# John Deere 1000 Series Tractors

JOHN DEERE

## SERVICE MANUAL

John Deere 1000
Series Tractors

SM2033 01MAR65 English

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**John Deere Tractor Works**
**SM2033 01MAR65**

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# SERVICE MANUAL FOR JOHN DEERE DEALERS

# 1000 SERIES TRACTORS

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SM-2033 (7-61)



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## GREASES

SAE multipurpose type grease is recommended for all grease fittings and hand packing points on your tractor and its optional equipment.

SAE multipurpose type grease, made from lithium soap for extreme resistance to both heat and water washing, has a broad range of uses.

Single applications of these greases provide lubrication for a relatively long period and serve the important function of helping to keep contamination out of bearings.

## STORING LUBRICANTS

Use clean containers to store and handle all lubricants. The tractor can operate at top efficiency only if clean lubricants are used.

The tractor is equipped with safeguards, such as the air cleaner and oil filter, which are designed to keep dust, dirt, and other abrasives from reaching operating parts. Clean lubricants will help these safeguards do their jobs properly.

## LUBRICATION AND SERVICE INTERVALS

The lubrication and service periods for the tractor are daily or every 10 hours, every 100 hours, every 200 hours, every 600 hours, every 1200 hours, and every spring and fall season. These intervals are based on operation under normal conditions. When the tractor is operated under unusual conditions, such as excessive heat, cold or dust, the tractor should be checked and serviced at more frequent intervals.

The chart on the following pages is a condensed list of the tractor components to be serviced at each interval and the service to be performed.

## LUBRICATION TIMETABLE

| Component | Description of Service | Capacity or Measurement | Description of Lubricant |
|---|---|---|---|
| **EVERY 10 HOURS** | | | |
| Crankcase | Check oil level with dipstick | To "Full" mark | Oil types: DM or DS (diesel); MS (gasoline)<br>Above 90° F: SAE 30 or 20W-40<br>32° F. to 90° F: SAE 20W or 10W-30<br>-10° F. to 32° F: SAE 10W or 10W-30<br>Below -10° F: SAE 5W or 5W-20 |
| Air Cleaner | Check dirt and oil level in cup | To "Oil Level" line | Same as Crankcase (above) |
| Pre-cleaner | Clean out foreign material | . . . . . | . . . . . |
| Fuel Filter Sediment Bowl (Diesel) (42001-up) | Drain out water or dirt deposits | . . . . . | . . . . . |
| Roll-O-Matic Front Wheels (Row-Crop | Lubricate two fittings | Several strokes of grease gun | SAE multipurpose grease |
| Radiator | Check coolant level | Maintain midway between core and filler neck | See Section 80 |
| **EVERY 100 HOURS** | | | |
| Equalizer Lever | Lubricate one fitting | Two strokes of grease gun | SAE multipurpose grease |
| Hydraulic System | Check oil level at test cock | To level of test cock | John Deere Type 303 Special Purpose Oil* |

*~~Or its equivalent~~



*Or its equivalent

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# Group 15
# SPECIFICATIONS

| | Gasoline | Diesel |
|---|---|---|
| PERFORMANCE (OBSERVED AT NEBRASKA TESTS 802 and 803) | | |
| Maximum drawbar horsepower | 30.91 | 30.82 |
| Maximum power take-off horsepower | 36.13 | 35.99 |

CAPACITIES (U.S. STANDARD MEASURE)

| | |
|---|---|
| Fuel tank | 12 gals. |
| Cooling system | 2-3/4 gals. |
| Air cleaner cup | To mark |
| Engine lubrication (including filter) | 5 qts. |

| Transmission | Tractors (-42000) | Tractors (42001-Up) |
|---|---|---|
| (dual speed PTO) (O, RS, U) | 9 qts. | 13 qts. |
| (540 rpm PTO) (O, RS, U) | 10 qts. | 14 qts. |
| (dual speed PTO) (R, RU) | 12 qts. | 16 qts. |
| (540 rpm PTO) (R, RU, RUS) | 13 qts. | 17 qts. |

| | |
|---|---|
| Final drive cases (each) | |
| (O and U) | 1-1/4 qts. |
| (RS) | 1-3/4 qts. |
| (R, RU, RUS) | 3 qts. |
| Belt pulley | 3/4 qt. |
| Hydraulic system: | |
| Single (O, RS, U, RUS) | 4-1/2 qts. |
| Dual (RS) | 5-1/2 qts. |
| Single and dual (R, RU) | 4-1/4 qts. |

ENGINE

| | |
|---|---|
| Number of cylinders | 4 |
| Bore and stroke, inches | Gasoline, 3-1/2 x 3;<br>Diesel, 3-5/8 x 3-1/2 |
| Displacement in cubic inches | Gasoline, 115;<br>Diesel, 145 |
| Tappet clearance (engine cold) | |
| Intake valves | .012-inch |
| Exhaust valves | .018-inch |
| Compression ratio | Gasoline, 7.9 to 1*<br>Diesel, 19 to 1 |
| Engine speeds: | |
| Slow idle | 600 rpm, Gasoline<br>800 rpm, Diesel |
| SAE standard PTO engine speed | 1900 rpm |
| Fast idle for SAE standard PTO | 2100 rpm |
| Fast idle for full engine power | 2700 rpm, Gasoline<br>2650 rpm, Diesel |
| Full engine power | 2500 rpm |

**9.0 to 1 on high altitude engines*

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# Group 15
# TRACTOR ADJUSTMENT

The tractor adjustments given here will make the tractor safer to operate and easier to handle. While making these adjustments, check all bolts and cap screws on the tractor for proper tightness. The table below explains how various bolts and cap screws should be torqued.

## TORQUE CHART

| RECOMMENDED TORQUE IN FOOT-POUNDS COARSE AND FINE THREADS | | | |
|---|---|---|---|
| Bolt Diameter | Plain Head* | Three Radial Dashes* | Six Radial Dashes* |
| 1/4 | 6 | 10 | 14 |
| 5/16 | 13 | 20 | 30 |
| 3/8 | 23 | 35 | 50 |
| 7/16 | 35 | 55 | 80 |
| 1/2 | 55 | 85 | 130 |
| 9/16 | 75 | 130 | 185 |
| 5/8 | 105 | 170 | 250 |
| 3/4 | 185 | 300 | 420 |
| 7/8 | 160** | 445 | 670 |
| 1 | 250 | 670 | 1000 |

*The types of bolts and cap screws are identified by head markings as follows:

*Plain Head:* regular machine bolts and cap screws.

*3-Dash Head:* tempered steel high-strength bolts and cap screws.

*6-Dash Head:* tempered steel *extra* high-strength bolts and cap screws.

**Machine bolts and cap screws 7/8-inch and larger are sometimes formed hot rather than cold, which accounts for the lower torque.

## BRAKE ADJUSTMENT

The only brake adjustment is for correct free travel at the brake pedals.

The free travel adjustment is made by loosening lock nut and tightening brake adjustment nut to decrease brake clearance (see Figs. 40-15-1 and 2).

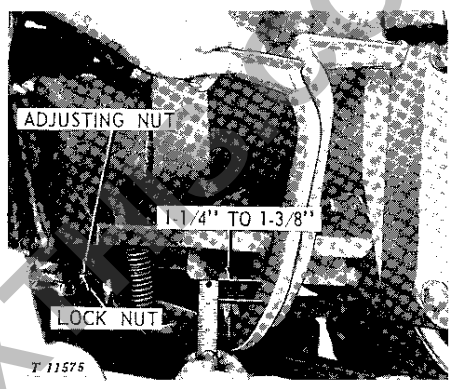



*Fig. 40-15-1–Adjusting Brakes (R, RU, and RUS)*

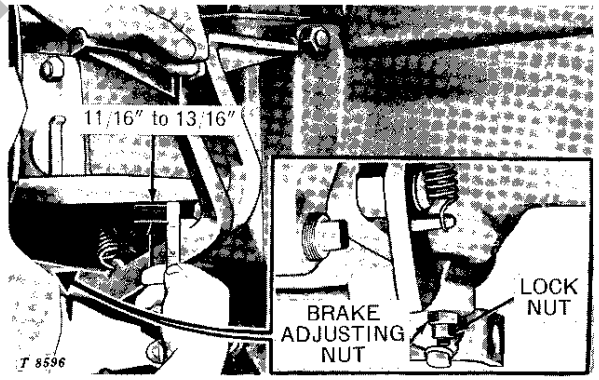



*Fig. 40-15-2–Adjusting Brakes (O, RS, and U)*

Turn adjusting nut until brake pedal free travel is correct as shown above when measured between the right foot rest and the brake pedal stop. If pedal pads are not in alignment when brakes are applied, equalize them by increasing the free travel on the one having the least free travel. (See Section 170 for detailed service information on brakes.)



