

# NEW HOLLAND 3415

# REPAIR MANUAL

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NEW HOLLAND

SERVICE

87028646 1/03

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# 3415 REPAIR MANUAL
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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.*

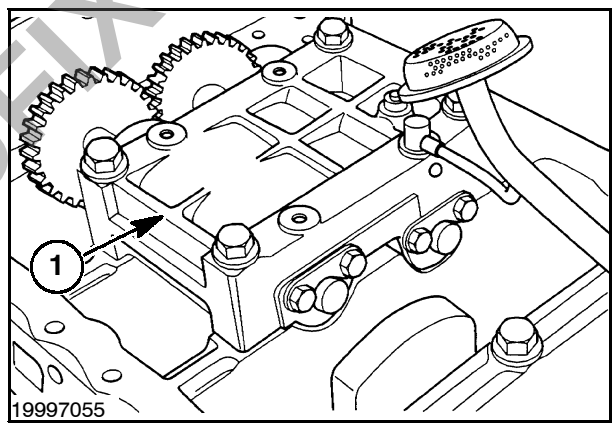
The cylinder block assembly contains the pistons, connecting rods, crankshaft, camshaft, timing gears, engine oil pump and dynamic balancer assembly.

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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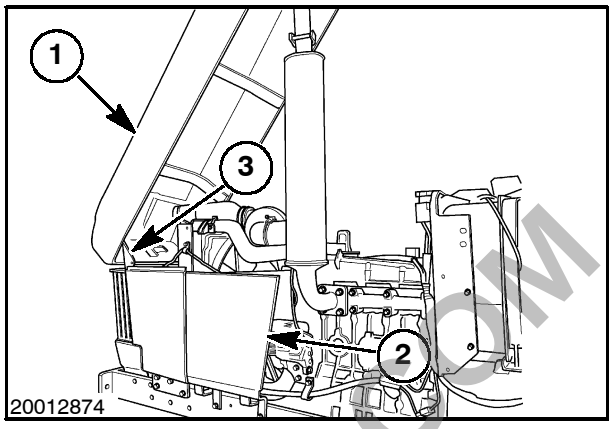


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## ENGINE OVERHAUL

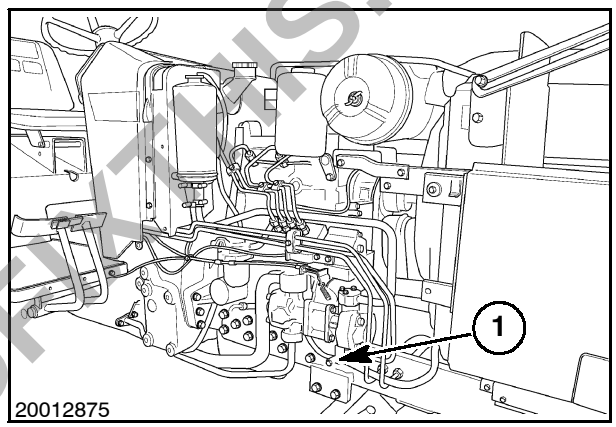
### Cylinder Head Removal

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



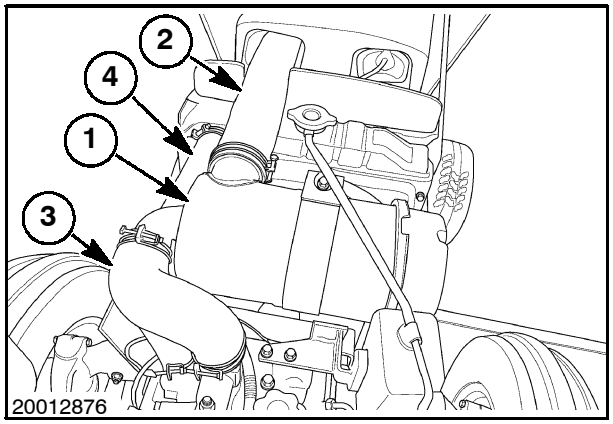

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2. Drain the coolant from the radiator and engine block through the radiator drain cock, 1.




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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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## ENGINE TROUBLESHOOTING

### Engine

| PROBLEM | POSSIBLE CAUSE | CORRECTION |
|---|---|---|
| Engine does not develop full power | Clogged air cleaner | Inspect and replace air cleaner if necessary |
| | Fuel line obstructed | Check for crimping fuel line; inspect fuel filter for cleanliness; repair or replace components as required |
| | Improper injection timing | Correct injection timing |
| | Improper nozzle injection pressure and angle | Inspect for proper injection pressure and angle |
| | Low cylinder compression | Check engine compression |
| | Insufficient fuel injection | Repair at authorized shop |
| | Improper valve lash adjustment | Adjust valves to correct tolerances |
| | Burned, worn, or sticking valves | Inspect and replace as necessary |
| | Blown head gasket | Replace head gasket |
| | Worn or sticking piston rings | Overhaul as necessary |
| Low oil pressure | Engine oil level low | Fill to proper level |
| | Wrong grade oil | Replace with correct grade oil |
| | Clogged oil pump filter | Change oil pump filter |
| | Faulty oil pressure relief valve | Replace relief valve |
| | Worn oil pump drive shaft or gears, or broken oil pipe | Inspect oil system and components; replace defective components |
| | Excessive main or connecting rod bearing clearance | Replace bearings or crankshaft if necessary |
| Low cylinder compression | Burned, worn or sticking valves | Inspect and replace as necessary |
| | Bent valve stem | Inspect and replace as necessary |
| | Broken or weak valve spring | Replace valve spring |
| | Blown cylinder head gasket | Replace cylinder head gasket |
| | Worn or sticking piston rings | Replace piston rings |
| | Scored piston | Replace piston |

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## ENGINE SPECIFICATIONS

### General

| | |
|---|---|
| Engine Model | N844L |
| Number of Cylinders | 4 |
| Bore x Stroke | 84 x 100 mm (3.307″ x 3.94″) |
| Displacement | 2216 cc (135.20 cu. in.) |
| Compression Ratio | 22.5:1 |
| Rated Speed (RPM) | 2600 |
| Muffler | Vertical |
| Firing Order | 11 - 3 - 4 - 2 |
| Idle Speed (RPM) | 950 |
| Maximum No-Load Speed | 2810 - 2860 |
| Cylinder Arrangement | In-Line Vertical |
| Valve Arrangement | Overhead |
| Compression Pressure @200 RPM (Cylinder Speed) | 29 bar (427± 50 PSI) |
| Variation Between Cylinders | ± 24 bar (± 50 PSI) |

