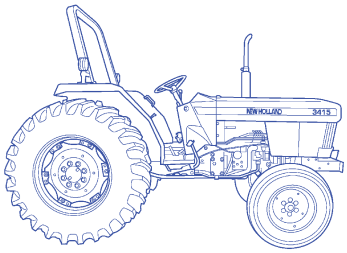


NEW HOLLAND 3415 REPAIR MANUAL

NEW HOLLAND

SERVICE

3415 REPAIR MANUAL CONTENTS

SECTION 1 - ENGINE SYSTEMS

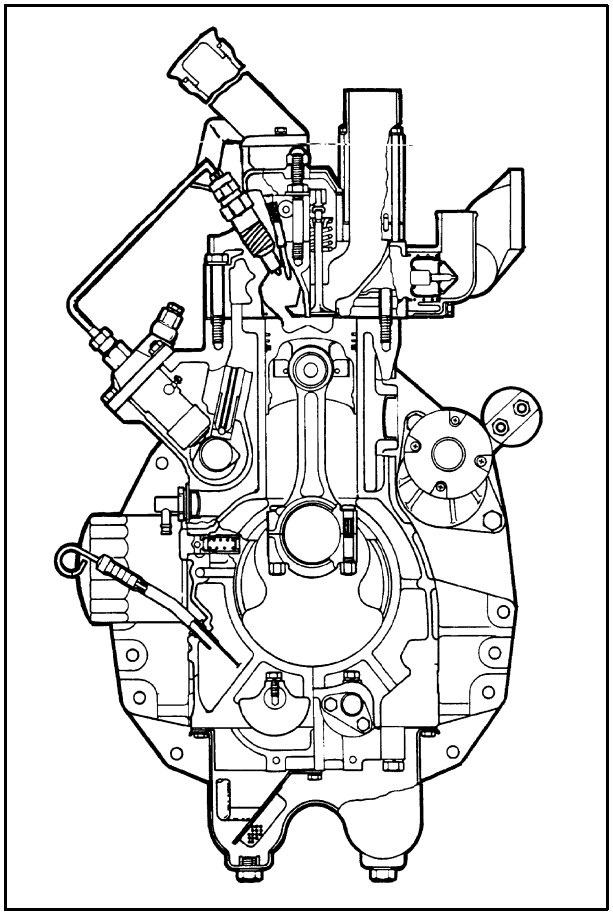
Chapter 1 - Engine and Lubrication System

CONTENTS

ENGINE SYSTEM DESCRIPTION AND OPERATION

This chapter describes engine overhaul and repairs procedures for the Model 3415 tractor engine.

The engine is a four cylinder, four cycle, overhead valve, liquid cooled engine, Figures 1 and 2.



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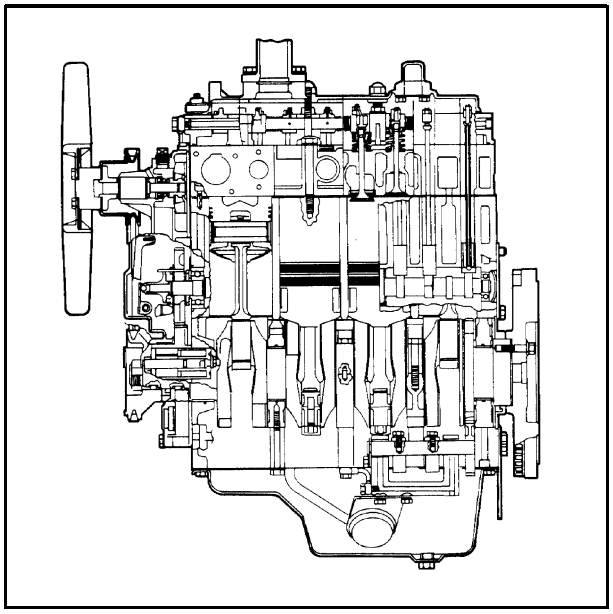

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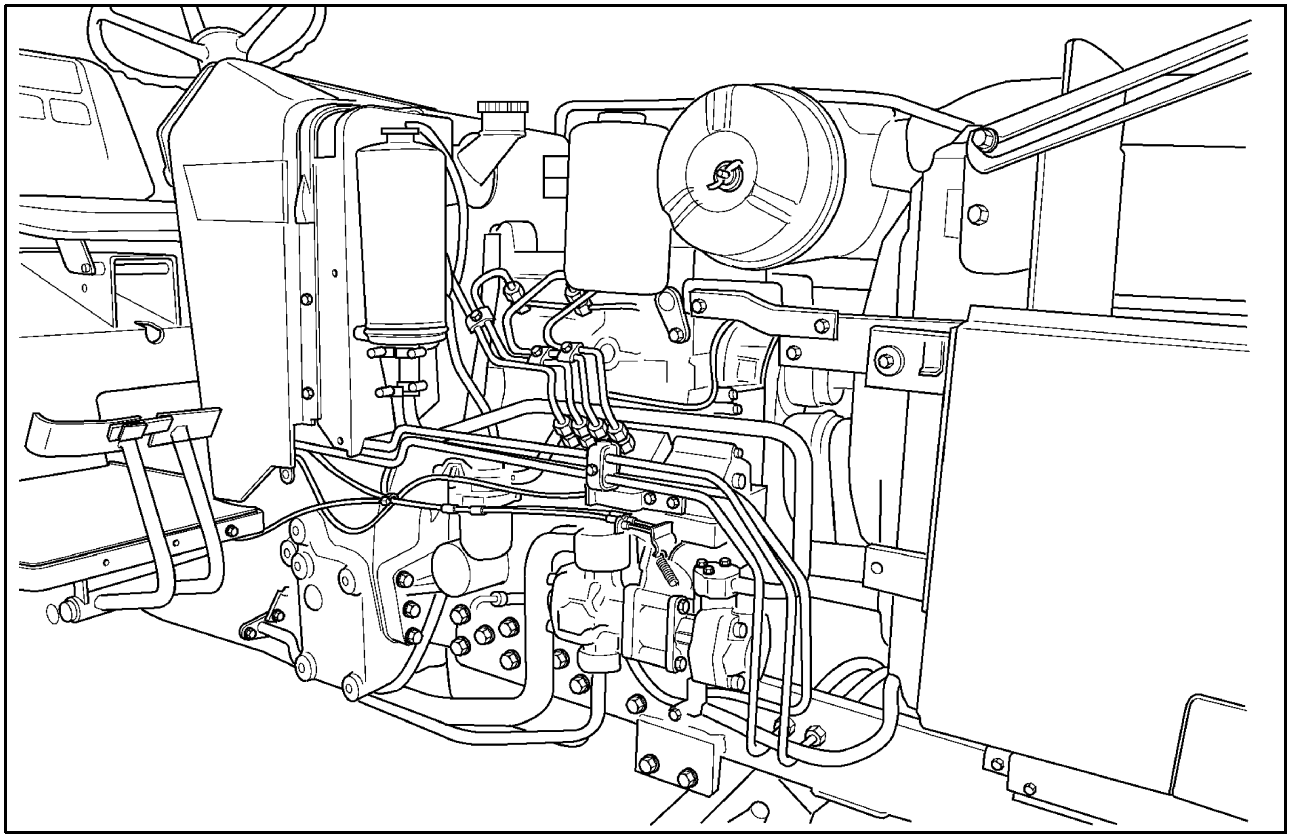

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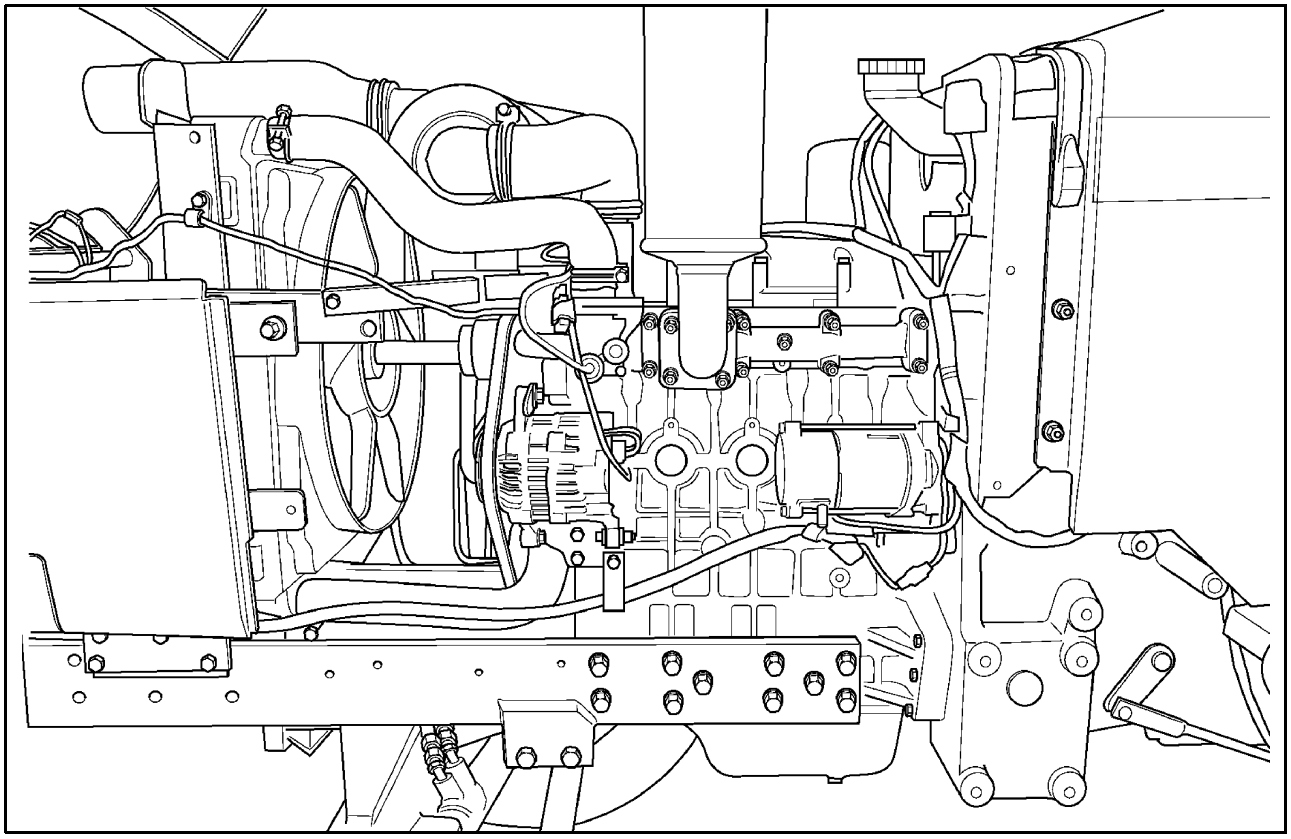
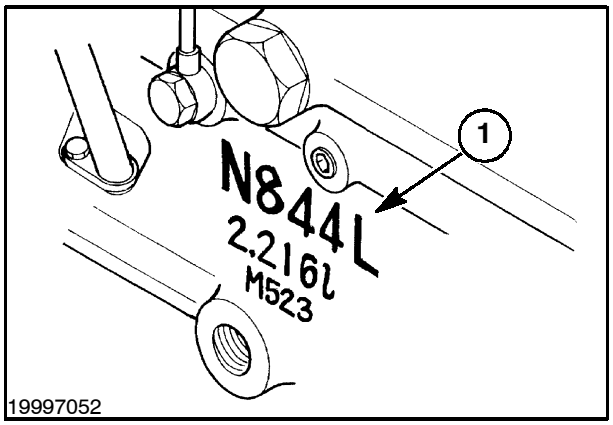


4

The engines is identified by a code number, 1, cast into the side of the cylinder block.