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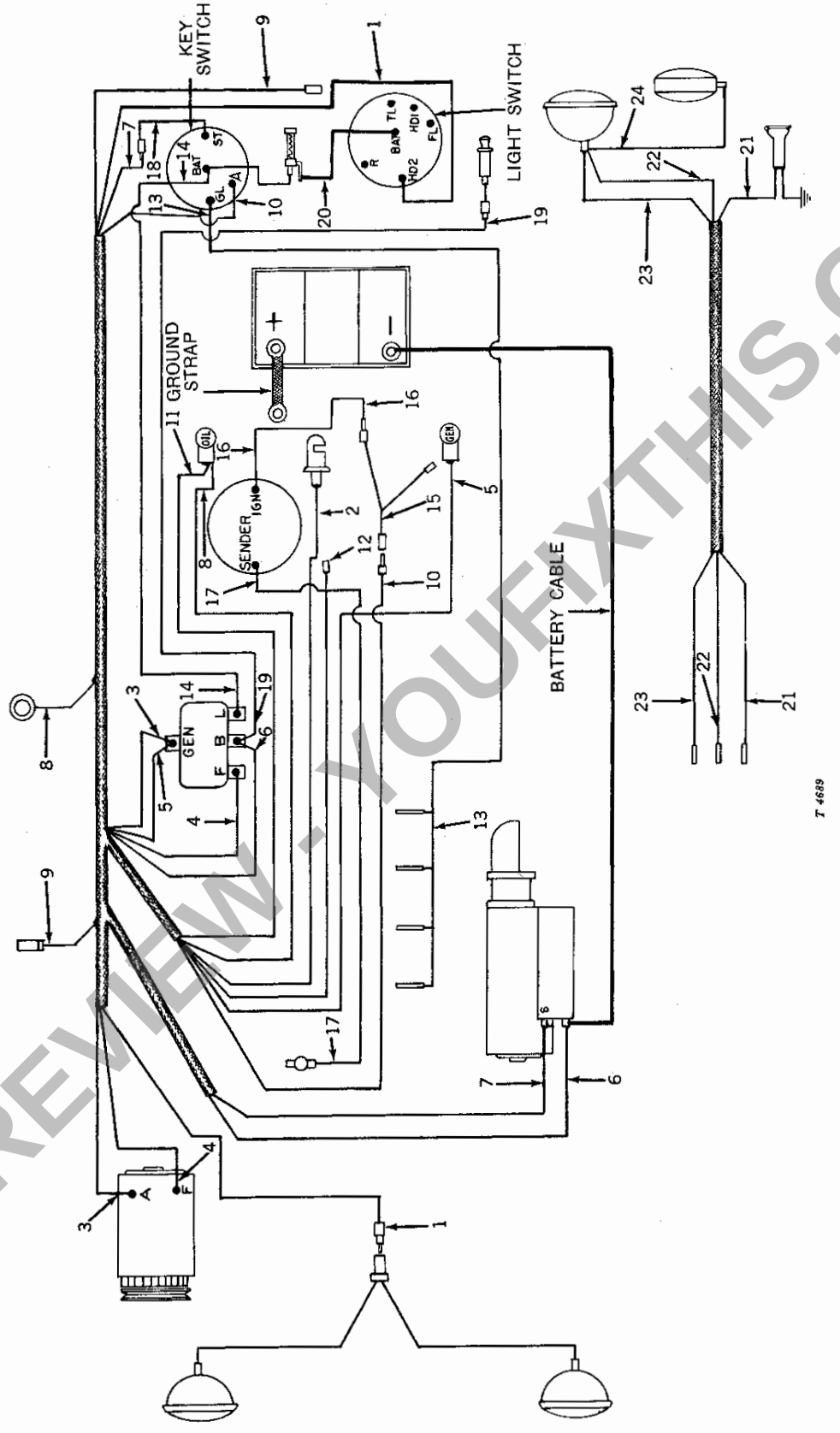



*Fig. 100-35-2—Schematic Diagram of Wiring System for 1010 Diesel Tractors ( —16648)*



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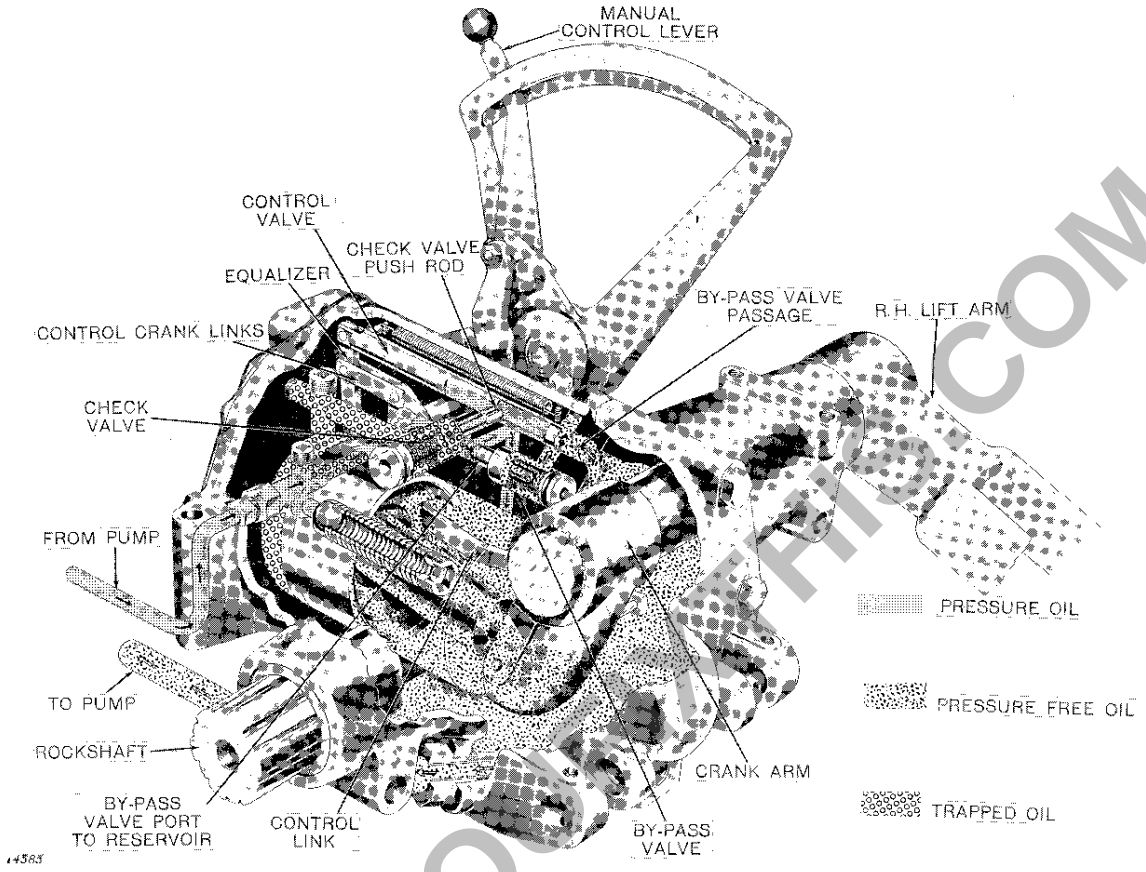



*Fig. 210-5-3—Single Hydraulic System in Neutral Position*

NEUTRAL POSITION

The flow of pressure oil is indicated by solid arrows and the flow of pressure-free oil by open arrows.

Each time a raising or lowering cycle of the hydraulic operation is completed, the system returns to a neutral position because of equalizer linkage and valve arrangement. In Fig. 210-5-3 we assume that a lowering cycle has been completed. The rockshaft and lift arms have reached the position corresponding to a position of the manual control lever. The control link connected to the crank arm has moved forward, pivoting the equalizer at the control crank link, pushing the control valve back until the check valve push rod is off the control valve ramp, allowing the check valve to snap shut. Since the passage at rear of bypass valve remains open, the pressure oil from the pump holds the bypass valve open, and flows past the valve to reservoir.



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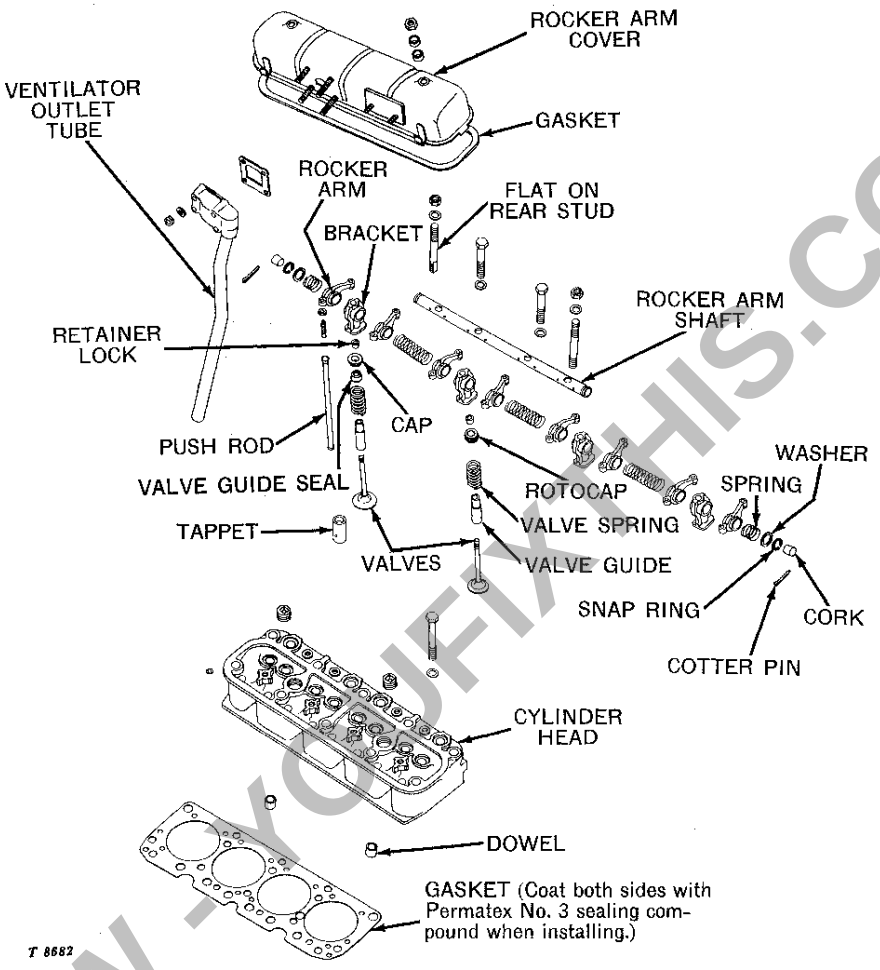



*Fig. 50-15-13–Exploded View of Cylinder Head*

Thoroughly clean holes in rocker arm mounting brackets. This is especially important for rear bracket, because it is through this hole that oil is fed to rocker arm shaft.

