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

COMPONENT TECHNICAL MANUAL



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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.



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DX,REPAIR -19-04JUN90

DISPOSE OF WASTE PROPERLY

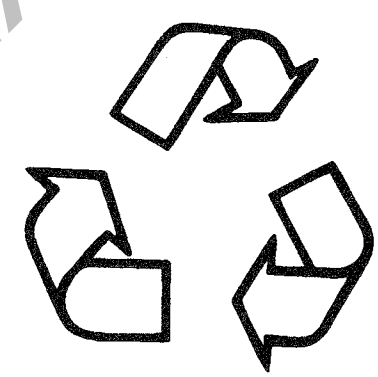
Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

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.



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DX,DRAIN -19-03MAR93

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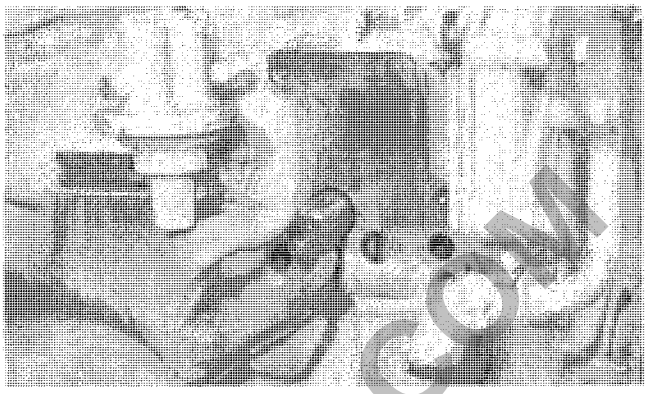
4. Remove pressure regulating valve.

IMPORTANT: The hole in the valve must align with the hole in the block.

5. After repair, install new O-ring on valve and install into block.

6. Install new gaskets. Install the oil cooler and filter assembly. Tighten oil cooler housing cap screws to 47 N·m (35 lb-ft). Tighten oil filter housing cap screws to 37 N·m (27 lb-ft).

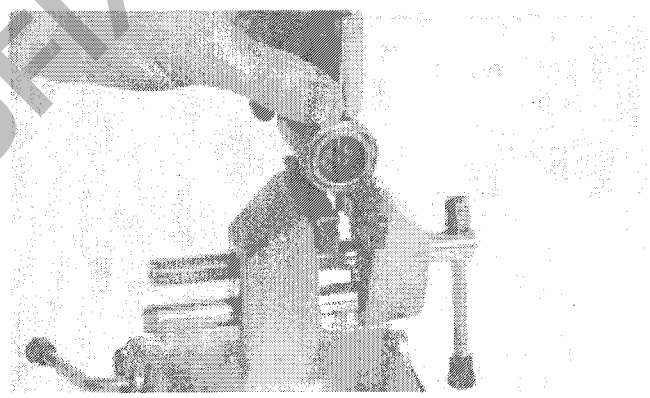
7. Connect lines to oil cooler.



S11,29020,GW -19-12JUN90

REPAIR OIL PRESSURE REGULATING VALVE (4276, 6414 ENGINES)

1. Remove spring pin to remove valve and spring.



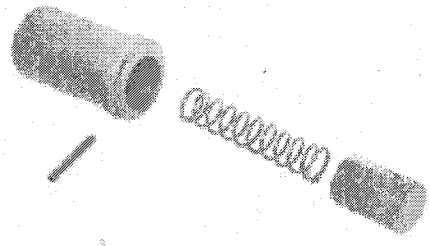
S11,2020,GX -19-14JUL95

2. Check valve spring using spring compression tester.

PRESSURE REGULATING VALVE SPECIFICATIONS

Spring Free Length	59 mm (2.32 in.)
Spring Tension at 34 mm (1.34 in.)	92—112 N (21—25 lb-force)

3. Inspect valve and housing bore for damage. Valve must slide freely in bore.



S11,2020,GY -19-21SEP95

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CYLINDER HEAD AND VALVES SPECIFICATIONS

ITEM	SPECIFICATION	WEAR LIMIT
Thickness of New Cylinder Head	104.87—105.13 mm (4.129—4.139 in.)	——
Minimum Acceptable Thickness of Cylinder Head	104.24 mm (4.104 in.)	——
Maximum Material Removal for Resurfacing Head	0.76 mm (0.03 in.)	——
Maximum Acceptable Head Out-of-Flat (Entire Length/Width)	0.102 mm (0.004 in.)	——
Combustion Face Surface Finish (Surface Grind Only) (AA)	0.0008—0.0032 mm (31—125 micro-in.)	—— ——
Maximum Wave Depth	0.012 mm (0.0005 in.)	——
Valve Stem OD (standard)	9.43—9.46 mm (0.371—0.372 in.)	——
Valve Guide ID	9.51—9.53 mm (0.374—0.375 in.)	0.025 mm (0.001 in.)
Valve Stem-to-Guide Clearance	0.05—0.10 mm (0.002—0.004 in.)	0.15 mm (0.006 in.)
Valve Stem Oversize, Stem Diameter larger than standard by	0.08 mm (0.003 in.) 0.381 mm (0.015 in.) 0.76 mm (0.030 in.)	——

RG,CTM4,DT435 -19-01NOV95

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RECOMMENDED ENGINE COOLANT

Solutions of antifreeze and supplemental coolant additives MUST be used year-round for freeze protection, boil-over protection, and to provide a stable, non-corrosive environment for seals, hoses and metal engine parts.