Engine Identification	Tractor Model	Horsepower
N844L	3415	47.0



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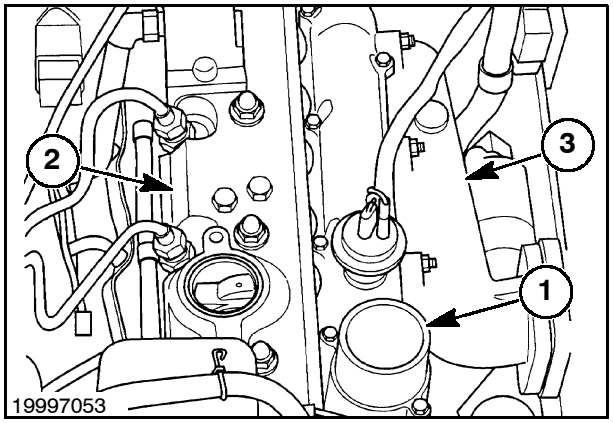
Cylinder Head and Valve Train Components
The cylinder head incorporates the valve assemblies, rocker arms, rocker shaft, push rods, and lifters.

The intake manifold, 1, is located on the top of the cylinder head and is separate from the valve cover, 2.

The exhaust manifold, 3, is bolted to the left side of the cylinder head.



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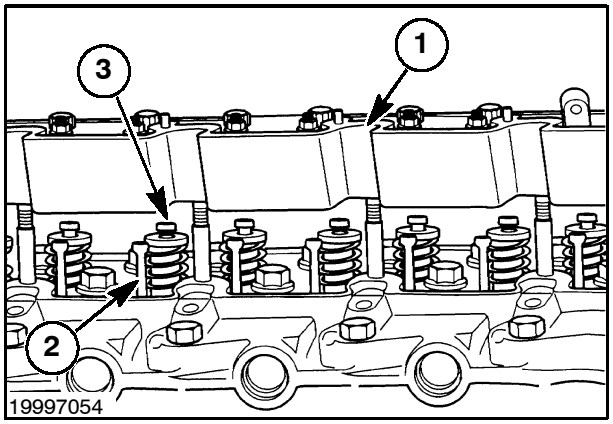
The valve rocker arms and support shaft, 1, are mounted in a separate support casting bolted to the top of the cylinder head.



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Cylinder Block Assembly

NOTE: *This engine is certified to 1999 EPA emission legislation. No one is permitted to repair the engine unless the fuel delivery is unchanged, therefore preserving the emissions performance, eg. replacement of block, short block assembly, smoke set, etc. is not permitted. In that case please use a long block assembly for repairing.*

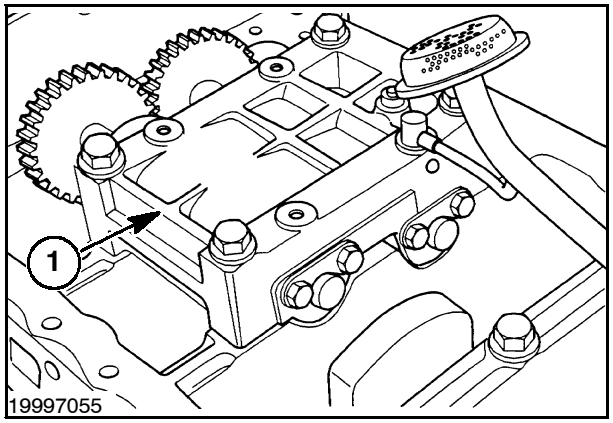
The cylinder block assembly contains the pistons, connecting rods, crankshaft, camshaft, timing gears, engine oil pump and dynamic balancer assembly.

The engine is equipped with straight connecting rods.

The crankshaft is supported on five main bearings. The front bearing is supported in a bore in the front casting of the cylinder block.

All remaining bearings are split liners retained in cast iron holders.

The engine incorporates a dynamic balancer assembly, 1, that is bolted to the under side of the block and driven by the crankshaft.



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Lubrication System

The oil pump assembly is located within the idle gear at the front of the block and below and to the left of the crankshaft as viewed from the front. The oil pump is driven by the crankshaft gear.

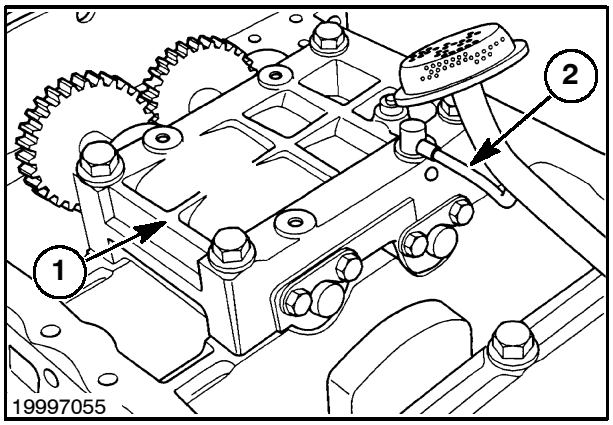
Oil is picked up from the sump by the intake tube and drawn into the lower side drilling in the block to the oil pump. Oil from the pump flows through passages in the block, past the relief valve, through the oil filter and returns to the main oil gallery in the area of the drilled bolt located on the side of the block. Oil flow in the main oil gallery extends to the main bearings. Oil flow to the main bearings passes through drilled passages in the crankshaft to the connecting rod bearings.

Oil from the main oil gallery supplies pressure oil to the dynamic balancer, 1, through a tube, 2, connected to the under side of the block.

Pressure oil from the main oil gallery flows through a tube, 3, to the front of the valve rocker shaft to lubricate the rocker arms, valve stems, push rods and tappets.

The relief valve, 4, is mounted in the side of the block and intersects the main oil passage. When the oil pressure exceeds the rated pressure, oil is bypassed through the relief valve directly to sump.

The cylinder walls, pistons and piston pins are splash lubricated by the crankshaft.



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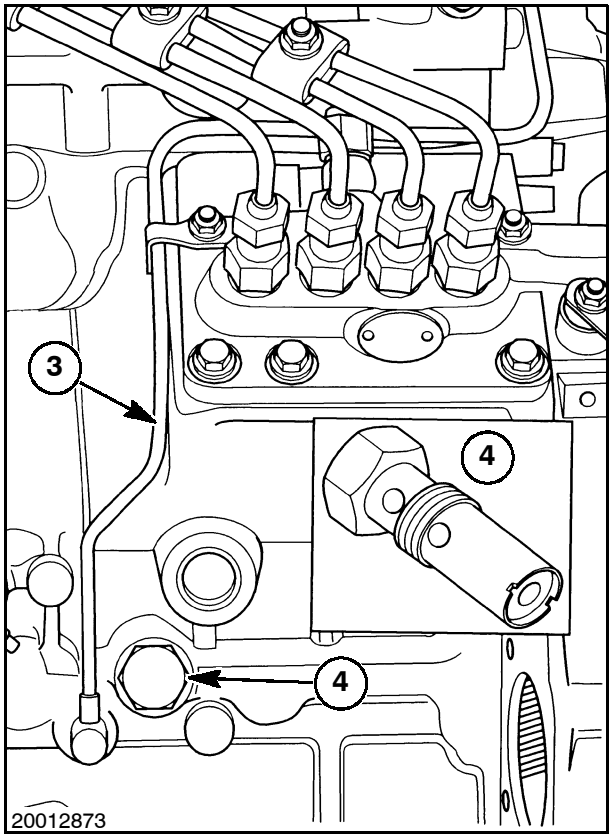

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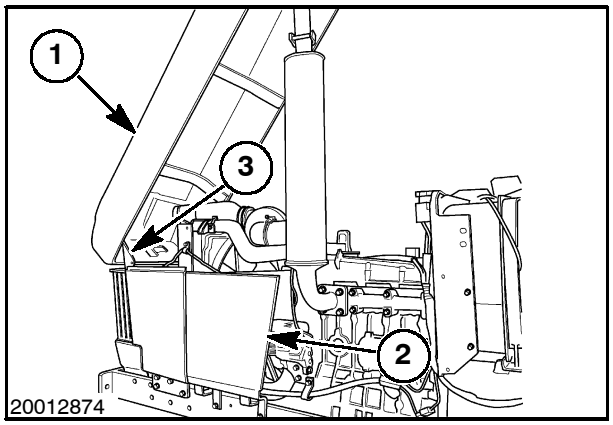
ENGINE OVERHAUL

Cylinder Head Removal

1. Open the hood, 1, and remove the side covers, 2. Disconnect the headlight wiring, 3. Remove the hood assembly.



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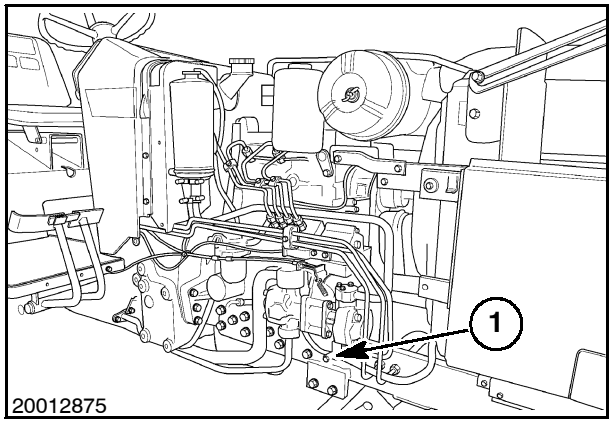
2. Drain the coolant from the radiator and engine block through the radiator drain cock, 1.



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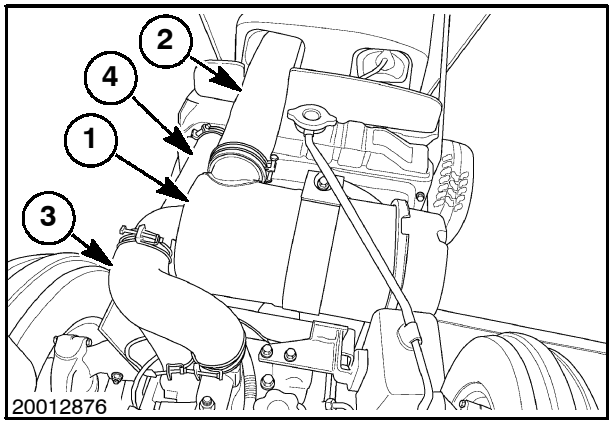
3. Remove the air cleaner assembly, 1, along with the air inlet tube, 2, and air outlet tube, 3.
4. Remove the upper radiator hose, 4, from the cylinder head.