### Cylinder Block

| | |
|---|---|
| Bore | |
| Standard | 84.00 - 84.019 mm (3.307″ - 3.308″) |
| Maximum | 85.20 mm (3.354″) |
| Head Surface Warp | |
| Standard | 0.05 mm (0.002″) |
| Maximum | 0.12 mm (0.005″) |
| *Re-Bore Size | |
| 0.5 mm (0.020″) Oversize | 84.50 - 84.519 mm (3.327″ - 3.328″) |
| 1.0 mm (0.040″) Oversize | 85.00 - 85.019 mm (3.346″ - 3.347″) |

*If bore size exceeds 85.2 mm (3.354″) replace the cylinder block.

### Cylinder Head

| | |
|---|---|
| Head Warp | |
| Standard | 0.05 mm (0.002″) |
| Maximum | 0.12 mm (0.005″) |
| Valve Seat Width | |
| Standard | 1.90 - 2.10 mm (0.075″ - 0.083″) |
| Maximum | 2.8 mm (0.11″) |
| Valve Seat Sink | |
| Standard | 0.65 - 0.95 mm (0.026″ - 0.037″) |
| Maximum | 1.6 mm (0.063″) |
| Valve Angle | 45° |

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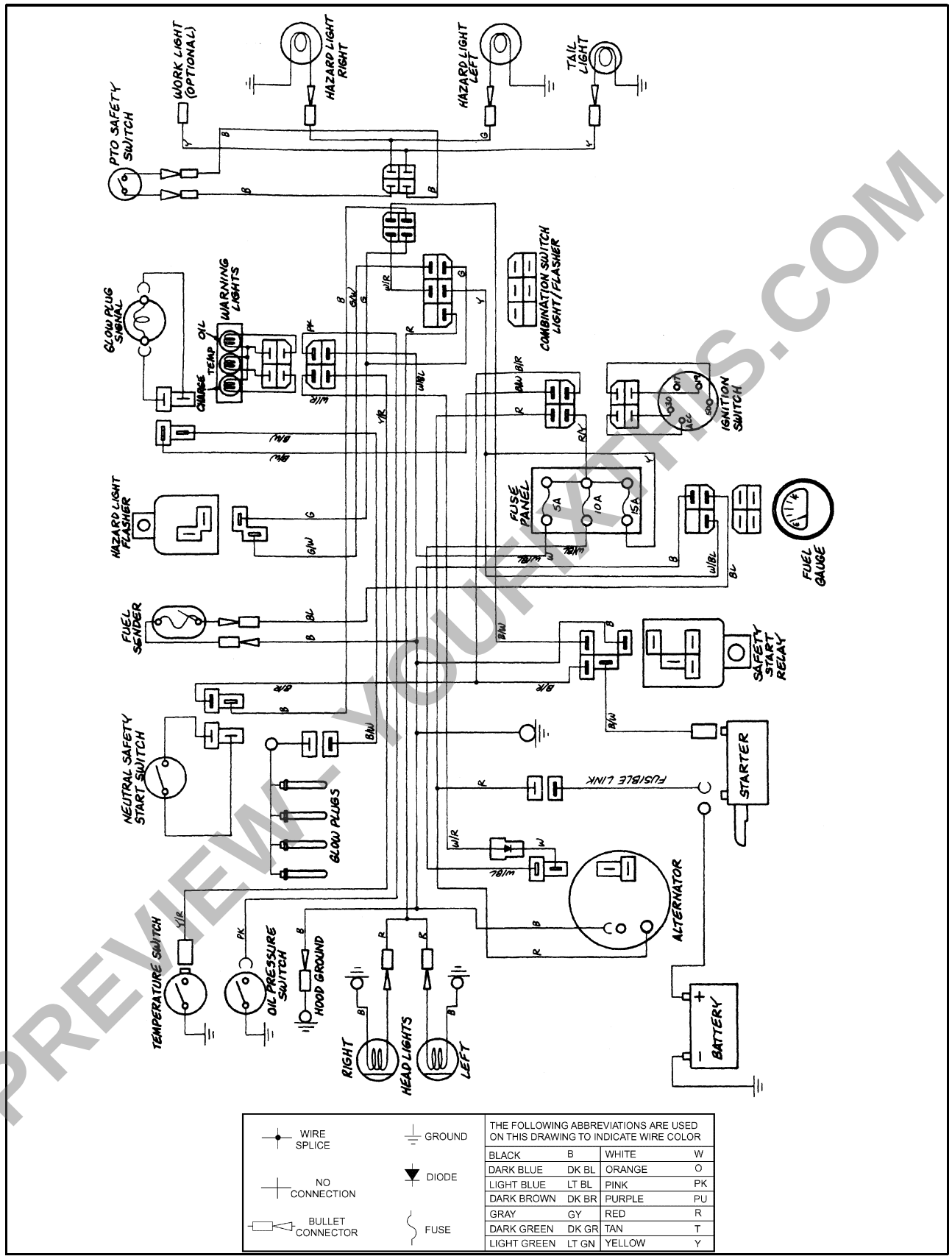
**ASSEMBLY TORQUES**

| | N·m | Ft Lbs |
|---|---|---|
| Cylinder Head Baits | 98 - 103 | (73 - 77) |
| Rocker Arm Support Nut | 27 - 39 | (20 - 29) |
| Crankshaft Bearing Holder Bolts | 49 - 54 | (36 - 40) |
| Bearing Holder Retaining Bolts | 49 - 54 | (36 - 40) |
| Balancer Counterweight Retaining Bolt | 23 - 29 | (17 - 22) |
| Connecting Rod Cap Bolts | 49 - 54 | (36 - 40) |
| Balancer Attaching Bolts | 49 - 54 | (36 - 40) |
| Oil Pan Retaining Bolts | 14 - 19 | (10 - 14) |
| Oil Transfer Tube Bolts (8 mm) | 9 - 13 | (7 - 9) |
| Oil Pump Relief Valve | 59 - 69 | (43 - 51) |
| Crankshaft Pulley Retaining Nut | 274 - 333 | (202 - 246) |
| Flywheel Crankshaft Retaining Bolts | 69 - 78 | (51 - 58) |
| Rocker Arm Adjust Screw Nut | 11 -15 | (8 - 11) |
| Injection Pump Delivery Valve Holder | 39 - 44 | (29 - 33) |