John Deere Prediluted Antifreeze/Summer Coolant is preferred. John Deere Antifreeze/Summer Coolant Concentrate and John Deere COOL-GARD™, where available, are also recommended.

Refer to your vehicle operator's manual for the service life of these products.

• JOHN DEERE PREDILUTED ANTIFREEZE/SUMMER COOLANT

This product contains all the necessary ingredients that make up the proper coolant solution: chemically pure water, ethylene glycol (low silicate antifreeze), and supplemental coolant additives (SCA's). It is ready to use; no mixing is required.

• JOHN DEERE ANTIFREEZE/SUMMER COOLANT CONCENTRATE

This product contains ethylene glycol (low silicate antifreeze) and supplemental coolant additives (SCA's). It must be mixed with quality water, as described later in this section, before adding to the engine cooling system. The proportion of water to be used depends upon the lowest freeze protection temperature desired according to the following table:

% CONCENTRATE	FREEZE PROTECTION LIMIT
40	-24° C (-12° F)
50	-37° C (-34° F)
60	-52° C (-62° F)

• JOHN DEERE COOL-GARD™

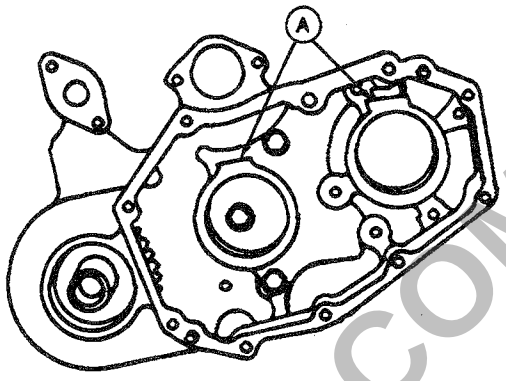
In certain geographical areas, John Deere COOL-GARD is marketed for use in the engine cooling system. This product contains all the necessary ingredients that make up the proper coolant solution: chemically pure water, ethylene glycol (low silicate antifreeze), and supplemental coolant additives (SCA's). It is ready to add to cooling system as is; no mixing or supplemental coolant additives required. Contact your John Deere Parts Network for local availability.

RG,COOL2,CTM -19-06OCT95

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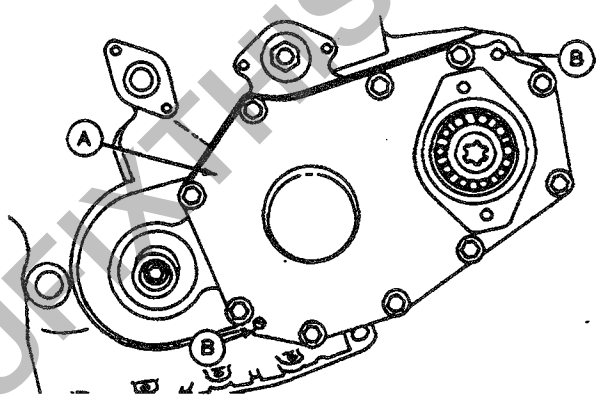
The idler and output gears are supported by ball bearings. Gears and bearings are splash lubricated. Splash oil collecting on top of bearing bosses (A) is directed down through a hole in each boss to lubricate the bearings.



RG5176 -UN-30NOV88

S11,22010,DN -19-21JUL92

The auxiliary gear cover (A) supports the outer bearing race for the idler and output gear assemblies. Two dowel pins (B) are used to properly align auxiliary gear cover to timing gear cover.



RG5177 -UN-30NOV88

S11,22010,DO -19-21JUL92

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SEALANT APPLICATION GUIDELINES

Listed below are sealants which have been tested and are used by the John Deere factory to control leakage and assure hardware retention. ALWAYS use the following recommended sealants when assembling your John Deere Diesel Engine to assure quality performance.

LOCTITE® products are designed to perform to sealing standards with machine oil residue present. If excessive machine oil or poor cleanliness quality exist, clean with solvent.

• LOCTITE 242 Thread Lock & Sealer (Medium Strength) (blue):

TY9370 6 mL tube/T43512 50 mL tube

—Plugs and fittings—fuel filter base, fuel transfer pump, intake manifold, cylinder block (oil galley), 4276 and 6414 oil filter base housing

—Cap Screws—injection pump access cover, electronic tachometer cover, oil filler inlet, flywheel, fuel transfer pump, oil cooler housing-to-cylinder block (open holes only).

—Oil pressure sending unit

• LOCTITE 271 Thread Lock & Sealer (High Strength) (clear):

TY9371 6 mL tube/T43513 50 mL bottle

—Studs—water pump-to-cylinder block, injection pump-to-front plate, exhaust manifold-to-turbocharger.