Check condition of oil deflectors (or valve guide seals) which fit over intake valve guides.

Replace parts as necessary.

*NOTE: If a failed valve has been replaced, also replace the rocker arm assembly for that valve. Often the rocker arm is bent or otherwise damaged when the valve fails, even though this may not be noticeable.*



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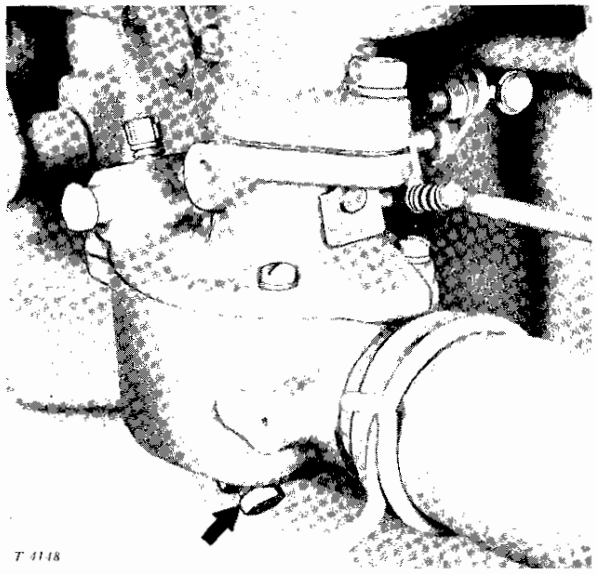



*Fig. 10-10-8—Carburetor Drain Plug*

If tractor is not to be used for several days, shut off gasoline supply at fuel shut-off valve, located below the gasoline tank. (Fig. 10-10-3.) Open drain plug on underside of carburetor and drain carburetor. Be sure to replace this plug after draining, to prevent dirt from entering carburetor. Draining will prevent accumulation of gum in carburetor, caused by evaporation of gasoline. This gum is a contributing factor to hard starting and poor engine operation.

DIESEL ENGINE

Stop the engine by performing the following sequence of operations.

1. Allow engine to idle at 1000 rpm for a short time.

2. Turn key switch to "OFF" (vertical) position and pull out engine stop knob to cut off fuel. Pulling out the engine stop knob will place the pump in the "NO FUEL" position.

CAUTION: Do not attempt to stop engine by turning off fuel supply at fuel tank shut-off valve. Doing so will cause pump to run dry and damage internal parts.

## ENGINE BREAK-IN

Before the tractor was shipped from the factory, all bearings and friction surfaces were correctly fitted, and crankcase was filled with a "breaking-in" oil.

To be sure that all bearing surfaces will be properly lubricated, operate tractor under normal load for the first 20 hours of operation. Light loads and excessive engine idling should be avoided in order that piston rings may be properly seated. Check periodically to be sure that an adequate supply of oil is maintained in the crankcase. If it becomes necessary to add oil during "breaking-in" period either SAE 10W or SAE 5W-20 can be used. At the end of this 20 hour period, "breaking-in" oil should be drained, oil filter changed, and crankcase filled with new oil in accordance with recommendations in Section 30 of this Manual.

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# Section 40
# ENGINE TUNE-UP AND TRACTOR ADJUSTMENT

## Group 5
## PURPOSE OF TUNE-UP AND ADJUSTMENT

Tune-up means making minor adjustments and repairs in an orderly sequence to improve the operation of the tractor. The procedure given here has proved most successful, and should be used step-by-step to put the customer's tractor in top-notch running condition.

Generally, the customer's complaint will decide which system or part of the tractor is checked first. But within each area, the prescribed order of checks and adjustments should be followed.

Unless otherwise noted, the tune-up procedures given apply to all 1000 Series Tire-Type Tractors.

### VISUAL INSPECTION

A visual inspection can give definite clues to the tractor's condition. These clues may suggest checks and adjustments, which are given in Groups 10 and 15 of this Section.

#### OIL AND WATER LEAKAGE

Make a general check of all external areas of tractor and engine, including lines, hoses, and connections. Look for evidence of oil or water leakage.

#### ELECTRICAL AND IGNITION SYSTEM

Note general condition of wiring and battery cables. Check for oil-soaked, frayed or damaged insulation and excessive corrosion.

On tractors with gasoline engine, check distributor for cracked cap, excessive dirt, or grease. Inspect spark plug and ignition coil connections for corrosion or excess dirt or moisture which might cause shorting.

Check battery for excessive corrosion, cracked case, correct caps, amount of electrolyte, proper mounting and cable connections.

Inspect starter and generator for excessive dirt or grease, loose cables and worn wiring. Check belt for wear, cracks, or frayed condition.

Check lights for proper operation. Dash lamp should also light up when light switch is moved to any position from "OFF."

Turn the starter switch to the "ON" position. The generator and oil pressure indicator lights on the dash should light up. If they fail to light when the switch key is turned on, see Section 100, Group 35 of this Manual.

Start the engine and note the oil pressure and generator indicator lights. These lights should go out within a 15 or 20 second period. If oil pressure indicator light glows after the prescribed period of operation, shut off engine and determine the cause of reduced oil pressure. Oil pressure should be rechecked with a master gauge before attempting to locate the failure, as outlined in Section 60, Group 5.

#### EXHAUST SMOKE ANALYSIS

Warm up engine to normal operating temperature, and observe exhaust smoke for the following conditions.

*Diesel Engines*

Black or Gray Exhaust Smoke

Use of an improper grade of fuel will cause black or gray smoke. See "Fuel Specifications," Section 91, Group 5.

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## TO THE JOHN DEERE SERVICEMAN

This service manual contains maintenance instructions for John Deere 1000 Series tractors. Included are complete instructions for removal, disassembly, inspection, repair, assembly and installation of the major parts and assemblies of the tractor.

In addition, the manual contains brief descriptions of the more complicated systems of the tractor, and tells how they operate. Dimensions of many new wearing parts are given as an aid in determining when parts replacement is necessary. Tests and adjustments, required to keep the tractor operating efficiently, are explained in detail.

A section on "Tune-Up and Adjustment" contains instructions for performing the services necessary to help the tractor perform efficiently and economically after it has been in the field for some time.

This manual was planned and written for the Service Department; its place is in the shop. Use the manual whenever in doubt about correct maintenance procedures. Use it as a text book for training new Service Department personnel who are unfamiliar with John Deere Tractors.

Daily use of the Service Manual as a guide for any and all service problems will reduce error and costly delay to a minimum and assure you the best in finished service work. In many instances your customer's confidence in your work will be improved when he sees you using the Service Manual. He knows you are following approved maintenance procedures and making proper adjustments. There is no guesswork when you use the manual.






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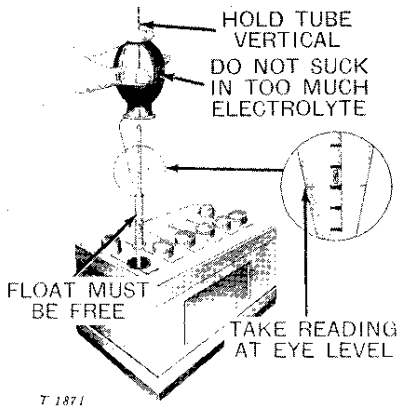



*Fig. 40-10-4—Checking Specific Gravity of Battery*

Check specific gravity of battery (Fig. 40-10-4). If specific gravity of battery is below 1.225, recharge the battery (Section 100, Group 30).

STARTER, GENERATOR

Complete service information on starting motors and generators is covered in Service Manual SM-2029, John Deere Electrical Systems.

DISTRIBUTOR

Test and service distributor, following instructions given in Section 100, Group 5 of this Manual, and in Service Manual SM-2029, John Deere Electrical Systems.




*Fig. 40-10-5—Setting Distributor Point Gap*

The distributor rotates counterclockwise, viewed from the top. The automatic spark advance is 26 degrees of engine rotation. Clean points to remove corrosion and set point gap to .022 inch (Fig. 40-10-5). Pitted or corroded points cannot be accurately set with a feeler gauge. (For details, see Section 100, Group 5 of this Manual.)