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**CIRCUITS DESCRIPTION AND OPERATION**

**Tractor Wiring Schematic**



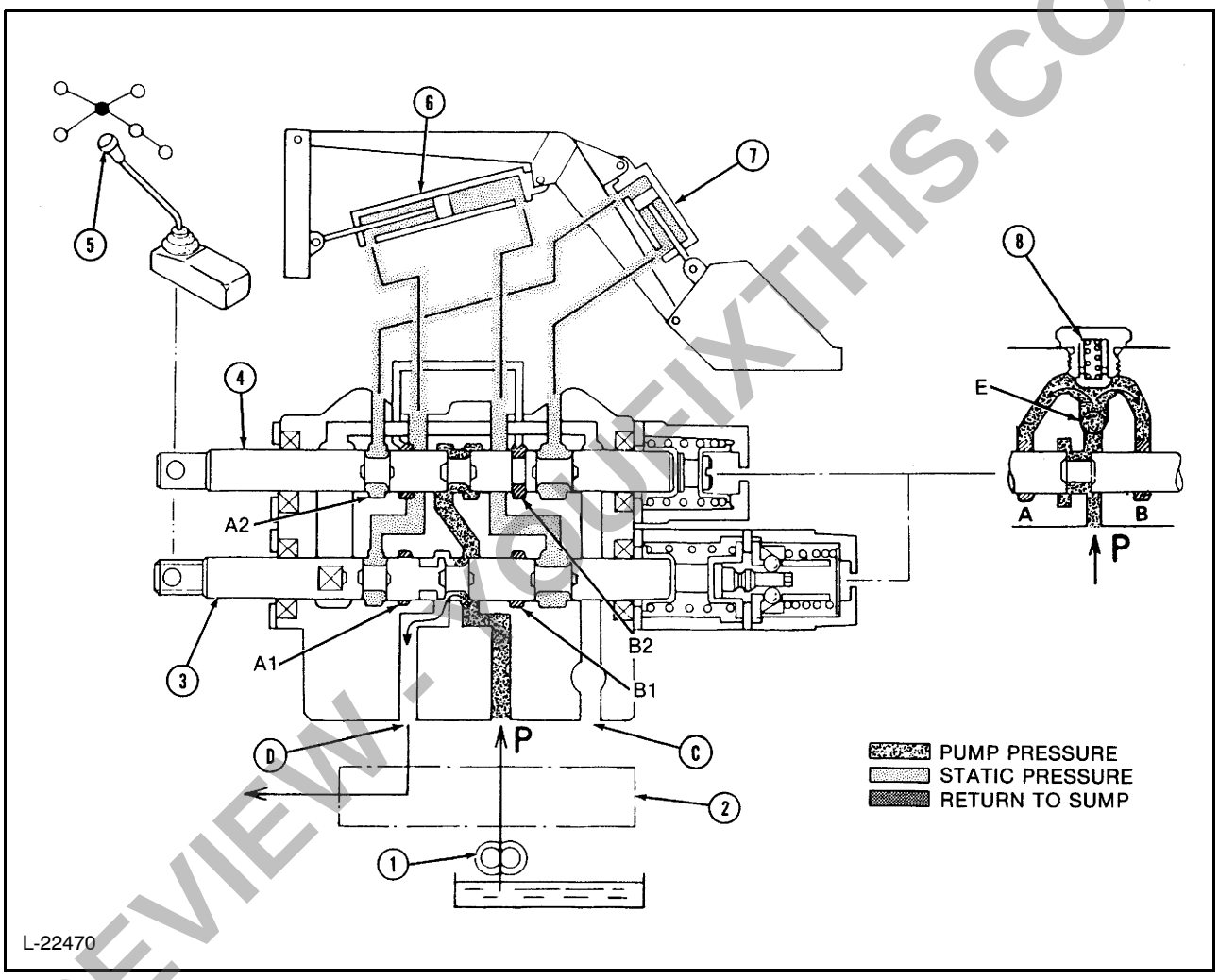
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**Oil Flow-Bucket Control**

**(Neutral and Lift Control-Neutral)**
**(Two Spool Remote)**
In the neutral position, the two control valve spools are centered in the valve body. Oil from the hydraulic pump is directed to the center of the two valve spools.

In this position, the spool lands block the passage to the loader cylinders. Oil is contained in the loader bucket cylinders and lift cylinders, is trapped by the spools and the cylinders remain in a fixed position.

Oil under pressure from the pump flows through the diverter valve manifold and enters the valve body at Port “P” to the open center passage of both spools. With all cylinder passages blocked, the oil flows through the main hydraulic system control valve. If the oil is not used by the 3-Point system, it is redirected back to sump.




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**Oil Flow - Neutral Position (Schematic) (Two Spool Control Valve)**

1. Oil Pump
2. System Relief Diverter Manifold
3. Lift Control Valve Spool
4. Bucket Control Valve Spool
5. Control Lever
6. Lift Cylinder
7. Bucket Cylinder
8. Load Check Valve

**P** – Pump Pressure Port
**$A^1$** – To Lift Cylinder – Rod End
**$B^1$** – To Lift Cylinder – Piston End
**$A^2$** – To Bucket Cylinder – Piston End
**$B^2$** – To Bucket Cylinder – Rod End
**C** – Return to Sump Port
**D** – To Main Valve
**E** – Open Center Passage