—Mechanical tachometer drive gear

—Oil filter nipple

• LOCTITE 277 Plastic Gasket (High Strength) (red):

T43514 50 mL bottle

—Steel cap plugs—cylinder block, cylinder head, and water pump

—O-ring adapter for oil pump outlet tube

—Nipples and elbows which are pressed into place, water pump housing, and oil cooler cover.

• LOCTITE 515 Flexible Sealant (General Purpose) (purple):

TY6304 50 mL bottle

—Flywheel housing-to-cylinder block

—Oil pan gasket surfaces and dipstick nipple threads

—Thermostat cover gaskets

• LOCTITE 592 Pipe Sealant with Teflon® (white):

TY9374 6 mL tube/TY9375 50 mL tube

—Pipe plugs—cylinder block (water manifold), thermostat housing, air intake manifold, water pump, flywheel housing (drain).

—Dipstick tube threads

—Injection pump governor cover fitting (fuel return)

—Threaded nipples and elbows in water pump housing

—Temperature sending unit

—Oil pan (drain hose and drain valve)

—Connectors—Turbo line, turbo drain, and water return-to-cylinder block (4276 and 6414 engines).

—Adapter fitting and plug for turbo lube on dual oil filter base

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INSTALL SEALS ON INJECTION NOZZLE

IMPORTANT: Each time an injection nozzle is removed from the cylinder head, replace carbon stop seal (C) with a new one.



1. Position JD258 (ROS16477) Pilot Tool (A) over nozzle tip.

2. Position a new carbon stop seal on pilot tool. Use a new seal washer (B) to help slide the carbon seal into place until it seats in it's groove on nozzle body.

3. Continue to slide upper sealing washer onto nozzle body until it seats against inlet fitting.

NOTE: If nozzle is not going to be installed at this time, install a No. 16189 Nozzle Protector Cap over nozzle tip. Plug all other openings in nozzle to prevent contamination.

S11,3010,OI -19-29JUN95

INSTALL INJECTION NOZZLES

NOTE: If nozzle bore in cylinder head must be cleaned, use JDE39 Nozzle Bore Cleaning Tool. (See CLEAN FUEL INJECTION NOZZLE BORE earlier in this group.)

IMPORTANT: Before installing injection nozzles, make sure nozzles are clean and free from oil or grease.

1. Remove plug (if installed previously) from nozzle bore in cylinder head and blow out bore with compressed air.

NOTE: Make sure that the sealing surface of the cylinder head (on which the seal washer will be resting) is smooth and free of damage or dirt. This could prevent proper sealing. Dirt and roughness could also cause distortion to nozzle when the attaching screw is tightened, making the valve stick.

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S11,3010,OJ -19-21SEP95

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ABOUT THIS MANUAL

This Component Technical Manual (CTM4) covers the recommended repair procedures for the following engines:

- All 179 cu. in. (2.9 L), 239 cu. in. (3.9 L), and 359 cu. in. (5.9 L) produced in Saran, France having Engine Serial No. (CD394145—).

- All 239 cu. in. (3.9 L) and 359 cu. in. (5.9 L) produced in Dubuque, Iowa having Engine Serial No. (T0100001—300000).

- All 276 cu. in. (4.5 L) and 414 cu. in. (6.8 L) produced in Dubuque, Iowa having Engine Serial No. (T0100001—300000). These engines have serial number plates with raised letters and numbers, and were manufactured November 1983 or later.

Before beginning repair of an engine, clean the engine and mount on a repair stand. (See Group 03 - Engine Mounting.)

This manual contains SI Metric units of measure, followed immediately by the U.S. customary units of measure.

Direction of engine crankshaft rotation in this manual is referenced from facing the flywheel looking toward water pump. Front of engine is water pump end. NORMAL CRANKSHAFT ROTATION IS COUNTERCLOCKWISE.

Some components of this engine may be serviced without removing the engine from the machine. Refer to the specific machine technical manuals for information on components that can be serviced without removing the engine from the machine and for engine removal and installation procedures.

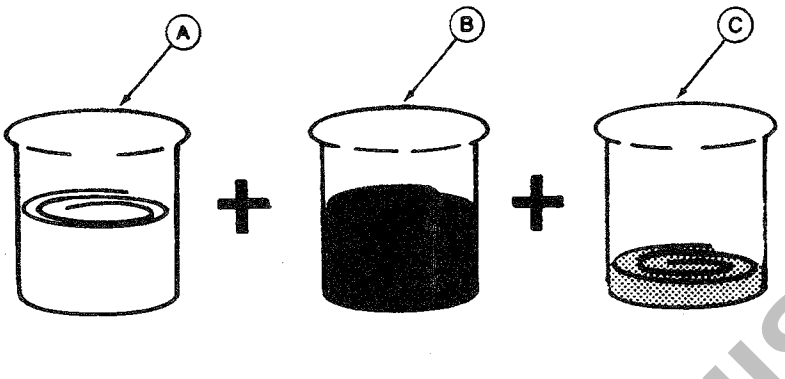
Read each module completely before performing service to check for differences in procedure or specifications. Follow only the procedures that apply to the engine model number you are working on. If only one procedure is given, that procedure applies to all 300 Series Diesel Engines in this manual.