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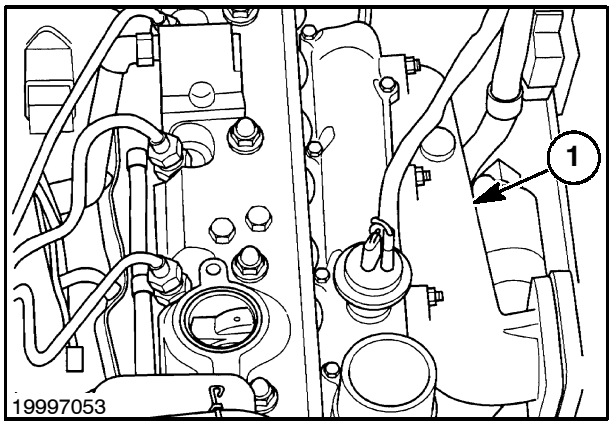
5. Remove the exhaust muffler and manifold assembly, 1.



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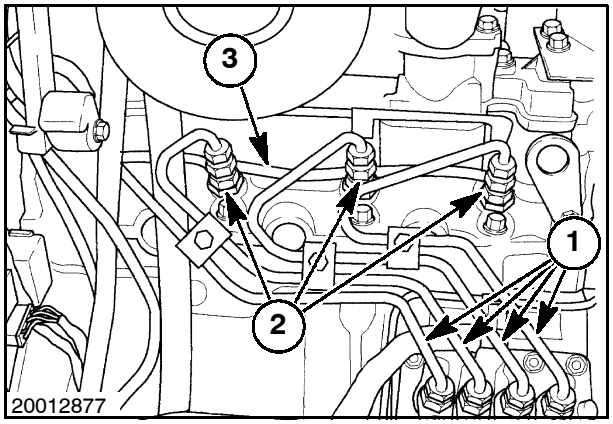
6. Remove the fuel injection lines, 1, and fuel leakoff line, 3, and cap all openings.
7. Remove the injector assemblies, 2.



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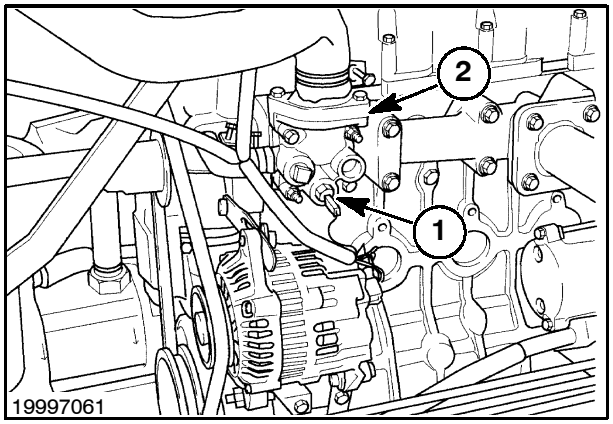
8. Remove the thermostat housing, 2, and thermostat.
9. Remove the fuel tank and baffle.



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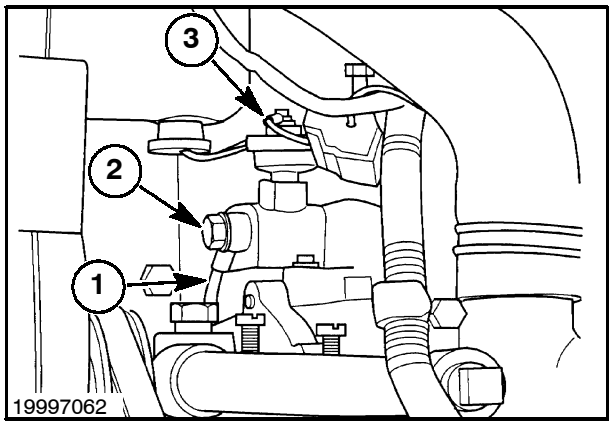
10. Remove the oil pressure sensor switch, 3.

11. Remove the external oil tube banjo bolt, 2, from the front end of the valve rocker shaft.



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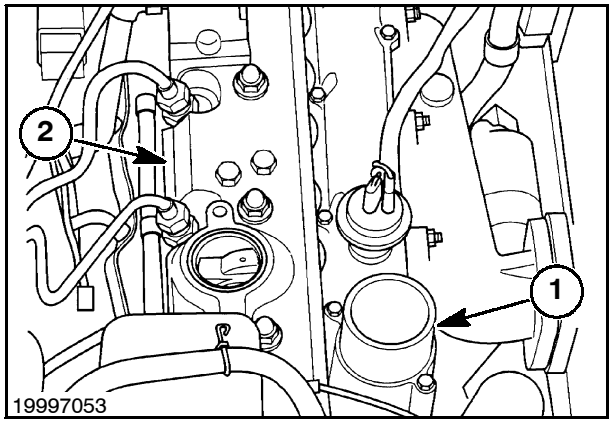
12. Remove the air intake manifold, 1.

13. Remove the valve cover assembly, 2.



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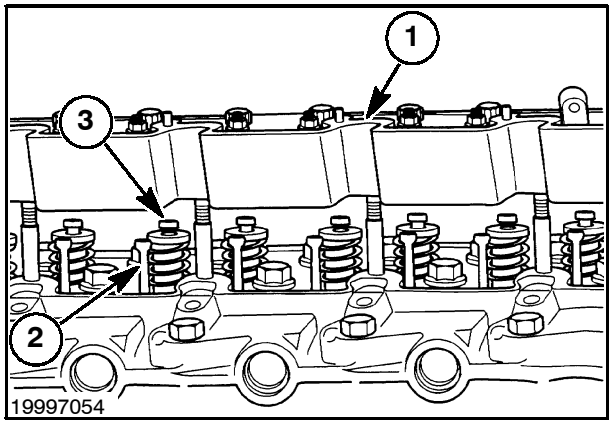
14. Remove the valve rocker support, 1, as an assembly.

NOTE: *Alternately loosen the rocker support bolts a turn at a time to prevent distorting the rocker shaft.*

15. Remove the valve stem caps, 3, and push rods, 2.

NOTE: *Keep all valve components in separately marked containers for reassembly in their original position.*

16. Loosen the cylinder head bolts gradually a half turn at a time to prevent warping of the cylinder head and remove the cylinder head.



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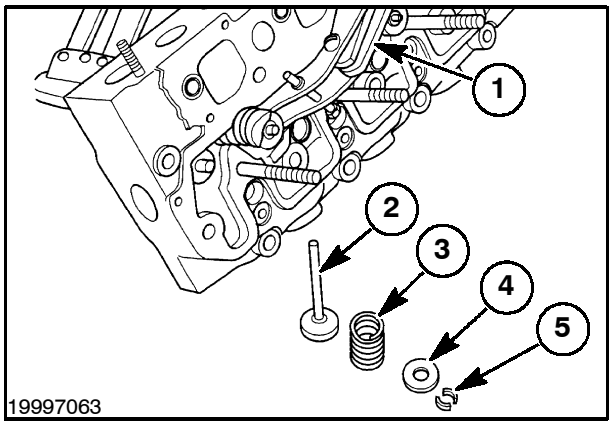
Cylinder Head Disassembly

1. Clean the cylinder head and remove any carbon deposits from around the valve heads.
2. Using a valve spring compressor, 1, compress the valve spring, 3, and remove the retainer locks, 5.
3. Release the valve spring compressor and remove the valve spring and retainer, 4.
4. Remove the valves, 2, from the head and place in a numbered container to facilitate identification for installing the components in their original location on assembly.



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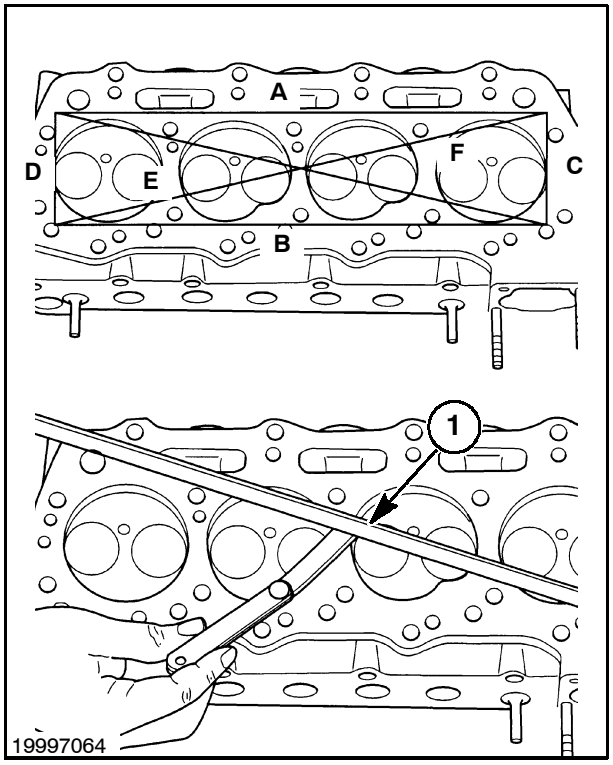
Cylinder Head Inspection and Repair

1. Clean the valve ports using a wire brush and scraper.
2. Clean all dirt and residue from the gasket surface using care not to scratch or nick the machined surface.
3. Clean the cylinder head in solvent and air dry.
4. Check the head for cracks or damage in the following areas:

- Valve ports.
- Valve seats.
- External cracks in the water jackets.

5. Inspect the gasket surfaces for scratches or nicks which would cause leakage.
6. Examine the core hole plugs for rust or signs of leakage. If a plug shows signs of damaging rust or leakage, replace all the plugs in the head.
7. Use a straight edge, 1, and feeler gauge and check the cylinder head for warp in the areas shown, (A – F).

   Resurface or replace the head if warpage is greater than 0.12 mm (0.005″).
8. Check the push rods for straightness. Replace bent push rods. Do not attempt to straighten.



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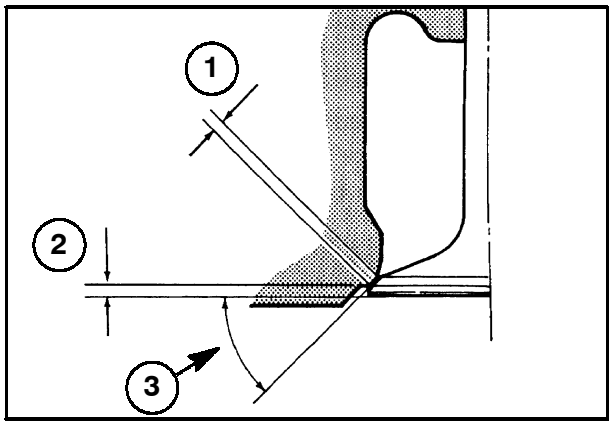
Valve Seats
Examine the valve seats and reface the seat if damaged.

Valve seat grinding requires that the seat be ground to the correct width and properly positioned.

A valve that extends too deep into the combustion area will result in valve burning and if the valve is recessed too deep into the head it will cause a rapid build-up of carbon deposits.



