The front main bearing is located in a bore in the front of the block while the rear bearing is located in the rear bearing cover assembly, which is bolted to the rear of the engine block.

The camshaft is supported by two ball bearings on the front and rear and one needle bearing in the center of the block.

### PISTON AND CONNECTING RODS

Both engines utilize four ring pistons with offset connecting rods.

### LUBRICATION SYSTEM

The oil pump is located in a bore in the front of the block assembly 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 of the oil pump body. 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 directly above the oil pump.

Oil flow in the main oil gallery extends the length of the block on the right hand side to connecting passages to each of the main bearings.

Oil flow to the main bearings passes through drilled passages in the crankshaft to the connecting rod bearings.

The remaining oil flow is directed through the external tube at the front of the block to a drilled bolt located above the camshaft and extends into an oil gallery that extends the length of the block on the left hand side. The valve tappet bores are located within this oil passage. Oil flows around the tappets for lubrication and into a cross drilling in the tappets. From the tappets, oil flows through the center of the tappet and up the hollow push rods to the rocker arm assembly.

The adjusting screws and rocker arms have drilled passages which provide pressurized lubrication to the rocker arm shafts. Controlled leakage at the rocker arms flows from the top of the head back to the sump.

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

## B. ENGINE AND LUBRICATION SYSTEM — OVERHAUL

### CYLINDER HEAD

#### REMOVAL

**Reference-Figure 3**

1. Remove the hood pivot bolts and remove the hood assembly.

   **NOTE:** *On newer model 1910 and 2110 tractors there are hood props to disconnect also.*

2. Drain the coolant from the radiator and engine block.

**Reference-Figure 4**

3. Loosen the hose clamps and remove the air cleaner hose from the inlet manifold.

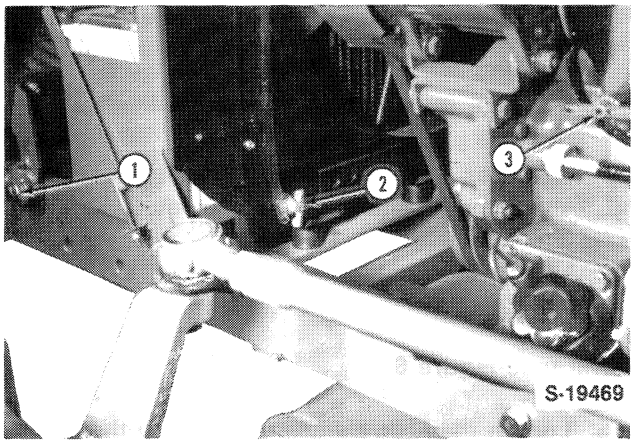



**Figure 3**
**Cylinder Head Removal**

1. Hood Pivot Bolts
2. Radiator Drain Cock
3. Cylinder Block Drain Cock



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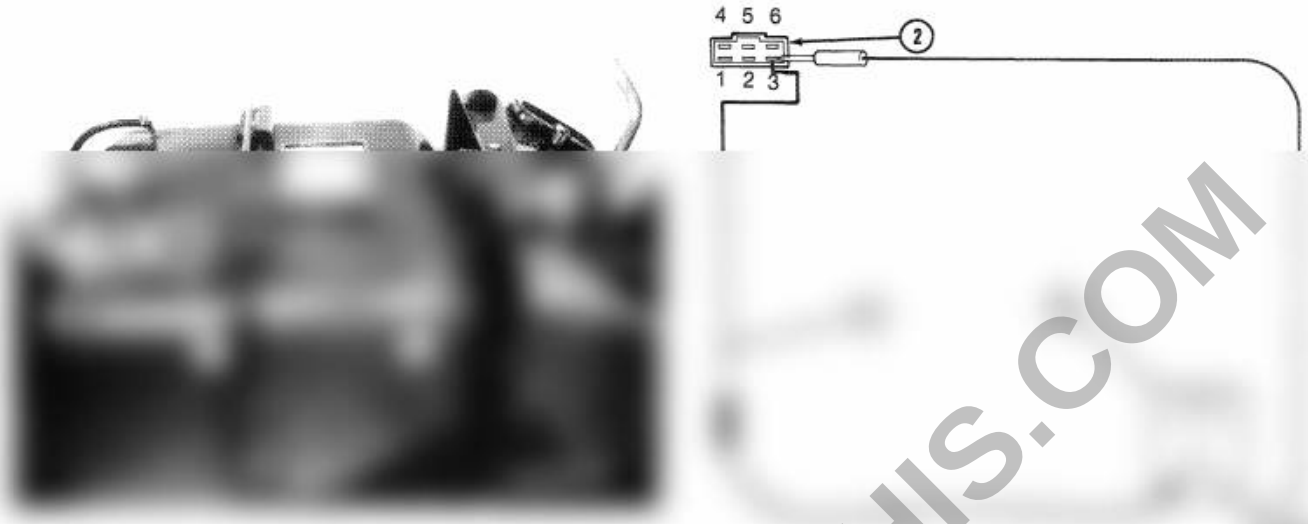
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## GENERAL BOLT TORQUE SPECIFICATION

