plate and tighten cap screws securely.

4. Transfer timing mark from the template to the new front plate using a scribe. Scribe deep enough so mark becomes a permanent reference.

5. Remove template from front plate and refer to Group 16 for front plate installation procedure.



RG5590 -UN-01NOV89

Front Plate (Viewed From Pump Side)

RG,CTM8,G35,33 -19-29SEP94

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• Leakage Test

1. Check nozzle for fuel leakage past valve seat by positioning nozzle on nozzle tester with nozzle tip down.

2. Operate pump handle rapidly to firmly seat valve. Wipe the nozzle tip dry with a clean, lint-free cloth.

3. Slowly raise pressure at nozzle to about 2800—3500 kPa (28—35 bar) (400—500 psi) under specified opening pressure and hold at that pressure. Watch for an accumulation of fuel around the nozzle tip orifices.

If fuel drips from nozzle within 5 seconds, nozzle must be lapped.

S11,3010,NR -19-11SEP92

• Valve Stem and Guide Wear Test

1. Position nozzle with tip slightly above the horizontal plane.

CAUTION: Completely enclose spray zone in a glass beaker to avoid possible personal injury from spray.

2. Slowly raise pressure to 10 300 kPa (103 bar) (1500 psi) on test gauge.

NOTE: Leakage rate based on use of No. 2 diesel fuel or an equivalent viscosity of test oil at 18˚—24˚C (65˚—75˚F) ambient temperature.

3. Look for leakage from the return end of nozzle. After one drop, leakage should be 3—10 drops in 30 seconds.

If nozzle leakage is not within specified range, nozzle must be reconditioned as outlined later in this group.

S11,3010,NR1 -19-21SEP95

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2. Install nozzle in cylinder head using a slight twisting motion as nozzle is seated in bore.

NOTE: Illustration shows relationship of parts required for installation.

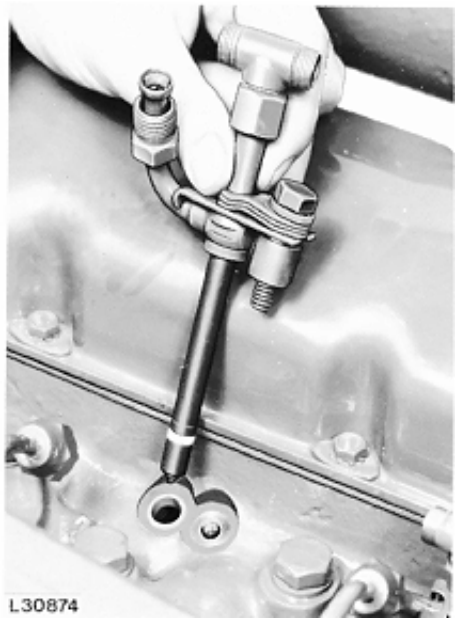
3. Install spacer, clamp and cap screw. Do not tighten cap screw at this stage.

4. Connect fuel pressure line to nozzle. Leave connection slightly loose until air is bled from system.

5. Tighten nozzle hold-down cap screws to 27 N·m (20 lb-ft).

6. Install leak-off line assembly.

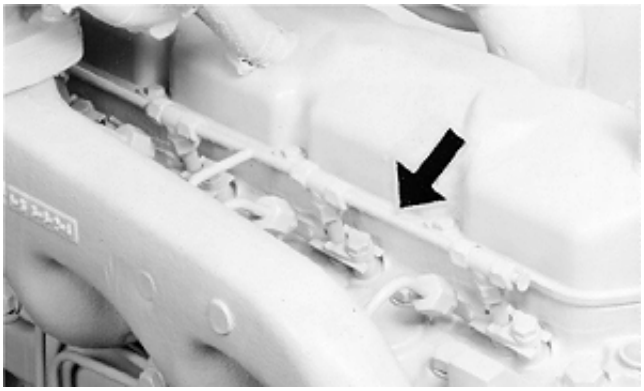
7. Bleed air from loose injection line connection. Tighten connection using two wrenches to 34 N·m (25 lb-ft). (See BLEED THE FUEL SYSTEM in Group 115.)



