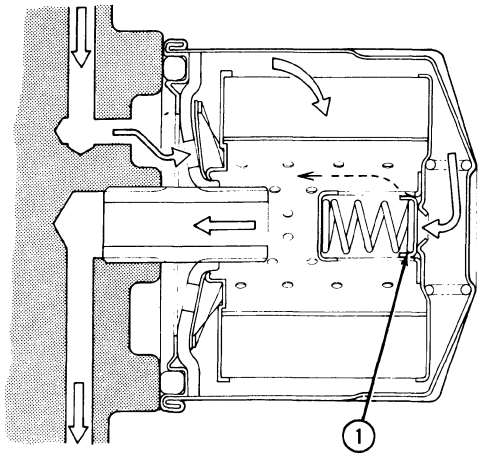



**Figure 5**
**Full Flow Oil Filter Assembly**
1. Relief Valve

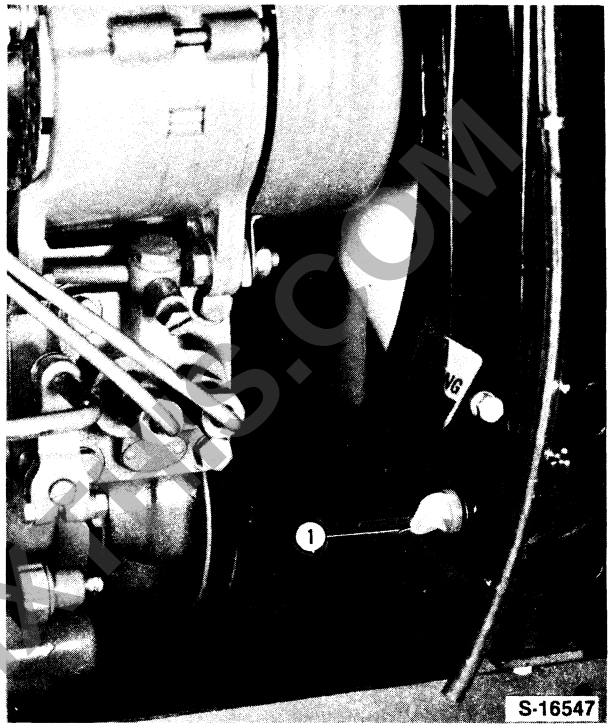



**Figure 6**
**Radiator Coolant Drain**
1. Drain Cock

## B. ENGINE OVERHAUL

### CYLINDER HEAD AND RELATED COMPONENTS

### REMOVAL

1. Drain the radiator, Figure 6.
2. Remove the air cleaner assembly, Figure 7.
3. Remove the upper radiator hose.
4. Remove the exhaust muffler and manifold assembly, Figure 7.
5. Remove the upper radiator brace from the top of the cylinder head.
6. Remove the injector lines and cap all openings.
7. Remove the glow plugs, Figure 8.
8. Remove the injector assemblies, Figure 8.

   **NOTE:** *Be sure to remove the injector sealing washer and the cup type heat shield from the injector bore, if not removed with the injector.*

9. Remove the temperature sender switch, Figure 9.
10. Remove the thermostat housing and thermostat, Figure 10, Model 1110.

    Remove the water pump and thermostat assembly, Figure 11, Model 1210.
11. On the Model 1210, remove the external oil transfer tube, Figure 4.
12. Remove the valve cover and gasket.
13. Remove the valve rocker arm and shaft as an assembly, Figure 12.
14. Remove the valve stem caps (Model 1210) and push rods.