| BOLT SIZE | BOLT HEAD IDENTIFICATION MARKS AS PER GRADE | COARSE THREAD | | | | FINE THREAD | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | PITCH | TORQUE | | | PITCH | TORQUE | | |
| | | (mm) | kgf m | Lbs.-Ft. | Nm | (mm) | kgf m | Lbs.-Ft. | Nm |

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# PART 1
# ENGINE SYSTEMS — MODELS 1910 AND 2110

## Chapter 3
## TROUBLE SHOOTING — SPECIFICATIONS AND SPECIAL TOOLS

**Section** **Page**


A. TROUBLE SHOOTING ..... 49
B. SPECIFICATIONS ..... 54
C. SPECIAL TOOLS ..... 58


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### CHAPTER 3
### A. TROUBLE SHOOTING

**ENGINE**

| Condition | Possible Causes |
|---|---|
| **Engine Does Not Develop Full Power** | 1. Clogged air cleaner.<br>2. Fuel line obstructed.<br>3. Improper injection timing.<br>4. Improper nozzle injection pressure and angle.<br>5. Low cylinder compression.<br>6. Insufficient fuel injection.<br>7. Improper valve lash adjustment.<br>8. Burned, worn or sticking valves.<br>9. Blown head gasket.<br>10. Worn or sticking piston ring. |
| **Low Cylinder Compression** | 1. Burned, worn or sticking valves.<br>2. Bent valve stem.<br>3. Broken or weak valve spring.<br>4. Blown cylinder head gasket.<br>5. Worn or sticking piston ring.<br>6. Scored piston.<br>7. Improper valve lash adjustment. |



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## B. SPECIFICATIONS

### GENERAL SPECIFICATIONS

| Tractor Model | 1910 | 2110 |
|---|---|---|

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# PART 1
# ENGINE SYSTEMS — MODELS 1910 AND 2110

## Chapter 1
## ENGINE AND LUBRICATION SYSTEM


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## Chapter 2
## COOLING SYSTEM


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## Chapter 3
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# SAFETY PRECAUTIONS

Practically all Service work involves the need to drive the tractor. The Operator's Manual, supplied with each tractor, contains detailed safety precautions relating to Driving, Operating and Servicing that tractor. These precautions are as applicable to the service technician as they are to the operator, and should be read, understood and practiced by all personnel.

Prior to undertaking any maintenance, repair, overhaul, dismantling or re-assembly operations, whether within a workshop facility or out ''in the field'', consideration should be given to factors that may have an effect upon Safety, not only upon the mechanic carrying out the work, but also upon bystanders.

## PERSONAL CONSIDERATIONS

- The wrong clothes or carelessness in dress can cause accidents. Check to see that you are suitably clothed.
- Some jobs require special protective equipment.
- **Skin Protection**
  Used motor oil may cause skin cancer. Follow work practices that minimize the amount of skin exposed and length of time used oil stays on skin.
- **Eye Protection**
  The smallest eye injury may cause loss of vision. Injury can be avoided by wearing eye protection when engaged in chiselling, grinding, discing, welding, painting, etc.
- **Breathing Protection**
  Fumes, dust and paint spray are unpleasant and harmful. These can be avoided by wearing respiratory protection.
- **Hearing Protection**
  Loud noise may damage your hearing and the greater the exposure the worse the damage. If the noise is excessive, wear ear protection.
- Avoid injury by correctly handling components. Make sure you are capable of lifting the object. If in doubt get help.
- **Hand Protection**
  It is advisable to use a protective cream before work to prevent irritation and skin contamination. After work clean your hands with soap and water. Solvents such as white spirit, paraffin, etc., may harm the skin.
- **Foot Protection**
  Substantial or protective footwear with reinforced toe-caps will protect your feet from falling objects. Additionally, oil-resistant soles will help to avoid slipping.
- **Special Clothing**
  For certain work it may be necessary to wear flame or acid-resistant clothing.
- Avoid injury through incorrect handling of components. Make sure you are capable of lifting the object. If in doubt get help.