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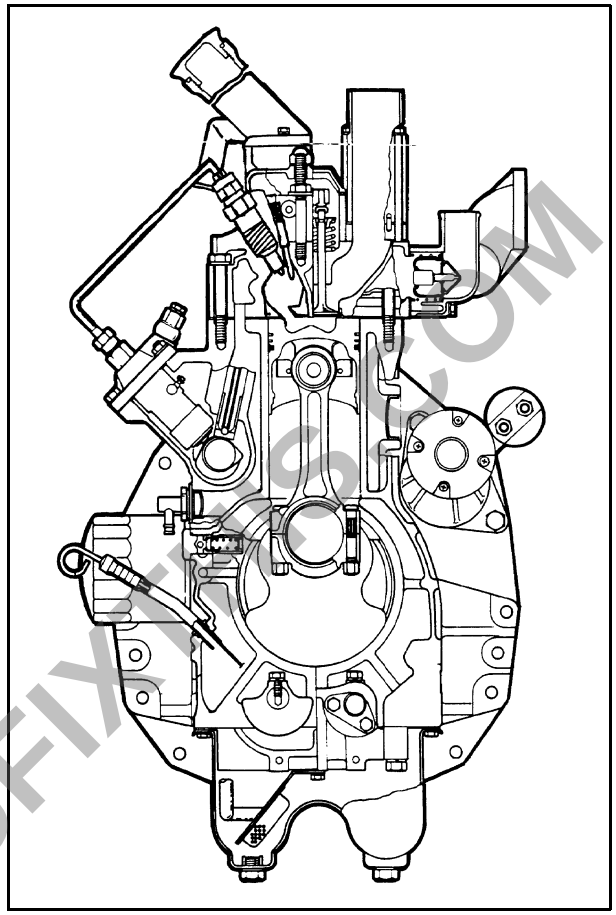


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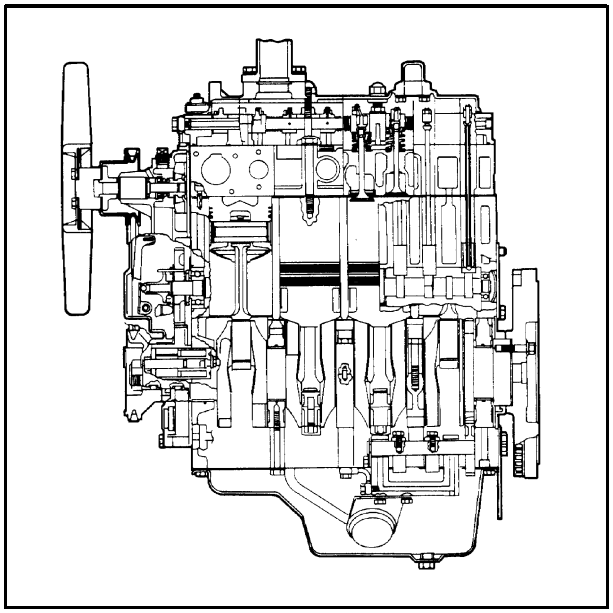
**ENGINE SYSTEM DESCRIPTION AND OPERATION**

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.



1



2

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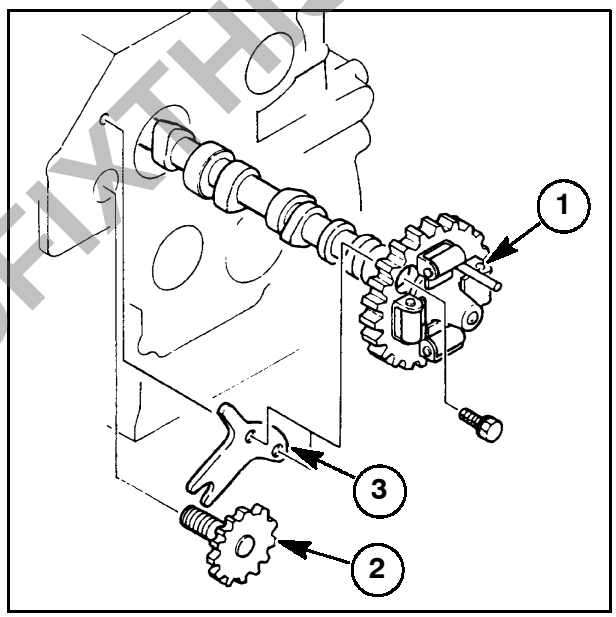
**Camshaft Installation**

Assembly and installation generally follows the removal procedure in reverse.

Observe the following during assembly of the camshaft and timing gear components.

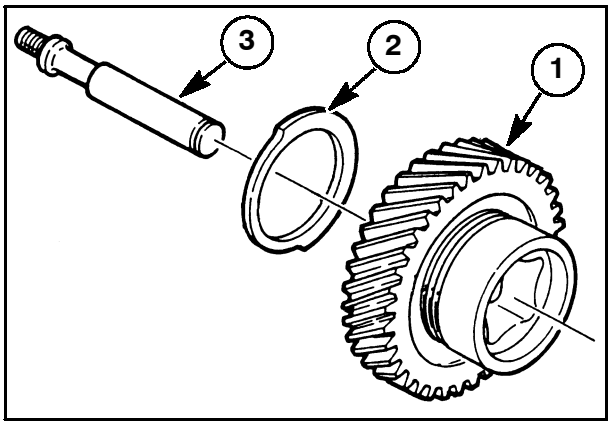
- Apply petroleum jelly to each tappet foot and coat the tappet body with clean engine oil. Install the tappets in the bores from which they were removed.
- Lubricate the camshaft journals with clean engine oil and apply petroleum jelly to the cam holes.
- Lubricate the camshaft bearings before installing in the block.
- Install a new camshaft key.
- Be sure to correctly align the timing gear timing marks. See “Timing Gears and Cover Assembly and Installation,” this section.

  If any new injection pump drive components are installed or timing marks are not present, see “Injection Pump Timing,” Part 2.
- Install the front plate and gasket.
- Install the camshaft, 1, tachometer drive gear, 2, plate assembly, 3, and governor components as shown.




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- Install the injection pump drive idler gear, 1, thrust washer, 2, and shaft, 3.