S11,3010,OK -19-29JUN95

REPAIR LEAK-OFF LINE ASSEMBLY

NOTE: When all fuel injection nozzles have to be removed, disconnect leak-off line at fuel tank return line and at fuel injection pump T-fittings only. Loosen nut on each fuel injection nozzle and lift off complete leak-off line as an assembly.



S11,3010,OO -19-29JUN95

ENGINE BREAK-IN GUIDELINES

Engine break-in should be performed when the following repairs 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,G105,2-19-25JUL95

GENERAL ENGINE DESCRIPTION

Model 3179, 4239, 4276, 6359, and 6414 engines are vertical-in-line, valve in head, 4-cycle (stroke) diesel engines.

Direct fuel injection is provided by a distributor-type fuel injection pump and 9.5 mm injection nozzles mounted in cylinder head. The pump is driven by an intermediate gear in the timing gear train meshing with the crankshaft gear.

Some engines are equipped with a turbocharger. Operated by exhaust gases, the turbocharger compresses intake air from air cleaner and routes it to the combustion chamber.

Aftercooled engines are turbocharged, and in addition, have a heat exchanger (called an aftercooler) located in the intake manifold. The aftercooler cools the compressed (and heated) intake air from the turbocharger before entering the combustion chamber. Engine coolant flowing through the aftercooler is the media used for heat exchange.

The camshaft is driven by an intermediate gear in the timing gear train which meshes with the crankshaft gear. Camshaft rotates in honed machined bores in cylinder block; no bushings are used. The camshaft lobes determine the time and rate of opening of each valve and actuates the fuel transfer pump.

Intake and exhaust valves are operated by cam followers, push rods and rocker arm assembly. Valve seat inserts in cylinder head are used for intake and exhaust valves on turbocharged engine. Naturally aspirated engines have inserts for intake valves only.

The crankshaft is a one-piece, heat treated, steel forging which operates in replaceable two-piece main bearings.

Two different types of crankshaft main thrust bearing inserts are used to control end-play, depending on the producing factory. Normally a two-piece thrust bearing insert is used on Dubuque engines. A five-piece bearing insert normally is installed on Saran engines. The five-piece bearing has high thrust load capability.

The five-piece thrust bearings must be installed as a set. They may also be retro-fitted to Dubuque engines at service repair if so desired. Should a crankshaft be found to have developed excessive end play, an oversized thrust bearing plate set is available through service parts. Thrust bearing side plates are available in either standard size or 0.007 in. oversize.

Cylinder liners are “wet” (surrounded by coolant) and are individually replaceable. O-rings are used to seal the connection between cylinder block and liners.

Pistons are constructed of cast aluminum alloy and cam ground. The piston crown has a cut-out swivel cup with a truncated cone in the center. Two compression rings and one oil control ring are used. The top compression ring is a keystone type ring. All piston rings are located above the piston pin.

The 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.

The engine is supplied with lubricating oil by a gear pump driven by the crankshaft. The lubricating oil passes through a full-flow oil filter in the main oil gallery of cylinder block. To ensure engine lubrication, the oil filter is provided with a by-pass valve which opens when the filter element is restricted. On most engines, engine oil is cooled by means of an oil cooler mounted externally on the cylinder block. Engine oil passes through the oil cooler before flowing to the oil filter. A by-pass valve located between oil pump and main gallery relieves any pressure build-up in this area.

Balancer shafts are used on some four-cylinder engines to reduce vibration. The two shafts operate on bushings in cylinder block and are counter-rotating at twice the engine speed.

The engine has a pressurized cooling system, consisting of radiator, water pump, multi-blade fan and one or two thermostats.

S11,2000,EG -19-26JUN95

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

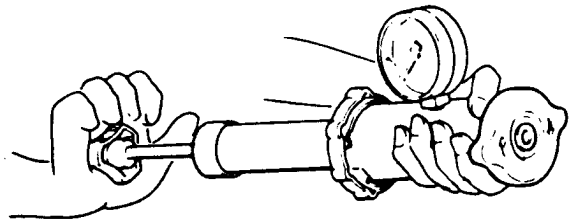
Possible Causes:

- 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

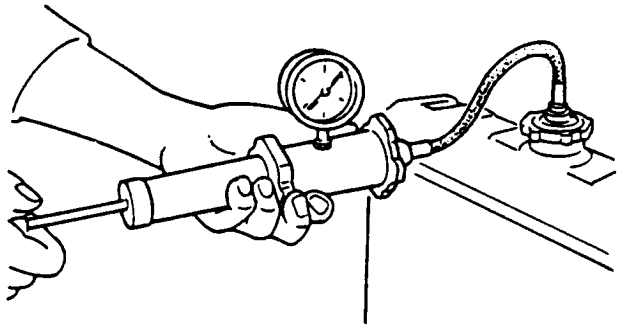
NOTE: Cracked cylinder head or liners may also allow combustion gas leakage into coolant.