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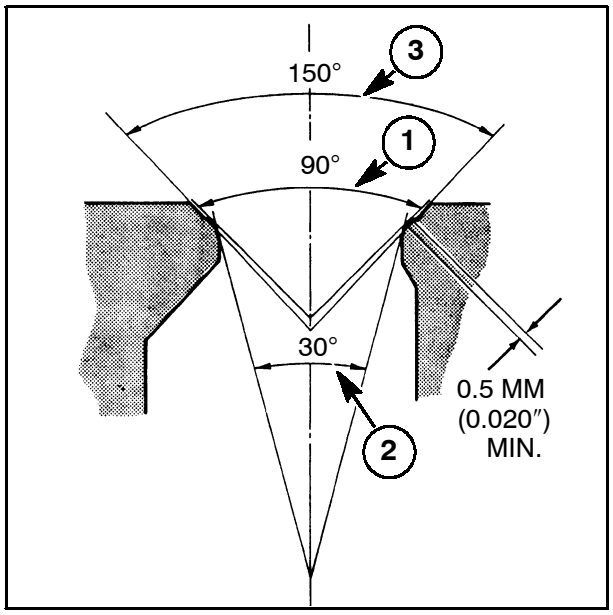
1. Correct Valve Seat Width: 1.7 - 2.1 mm (0.067″ - 0.0826″) - Seat must strike center of valve face
2. Correct Valve Head Margin: 0.775 - 1.075 mm (0.0305″ - 0.0420″)
3. Angle of Valve Seat: 45°

1. Check the seat for surface defects. Use a 45° stone if necessary to reface. Grind away only enough material to provide a smooth even seat.
2. Check the seat width. If necessary, use a 15° stone to lower the seat contact point and use a 75° stone to raise the seat contact point.

NOTE: *Refacing the seat should always be coordinated with refacing of the valve to assure a compression tight fit.*



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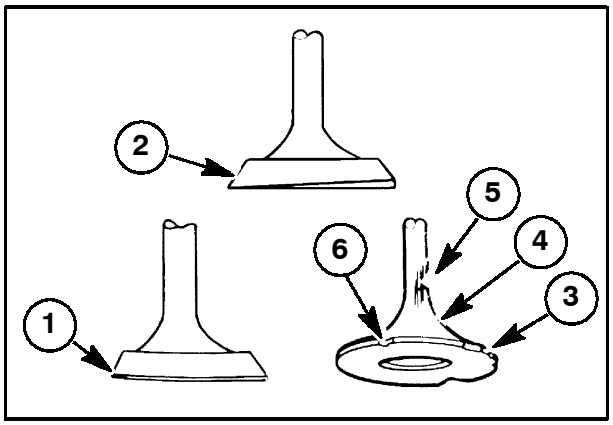
1. Seat angle - 45° Stone
2. Lower Seat Location - 15° Stone
3. Raise Seat Location - 75° Stone

Valves

1. Clean all deposits from the valves using a soft wire brush. Inspect the condition of the valve and discard any that are badly burned, cracked or bent.



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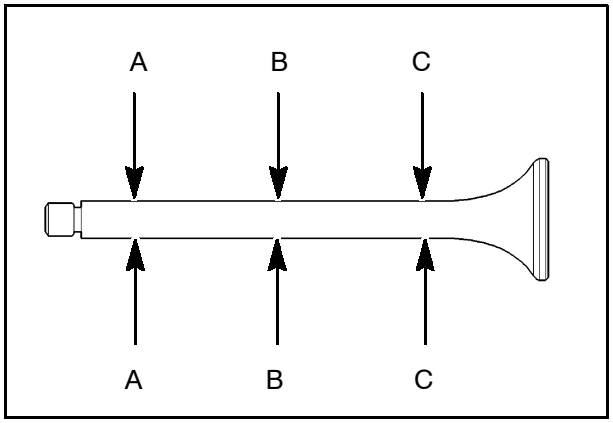
1. Margin Too Thin
   1920 - 0.5 mm (0.002″) Min.
   2120 - 1.0 mm (0.039″) Min.
2. Bent Valve
3. Pitting
4. Indented
5. Wear or Nicking
6. Burned

2. Using a micrometer, measure the stem diameter at three points “A,” “B,” and “C.”

   Replace valves if the stem wear diameter is less than the following dimensions:

Intake	Exhaust
6.89 mm (0.271″)	6.84 mm (0.269″)



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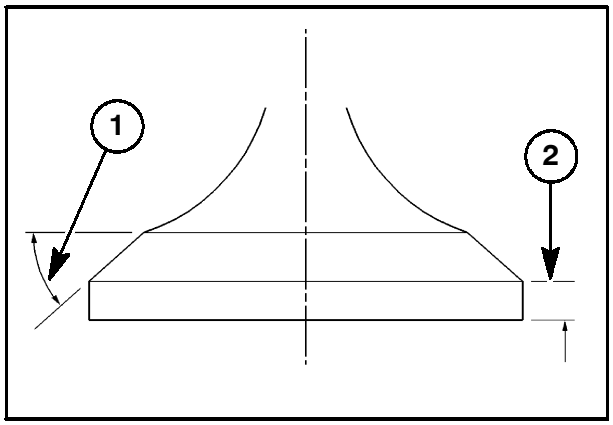
3. If inspection indicates that the valve may be reused, the valve should be ground as shown.

IMPORTANT: *After grinding the valve and seat, check to assure that the seat contacts the center of the valve face. Using Prussian Blue, lightly coat the valve seat, place the valve in position and rotate the valve slightly while holding a light pressure against the valve. If the blue is transferred to the center of the valve face, the contact is correct.*



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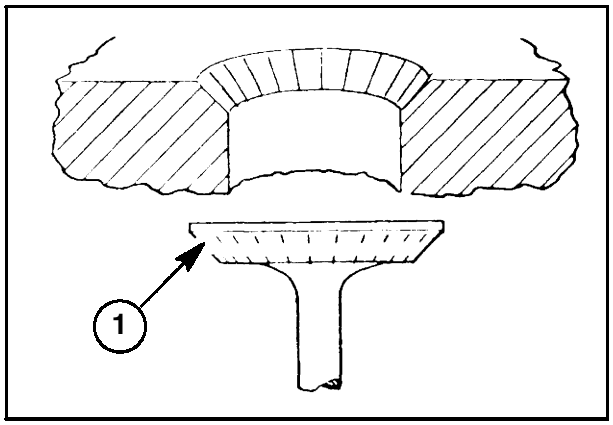
1. 45° Seat Angle
2. Minimum Valve Margin 0.5 mm (0.002″)

If Prussian Blue is not available, mark the valve face or seat with a soft lead pencil as shown. Rotate the valve slightly in the seat. The penciled lines will be broken at the seat contact area.



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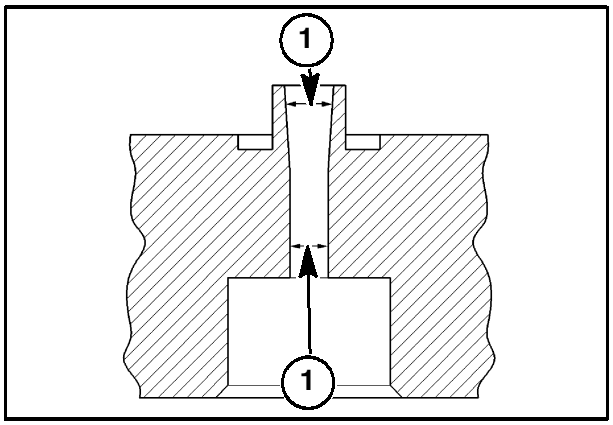
Valve Guides

Thoroughly clean the valve guides before attempting to check internal wear.

1. Using a small hole gauge, measure the valve guide bore at the top and bottom wear points, 1.



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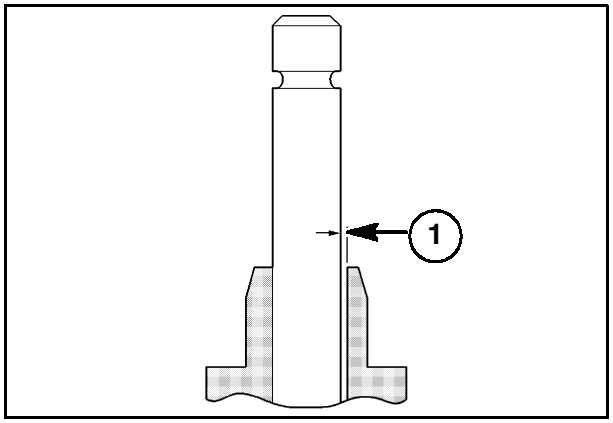
2. Determine the stem-to-guide clearance by subtracting the stem diameter from the valve guide. Replace the valves if the clearance is more than the specified limits:

Intake	Exhaust
0.20 mm (0.008″) Max	0.25 mm (0.010″) Max

3. Replace the cylinder head if excessive clearance is determined. See “Specifications.”



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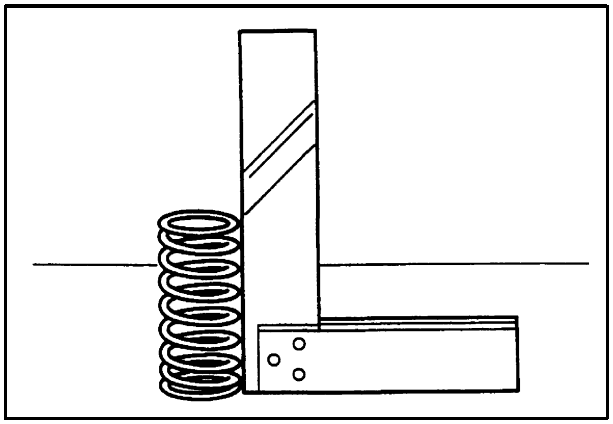
Valve Springs

1. Place the valve springs on a flat surface. Measure the free-length of the spring and squareness.

   Replace springs that do not meet the following specifications:

	Standard	Maximum
Out of Round	1.2 mm (0.047″)	2.0 mm (0.079″)
Free Length	35.0 mm (1.378″)	33.5 mm (1.319″)



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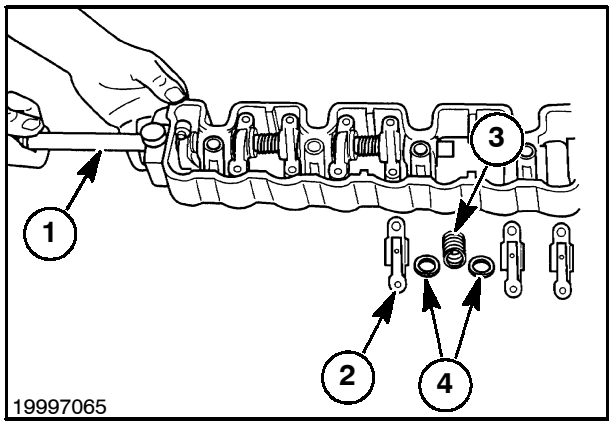
2. Place the springs in a suitable spring load tester and measure the spring load rating. Replace the springs that do not meet the following load specifications:

Standard	Minimum
8.1 kg (17.857 lbs) at 30.4 mm (1.197″)	7 kg (15.432 lbs) at 30.4 mm (1.197″)

Rocker Arm Pivots Disassembly

1. Screw a 8M bolt into the front end of the rocker shaft, 1, and pull the rocker shaft out of the support.
2. Remove the springs, 3, shims, 4, and rocker arms, 2.