    **NOTE:** *Be sure to keep the valve components in separately marked containers for re-assembly in their original position.*

15. Remove the cylinder head bolts and nuts alternately a half turn at a time to prevent warping the head.



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## GENERAL BOLT TORQUE SPECIFICATION

| | BOLT HEAD | COARSE THREAD | FINE THREAD |
|---|---|---|---|

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# PART 1
# ENGINE SYSTEMS

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


| Section | | Page |
|---|---|---|
| A. | TROUBLE SHOOTING | 63 |
| B. | SPECIFICATIONS | 68 |
| C. | SPECIAL TOOLS | 75 |


### A. TROUBLE SHOOTING

| Condition | Possible Cause |
|---|---|
| **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. Blown piston. |

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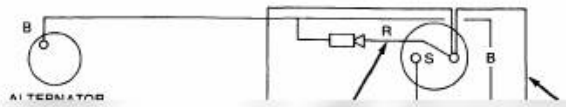
## B. SPECIFICATIONS

### GENERAL

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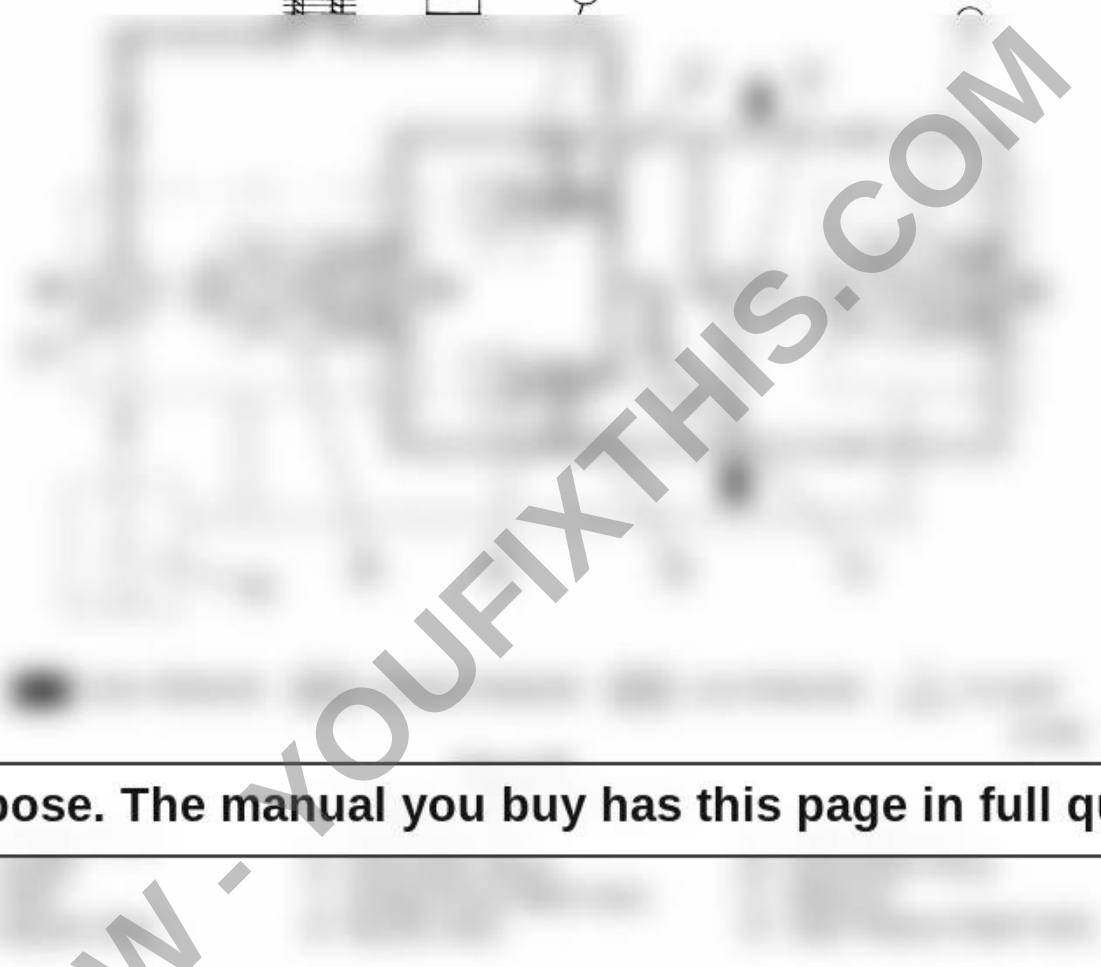