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

PRESSURE TEST COOLING SYSTEM AND RADIATOR CAP



RG6557 -UN-20JAN93



RG6558 -UN-20JAN93

CAUTION: Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

Test Radiator Cap:

1. Remove radiator cap and attach to D05104ST Pressure Pump as shown.

2. Pressurize cap to 50 kPa (0.5 bar) (7 psi)*. Gauge should hold pressure for 10 seconds within the normal range if cap is acceptable.

If gauge does not hold pressure, replace radiator cap.

3. Remove the cap from gauge, turn it 180°, and retest cap. This will verify that the first measurement was accurate.

Test Cooling System:

NOTE: Engine should be warmed up to test overall cooling system.

1. Allow engine to cool, then carefully remove radiator cap.

2. Fill radiator with coolant to the normal operating level.

IMPORTANT: DO NOT apply excessive pressure to cooling system, doing so may damage radiator and hoses.

3. Connect gauge and adapter to radiator filler neck. Pressurize cooling system to 50 kPa (0.5 bar) (7 psi)*, using D05104ST Pressure Pump.

4. With pressure applied, check all cooling system hose connections, radiator, and overall engine for leaks.

If leakage is detected, correct as necessary and pressure test system again.

If no leakage is detected, but the gauge indicated a drop in pressure, coolant may be leaking internally within the system or at the block-to-head gasket. Have your servicing dealer or distributor correct this problem immediately.

**Test pressures recommended are for all Deere OEM cooling systems. On specific vehicle applications, test cooling system and pressure cap according to the recommended pressure for that vehicle.*

RG18293,6 -19-28SEP95

CHECK INTAKE MANIFOLD PRESSURE (TURBO BOOST)


T6022AA -UN-09FEB89

NOTE: See AIR INTAKE AND EXHAUST SYSTEM TEST SPECIFICATIONS at the beginning of this group for all OEM (TF) engine specifications. Refer to the appropriate machine technical manual for specific machine applications.

1. Remove plug from intake manifold and install the appropriate fitting from JDE147 Kit. Connect gauge and test line to fitting.

2. Before checking boost pressure, warm up engine to allow the lubricating oil to reach 93˚C (200˚F).

IMPORTANT: Engine speed and load should be stabilized before taking readings on gauge. Be sure that gauge works properly.

Pressure checks are only a guide to determine if there is an engine problem (valve leakage, defective nozzles, etc.). Low readings are not a valid reason for increasing injection pump fuel delivery. Pump adjustment should be within specification as established by an authorized pump repair station.

3. Observe pressure reading on gauge. Reading should be at least 60 kPa (0.6 bar) (9 psi) when engine is developing rated power at full load rated speed.

S11,23005,AT -19-28SEP95

FUEL INJECTION PUMP TIMING

Fuel injection pumps on John Deere Diesel Engines are timed one of two ways at the factory:

—By Static Timing, which is accomplished by the alignment of internal pump timing marks (cam ring-to-governor weight retainer) and/or the alignment of injection pump flange-to-front plate timing marks.

—By Dynamic Timing, which involves a sensor installed within the No. 1 fuel line and connected to a pulse-activated timing meter to determine precisely at what point injection occurs. Another form of dynamic timing employs the use of a timing light along with a fixed reference mark on engine block and a timing mark on crankshaft damper or pulley which aligns with fixed reference mark when light flashes.

Both types of timing are covered in this manual. Dynamic timing the engine is the preferred method. However, on some applications, dynamic timing values are not available and the engine must be static timed.