## EQUIPMENT CONSIDERATIONS

- **Machine Guards**
  Before using any machine, check to ensure that the machine guards are in position and serviceable. These guards not only prevent parts of the body or clothing coming in contact with the moving parts of the machine, but also ward off objects that might fly off the machine and cause injury.
- **Lifting Appliances**
  Always ensure that lifting equipment, such as chains, slings, lifting brackets, hooks and eyes are thoroughly checked before use. If in doubt, select stronger equipment than is necessary.

  Never stand under a suspended load or raised implement.
- **Compressed Air**
  The pressure from a compressed air line is often as high as 100 psi (6.9 bar) 7 (kgf/cm²). It is perfectly safe if used correctly. Any misuse may cause injury.



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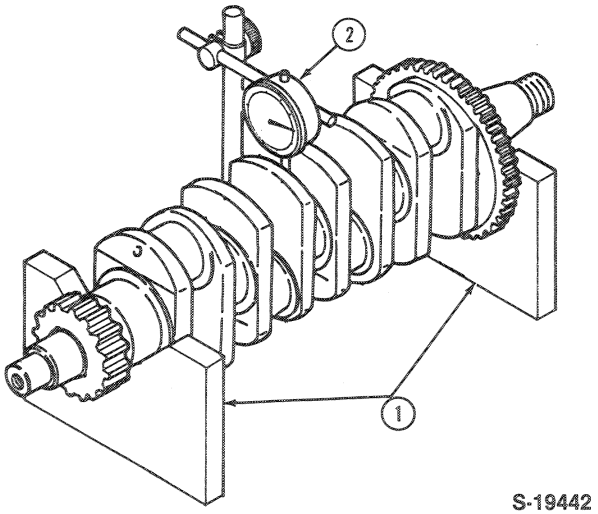



**Figure 86**
**Crankshaft Run-Out Check (Model 2110 Shown)**

1. V-Blocks
2. Dial Indicator

## ASSEMBLY

On the Model 1910 and 2110 tractors full circle crankshaft bearing liners are utilized on the crankshaft front and rear main bearing journals. The front liner is located in the engine block and the rear liner is located in the crankshaft rear bearing cover, Figure 87.

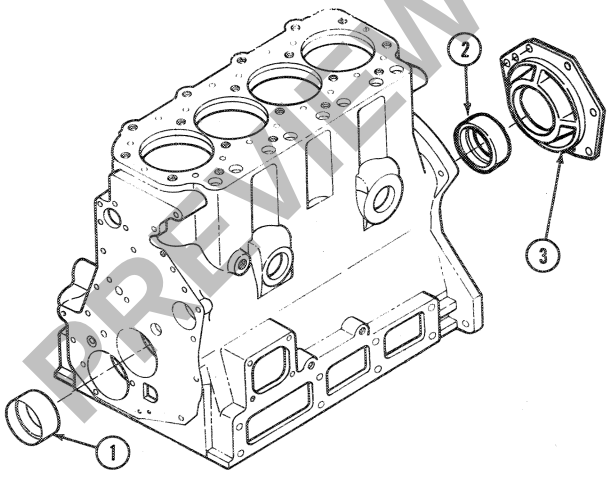



**Figure 87**
**Crankshaft Front and Rear Main Bearings**

1. Front Main Bearing Liner
2. Rear Main Bearing Liner
3. Rear Bearing Support Cover

1. Before installing the crankshaft, use a dial indicator gauge and measure the inside diameter of the front and rear liners for excess wear, Figure 88.