S11,2000,DF -19-28SEP95

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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 group, 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 -19-01NOV95

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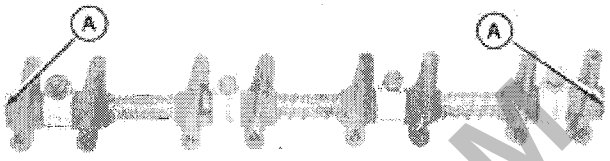
ASSEMBLE ROCKER ARMS ON SHAFT

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.



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S11,2005,KJ -19-22JUN95

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CLEAN AND INSPECT PUSH RODS

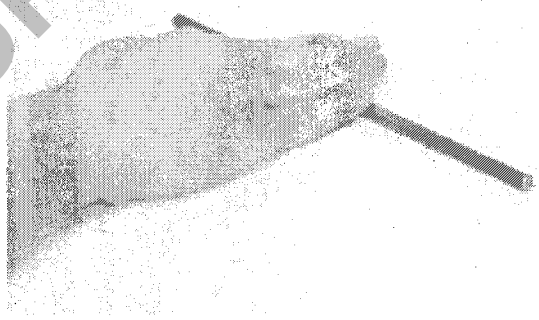
1. Clean push rods with solvent and compressed air.

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.



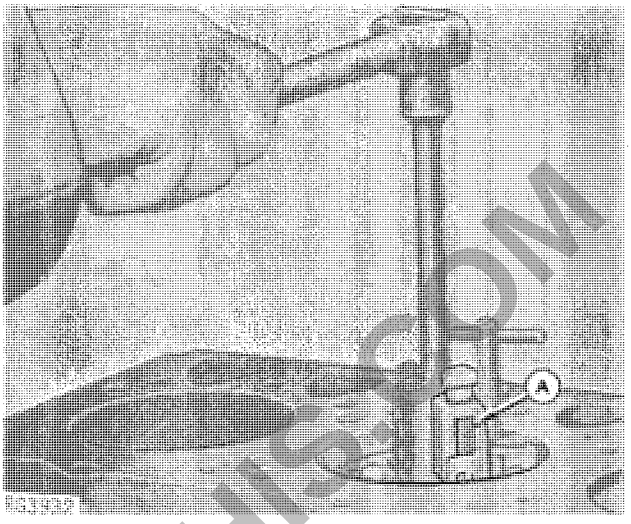
T81233 -UN-01NOV88

S11,2005,JN -19-01NOV95

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6. Remove carbon from liner bore with a scraper or reamer (A). Use compressed air to remove loose material from cylinders.

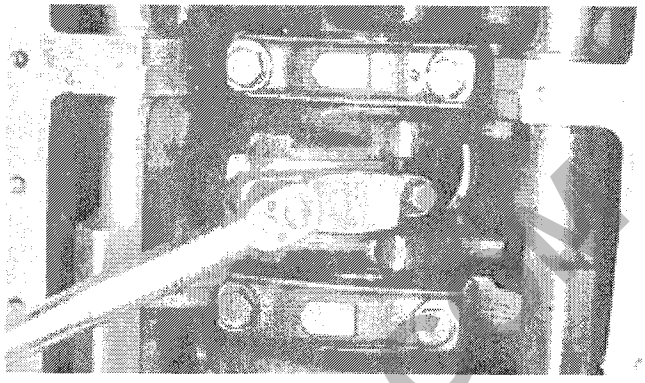


S11,2010,FV -19-07JUL92

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IMPORTANT: NEVER use connecting rod cap screws more than once for final engine assembly. Once rod cap screws have been tightened, they cannot be reused for final assembly.


T81615 -UN-07NOV88

On 3179, 4239, and 6359 Engines, two rod cap screws are available for service. They are not interchangeable:

—Connecting rod cap equipped with two protruding spot facings, use R80033 cap screws.

—Connecting rod cap equipped with two embedded spot facings, use R74194 (phosphate coated) cap screws.

7. Dip NEW connecting rod cap screws in clean oil and install. Tighten cap screws alternately to following torques:

- 3179, 4239, and 6359 Engines:
  —R74194, length- 54 mm (2.13 in.)—
  75 N·m (55 lb-ft)

  —R80033, length- 59 mm (2.32 in.)—
  75 N·m (55 lb-ft)

- 4276, 6414 Engines:
  —R74195, length- 63.5 mm (2.5 in.)—
  130 N·m (95 lb-ft)