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# PART 1
# ENGINE SYSTEMS

## Chapter 1
## ENGINE AND LUBRICATION SYSTEM


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| B. | ENGINE — OVERHAUL | 5 |
| | • CYLINDER HEAD, VALVES AND RELATED COMPONENTS | 5 |
| | • ENGINE FRONT COVER, TIMING GEARS, AND OIL PUMP | 16 |
| | • CONNECTING RODS, BEARINGS, PISTONS, RINGS AND CYLINDER BLOCK | 33 |
| | • MAIN BEARINGS, CRANKSHAFT, CAMSHAFT AND FLYWHEEL | 41 |


## Chapter 2
## COOLING SYSTEMS


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


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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.

- **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 you feel the noise excessive, wear ear protection.

- **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.

  Never use compressed air to blow dust, filing, dirt, etc., away from your work area unless the correct type of nozzle is fitted.

  Compressed air is not a cleaning agent, it will only move dust, etc., from one place to another. Look around before using an air hose as bystanders may get grit into their eyes, ears or skin.



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# FOREWORD

This repair manual provides information for the proper servicing and overhaul of Ford 1110 and 1210 Tractor Models and is an essential publication for all service personnel carrying out repairs and maintenance procedures.

The Manual is divided into twelve PARTS each sub-divided into Chapters. Each Chapter contains information on general operating principles, detailed inspection and overhaul and, where applicable, trouble shooting, special tools and specifications.

The material contained in this Manual was correct at the time of going to print but Ford policy is one of continuous improvement and the right to change prices, specifications, equipment or design at anytime without notice is reserved. All data in this Manual is subject to production variations, so overall dimensions and weights should be considered as approximately only and the illustrations do not necessarily depict the unit to standard build specification.

TRACTOR OPERATIONS
FORD MOTOR COMPANY

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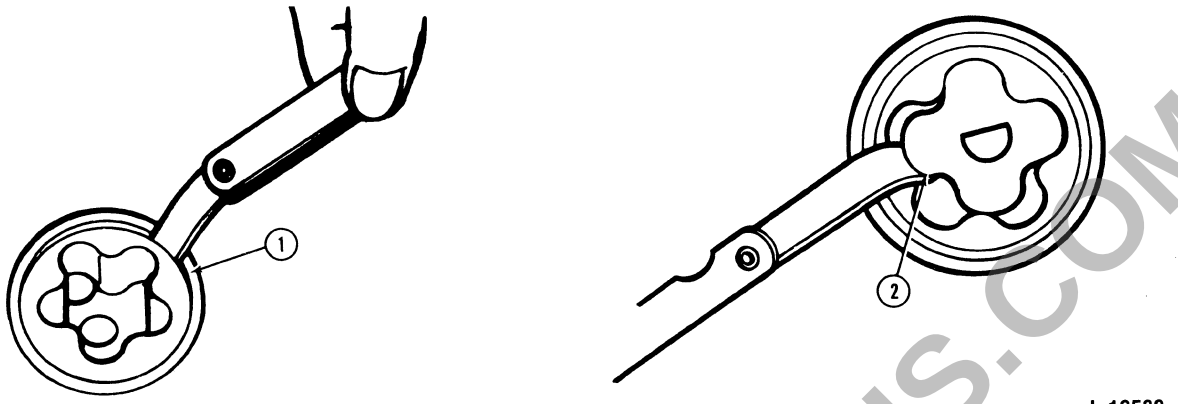



**Figure 61**
**Oil Pump Rotor Wear Check — Model 1110**
1. Outer Rotor Clearance Check
2. Rotor-to-Rotor Clearance Check

**Model 1210 (Refer Figure 67):**

1. Wash all parts in a suitable solvent and dry with a lint free cloth or compressed air.

2. Inspect the inside of the pump cover and the forward face of the port head for scratches or score marks.

3. Use a feeler gauge and measure the rotor to rotor clearance, Figure 62.

   Rotor to Rotor Wear Clearance = 0.010 in. (.25 mm) max.