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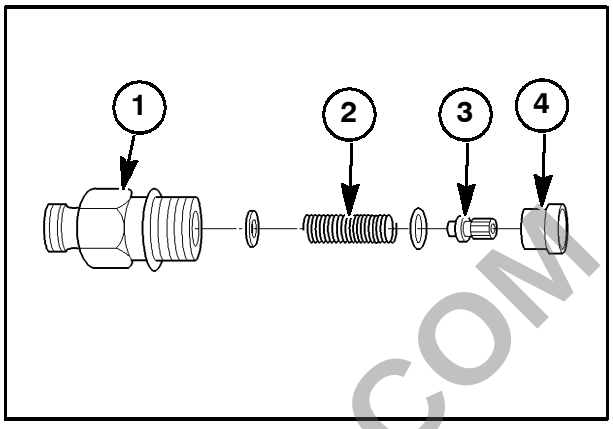


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## DELIVERY VALVES

Located above each pumping element is a delivery valve assembly. The delivery valve consists of a delivery valve holder, 1, spring, 2, piston and stem assembly, 3, operating within a cylindrical guide, 4, which terminates in a conical seat. The lower part of the stem has four vertical flutes which accurately locate within the guide while permitting fuel to pass. Above the flutes is a piston which is a lapped fit in the bore of the valve guide.

The delivery valve serves as a non-return valve and also as a means of rapidly reducing the fuel pressure in the injector line when injection ceases. Rapid pressure reduction is required to be sure injector needle valve “snaps” shut to prevent fuel “dribble”, a condition which can cause carbon formation on the injector tip.

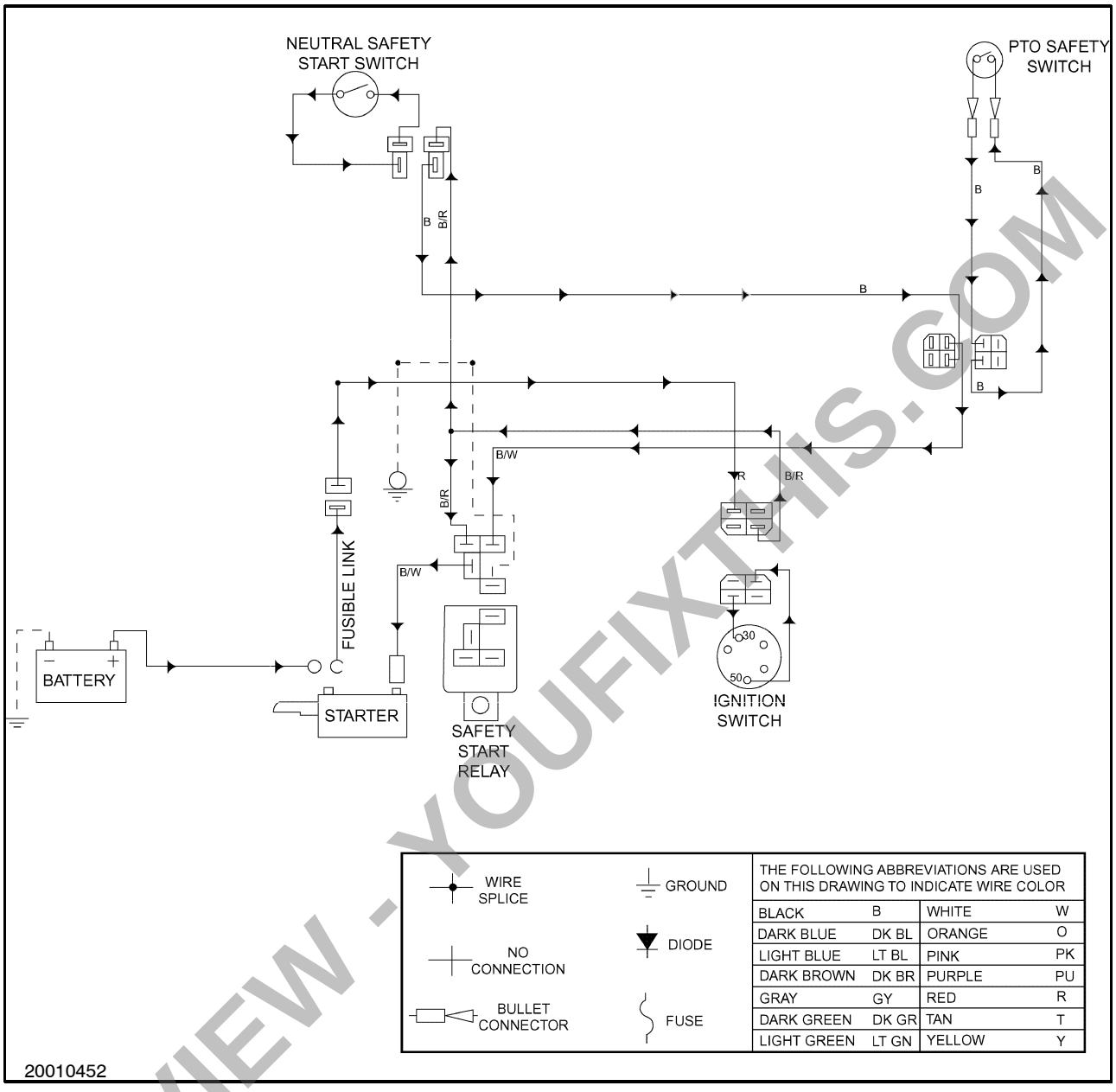



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**Starting Circuit**

1. Current flow starts at the positive (+) terminal of the tractor battery. From the battery, current flows to the engine starter motor through the positive (+) battery cable.

2. From the starter motor, current flows through the fusible link wire and through a connector to terminal 30 of the ignition switch. When the ignition switch is in the “START” position, current crosses from terminal 30 to terminal 50. Current then flows from terminal 50 through a connector to a wire splice. From the wire splice, current travels through a connector to the neutral safety switch.

3. When the tractor is in neutral, the neutral safety switch closes and allows current to flow through a connector to the PTO safety switch.

4. When the PTO is in the “OFF” position, the PTO safety switch closes and allows current to flow through a connector to the safety start relay. This energizes the safety start relay causing it to latch.