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S11,2010,HU -19-29JUN95

CHECK ENGINE ROTATION FOR EXCESSIVE TIGHTNESS

1. Rotate crankshaft several revolutions to be sure engine rotates without excessive tightness.

2. Check liners for deep scratches caused by an improperly installed or broken piston ring.

3. Check side clearance of rods. Must have slight side-to-side movement.

S11,0402,BK -19-16JUN95

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MEASURE ASSEMBLED ID OF BEARINGS AND OD OF CRANKSHAFT JOURNAL

1. With crankshaft removed from engine, assemble main bearing caps with bearing inserts.

2. Tighten main bearing cap screws to specified torque.

MAIN BEARING CAP SCREW TORQUE SPECIFICATIONS

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)

3. Measure and record main bearing assembled ID at several points.

4. Measure and record crankshaft main journal OD at several points around each journal.

5. Compare measurements with specifications given below.

MAIN BEARING AND CRANKSHAFT JOURNAL SPECIFICATIONS

Main Bearing ID (standard) . . . . . 79.375—79.426 mm (3.1249—3.1270 in.)

Crankshaft Journal OD (standard) . . . . . 79.324—79.350 mm (3.1229—3.1240 in.)

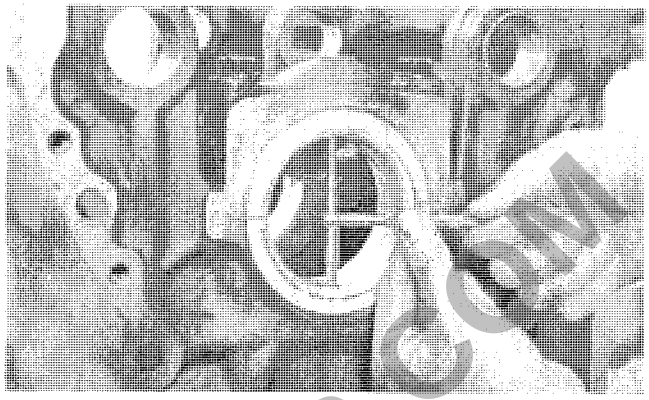
Main Bearing-to-Journal Oil Clearance . . . . . 0.025—0.102 mm (0.0009—0.0040 in.)

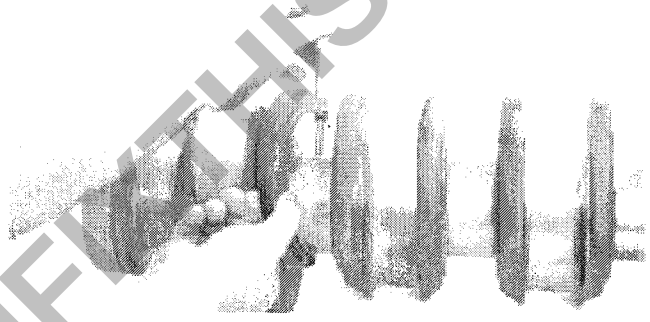
Maximum Main or Rod Journal Taper . . . . . 0.010 mm (0.0004 in.)

Maximum Main or Rod Journal Out-of-Roundness . . . . . 0.005 mm (0.0002 in.)

Replace or recondition crankshaft if it does not fall within above specifications.

NOTE: If an undersized crankshaft has been installed, measured dimensions will not meet above specifications. However, bearing-to-journal oil clearance must be within specification. See CRANKSHAFT GRINDING GUIDELINES later in this group.


T81186 -UN-09NOV88


T86550 -UN-14OCT88

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RG,CTM4,DW649 -19-22SEP95

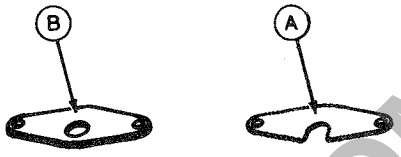
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INSPECT BALANCER SHAFT GEARS AND THRUST PLATES

1. Inspect for broken, cracked or excessively worn gears. Check thrust plate for scoring or other excessive wear.

—Thrust plates on Option Code 4501 (60 percent balance-4239T) and Code 4502 (full balance-4239D) have a slotted hole (A) to permit removal and installation without removing the gear. For Code 4502 (on full balance-4239T and 4276 Engines), the gear must first be removed since the thrust plate hole (B) is not slotted.

—Saran built 4239 production engines beginning with Engine Serial No. (CD716485—) no longer use the slotted thrust plate for both naturally aspirated and turbocharged engines. A new plate without the slotted hole replaces both the slotted and non-slotted types previously used. Gear removal is required.



RG4742 -UN-20FEB95

BALANCER SHAFT THRUST PLATE SPECIFICATIONS

Thrust Plate Thickness (new)	2.97—3.02 mm (0.117—0.119 in.)

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IDENTIFY OIL COOLER TYPE—3179, 4239, 6359 ENGINES

Two types of oil coolers are used:

- **Standard-Flow Oil Cooler (A, B, C)**

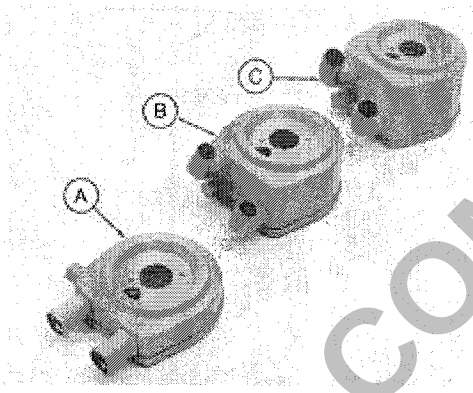
Standard-flow coolers are positioned between the oil filter and cylinder block. The standard-flow oil cooler may be of the 4-plate (A), 8-plate (B), or 10-plate (C) type.