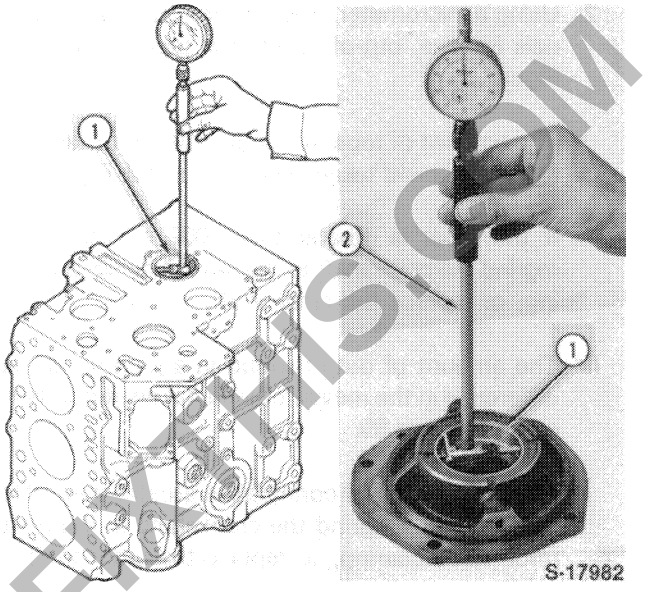



**Figure 88**
**Crankshaft Bushing Wear Check**

1. Crankshaft Front and Rear Bearing Liner
2. Dial Indicator

Replace bushings that measure in excess of the following specification:

Inside diameter wear limit . . . . . .2.683 in. (68.15 mm)

To determine the bushing liner to crankshaft clearance, subtract the crankshaft journal diameter from the inside diameter measurement of the bushing liner.

Replace bushings or crankshaft components, or regrind the crankshaft to fit undersized bearing liners as required to meet the following specifications:

Standard bearing clearance . . . . . .002-.005 in. (.056-.134 mm)

Maximum bearing clearance . . .008 in. (.2 mm)

2. Check the remaining main bearing-to-crankshaft clearances before installing the crankshaft in the block. Position a piece of plastigauge of the correct size across the full width of each liner at approximately 1/4 inch off center, Figure 89.



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## A. TROUBLE SHOOTING (CONT'D.)

| Condition | Cause | Remedy |
|---|---|---|
| Engine starts and stops | 1. Fuel starvation | 1. Check and flush clean restricted fuel lines or fuel filter |
| | 2. Contaminated fuel | 2. Check for water in the fuel |
| | 3. Restricted air intake | 3. Check for restrictions in the air intake |
| | 4. Engine overheating | 4. Check cooling system |
| | 5. Air in system | 5. Check for air leaks on the suction side of the system |
| Erratic engine operation (surge, misfiring, poor governor regulation) | 1. Fuel leakage | 1. Check the injector lines and connectors for leakage |
| | 2. Fuel starvation | 2. Check and flush restricted fuel lines or filters |
| | 3. Incorrect pump timing | 3. Check the pump timing |
| | 4. Contaminated fuel | 4. Check for water in the fuel |
| | 5. Air in system | 5. Bleed the fuel system |
| | 6. Faulty or sticking injector nozzles | 6. See injector trouble shooting |
| | 7. Incorrect engine timing | 7. Check for faulty engine valves |
| Engine does not develop full power or speed | 1. Incorrect throttle adjustment | 1. Check for insufficient throttle control movement |
| | 2. Incorrect maximum no-load speed | 2. Check maximum no-load speed adjustment |
| | 3. Fuel starvation | 3. Check and flush clean restricted fuel lines and filters |
| | 4. Air in system | 4. Check for air-leaks on the suction side of the system |
| | 5. Incorrect timing | 5. Check pump timing |
| | 6. Low compression | 6. Check engine compression |
| | 7. Incorrect engine timing | 7. Check for improper valve adjustment or faulty valves |
| Engine emits black smoke | 1. Restricted air intake | 1. Check for restricted air intake |
| | 2. Engine overheating | 2. Check cooling system |
| | 3. Incorrect timing | 3. Check the pump timing |
| | 4. Faulty injectors | 4. See injector trouble shooting |
| | 5. Low compression | 5. Check the engine compression |
| | 6. Incorrect engine timing | 6. Check the engine valves |
| Pump fails to deliver fuel to all injectors | 1. Blocked fuel lines to pump | 1. Remove fuel lines and flush or replace |
| | 2. Air in fuel lines to injectors | 2. Bleed fuel lines |
| | 3. Control rod seized in OFF position | 3. Repair or replace control rod |
| Pump fails to deliver fuel to one injector | 1. Air in fuel line to injector | 1. Bleed fuel line |
| | 2. Plunger spring broken | 2. Replace spring |
| | 3. Plunger seized | 3. Repair or replace barrel and plunger assembly |