**Timing Distributor with Power Timing Light**

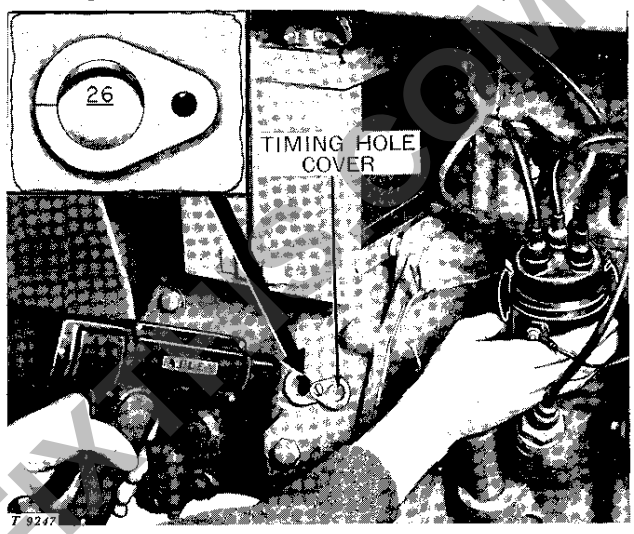



*Fig. 40-10-6—Timing Distributor with Timing Light*

Although the distributor can be timed either by use of a power timing light or by the manual method, it is highly recommended that the power timing light method be used.

Instructions for using power timing lights are provided by the timing light manufacturer. However, the following steps must be taken to prepare the engine for timing by this method.

1. Start engine and allow it to run until normal operating temperature is reached.
2. Uncover timing hole (Fig. 40-10-6).
3. Stop engine and follow manufacturer's instructions for attaching timing light leads to battery and to No. 1 (front) spark plug. (Positive side of battery is grounded in 1000 Series Tractors.)
4. Start engine and bring it up to 2500 rpm, plus or minus 25 rpm.
5. Loosen distributor attaching cap screws.
6. Direct timing light toward timing hole in center frame (Fig. 40-10-6) and rotate distributor body until "26" mark on flywheel lines up with mark on timing hole.
7. Hold distributor in this timed position and tighten attaching cap screws.
8. Recheck position of "26" mark. When engine is properly timed, remove timing light leads in order outlined in manufacturer's instructions.
9. Slide cover over timing hole and tighten screw securely.



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## INSPECTION AND REPAIR OF CAMSHAFT, CYLINDER BLOCK, AND CYLINDER LINER PLATE ASSEMBLY

### CAMSHAFT

Inspect camshaft journals for signs of wear or out-of-round condition. Measure inside diameter of camshaft bearings in cylinder block. In all cases there must be a bearing clearance of at least .001-inch to provide space for bearing oil film. Refer to Group 30 of this Section for camshaft bearing and journal dimensions.

Inspect drive gear in center of camshaft and inspect camshaft lobes for wear or damage.

Inspect camshaft gear for damage and replace if necessary.

Inspect tappets for wear or damage and replace if necessary.

### CYLINDER BLOCK

Strip off all gaskets adhering to cylinder block surfaces and clean exterior and interior of cylinder block and all passages with steam or a cleaning solvent.

NOTE: Cylinder liner plate assembly need not be removed for cleaning or honing.

Inspect cylinder block for cracks or fractures. Check cylinder liner walls for scoring or other damage. Replace the block if damage is serious. If damage is in cylinder walls, only the cylinder liner plate assembly need be replaced.

Cylinder Bore Measurements (Fig. 50-25-17).

1. With cylinder liner plate firmly bolted to block by two diagonally-located bolts, measure inside diameter of the cylinder bore crosswise of the liner. Take readings at points approximately 3/8-inch and 4 inches below top of cylinder bore and at approximately 3/8-inch and 2-1/2-inches above the bottom of the cylinder bore (ring travel zone).

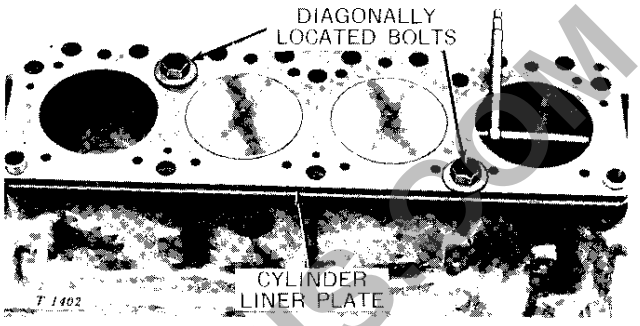



*Fig. 50-25-17 -- Measuring Cylinder Bore*

2. Repeat procedure in step (1), this time measuring cylinder bores lengthwise of the liner. Comparison of readings in steps (1) and (2) with specifications of bores in a new liner will show the amount of wear.

Refer to Group 30 of this Section for original dimensions of cylinder liner bores.

NOTE: While the determining factor as to when a cylinder liner plate assembly should be replaced is directly connected with the performance of the engine at time of disassembly, .010-inch oversize is the wear limit at which normal replacement should take place:

If any measurement taken in the liner walls exceeds .010-inch oversize, liner plate assembly should be replaced. NOTE: Normally, pistons should be replaced when a new liner plate assembly is installed.

Breaking Glaze in Cylinder Bores.

The glazed surface in the cylinder liners should be removed before engine is reassembled. Instructions for removing glaze are furnished by the hone manufacturer.

NOTE: Bolt down plate while honing cylinder liners (Fig. 50-25-17).



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## INSTALLATION OF CAMSHAFT

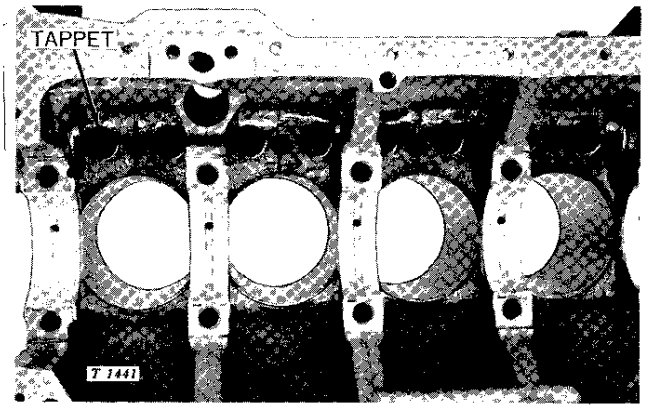



*Fig. 51-25-23 -- Tappets Installed*

### INSTALL TAPPETS

Place tappets in tappet bores (Fig. 51-25-23) so that open end will face away from camshaft.

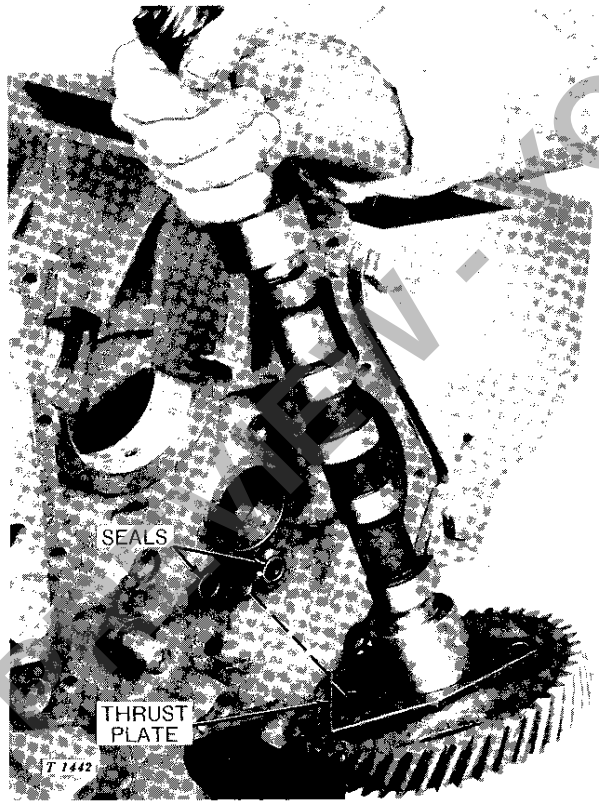



*Fig. 51-25-24 -- Position of Camshaft Thrust Plate*

### INSTALL CAMSHAFT

NOTE: Make sure the oil seals for the oil passages in the camshaft mounting pad are in position in their counterbores (Fig. 51-25-24).

Coat entire camshaft with a film of light oil and slip it into front camshaft bearing.

CAUTION: Be careful while installing camshaft that camshaft bearings are not damaged by dragging lobes of camshaft across them.

Push camshaft into place. If crankshaft has not been removed, mesh proper teeth so that timing marks on crankshaft gear and on camshaft gear are together (Fig. 51-25-26). Install camshaft attaching cap screws and locks. Tighten securely and turn tab of lock against flat of cap screw heads (Fig. 51-25-8).

CAUTION: Be sure to position camshaft thrust plate so that the two square corners of thrust plate cover seals and oil passages in block (Fig. 51-25-24).