NOTE: On Saran Engines (794194CD—) the 4 and 8 plate oil coolers have been replaced by a 6 plate cooler. On Saran Engines (795107CD—) the 10 plate oil cooler has been replaced by an 8 plate cooler.

- **High-Flow Oil Cooler (D)**

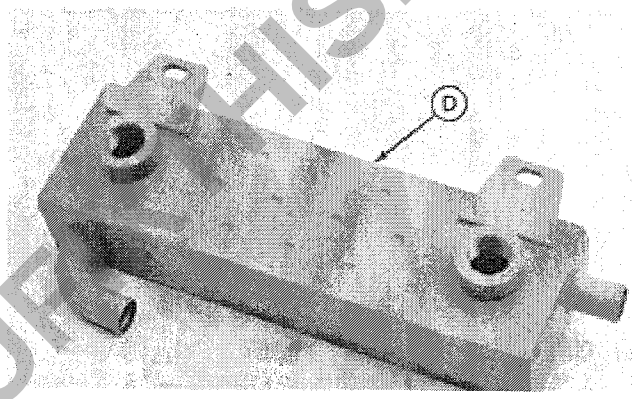
High-flow coolers are attached to the cylinder head or block. High-flow oil coolers have 7 plates.

NOTE: High-flow oil coolers are used on some 6359T and all 6359A Engines.



RG4798 -UN-29NOV88

Standard-Flow Oil Cooler



RG4927 -UN-29NOV88

High-Flow Oil Cooler

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REMOVE, INSPECT, AND INSTALL STANDARD-FLOW OIL COOLER (3179, 4239, 6359 ENGINES)

Inspect coolant hoses. Replace if cracked or damaged.

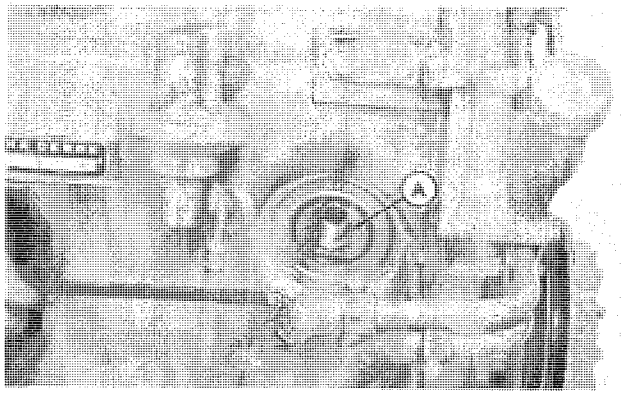
1. Drain coolant. A drain plug is located on side of oil cooler base.

2. Remove oil filter.

3. Disconnect coolant hoses.

4. Remove adapter (A) to remove oil cooler.

5. Inspect coolant passage through cooler for a restriction caused by scale or sludge. Use compressed air and blow through passage to make sure it is open. If engine lubricating oil was contaminated with metallic particles, discard oil cooler (puncture to prevent accidental reuse) and install a new one.



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7. Clean gasket surfaces.

8. Apply a light coating of multi-purpose grease to new O-rings, Option Code 2102, and install a thermostat housing and water pump. Insert tube in housing.

9. Install housing with new gasket onto cylinder head. (Make sure tube correctly enters water pump.)

THERMOSTAT HOUSING-TO-CYLINDER HEAD TORQUE SPECIFICATIONS

All engines except 6359DH-01	47 N·m (35 lb-ft)
6359DH-01 only	130 N·m (90 lb-ft)

10. Install thermostat(s) and thermostat cover using a new gasket. Tighten cover cap screws to 30 N·m (22 lb-ft).

11. Connect hoses.

12. Fill cooling system and check for leaks.

IMPORTANT: Air must be expelled from cooling system when 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.

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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.

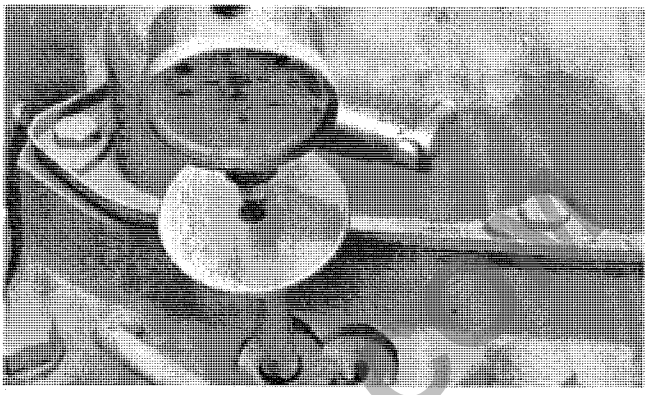
If bearing end play is not within specification, replace center housing and rotating assembly. (See REPLACE CENTER HOUSING AND ROTATING ASSEMBLY for your model of turbocharger, later in this group.)