S55,3010,BR -19-28SEP95

CHECK AND ADJUST INJECTION PUMP DYNAMIC TIMING USING JT07158 TIME TRAC KIT

The JT07158 Time Trac Kit electronically indicates start of injection with respect to piston top dead center (TDC), and allows accurate setting of injection pump timing to provide optimum power, smoke, and exhaust emissions.

Timing engines with this timing kit improves consistency between engines and helps to control cylinder firing pressures which can be a factor in head gasket failures as well as improve overall engine efficiencies.

RG,CTM8,G115,20-19-02FEB95

3. Install pump on engine. Tighten pump-to-front plate hex nuts finger tight.

4. Pivot pump toward cylinder block as far as slots will allow. Then, slowly pivot pump away from block until snap ring is aligned with correct letter-designated scribe mark (inside pump) for the specific engine model and application.

5. Tighten pump to front plate mounting nuts 27 N·m (20 lb-ft).

6. Install inspection cover plate on injection pump using a new gasket. Tighten cap screws 3.5 N·m (2.5 lb-ft).

NOTE: If pump is under warranty and approval (by the authorized repair station) was given to remove the original sealing wire, a new sealing wire must be installed. Contact your authorized Roto Diesel/Lucas CAV repair station for instructions.

7. Remove dial indicator and valve from No. 1 injection nozzle hole. Install injection nozzle in cylinder head.

8. Bleed air from system and check for leaks. (See BLEED FUEL SYSTEM later in this group.)

NOTE: If speed advance on Roto Diesel/Lucas CAV pump is suspected to be faulty, pump must be removed and taken to an authorized repair station for repair.

S11,23010,GZ -19-28SEP95

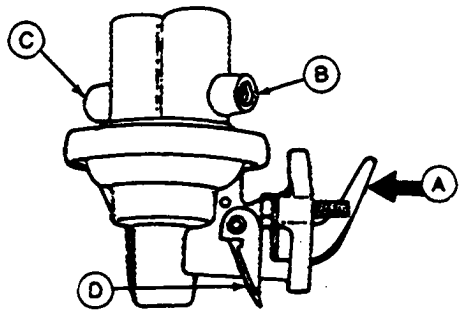
FUEL SUPPLY PUMP OPERATION—IF EQUIPPED

NOTE: Some vehicle applications which use the 3179 engine may not utilize the fuel supply pump. Fuel is supplied by injection pump pressure.

An eccentric lobe on the engine camshaft operates the lever (A) on supply pump to pressurize fuel system.

Fuel flows from the fuel tank at gravity pressure to the inlet side (B) of the diaphragm-type pump. This pump increases the fuel pressure to 25—30 kPa (0.25—0.30 bar) (3.5—4.5 psi) at slow idle speed and forces fuel through the outlet side (C) to the filter and fuel injection pump. Minimum output pressure--15 kPa (0.15 bar) (2 psi).

A hand primer lever (D) is provided for manually forcing fuel through the system to bleed fuel filter, etc.



-UN-14DEC88

RG5167

A—Lever
B—Inlet Side
C—Outlet Side
D—Hand Primer Lever

RG,CTM4,DX404 -19-28SEP95

Refer to illustration on previous page.

Fuel at supply pump pressure (Q) flows past the rotor retainers (E) into an annulus on the rotor. It then flows through a connecting passage (F) in the head to the advance (G) and charging circuit (H). The fuel flows around the annulus (I) through a connecting passage to the metering valve (J). The radial position of the metering valve (controlled by the governor) regulates the flow of fuel into the charging ring (K) which incorporates the charging ports.

As the rotor revolves, the two inlet passages (L) register with the charging ports in the hydraulic head, allowing fuel to flow into the pumping cylinders. With further rotation, the inlet passages move out of registry, and the discharge port of the rotor registers with one of the head outlets. While the discharge port is opened, the rollers (M) contact the camshaft lobes, forcing the plungers together. Fuel trapped between the plungers is then delivered to the injection nozzle.

With the exception of the drive shaft bearing, lubrication of the working parts of the pump is achieved by utilizing by-passed fuel from the supply pump before it is returned to the fuel tank. The drive shaft bearing is lubricated by engine oil from the timing gear housing.