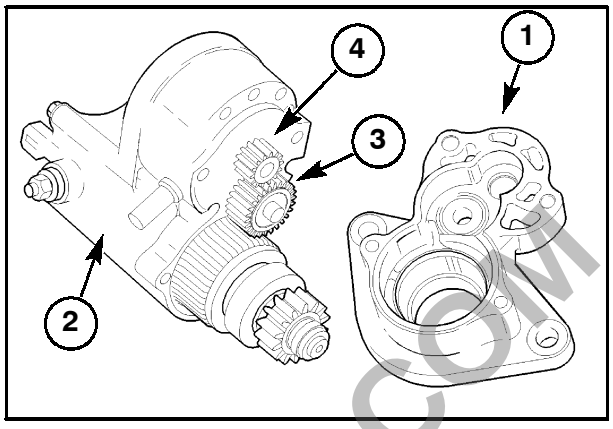
5. When the safety start relay is energized, the function circuit of the relay closes and the circuit to the engine starter solenoid and motor is completed, which will then power the starter motor.

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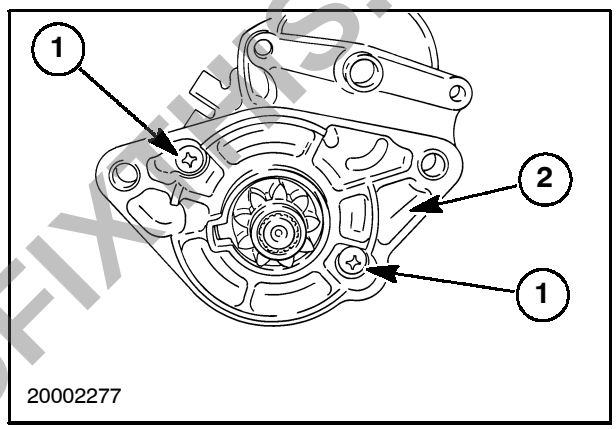
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5. Grease and install the pinion clutch, 5, in the starter housing. Make sure the rear clutch bearing is completely seated in the housing.
6. Grease the idler gear bearing and gear and install the gear, 3, and bearing onto the starter housing. Align the bearing and gear so that it meshes with the pinion clutch and is aligned with the hole in the housing for the pin which the bearing rides on.
7. Install the drive gear, 4, in the proper recess in the reduction unit cover, 1, as the cover is being installed onto starter motor housing.




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8. Secure the gear reduction cover, 2, with the two (2) retaining screws, 1.



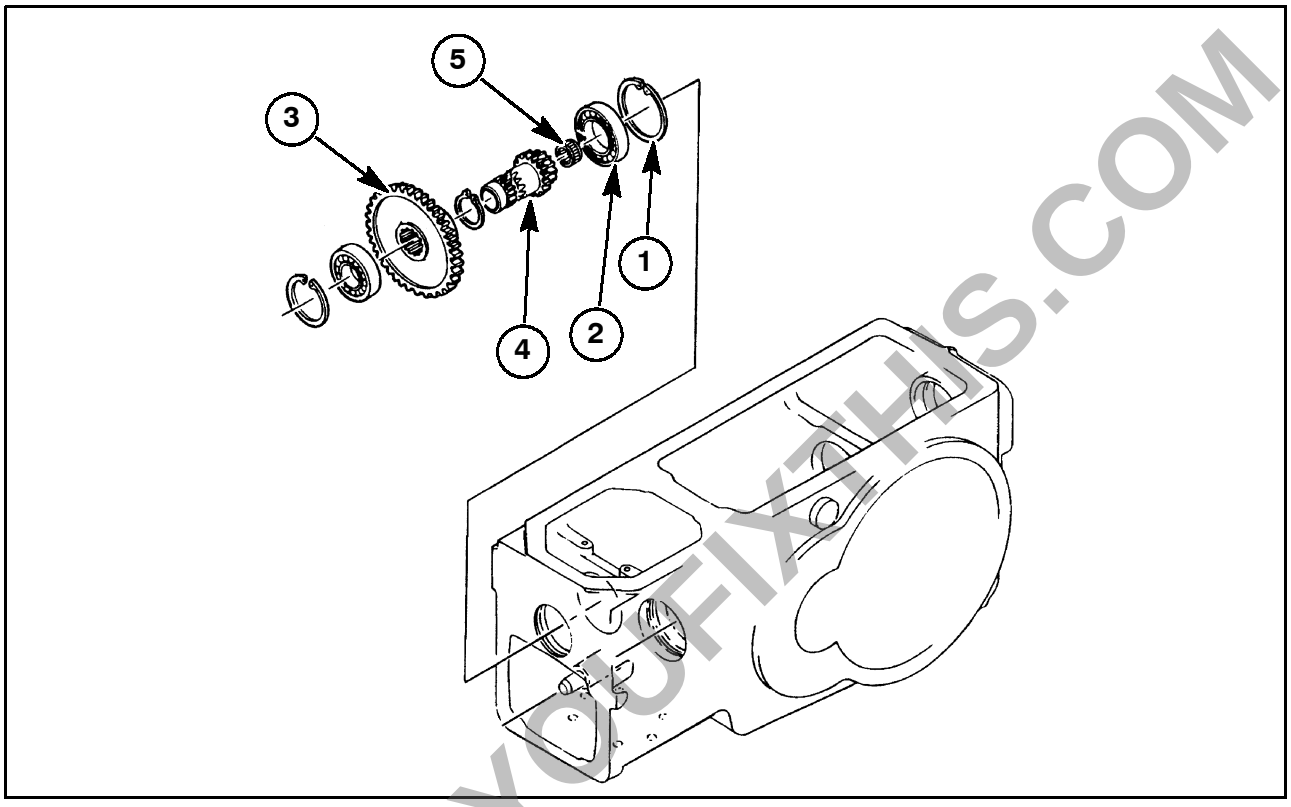

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5. Remove the snap ring, 1, from the behind of the rear bearing, 2. While supporting the creeper fixed gear, 3, remove the main shaft, 4, from the top of the housing. Remove the fixed gear, 3, from the top of the housing.