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2. Time Engine For Beginning Of Injection:


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• Rotate engine until No. 1 piston is at TDC of compression stroke.

• Remove No. 1 injection nozzle.

• Insert a 6466 engine valve into injection nozzle bore of cylinder head until valve contacts top of piston.

• Attach a dial indicator so that the indicator tip rests on valve head. Set dial indicator at 0.00 mm (in.).

• Rotate crankshaft opposite of running direction (clockwise, viewed from flywheel end) to bring valve 6.0 mm (0.20 in.) BTDC. This is necessary to eliminate timing gear backlash as crankshaft is rotated in running direction (next step).

• Slowly rotate crankshaft in normal running direction (counterclockwise, viewed from flywheel end) until dial indicator needle registers the specified piston stroke dimension——No. 1 piston at beginning of injection. Beginning of injection in degrees BTDC is equal to the following piston stroke movement:

13°—1.83 mm (0.072 in.) piston stroke
15°—2.43 mm (0.095 in.) piston stroke
17°—3.12 mm (0.123 in.) piston stroke
19°—3.88 mm (0.153 in.) piston stroke

NOTE: Engine timing (beginning of injection) varies with model and application. (See FUEL INJECTION PUMP SPECIFICATIONS at the beginning of this group.)

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• Adjust Nozzle Opening Pressure

Close pressure gauge valve and flush nozzle by operating pump rapidly.

Raise pressure on pump until nozzle opens (gauge drops sharply).

Refer to nozzle opening pressure specification, given in Fuel System Specifications at beginning of this group.

If opening pressure is incorrect:

1. Remove nozzle from tester and install in ROS17787 Holding Fixture (A).

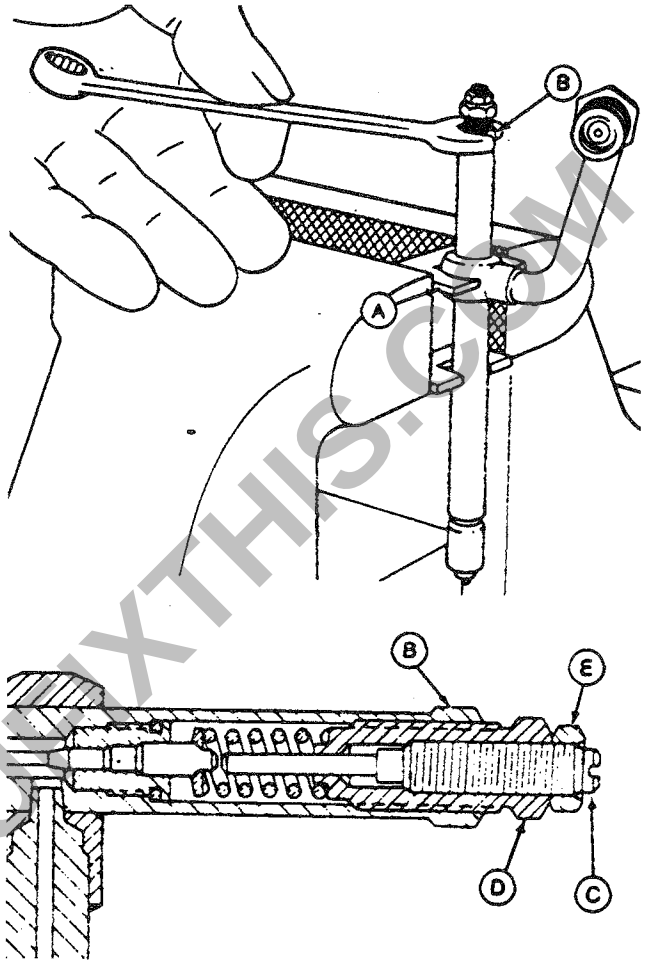
2. Loosen pressure adjusting screw lock nut (B).

3. Reconnect nozzle to tester with tip pointing downward.

4. Back out lift adjusting screw (C) far enough (two or three turns) to prevent bottoming when pressure adjusting screw (D) is turned.

5. Turn pressure adjusting screw in (clockwise) to increase opening pressure, or out (counterclockwise) to decrease opening pressure.

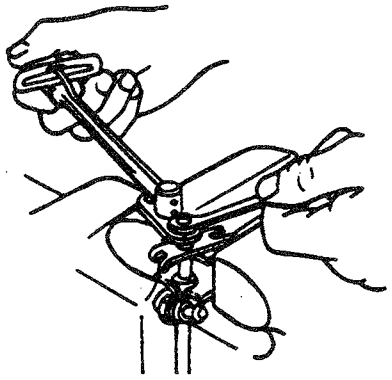
NOTE: It is desirable to set opening pressure to the high limit of specification. If required, repeat procedure to obtain proper result.