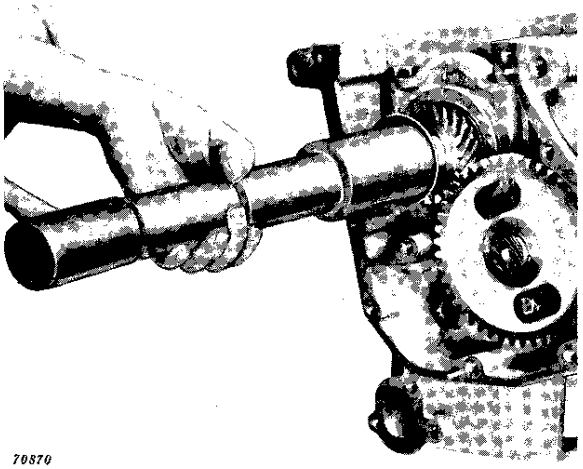
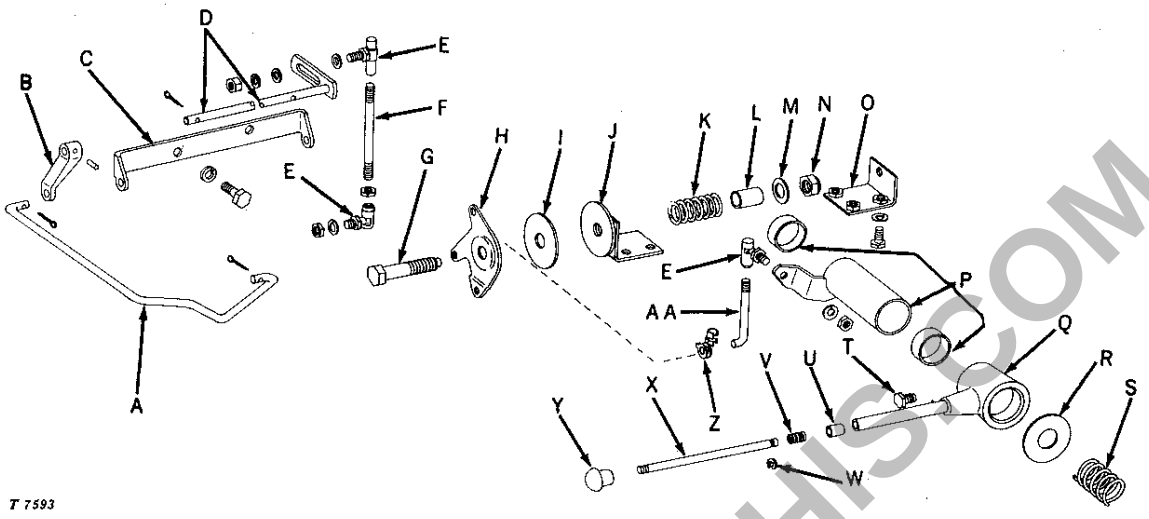



*Fig. 51-25-25 -- Installing Oil Thrower*

NOTE: If camshaft was removed without removing crankshaft, install oil thrower as shown in Fig. 51-25-25.



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A – Speed Control Rod
B – Control Lever
C – Control Bracket
D – Slotted Control Lever
E – Ball Joint Ends
F – Pump Control Rod
G – Stop Bolt
H – Friction Lever
I – Friction Disk
J – Friction Bracket
K – Spring
L – Spring Spacer Insert
M – Plain Washer
N – Stop Nut
O – Support Bracket
P – Tube Assembly (with Bushings)
Q – Hand Throttle Hub Assembly
R – Plain Washer
S – Spring
T – Hub Cap Screw
U – Guide
V – Spring
W – Retainer Ring
X – Throttle Stop Shaft
Y – Throttle Knob
Z – Clevis Clip
AA – Rear Control Rod

*Fig. 70-15-5–Exploded View of Speed Control Linkage (31001–Up)*

Inspect ball joints (E) on pump control rod (F) for wear or looseness.

If necessary, check injection pump for proper idling and speed advancing (Section 91, Group 20).

## ASSEMBLY AND INSTALLATION

*NOTE: See exploded views in Figs. 70-15-3, 70-15-4, and 70-15-5 for general parts guide.*

SPEED CONTROL LINKAGE TO PUMP

Refer to Fig. 70-15-6 and install parts as follows:

Insert control shaft and washer in left side of control bracket as shown. On tractors 20735-31000, place set screw stop on shaft inside bracket and secure to shaft with groov-pin. Place control lever on end of shaft and drive in groov-pin. Use washer and cotter pin at right side of shaft to hold shaft against bracket.

Install control bracket on rear of engine as shown and secure with two cap screws and lock washers.

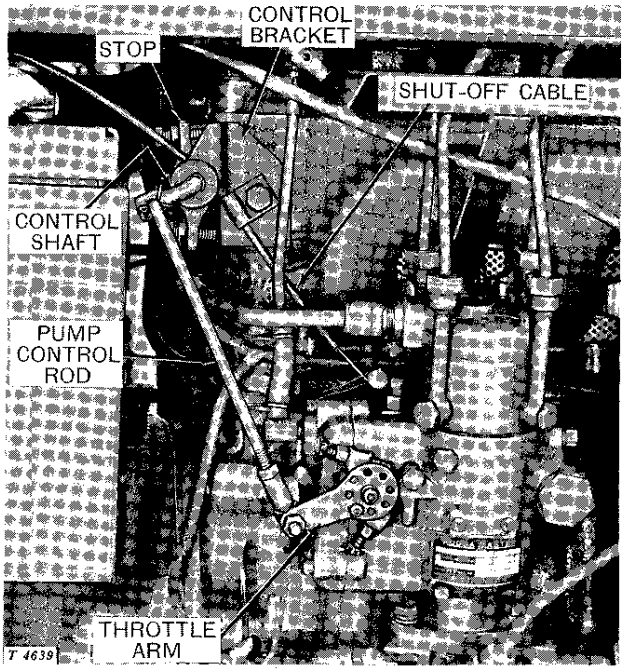



*Fig. 70-15-6–Speed Control Linkage to Injection Pump ( –31000 Shown)*



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# Group 20
# FUEL INJECTION PUMP

## DESCRIPTION AND OPERATION

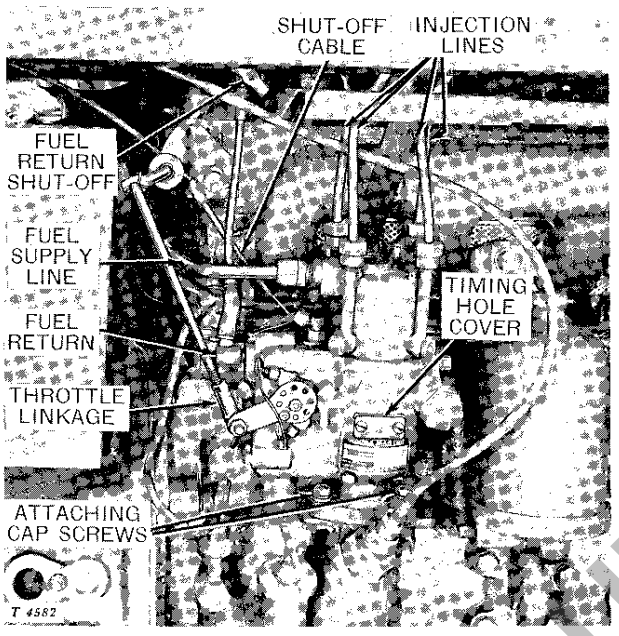



*Fig. 91-20-1—Fuel Injection Pump ( —31000)*

The fuel injection pump is mounted vertically on the right-hand side of the engine between the No. 3 and No. 4 cylinders (Fig. 91-20-1). The distributor is mounted in this location on the gasoline spark ignition engine.

The pump is a single cylinder, opposed plunger, inlet metering, distributor type. Its rotating parts (drive shaft, governor weights and retainer, rotor assembly, and transfer pump) revolve on a common axis. The pump contains its own mechanical or flyweight-type governor, capable of close speed regulation. The transfer pump, on the opposite end of the rotor assembly from the pumping cylinder, is of the positive displacement, vane type.

The function of the pump is to meter fuel with extreme accuracy to each cylinder, injecting at high pressure through nozzles into the combustion chamber at precisely timed intervals.

Air is drawn into the cylinder through the intake valve and compressed. A metered quantity of fuel is then injected into the cylinder, producing a combustible mixture which expands when self-ignited by its own high temperature. This action forces the piston downward. In the gasoline engine, the fuel and air are mixed in the carburetor before entering the cylinder, where ignition is caused by an electric spark.

Diesel fuel is delivered from the fuel tank, through the fuel filter and fuel strainer, by the vane-type transfer pump.

## IDENTIFICATION

The pump model and its characteristics are shown in code form on the name plate on the pump. The fuel injection pump on the 1000 Series Tractors carries the code DBGVC429-1J or DBGVC429-1DH. This code identifies the pump as follows: DB-model of pump; G-flyweight-type governor; V-vertical mounting; C-clockwise rotation (as viewed from drive end of pump); 4-four cylinder engine; 29-0.290-inch diameter plungers; and 1J or 1DH-JD application number.

## REMOVAL

Clean the pump, fittings, and all connections to be broken (Fig. 91-20-1) with diesel fuel or a steam cleaner. This will eliminate any chance of dirt entering the fuel system when the lines are disconnected.

**CAUTION: Never pour cold water on a warm injection pump. This could cause seizure of the pump.**

NOTE: All openings should be temporarily plugged with masking tape as the lines are disconnected. This will prevent entry of dirt and other foreign material which may damage the pump and plug the injector nozzles.

Remove the timing hole cover on name plate side of pump. Install timing window No. 13366. Bar the engine in the direction of rotation (counterclockwise as viewed from flywheel end) until the timing line on the governor weight retainer hub registers with the timing line on the cam.