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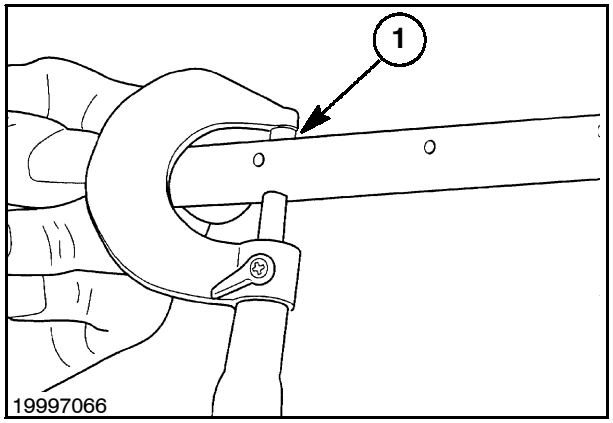
Rocker Arm Pivots Inspection and Repair

1. Inspect the rocker arms and shafts for wear of damage.
2. Inspect the valve stem contact area for pitting or wear. Slight wear patterns may be removed using a fine grit stone.
3. Check the adjusting screws for damaged threads or excessive wear.

   Replace any components which are visually worn or damaged.
4. Using a micrometer, measure the diameter of the rocker arm shaft, 1.

   Replace the rocker shaft if the wear at any point exceeds the following diameter:

Standard	Minimum
14.95 - 14.97 mm (0.5886″ - 0.5894″)	14.87 mm (0.5854″)



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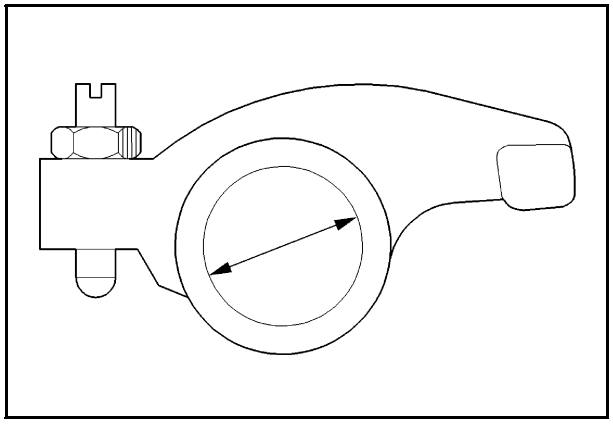
5. Using a hole gauge, measure the inside bore diameter of the rocker arm.

   Subtract the rocker shaft diameter from the rocker arm bore diameter to obtain the shaft-to-arm clearance.

   Replace the rocker arm and/or shaft assembly if the clearance exceeds the following specifications:

Standard	Maximum
0.032 - 0.068 mm (0.5886″ - 0.5894″)	0.2 mm (0.008″)



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Push Rods

1. Check all push rods for straightness by rolling on a flat surface. Replace rods which are bent.
2. Inspect the ends of the push rods for excessive wear. If any push rod is worn, the corresponding lifter and rocker arm should also be inspected for excessive wear.

Cylinder Head Assembly

1. Insert each valve into the guide from which it was removed and lightly lap the valve to be sure of an even set all around the valve face.
2. Remove the valve and remove all traces of lapping compound.
3. Using a spring compressor, assemble the valves, springs, retainers and locks.
4. Assemble the rocker arms onto the pivot shafts and install the snap rings.

Cylinder Head Installation

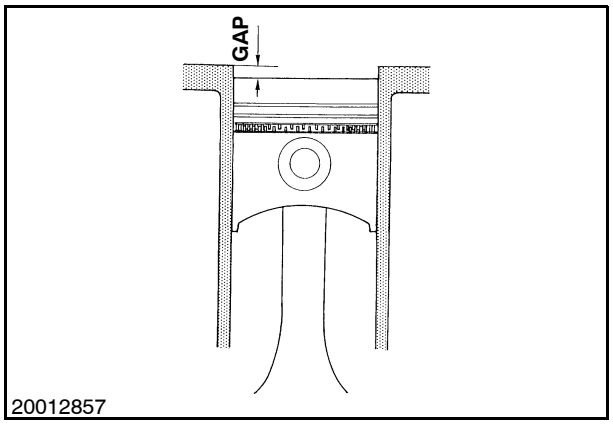
During assembly, the ultimate engine compression ratio is established by the thickness of the head gasket used. For service replacement, head gaskets of different thicknesses are available. The correct head gasket must be selected based upon the position of the piston to the face of the block when at top-dead-center.

The correct head gasket usage is determined as follows:

1. Position each of the pistons at top-dead-center and using a dial indicator, determine the distance of each piston to the face of the block.

NOTE: *Measure each of the pistons while holding a slight down pressure on the piston. Use the dimension taken from the cylinder which has the greatest gap and select a head gasket as indicated in the following chart.*

The variation between the pistons must not be greater than 0.1 mm (0.004″).



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MODEL	MEASUREMENT	HEAD GASKET	
		PART NUMBER	THICKNESS
3145	From 0.2 to 0.3 mm (0.0079″ to 0.0118″)	111147450	0.5 mm (0.0197″)
	From 0.3 to 0.4 mm (0.0118″ to 0.0157″)	111147460	0.4 mm (0.0157″)

2. If removed, install the tappets.
3. Select the proper head gasket and place it on the block with the side marked with the last four digits of part no. code, or “top” facing up.

   Carefully set the cylinder head in position without disturbing the head gasket.
4. Lubricate the head bolts with engine oil and install the bolts loosely.
5. Gradually tighten the head bolts in stages in sequence as shown.
6. Tighten all bolts to the specified torque:

   Head bolt torque: 98 - 103 N·m (73 - 77 ft lbs)
7. Replace the push rods and valve stem caps in their original locations.
8. Install the assembled rocker shaft, tighten the support bolts in steps to the specified torque. See “Specifications,” Chapter 3.
9. Position the assembled rocker arm and shaft assemblies over the stud bolts and install the nuts and washers.

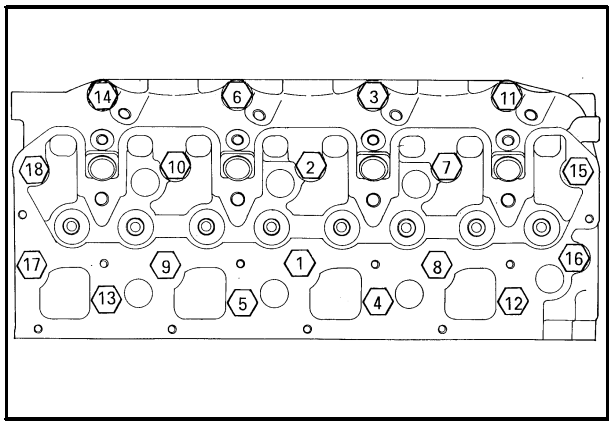
NOTE: *Use care to carefully position the rocker arms over the valve stem caps and push rods.*

10. Tighten the nuts to the specified torque:

    Rocker post stud
    nut torque: 27 - 39 N·m (20 - 29 ft lbs)
11. Adjust the valve rocker arms to valve clearance. Be sure the tappet is in its lowest position before making the adjustment. To be sure the tappet is in its lowest position, bring the piston to top-dead-center on the compression stroke (both valves closed).
12. Loosen the adjusting bolt lock nut, 2, and turn the adjusting screw to obtain the specified clearance:

Intake	Exhaust
0.20 mm (0.008″) Max	0.20 mm (0.008″) Max

13. Tighten the locknut.



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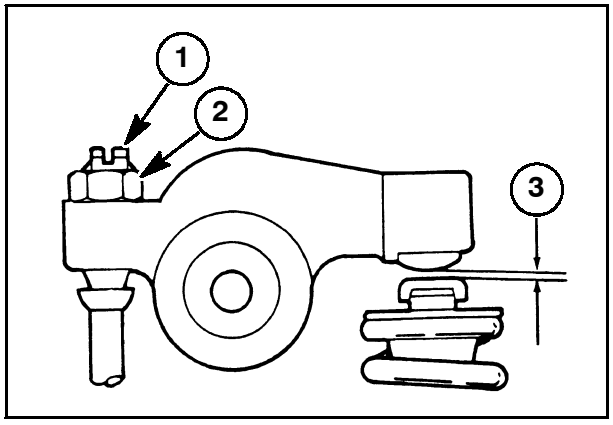

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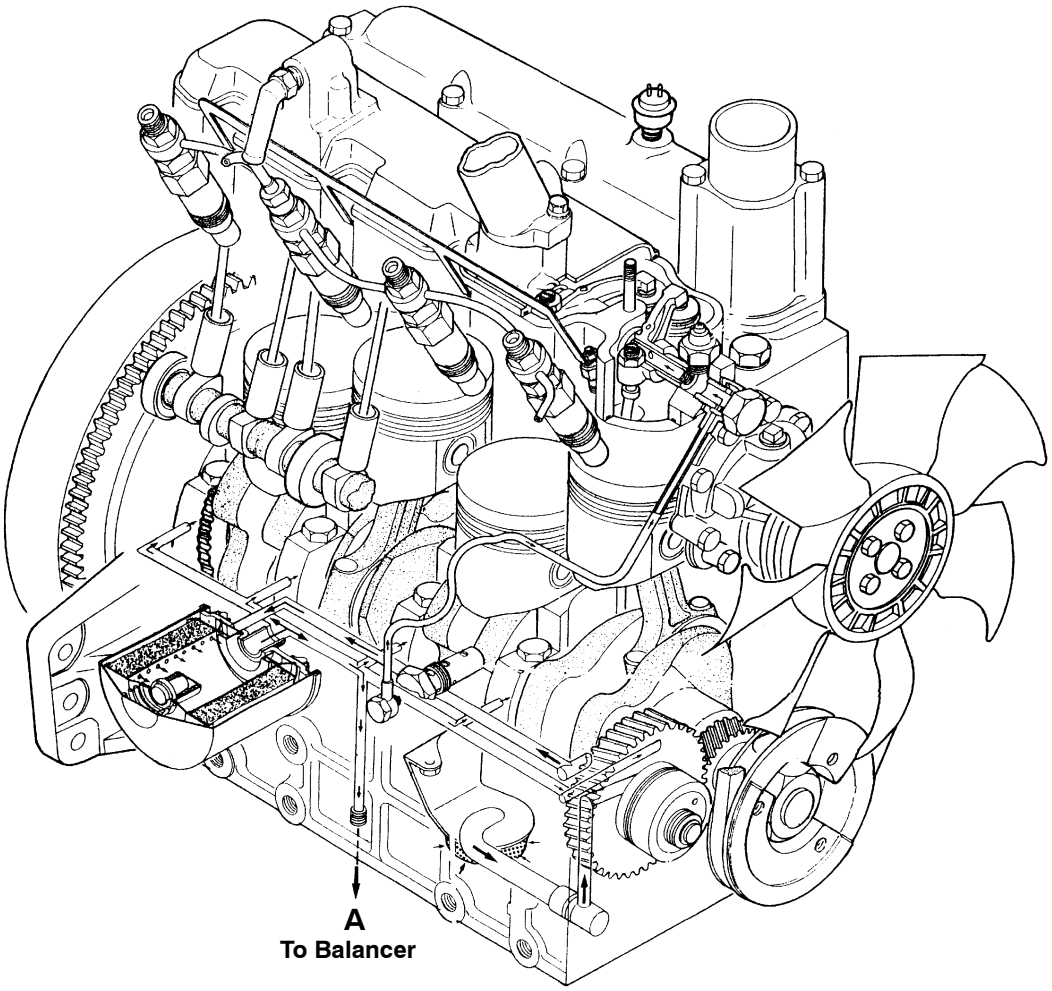
1. Adjusting Screw
2. Locknut
3. Valve Clearance