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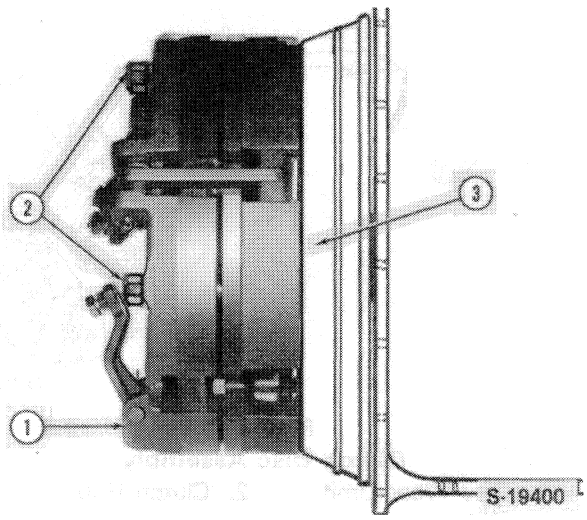



**Figure 3**
**Double Clutch — Removal**

1. Clutch Assy.
2. Mounting Bolts
3. Flywheel

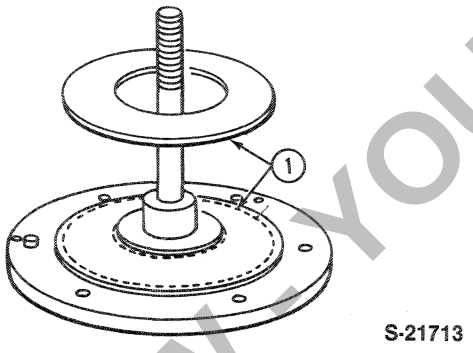



**Figure 3-A**
**Fixture with Spacer**

1. Spacer — FTC-46768

## DISASSEMBLY
**Reference-Figure 4**

1. Center spacer FTC-46768 on the fixture base as shown in Figure 3-A.
2. Mount the dual clutch assembly on the fixture base.
3. Install FTC-213246 spacer (2), Figure 4.
4. Place the bridge, tool no. 1594, over the spindle and install the thrust washer (6) and nut (7), Figure 4.
5. Tighten the nut until the release levers (8) are loose on their pivot pins (9).
6. Remove the pivot pins and swing the release levers and links out of the way, Figure 5.
7. Remove the spindle nut, thrust washer and bridge tool.
8. Remove the clutch outer cover, diaphragm spring, PTO pressure plate, clutch inner cover and second diaphragm spring, Figure 4.

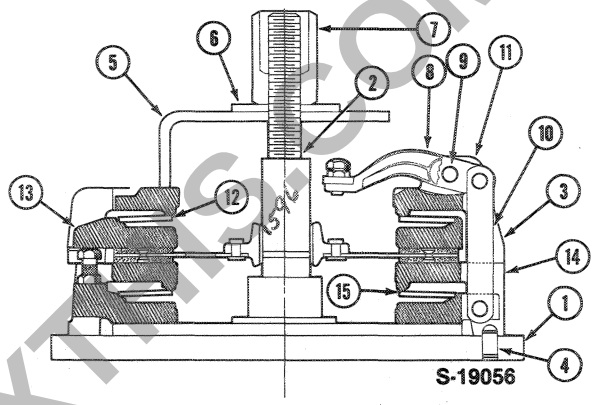



**Figure 4**
**Double Clutch Assembly**

1. Fixture, Tool No. 2706
2. Spacer, Tool No. FTC-213246
3. Clutch Assy.
4. Dowel Pins
5. Bridge, Tool No. 1594
6. Thrust Washer
7. Nut
8. Release Levers
9. Pivot Pins
10. Links
11. Outer Cover
12. PTO Diaphram Spring
13. PTO Pressure Plate
14. Clutch Inner Cover
15. Transmission Diaphram Spring

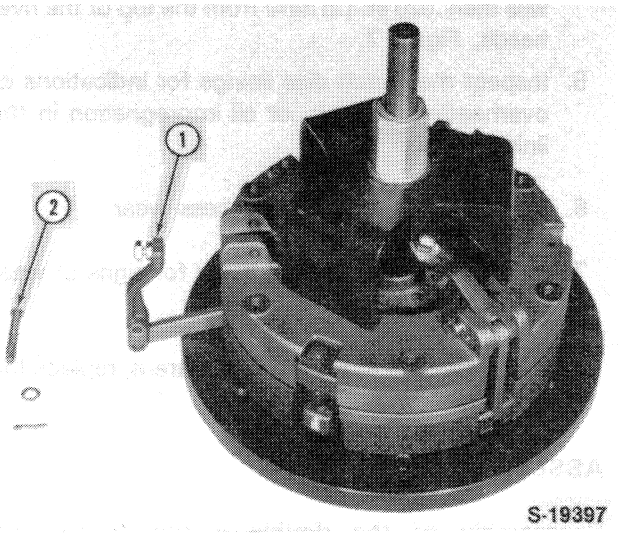



**Figure 5**
**Double Clutch Disassembly**

1. Release Lever and Link Assy.
2. Pivot Pin



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**Model 2110:**
**Reference-Figure 59**