Close the fuel supply and return shut-offs under the fuel tank to prevent fuel from flowing from the tank.

Disconnect the fuel supply, fuel return, and all high pressure lines to the pump. Plug all openings.



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## SERVICE

### LIGHT SWITCH

If visual inspection shows external damage or defective contacts, replace switch. Remove either cowl support panel and pull wires from switch terminal blades.

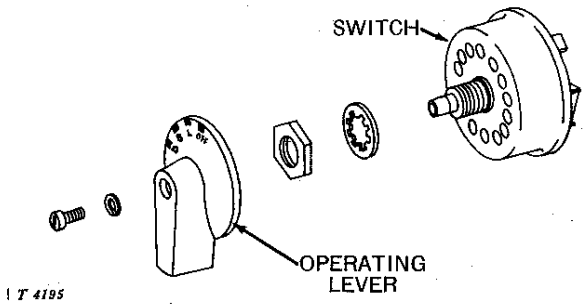



*Fig. 100-40-5—Exploded View of Light Switch*

Remove switch operating lever, hex. nut, internal tooth lock washer, and pull switch from panel.

### IGNITION SWITCH

If switch is defective, replace switch. Remove either cowl support panel and disconnect wires from switch terminals.

Remove hex. nut and internal tooth lock washers, and pull switch from panel.

The switch contains a resistor unit (back side of switch). This unit is not replaceable, and if inspection shows it to be defective, the switch assembly should be replaced.

### WIRING HARNESS

Clean corrosion from all connections and terminals and inspect all wires for excessively frayed or worn insulation. Be sure all terminal screws are kept tight.



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Remove shafts and forks (Fig. 120-11-3) in the following order: (1) 2nd and reverse speed; (2) 1st and 5th speed (or 1st and 4th speed); (3) 3rd and 4th speed (or 3rd and 5th speed).

Before removing a shaft and fork, be sure the others are locked in neutral. Then shift the fork to be removed against boss in cover. This avoids bending shaft when pin is removed. Drive out groov-pin which holds fork to shaft. Then drive out shaft using a brass drift.

Remove poppet balls and springs, interlock balls, and interlock pin.

## INSPECTION AND REPAIR

See exploded view (Fig. 120-11-4 or 120-11-5) to identify parts.

SHIFT LEVER LOCK PIN

Examine lock pin (H) in upper bore of cover. This pin keeps shift lever from rotating. If pin is worn or damaged, drive out and replace. Install new pin from inside and rivet outer end until pin is tight.

SHIFT LEVER

Check shift lever lock pin groove for excessive wear or rough edges. File off any burrs.

SHIFTER GUIDE AND SPRING

Examine shifter guide (A) for wear in notches. Check spring for rust and stretch. Replace if necessary.

SHIFTER SHAFTS

Be sure all shafts are straight. Examine around notches and holes for wear or burrs.

INTERLOCK PIN AND BALLS

Check pin (R) for damage or wear on ends. New pin is 0.527 - 0.532-inch long. If pin is damaged or worn excessively, it will not actuate balls to operate shifters properly. Inspect all balls for any flat spots which might prevent them from rolling freely.

## ASSEMBLY

*NOTE: Use Fig. 120-11-4 or 120-11-5 as a guide for correct reassembly of parts.*

Be sure to install each fork and shaft in its proper position. All balls are identical and interchangeable. Shafts can be identified as follows:

2nd and reverse shaft (T): Shaft has only one hole drilled through.

1st and 5th shaft (or 1st and 4th) (Q): Shaft has two holes drilled through, one hole having notches at each end for interlock balls.

3rd and 4th shaft (or 3rd and 5th) (L): Shaft has two plain holes drilled through.

INSTALL 3RD AND 4TH (OR 3RD AND 5TH) SPEED FORK, SHAFT, AND SHIFTER

Assemble fork (O) to shaft (L) so that when shaft is installed in cover, open end of fork will face rounded edge of cover and notch for interlock pin will face center shaft.

Slip shaft partway into cover and insert poppet spring and ball. Hold down on ball while sliding shaft through poppet boss. Slip shifter (K) on shaft with open side of shifter toward center shaft.

Line up holes in shaft and shifter and drive in groov-pin. Insert two balls in long interlock bore of boss (See Fig. 120-11-6).

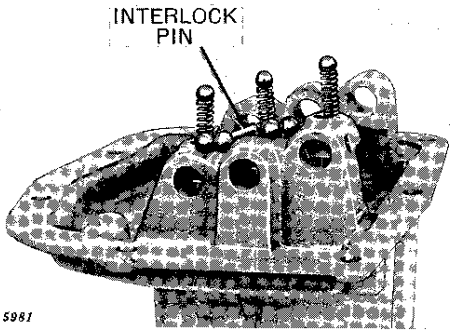



*Fig. 120-11-6—Relative Location of Poppet Springs and Balls and Interlock Springs and Balls*



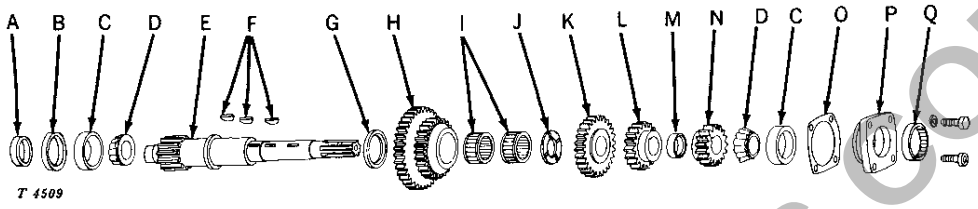
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## INSPECTION AND REPAIR

INPUT SHAFT

NOTE: Refer to Figures 120-25-10 and 120-25-11 for identification of parts.




A – Spacer
B – Oil Seal
C – Bearing Cup
D – Bearing Cone
E – Input Shaft
F – Woodruff Key
G – Rear Washer
H – First Speed Cluster Gear
I – Roller Bearings
J – Thrust Washer
K – Fifth Speed Gear
L – Fourth Speed Gear
M – Spacer
N – Third Speed Gear
O – Shim
P – Quill
Q – Needle Bearing

*Fig. 120-25-10–Exploded View of Input Shaft*

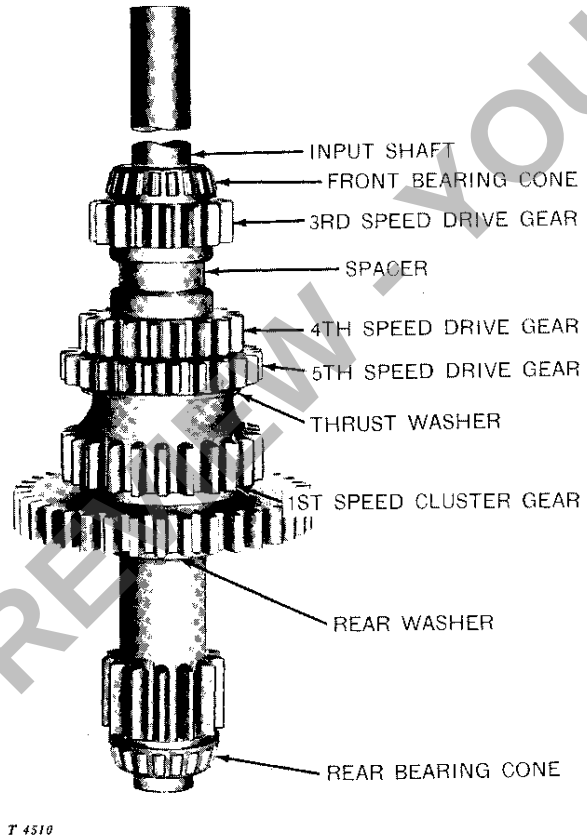



*Fig. 120-25-11–Input Shaft Assembly*

Inspect input shaft as a unit for damage or excessive wear. Check bearings for damaged or worn rollers. See that the cluster gear (H) rotates freely but without excessive looseness. If inspection shows that the input shaft must be disassembled for parts replacement, proceed as follows:

*Disassembly*

Use a knife-edge puller to remove bearing cones.

NOTE: If rear bearing is in satisfactory condition, it need not be removed to disassemble the remainder of the input shaft.

With an arbor press or gear puller, remove third-speed drive gear (N). Remove Woodruff key (F) and lift spacer (M) from splined end of shaft. Pull fourth-speed drive gear (L) and pry out Woodruff key. Pull fifth-speed drive gear (K). Pry out Woodruff key, slide off thrust washer (J), and slip cluster gear (H) with its roller bearings and rear washer (G) from shaft.

Check spacers and washers for excessive wear. Refer to Group 35 for dimensions of new parts.



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Inspect both housing needle bearings for excessive wear or damage. If replacement is necessary, use a JD214 Tool to press in new bearing, (numbered side facing driver), flush with face of bore.