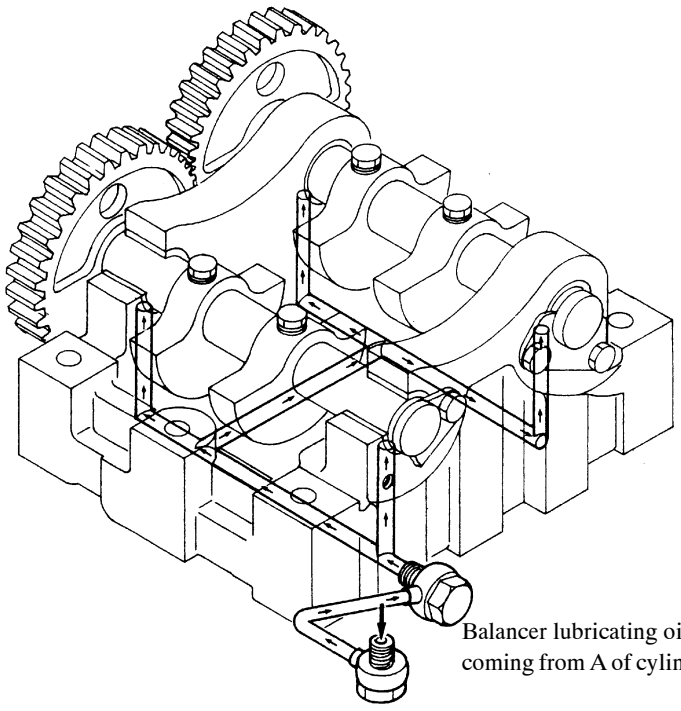
ENGINE LUBRICATION SYSTEM

DESCRIPTION

The oil pump assembly is located within the idler gear at the front of the block, below and to the left of the crankshaft as viewed from the front of the engine. The oil pump is driven by the crankshaft gear.

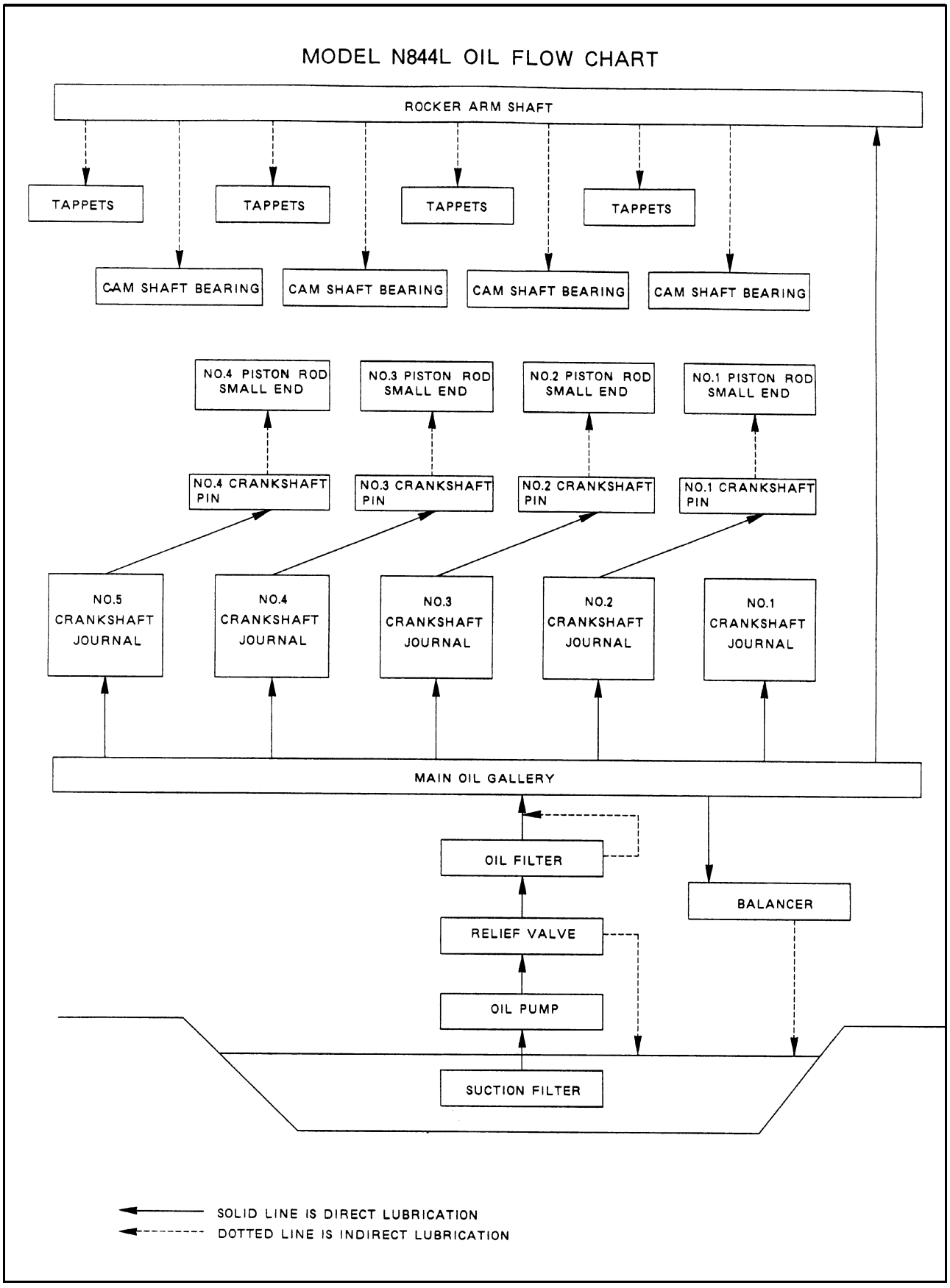
Oil is picked up from the sump through the suction strainer and intake tube and drawn into the lower side drilling in the block to the oil pump. Oil from the pump flows through passages in the block, past the relief valve, through the oil filter and returns to the main oil gallery in the area of the drilled bolt located on the side of the block. Oil flow in the main oil gallery extends to the five main bearings, and to the dynamic balancer through passage, A. Oil from passage A flows to oil transfer tube banjo bolts. From the banjo bolts oil flows to two shaft bushings on one shaft and then to two more shaft bushings on the other shaft. Oil flow to the main bearings passes through drilled passages in the crankshaft to the four connecting rod bearings. The remaining portion of the oil flow is directed through the external tube to the rocker arm assembly. Oil flows from the external tube into a passage in the rocker arm bracket to the rocker arm shaft. Oil leakage from clearance between the rocker arms and the shaft overflows in the valve cover and lubricates the valve stems, push rods, and tappets. The relief valve is mounted on the side of the engine block and intersects the main oil passage. When the oil pressure exceeds the rated pressure, oil is bypassed through the relief valve directly to the sump. The cylinder walls, pistons, and piston pins are splash lubricated by the crankshaft.





Balancer lubricating oil (Pressured oil)
coming from A of cylinder block bottom surface

37


MODEL N844L OIL FLOW CHART
ROCKER ARM SHAFT
TAPPETS
TAPPETS
TAPPETS
TAPPETS
CAM SHAFT BEARING
CAM SHAFT BEARING
CAM SHAFT BEARING
CAM SHAFT BEARING
NO.4 PISTON ROD SMALL END
NO.3 PISTON ROD SMALL END
NO.2 PISTON ROD SMALL END
NO.1 PISTON ROD SMALL END
NO.4 CRANKSHAFT PIN
NO.3 CRANKSHAFT PIN
NO.2 CRANKSHAFT PIN
NO.1 CRANKSHAFT PIN
NO.5 CRANKSHAFT JOURNAL
NO.4 CRANKSHAFT JOURNAL
NO.3 CRANKSHAFT JOURNAL
NO.2 CRANKSHAFT JOURNAL
NO.1 CRANKSHAFT JOURNAL
MAIN OIL GALLERY
OIL FILTER
BALANCER
RELIEF VALVE
OIL PUMP
SUCTION FILTER
SOLID LINE IS DIRECT LUBRICATION
DOTTED LINE IS INDIRECT LUBRICATION

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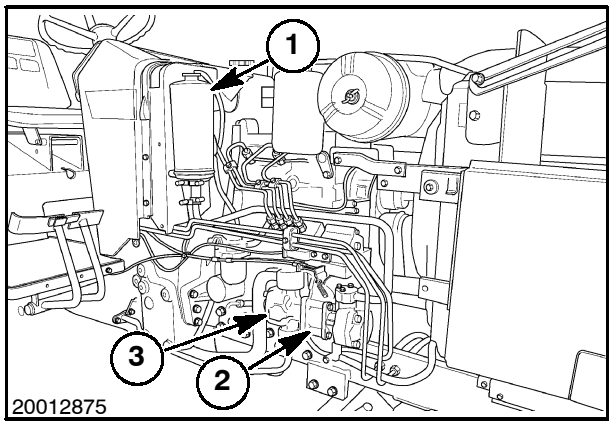
ENGINE LUBRICATION OVERHAUL

Engine Front Cover, Timing Gears and Oil Pump Removal

To remove the front cover assembly, first remove the radiator. See “Radiator Removal,” Chapter 2, this part.

1. Drain the oil from the power steering reservoir tank, 1.
2. Drain the transmission/hydraulic system oil and collect in a clean container. See Operator’s Manual.
3. Remove the tube supporting clamp from the under side of the transmission housing for supporting the hydraulic system intake and pressure tubes.
4. Remove the intake tube clamp bolts and move the tube away from the side of the engine.
5. Remove the power steering intake and pressure tubes from the power steering pump.
6. Remove the pump mounting stud nuts and remove the power steering pump, 2, and hydraulic system pump, 3, from the cover.
7. Remove the high pressure hydraulic tube.
8. Disconnect the alternator wiring, 1, and remove the alternator assembly, 2.
9. Remove the fan belt.
10. Remove the cooling fan.
11. Remove the crankshaft pulley retaining nut and pull the crankshaft pulley off of the crankshaft.