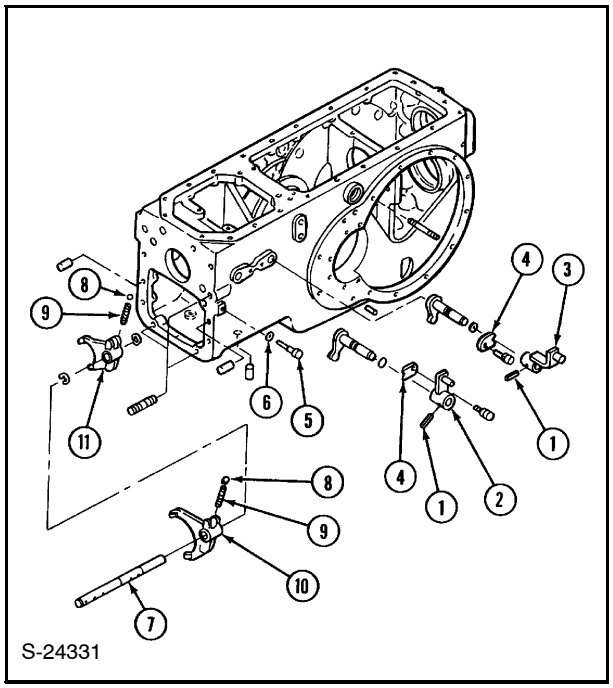



5

6. Drive out the roll pin(s), 1, from the change lever(s), 2 and 3.
7. Remove the shift arm locking plate(s), 4, from the housing.
8. Remove the creeper gear and/or front wheel drive gearshift rail locking bolt, 5, with sealing washer, 6, from the left hand of the housing.
9. Remove the shift rail, 7, from the front of the housing while supporting the shift fork(s). Using care no to lose the detent ball(s), 8, and spring(s), 9. Remove the shift fork(s), 10 and 11, from the top of the housing.

**⚠ WARNING ⚠**

**To prevent possible personal injury, wrap a shop towel around the shift fork and rod during removal, as the detent ball and spring may be expelled, with considerable force when disengaged.**




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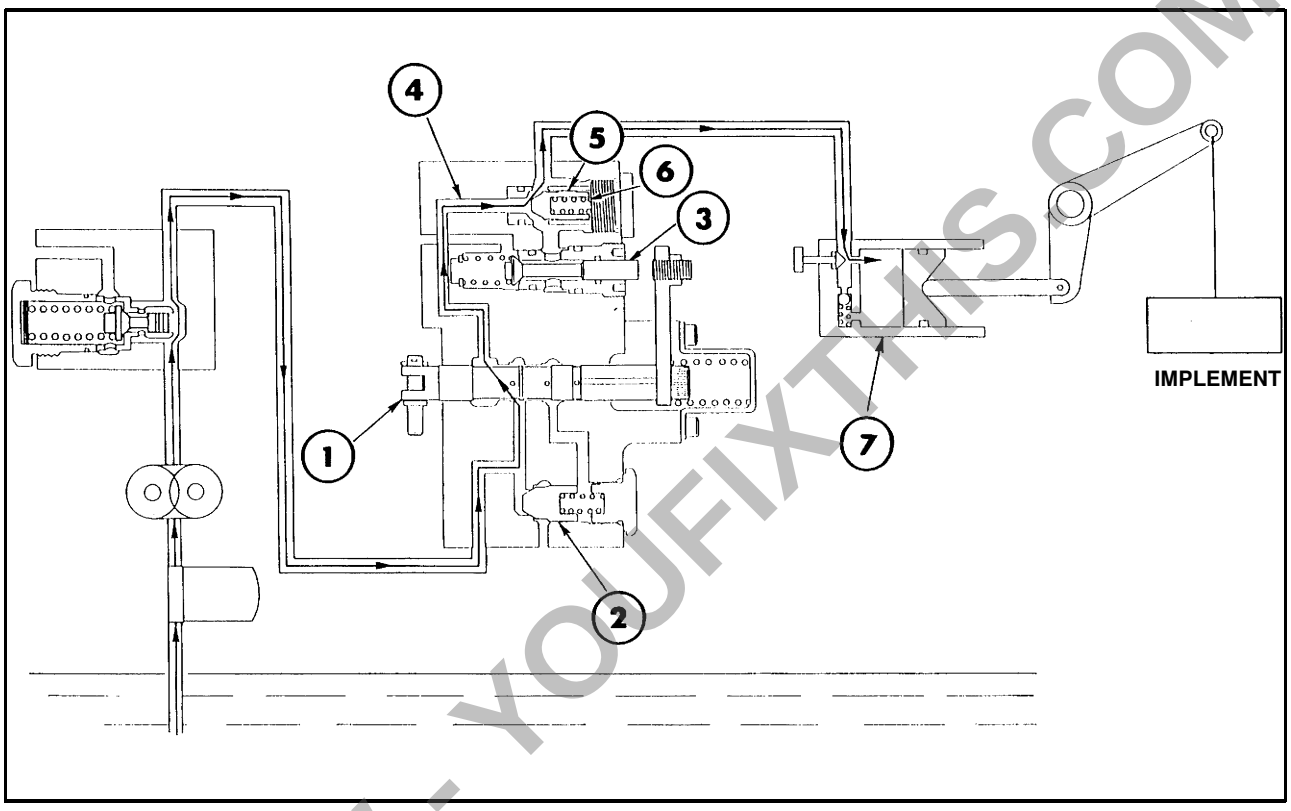
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**Raising Position-Fluid Flow**
**(Serial # UX 20373 and above)**

When the position control lever is moved to the raise position, the control valve spool, 1, is moved inward (rearward). The oil passages in the control valve are opened and oil flows through the check valve passage, 4, to the check valve, 5. The oil pressure against the check valve overcomes the check valve spring, 6, and lift cylinder oil static pressure on the check valve. This raises the check valve off the seat, allowing oil to flow to the lift cylinder, raising the implement. When the oil pressure exceeds system pressure, the relief valve opens and oil is returned to sump.