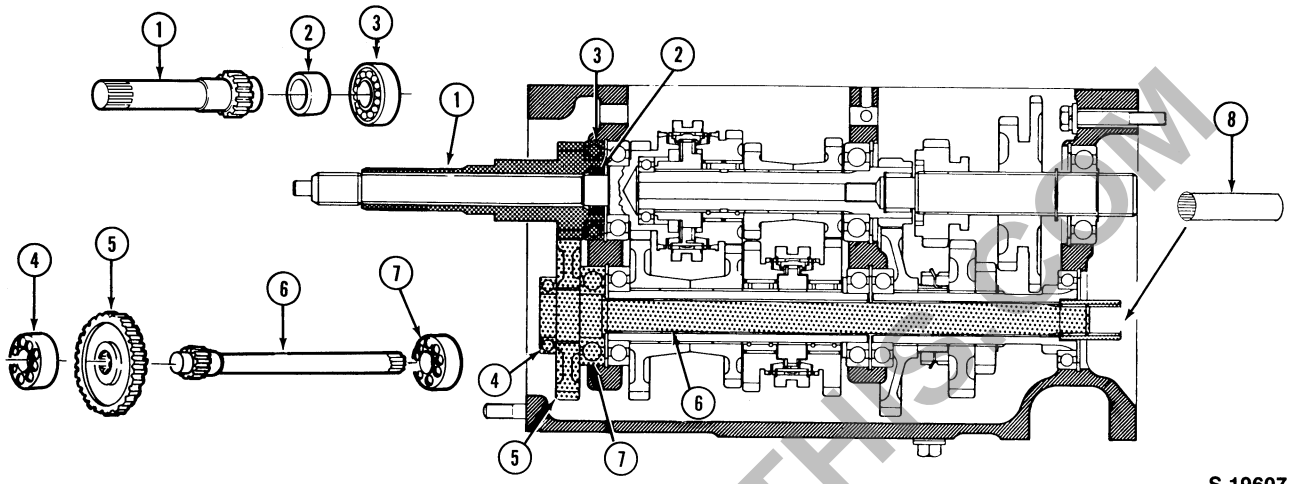



**Figure 59**
**PTO Drive Assembly (Model 2110)**

1. PTO Input Shaft
2. Seal
3. Bearing
4. Bearing
5. PTO Drive Gear
6. PTO Drive Shaft
7. Bearing
8. Coupling

1. If removed, install the bearing (3) on the input shaft (1).
2. Install a new oil seal (2) inside the input shaft counterbore.
3. If removed, install the bearing (7) on the PTO drive shaft (6).
4. Insert the drive shaft and bearing assembly through the transmission countershaft from the front.
5. Install the coupling (8) on the rear of the PTO drive shaft.
6. Install the PTO drive gear (5) and bearing assembly (4) on the forward end of the PTO drive shaft.
7. Install the PTO input shaft assembly (1) over the transmission drive input shaft using care to not damage the PTO input shaft seal.

## SHIFT FORKS AND RAILS ASSEMBLY
**Reference-Figure 60**

1. If removed, install the interlock pins (1) in the transmission case, Figure 60.
2. Position the mainshaft synchronizer fork (3) in place on the mainshaft synchronizer.