NOTE: *Use a suitable puller if necessary. Do not use a hammer to loosen the pulley.*



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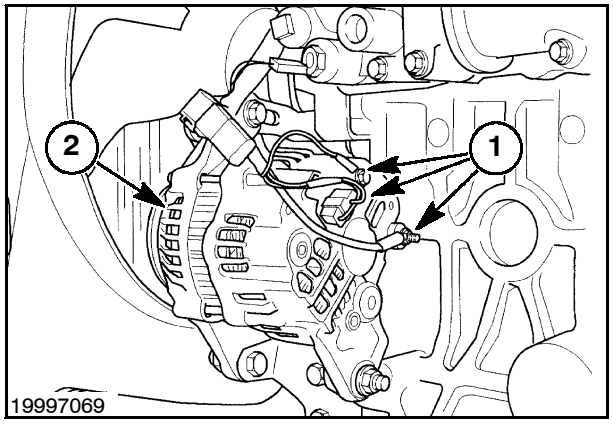

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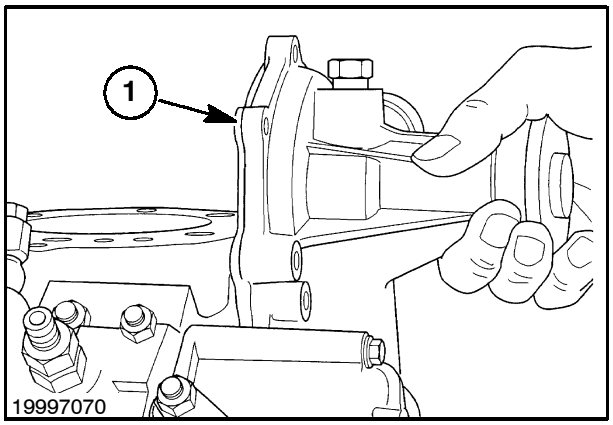
12. Remove the water pump assembly, 1.



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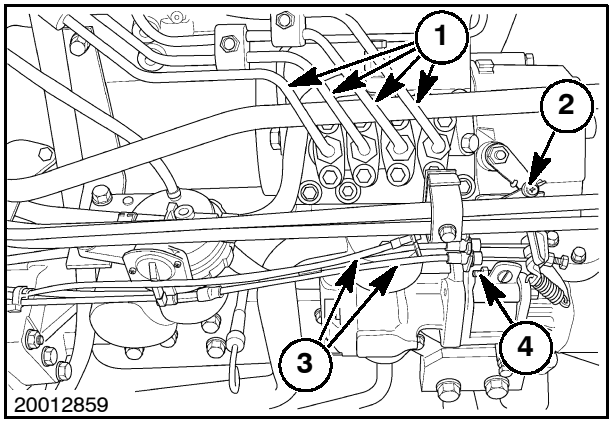
13. Remove the injector lines, 1, and cap all openings.
14. Disconnect the engine stop wire, 2.
15. Disconnect the throttle control cables, 3, from the governor linkage, 4.



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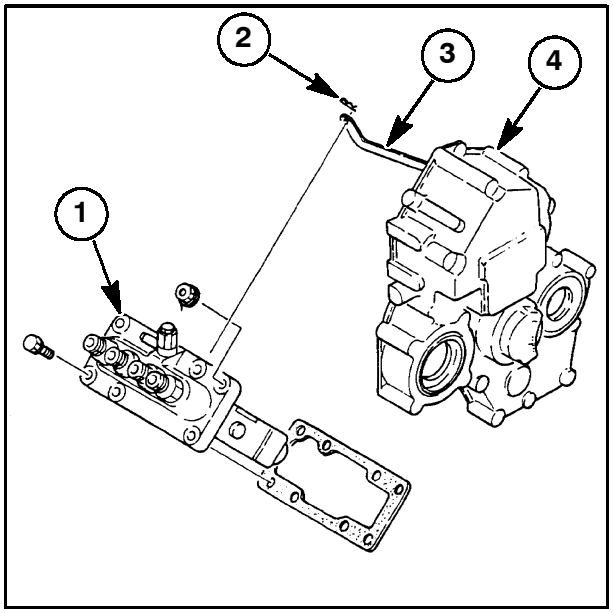
16. Remove the injection pump mounting bolts and raise the injection pump, 1, enough to disconnect the hairpin, 2, and separate the governor link, 3, from the control rack.

NOTE: *It is not necessary to remove the injection pump.*

17. Remove the timing gear cover bolts and remove the cover, 4, and gasket.



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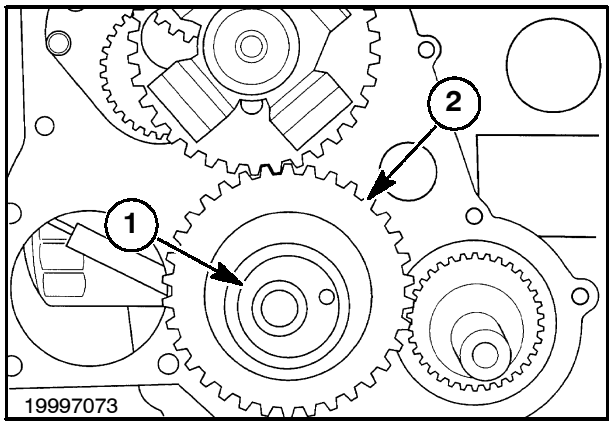
Timing Gears and Oil Pump Removal

The oil pump, 1, is located inside of the pump drive gear, 2, at the front of the engine block.



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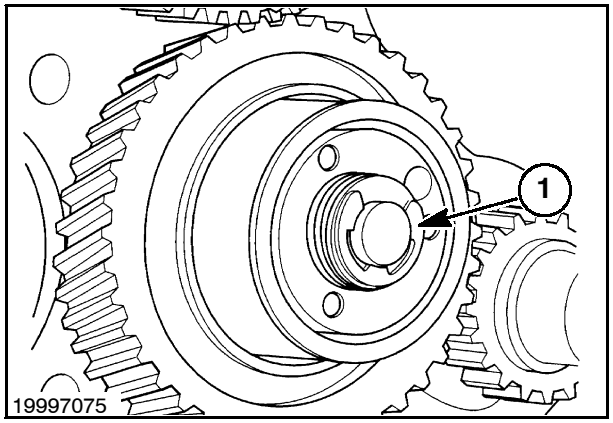
1. Remove the “E” snap ring, 1, and slide the drive gear along with the rotors, cover, spring, shim and collar off the pump shaft as an assembly.



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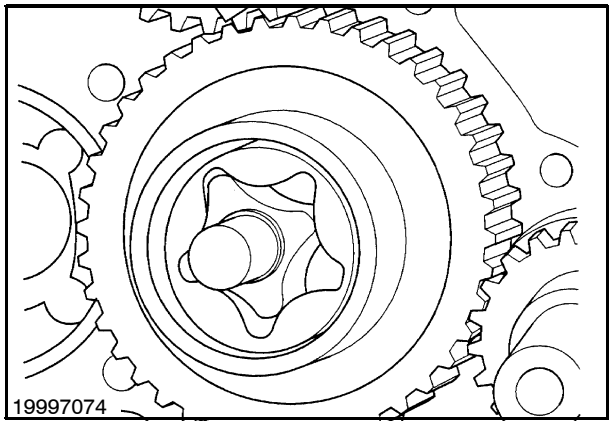

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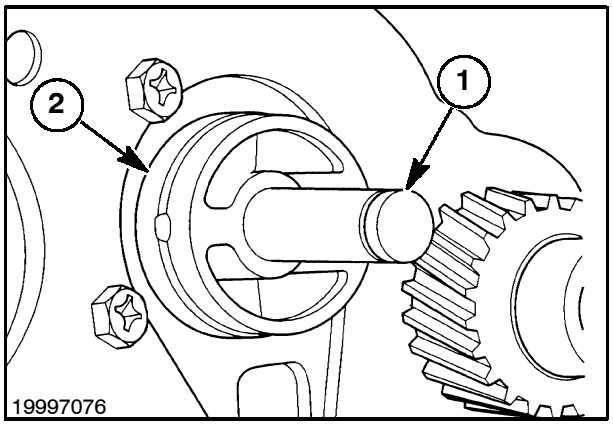
NOTE: *The oil pump shaft, 1, and port block assembly, 2, is a press fit in the block. If necessary to remove due to damage, remove the port block and shaft assembly as follows:*



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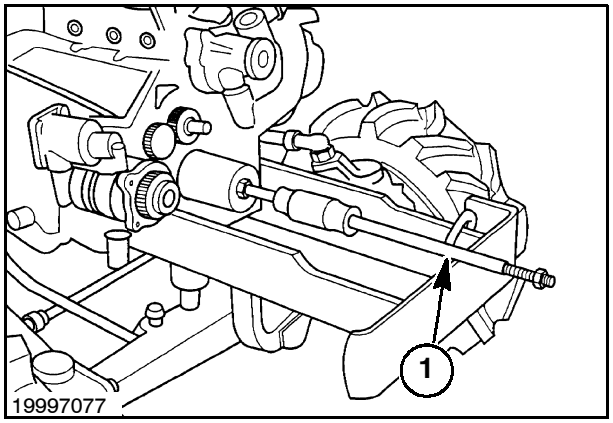
Using Tool No. FNH11097, place the collars in the grooves of the port block assembly. Align the setscrews of the puller with the counterbores in the collars and tighten. Using a slide hammer, 1, as shown, remove the port block.



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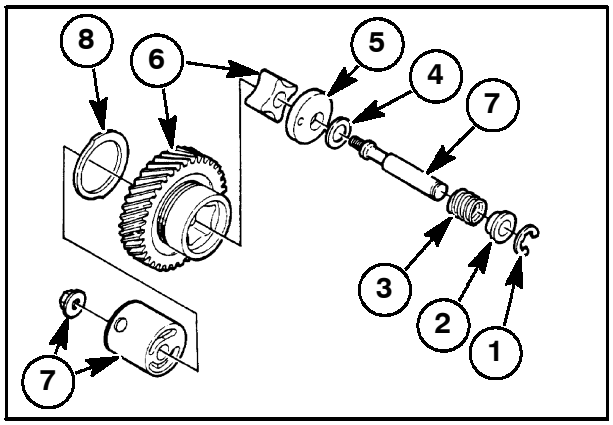
Timing Gears and Governor Assembly Inspection and Repair

1. Wash all components in a suitable solvent and air dry.
2. Inspect the governor assembly for excess wear or damage. Replace any components found faulty.
3. Inspect the timing gear teeth for excess wear, chips, etc.
4. Inspect the camshaft and injection pump drive keys and the keyways for wear.

Oil Pump Assembly
The oil pump consists of the inner and outer rotors, idler gear, port block, shaft and cover.

1. Check for excessive wear on the face of the pump cover, 5, and port block, 7.
2. Inspect the pump shaft and rotors for excessive wear or scratches.



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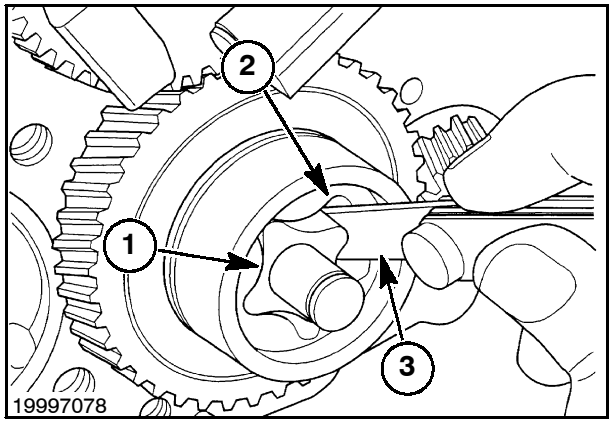
1. "E" Snap Ring
2. Collar
3. Spring
4. Shim
5. Cover
6. Rotor and Gear Assembly
7. Port Block and Shaft Assembly
8. Thrust Washer

3. Measure the rotor, 1, to rotor, 2, clearance by using a feeler gauge, 3. Replace the components as required if wear is excessive. See "Specifications," Chapter 3.