As fuel leaves the supply pump, it is directed through a passageway leading to an annulus in the hydraulic head. Connected to this passage way is a vent passage (N) located behind the metering valve bore. This vent passage contains a vent wire (O) to prevent excessive return fuel flow and high pressure loss. A short passage connects the vent passage with the governor linkage compartment. Should air enter the supply pump, it immediately passes to the vent passage. Air and small quantity of fuel then flow from the housing to the fuel tank by way of the return pipe.

S11,23010,CM -19-10AUG94

FUEL INJECTION NOZZLES—GENERAL INFORMATION AND OPERATION

The injection nozzles are located in the engine cylinder head and are of the spring and valve type, hydraulically operated by the fuel delivered from the injection pump.

A locating clamp (Q) positions the nozzle assembly in the cylinder head. The nozzle is sealed at the top end by a seal washer (E). A carbon stop seal (B), located on the lower end of the nozzle body, prevents carbon from collecting around the nozzle in the cylinder head.

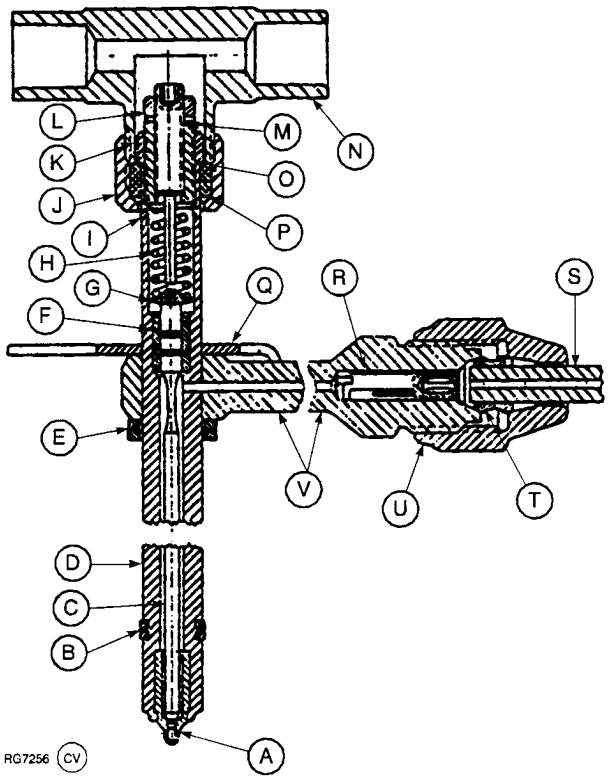
Enclosed in the nozzle body (D) are the valve (C), valve spring (H), and spring seat (G). The nozzle operating pressure is controlled by the pressure adjusting screw (O) in the upper end of the nozzle body. Valve lift is adjusted by the lift adjusting screw (M) located in the pressure adjusting screw. The nozzle tip (A) is pressed into the nozzle body and cannot be separated.

A leak-off line tee (N) is attached to the upper end of the injection nozzle, secured by a grommet (P) and hex nut (J).

Metered fuel, under high pressure, is delivered by the injection pump through the nozzle inlet on the valve body into the area surrounding the valve. When fuel pressure reaches nozzle opening pressure, the valve is forced from its seat against the pressure of the spring, permitting a measured amount of fuel to enter the combustion chamber through four small holes in the nozzle tip.

After fuel has been injected, the spring closes the valve. In actual operation, the valve opens and closes very rapidly, providing a distinct chatter.

A small amount of fuel leaks past the valve into the spring area. This provides lubrication for the nozzle working parts. This excess fuel is then removed from the nozzle at the top by means of a leak-off line routed to the fuel source.



RG7256 -UN-20JUL95

A—Spray Tip
B—Carbon Stop Seal
C—Nozzle Valve
D—Nozzle Body
E—Seal Washer
F—Nozzle Valve Guide
G—Spring Seat
H—Adjustable Pressure Spring
I—Spacer Washer
J—Hex Nut
K—Lock Nut
L—Lock Nut
M—Lift Adjusting Screw
N—Leak-Off Tee
O—Pressure Adjusting Screw
P—Grommet
Q—Locating Clamp
R—Filter Screen
S—Fuel Pressure Line
T—Nipple
U—Line Nut
V—Connection for Injection Line

S11,23010,HP -19-28SEP95