A—ROS17787 Holding Fixture
B—Pressure Adjusting Screw Locknut
C—Lift Adjusting Screw
D—Pressure Adjusting Screw
E—Lift Adjusting Screw Locknut

S11,3010,OF -19-19JUN90

6. Remove nozzle from tester and secure in holding fixture. While holding pressure adjusting screw, tighten pressure adjusting screw lock nut to 10 N·m (7 lb-ft) using the ROS18958 (English size) or No. 24374 (metric size) Torque Wrench Adapter.



S11,3010,OG -19-12MAY86

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DIAGNOSING ENGINE MALFUNCTIONS—CONTINUED

• Engine Overheats

Service Problem
- Lack of coolant in cooling system
- Radiator core and/or side screens dirty
- Cooling system limed up
- Engine overloaded
- Too low crankcase oil level

Basic Engine Problem
- Loose or defective fan belt
- Defective thermostat(s)
- Damaged cylinder head gasket
- Defective water pump
- Defective radiator cap

Fuel System Malfunction - See Group 115
- Fuel injection pump delivers too much fuel
- Fuel injection pump incorrectly timed

• Excessive Oil Consumption

Basic Engine Problem
- Oil control rings worn or broken
- Scored cylinder liners or pistons
- Excessive resistance in air intake system
- Oil flow through oil passages restricted
- Worn valve guides or stems
- Excessive oil pressure
- Piston ring grooves excessively worn
- Piston rings sticking in ring grooves
- Insufficient piston ring tension
- Piston ring gaps not staggered
- Excessive main or connecting rod bearing clearance
- Front and/or rear crankshaft oil seal faulty
- Glazed cylinder liners (insufficient load during engine break-in)

Service Problem
- Too low viscosity crankcase oil
- Crankcase oil level too high
- External oil leaks

• Low Oil Pressure

Service Problem
- Low crankcase oil level
- Improper crankcase oil
- Defective oil pressure warning switch or engine oil pressure indicator light

Basic Engine Problem
- Leakage at internal oil passages
- Defective oil pump
- Excessive main and connecting rod bearing clearance
- Improper regulating valve adjustment
- Piston cooling orifice missing

• High Oil Pressure

Basic Engine Problem
- Oil pressure regulating valve bushing loose (wanders)
- Improperly operating regulating valve
- Stuck or damaged filter bypass valve

• Excessive Fuel Consumption

Service Problem
- Engine overloaded
- Air cleaner restricted or dirty

Basic Engine Problem
- Compression too low

Fuel System Malfunction - See Group 115
- Leaks in fuel system
- Fuel injection nozzles dirty or faulty
- Fuel injection pump defective (delivers too much fuel)
- Fuel injection pump incorrectly timed

• Black or Grey Exhaust Smoke

Service Problem
- Excess fuel
- Engine overloaded
- Air cleaner restricted or dirty
- Defective muffler (causing back-pressure)

Fuel System Malfunction - See Group 115
- Fuel injection nozzles dirty or faulty
- Incorrect engine timing

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5. If marks are not aligned, disconnect fuel lines (B, C, and D) and loosen the pump-to-front plate mounting nuts (A).

6. Rotate pump counterclockwise (viewed from flywheel end) and then in opposite direction until timing marks on cam ring and governor weight retainer are aligned.

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

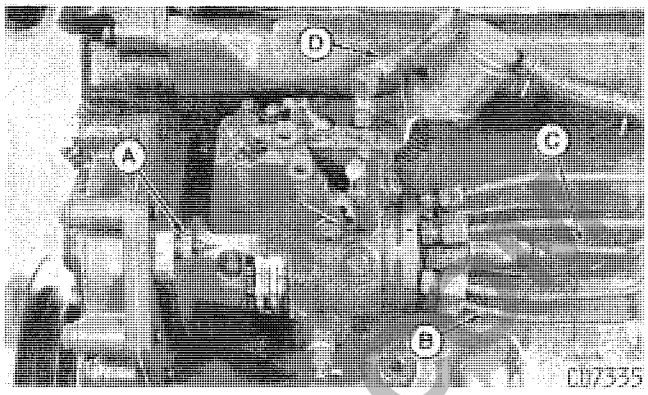
8. Connect injection pump pressure lines. Start with No. 1 outlet line and continue around pump head in counterclockwise direction, attaching lines in same order as engine firing (1-5-3-6-2-4 on 6-cylinder engines and 1-3-4-2 on 4-cylinder engines).

IMPORTANT: Always use a backup wrench when loosening or tightening fuel delivery lines at fuel injection pump, so that pump discharge fittings are not altered. This prevents possible internal pump damage.

9. Tighten fuel pressure lines at pump to 30 N·m (22 lb-ft) using a suitable 17 mm deep-well socket.

10. Connect fuel supply line (C), return line (D), and speed control rod.

11. Proceed to CHECK AND ADJUST ENGINE SPEEDS ON STANADYNE PUMP later in this group.



A—Pump Mounting Nuts
B—Fuel Pressure Lines
C—Fuel Supply Line
D—Fuel Return Line

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