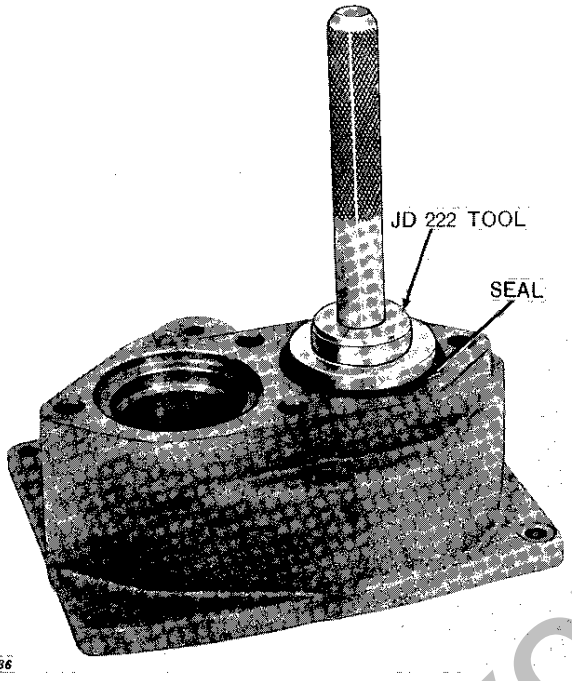



*Fig. 130-15-8–Pressing Oil Seal in Powershaft Gear Housing*

Inspect both housing oil seals for wear or damage. If replacement is necessary, use JD222 Tool to press in new seal with spring side of seal facing inward (Fig. 130-15-8). Coat sealing lips with multipurpose grease.

Reassemble idler gear assembly (Fig. 130-15-5).

Inspect splines on dual speed PTO stub shaft for excessive wear or damage. If there is any question regarding the serviceability of the stub shaft, it should be replaced.

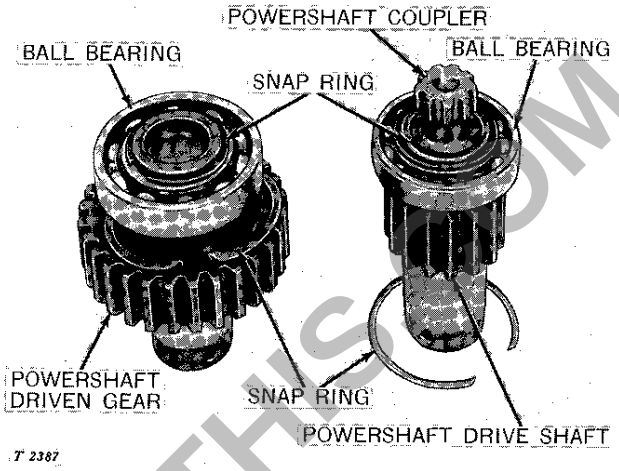



*Fig. 130-15-9–Driven Gear and Drive Shaft Assemblies*

Inspect driven gear for excessive tooth wear or broken teeth.

Inspect ball bearing for excessive wear or damage, and replace if necessary.

Inspect driven gear plug and snap rings for damage, and replace as necessary.

Inspect drive shaft for excessive tooth wear or broken teeth.

Inspect ball bearings for excessive wear or damage, and replace if necessary.

Inspect snap rings for damage and replace if necessary.

Inspect splines on powershaft coupler for excessive wear or damage and replace if necessary.



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On tractors equipped with power steering, disconnect the steering shaft as follows:

On tractors ( -48584), drive out the pin attaching the coupling to the power steering valve. On tractors (48585-up) remove snap ring from coupling and remove both pins.

Remove the cap screw in the rear coupling joining steering shaft and universal joint. Slide coupling rearward on universal joint to free shaft (Fig. 180-5-1).

Slide steering shaft rearward and remove coupling from front of steering shaft.

REMOVING UNIVERSAL JOINT ASSEMBLY

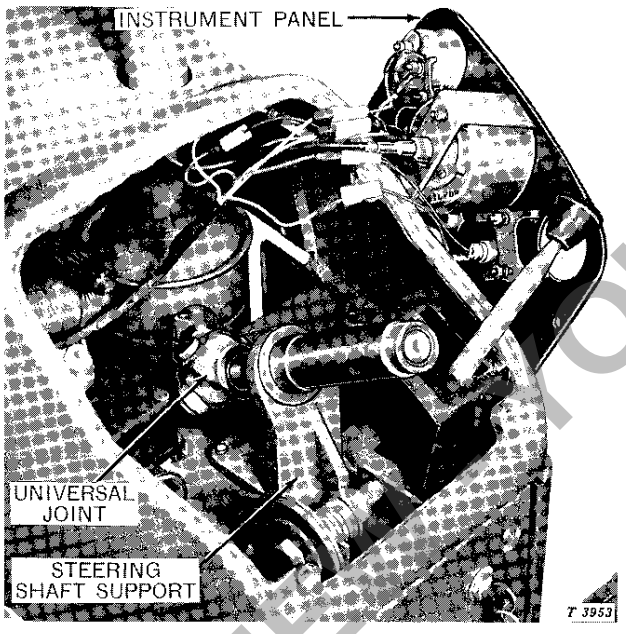



*Fig. 180-5-4—Instrument Panel Removed*

To remove universal joint assembly, remove steering wheel emblem. Back nut off flush with end of shaft. Tap end of shaft and nut to loosen steering wheel; or remove the nut and use a puller to remove steering wheel.

Refer to Section 70, Groups 10 and 15 for removal of throttle and hub assembly.

Remove instrument panel.

Remove the left cowl support panel.

Remove the cap screws attaching steering shaft support to cowl support, and lift the steering shaft support out of the cowl.

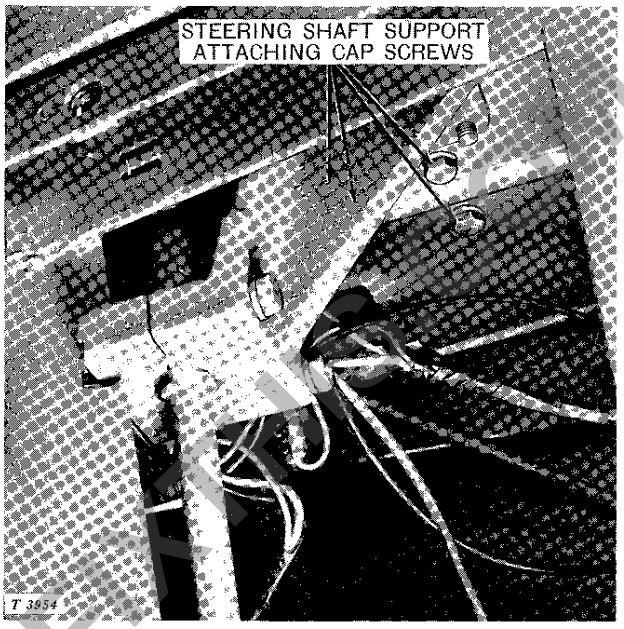



*Fig. 180-5-5—Steering Shaft Support Attaching Points*

REMOVING FUEL TANK

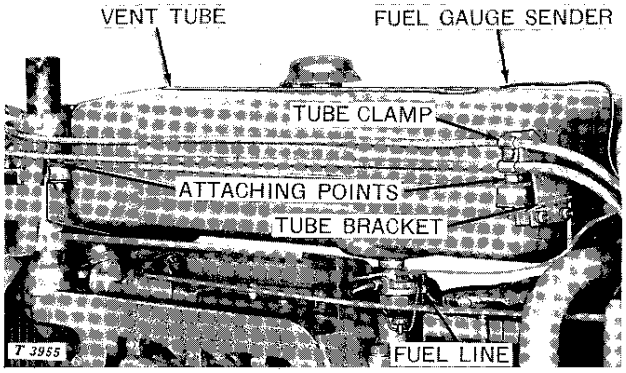



*Fig. 180-5-6—Fuel Tank*

Drain fuel tank.

Disconnect the fuel gauge sender on fuel tank.

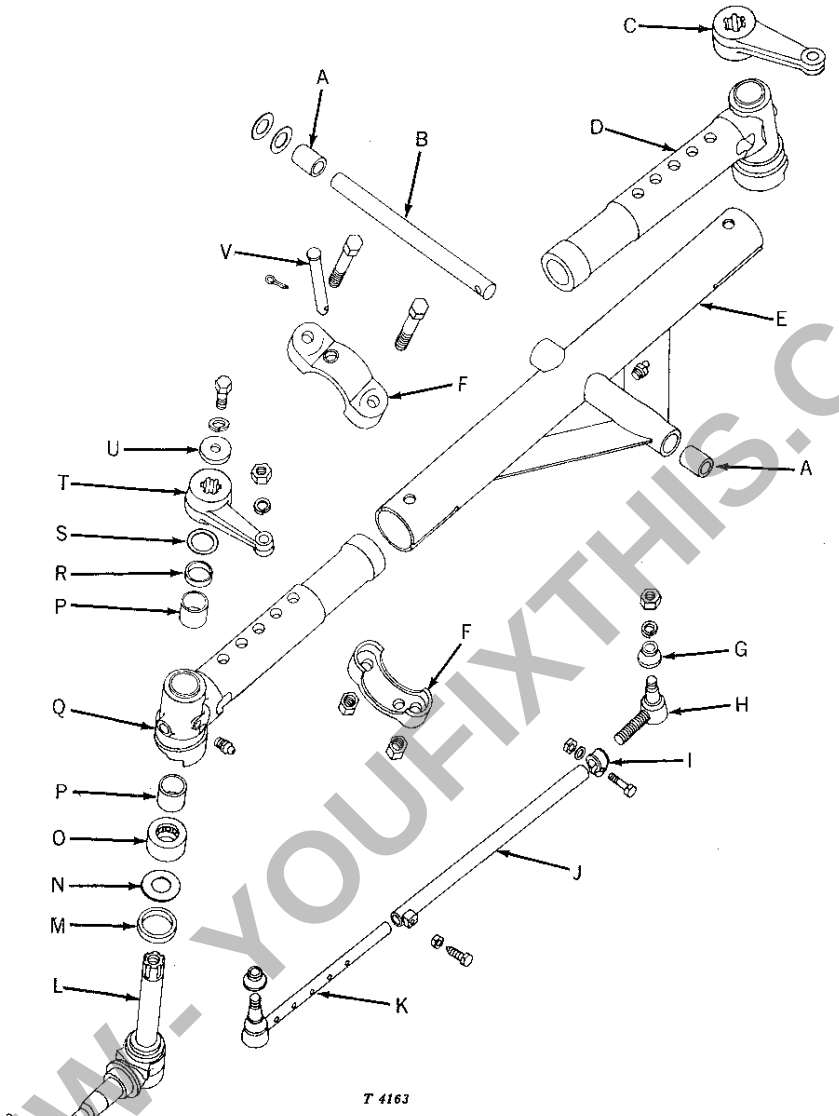
Disconnect fuel line from fuel filter assembly.