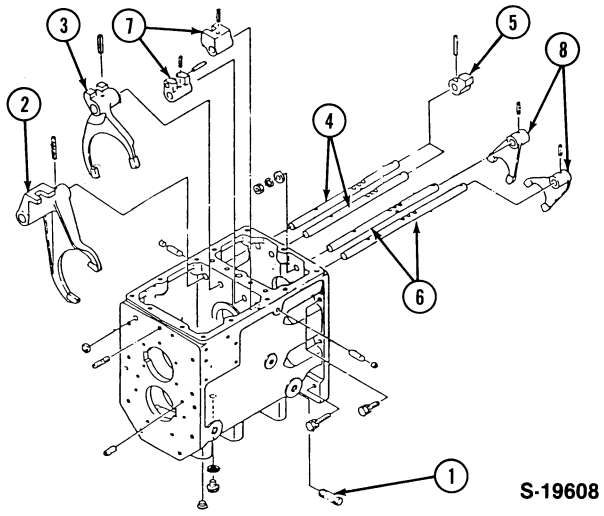



**Figure 60**
**Shift Forks and Rails Assembly**

1. Interlock Pins (2)
2. Countershaft Synchronizer Fork
3. Mainshaft Synchronizer Fork
4. Main Gear Shift Rails
5. Magnets (2)
6. Range Gear Shift Rails
7. Gates (2)
8. Range Gear Shift Forks



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# PART 8
# HYDRAULIC SYSTEM

## Chapter 1
## HYDRAULIC SYSTEM CIRCUITS


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## Chapter 2
## HYDRAULIC PUMP AND FILTER


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## Chapter 3
## TROUBLE SHOOTING, PRESSURE TESTING, SPECIFICATIONS AND SPECIAL TOOLS


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| D. | SPECIAL TOOLS | 36 |


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| Condition | Possible Cause | Remedy |
|---|---|---|
| **2. Lift arms cycle up and down when control lever is in "neutral position"** | 1. Faulty poppet valve and seat (single lever control system) | 1. Replace as required |
| | 2. Faulty check valve and seat | 2. Replace as required |
| | 3. Faulty lowering valve spool (two lever control system) | 3. Replace as required |
| | 4. Leaking O-Rings (poppet valve and seat, valve cover, unload valve plug), single lever control system | 4. Inspect and repair as required |
| | 5. Faulty lowering valve spool (two lever control system) | 5. Replace as required |
| **3. Implement rises too slow** | 1. Suction filter restricted | 1. Replace filter |
| | 2. Hydraulic pump capacity too low | 2. Perform flow test and replace pump if required |
| | 3. Faulty relief valve | 3. Repair or replace as required |
| | 4. Excessive leakage past lift cylinder piston | 4. Inspect cylinder and piston assembly. Repair or replace as required. |
| | 5. Faulty safety valve | 5. Repair or replace as required |
| | 6. Faulty unload valve and seat (single lever control system) | 6. Replace components as required |
| | 7. Faulty lowering valve spool operation (two lever control system) | 7. Replace lowering valve spool |
| | 8. Faulty control valve and plunger-operation (two lever system) | 8. Repair or replace as required |
| **4. Implement will not lower when control lever is in "lowering position"** | 1. Flow control valve in "closed" position | 1. Open valve |
| | 2. Poppet valve spool out of adjustment (single lever control system) | 2. Adjust poppet valve clearance |
| | 3. Lowering valve spool adjusting bolt out-of-adjustment (two lever control system) | 3. Adjust lowering valve adjusting bolt |
| **5. Implement does not raise to full height** | 1. Position control rod out of adjustment | 1. Adjust position control rod |
| **6. Relief valve operates when implement is raised to full height** | 1. Position control valve rod out of adjustment | 1. Adjust position control rod |
| **7. Hydraulic oil overheats** | 1. Faulty hydraulic pump<br>2. Restricted filter<br>3. Excessive oil leakage-internal | 1. Replace pump<br>2. Replace filter<br>3. See Remedy for conditions 1, 2, 3 and 6 |



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# PART 10
# FRONT AXLE AND RELATED PARTS

## Chapter 1
## FRONT AXLE AND RELATED PARTS — TWO WHEEL DRIVE

**Section** **Page**


A. FRONT AXLE AND RELATED PARTS — DESCRIPTION AND OPERATION ..... 1

B. FRONT AXLE AND RELATED PARTS — OVERHAUL ..... 4


### A. FRONT AXLE AND RELATED PARTS — DESCRIPTION AND OPERATION

**Reference-Figure 1**

Two widths of front axles are available for the 1910 model tractor. The front wheel tread settings on the standard front axle are adjustable from 43.1 to 57 in. (110-145 cm). Turf tire tread width settings are 46.9-56.9 in. (119-144.5 cm). Front wheel tread settings on the optional 72 in. (wide) front axle are adjustable from 48 to 72 in. (122-183 cm).