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1. Control Valve Spool
2. Unload Valve
3. Lowering Valve Spool
4. Check Valve Oil Passage
5. Check Valve
6. Check Valve Spring
7. Lift Cylinder

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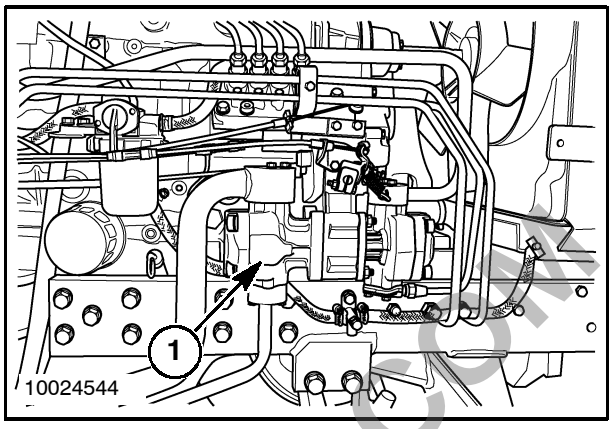


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## DESCRIPTION OF OPERATION

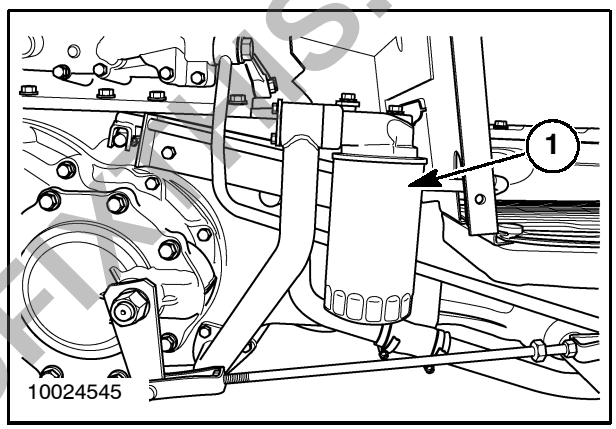
The hydraulic pump, 1, is mounted on the right side of the engine and is driven by the engine oil pump drive gear mounted on the front of the engine block.

The hydraulic pump is a gear type pump and, with the exception of replacing the seals, is not serviceable. The hydraulic pump must be serviced as a complete assembly.




1

A spin on type hydraulic suction filter, 1, is located on the right side of the rear axle center housing. The hydraulic fluid is drawn from the reservoir into the filter and then to the hydraulic pump. The filter should be changed after the first 50 hours of use and every 300 hours thereafter.

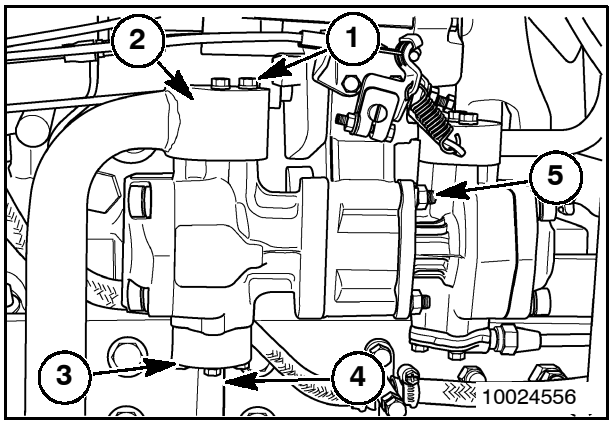



2

## HYDRAULIC PUMP

### Removal

1. Remove the suction tube flange bolts, 1, from the pump.
2. Remove the suction tube flange, 2, and tubing from the pump.
3. Remove the high pressure line attaching bolts, 3.
4. Remove the high pressure line, 4, from the pump.
5. Remove the pump mounting bolts and nuts, 5.
6. Remove the pump from the mounting plate.



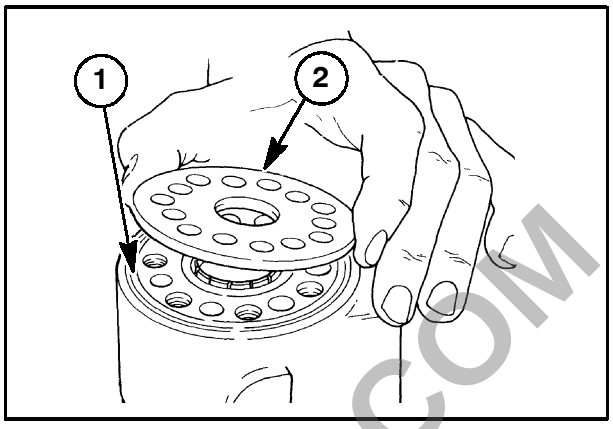

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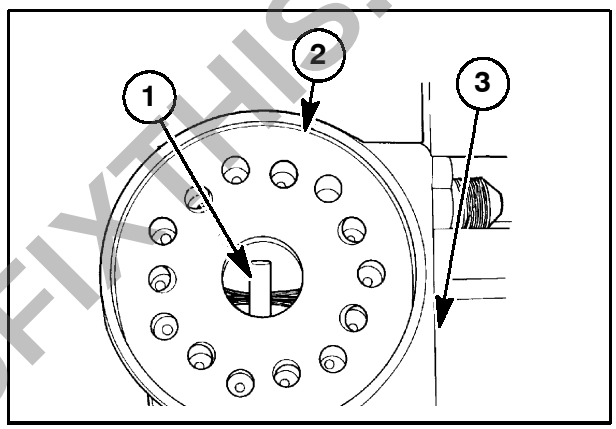
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12. Install a new O ring, 1, in the housing and position the spacer plate, 2, on the O ring so that the holes line up with those in the housing.



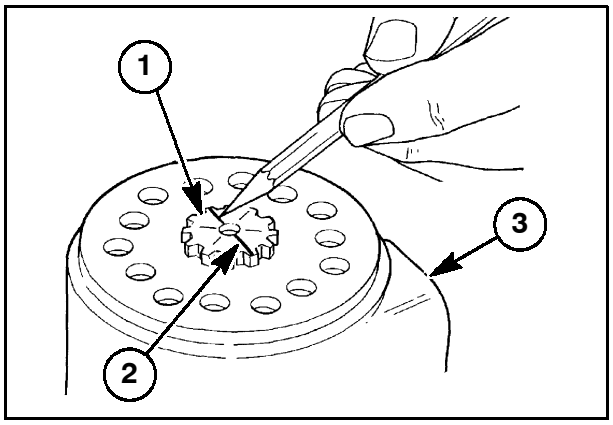

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13. Looking through the spacer plate end, 2, of the motor, position the spool and sleeve so that the pin, 1, is parallel with the port face of the steering motor housing, 3.




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14. Insert the drive shaft, 1, into the motor so that its slotted end engages the pin in the spool and sleeve. Mark a line, 2, on the face of the drive shaft that is parallel to the pin and to the port face of the steering motor housing, 3.




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