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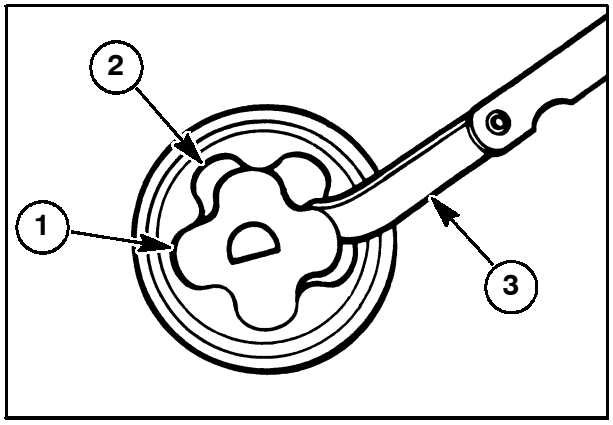

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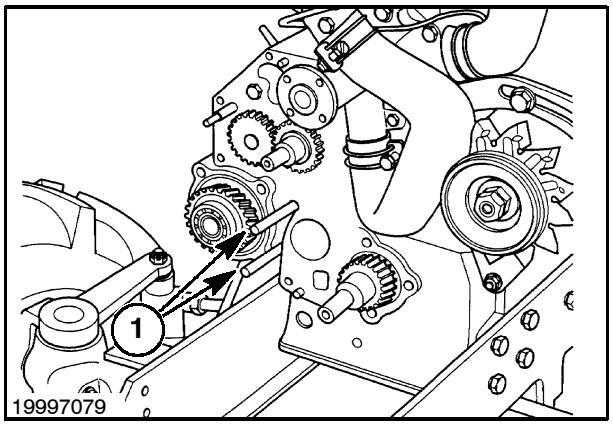
Oil Pump Installation

If the engine oil pump port block assembly was removed, install a new port block assembly as follows:

- Using Tool No. FNH00117, insert the threaded guide pins, 1, into the cylinder block. Assemble the oil pump shaft to the port block using nut and washer previously removed.



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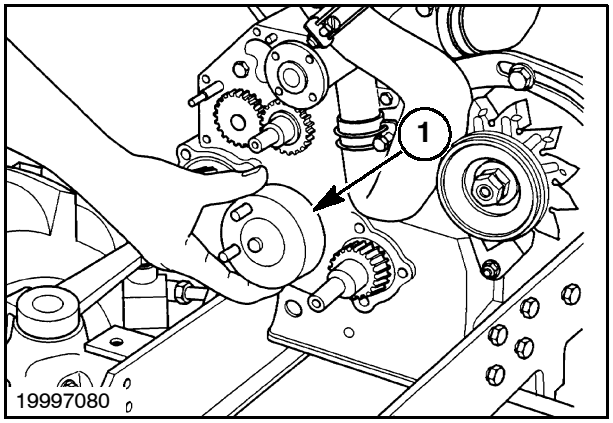
- Insert the port block assembly into the installer, 1, and place on the guide pins as shown.



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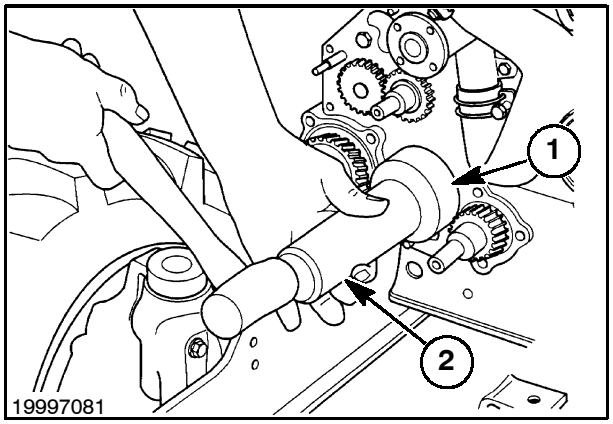
- Use a suitable driver, 2, and install the port block assembly as shown. The installer, 1, must bottom against the engine block when fully positioned.



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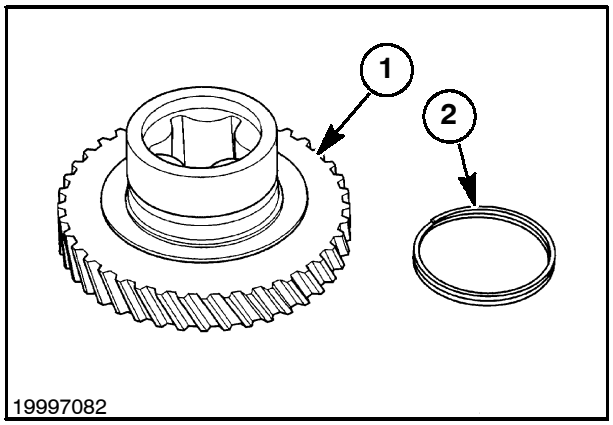
1. Assemble the pump drive gear, 1, and retaining spring, 2. Position the assembly on the port block. Turn the crankshaft to align the timing marks between the crankshaft and camshaft gears with the injection pump drive gear and install the pump drive gear in place.



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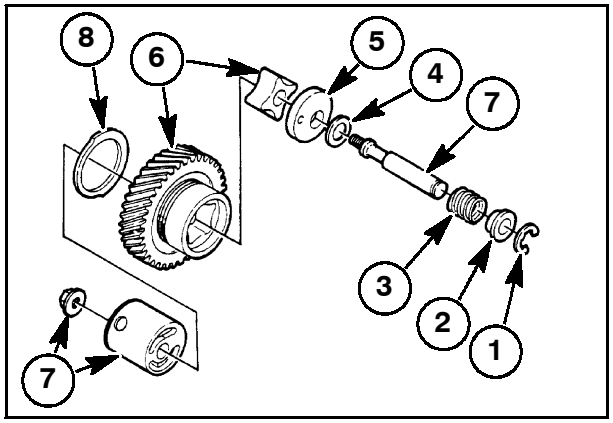
2. Position the oil pump inner rotor on the shaft inside the idler gear and install the cover, shim, spring, collar and "E" snap ring.



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1. "E" Snap Ring
2. Collar
3. Spring
4. Shim
5. Cover
6. Rotor and Gear Assembly
7. Port Block and Shaft Assembly
8. Thrust Washer

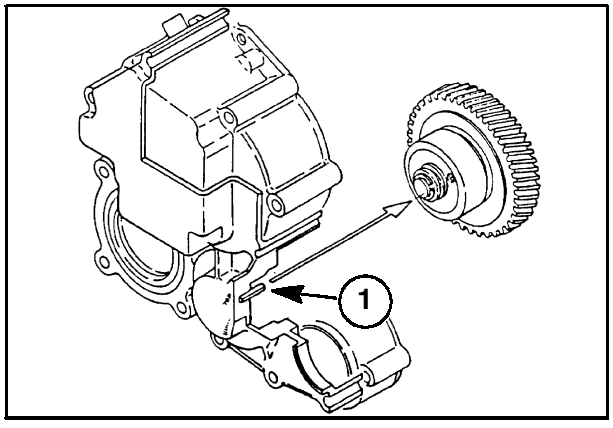
Timing Gear Cover Inspection and Repair

Inspect the governor linkage and replace any worn or damaged parts. See Part 2, Chapter 1 for governor linkage assembly and adjustments.

Timing Gear Cover Installation

1. Install a new timing gear cover gasket and reinstall the timing gear cover following the removal procedure in reverse.

NOTE: *Be sure the dowel pin, 1, in the cover properly aligns with the hole in the oil pump cover.*



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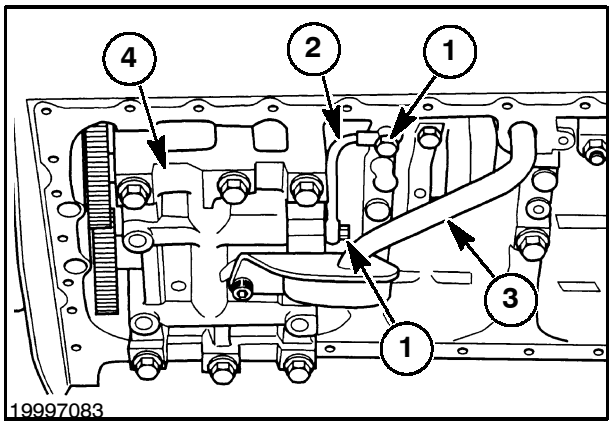
Connecting Rods, Bearings, Pistons, Rings and Cylinder Block Disassembly

Note the pistons and connecting rods can be removed with the engine in the tractor after removing the cylinder head and oil pan.

1. Remove the cylinder head assembly. See “Cylinder Head Removal,” this section.
2. Drain the engine oil, see Operator’s Manual.
3. Remove the oil pan bolts and remove the pan.



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4. Remove the oil transfer tube banjo bolts, 1, and remove the oil tube, 2, and suction tube, 3. Remove the dynamic balancer attaching bolts, 4, and lower the balancer assembly from the block.

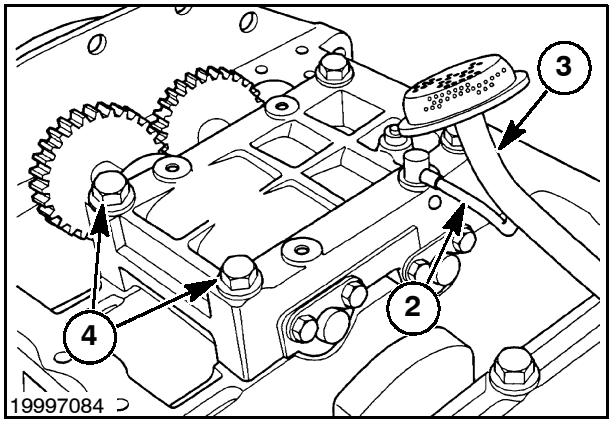
NOTE: *Observe the quantity of shims used, if and and retain for installation in their original location between the bouncer frame and engine block. See “Dynamic Balancer Removal,” this section.*

5. Remove the carbon deposit around the top of each of the cylinders.

   If necessary use a ridge reamer to remove the ridge at the top of the cylinder.

6. Remove the connecting rod bearing caps, 1, one a time and push the connecting rod and piston assembly out the top of the block.

NOTE: *Be sure to keep the connecting rod caps and bearing liners with the respective rods for reassembly in their original location.*



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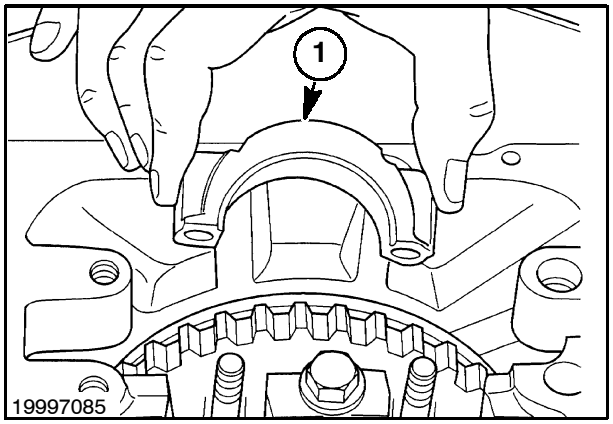

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