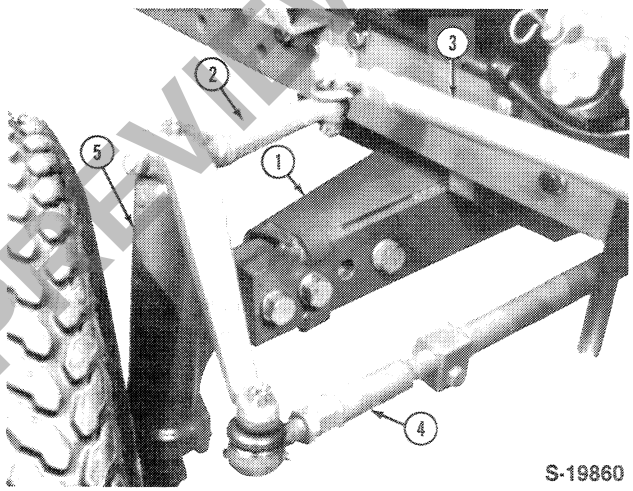



**Figure 1**
**Adjustable Front Axle — Model 1910**

1. Axle Center Section
2. Steering Arm
3. Drag Link Rod
4. Tie Rod Assembly
5. Axle Outer Section

**Reference-Figure 2**

The thread width settings for the Model 2110 tractor are adjustable from 48-72 in. (122-183 cm).

The front axle consists of a center axle member (1) and two outer axle sections (4). The center member is mounted centrally to the engine support (6), Figure 2 by a pivot shaft. The axle rotates on the pivot shaft,

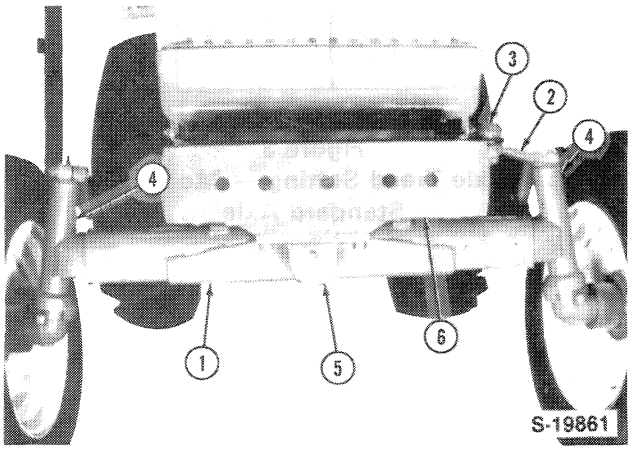



**Figure 2**
**Adjustable Front Axle — Model 2110**

1. Axle Center Section
2. Steering Arm
3. Drag Link Rod
4. Outer Axle Section
5. Pivot Shaft
6. Engine Support




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# PART 12
# SEPARATING THE TRACTOR

## Chapter 1
## SEPARATING THE TRACTOR


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| E. | REAR AXLE HOUSING — REMOVAL AND INSTALLATION | 13 |


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### A. FRONT AXLE REMOVAL AND INSTALLATION

**TWO AND FOUR WHEEL DRIVE**

1. Drain the radiator and engine block coolant and collect in a clean container, Figure 1 .
2. Remove the hood pivot bolts (3), Figure 1, and remove the hood from the tractor.
3. Disconnect the battery cables from the battery terminal connections.
4. Remove the upper radiator hose (1) from radiator connector, Figure 2.
5. Remove the lower radiator hose (2) from the water pump connector, Figure 2.
6. Remove the air cleaner hose (3) from the air cleaner assembly.

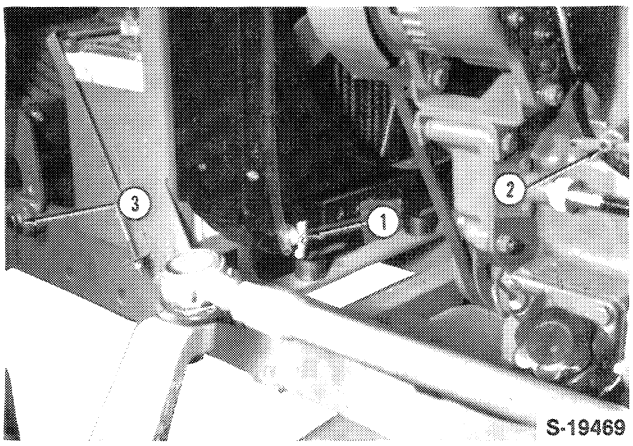



**Figure 1**
**Cooling System Drain Cocks and Hood Removal**

1. Radiator Drain Cock
2. Cylinder Block Drain Cock
3. Hood Pivot Bolts



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