*NOTE: On tractors equipped with power steering remove screw on tube clamp. Remove the tube clamp bracket from battery support.*

Remove the four hex. nuts and washers securing fuel tank to the radiator support and to battery support.



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A – Bushing
B – Pivot Shaft
C – Steering Arm (Left)
D – Adjustable End
E – Axle Cross Tube Assembly
F – Clamp
G – Dust Cover
H – Tie Rod End
I – Clamp
J – Tie Rod Tube
K – Adjustable Tie Rod End
L – Spindle and Knuckle
M – Lower Seal
N – Retainer
O – Thrust Bearing
P – Needle Bearing
Q – Adjustable End
R – Upper Seal
S – Shim
T – Steering Arm (Right)
U – Washer
V – Clamp Pin

*Fig. 200-5-6–Exploded View of Adjustable Axle (Utility Illustrated)*

Check needle bearings (P), thrust bearings (O), and oil seals (M, R) in front axle adjustable ends (D, Q). If there is evidence of excessive wear, replace parts. Use driver AM457T to install new needle bearings.

If needle bearings must be replaced, drive upper bearing out top of axle end and drive lower bearing out bottom of axle end. Use driver AM457T to install new needle bearings (Fig. 200-5-7). Use driver "A" to install upper needle



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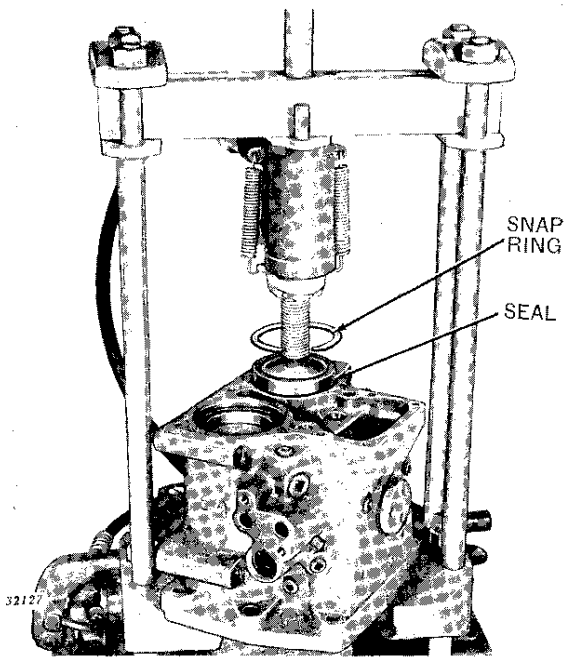



*Fig. 210-10-43—Pressing in Cylinder Head*

Press cylinder head into housing (Fig. 210-10-43), using a driver to prevent damage to head, until snap ring can just be installed in groove.

Place snap ring in groove, then release pressure on cylinder head.

CAUTION: Make sure snap ring expands to the bottom of its groove all the way around.

SET CHECK VALVES

NOTE: If a new valve housing, control valve, check valve, or push rod is installed in hydraulic unit, it is necessary to readjust check valve according to the following procedure. (All check valves are two-stage types.)

1. Lap the check valve to seat and be sure to clean housing and valve thoroughly after lapping. Set up Gauge No. AM453T with pin "A" in hole and plug "B" in control valve bore contacting pin "A" as shown in Figure 210-10-44.

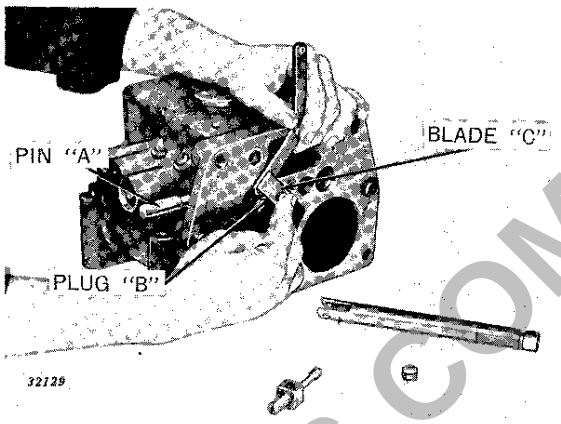



*Fig. 210-10-44—Determining Position of By-Pass Valve Passage*

2. Record feeler gauge reading taken between blade "C" and rear face of valve housing (Fig. 210-10-44). Pull pin "A" from housing and install the control valve into housing in operating position.

3. Install ball valve and first-stage spring in check valve, securing assembly with groov-pin. Place ball valve push-pin in end of push rod and place push rod in check valve (Fig. 210-10-45).

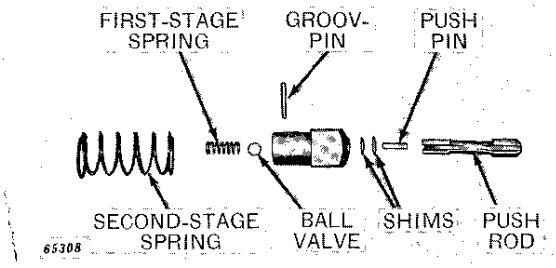



*Fig. 210-10-45—Exploded View of Two-Stage Check Valve*

4. Slip check valve assembly into its operating position in housing and hold snugly against its seat (Fig. 210-10-46). The check valve push rod must not contact the flat on control valve. If it does, install a shorter ball valve push-pin and repeat this step.



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A good method of checking this backlash is shown in Figure 210-21-17. Proceed as follows:

Find a tapered socket which will wedge in bore in top of pump driven gear. Tap socket lightly to secure.

Install a long 5/16-inch cap screw in pump mounting hole of adaptor. Turn in until tight.

Install a dial indicator by clamping on socket and placing indicator needle on cap screw. Make sure indicator is at right angles to the cap screw as shown.

Install an extension in socket and use a ratchet wrench to turn socket and pump driven gear. Movement will be measured on dial indicator moving against cap screw. This movement should be .007—.010-inch in order to have proper backlash on gears.

NOTE: This measurement is not the actual backlash on the gears but it must be used for this test. (Actual gear backlash is .004—.006-inch.)

Remove adaptor and adjust backlash with shims under adaptor. Add shims to increase backlash, or remove shims to decrease backlash.

Recheck with dial indicator until proper backlash is obtained.

PUMP ASSEMBLY

Install new gasket on pump mounting.

Lower hydraulic pump down onto its mounting, engaging splined end of drive shaft inside driven gear shaft. Secure pump with two cap screws and lock washers (Fig. 210-21-18).

Before attaching lines, fill pump with clean oil of viscosity recommended in lubrication chart in Section 30.

Connect hydraulic lines to elbows on pump (Fig. 210-21-18). Tighten lines only until snug.

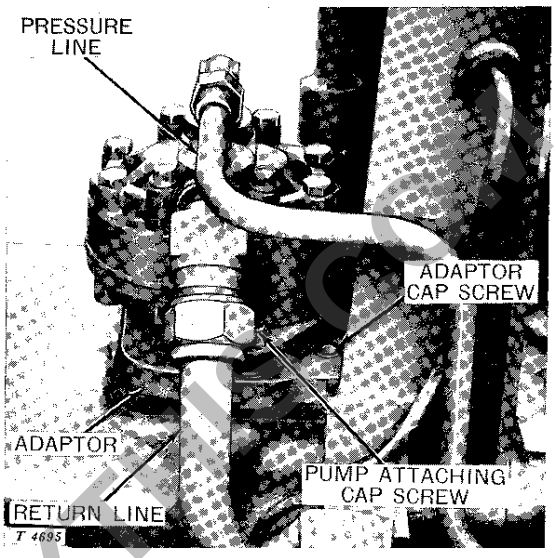



*Fig. 210-21-18—Pump Attaching Points*

Fill hydraulic system with oil of proper viscosity and quantity as recommended in lubrication chart in Section 30.

Check pump for proper operation as follows:

a. Start engine and operate at one-half speed for a minute without working hydraulic control lever.
b. At same speed, operate control lever back and forth several times to cycle system.
c. Increase engine speed to full throttle and operate lever several times to cycle system.
d. Idle engine and check pump and fittings for leaks. If leakage occurs, tighten connections very slowly until leak stops.

Recheck oil level in reservoir, adding oil if necessary (Section 30).



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