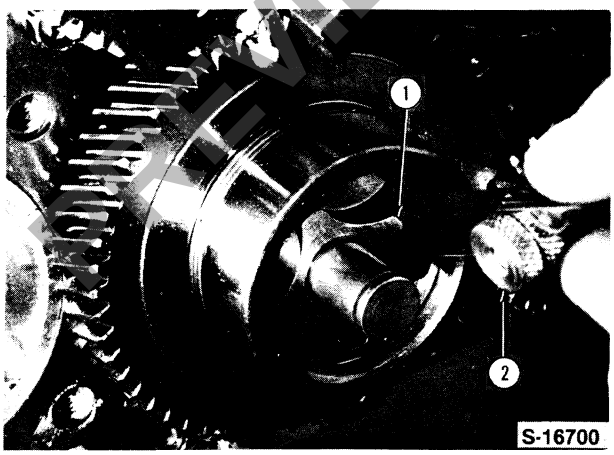



**Figure 62**
**Oil Pump Wear Check — Model 1210**
1. Rotor-to-Rotor Wear Clearance
2. Feeler Gauge

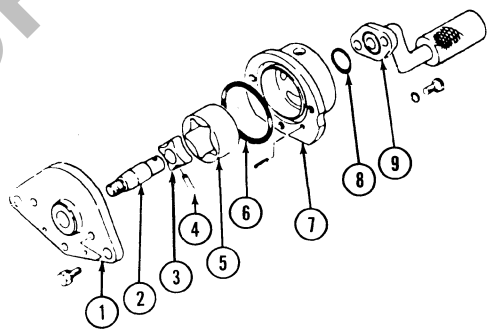



**Figure 63**
**Oil Pump Assembly — Model 1110**
1. Cover
2. Shaft
3. Inner Rotor
4. Pin
5. Outer Rotor
6. O-Ring
7. Body
8. O-Ring
9. Pick-Up Tube and Screen

## ASSEMBLY

**Model 1110:**

1. Assemble the oil pump using new O-rings, Figure 63.



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## TROUBLE SHOOTING CONT'D

| Condition | Possible Cause | Correction |
|---|---|---|
| **Coolant Loss — Boil Over** | Refer to Overheating Causes in addition to the following: | |
| | 1. Overfilled cooling system. | 1. Reduce coolant level to proper specification. |
| | 2. Quick shutdown after hard (hot) run. | 2. Allow engine to run at fast idle prior to shutdown. |
| | 3. Air in system resulting in occasional "burping" of coolant. | 3. Purge system. |
| | 4. Insufficient antifreeze allowing coolant boiling point to be too low. | 4. Add antifreeze to raise boiling point. |
| | 5. Antifreeze deteriorated because of age or contamination. | 5. Replace coolant. |
| | 6. Leaks due to loose hose clamps, loose nuts, bolts, drain valve, faulty hoses, or defective radiator. | 6. Pressure test system to locate leak then repair as necessary. |
| | 7. Faulty head gasket. | 7. Replace head gasket. |
| | 8. Cracked head, manifold, or block. | 8. Replace as necessary. |
| **Coolant Entry Into Crankcase or Cylinder** | 1. Faulty head gasket. | 1. Replace head gasket. |
| | 2. Crack in head, manifold, or block. | 2. Replace as necessary |
| **Noise** | 1. Fan contacting shroud. | 1. Reposition shroud and check engine mounts. |
| | 2. Loose water pump impeller. | 2. Replace pump. |
| | 3. Glazed fan belt. | 3. Apply silicone or replace belt. |
| | 4. Loose fan belt. | 4. Adjust fan belt. |
| | 5. Rough surface on drive pulley. | 5. Replace pulley. |
| | 6. Water pump bearing worn. | 6. Remove belt to isolate. Replace pump. |
| | 7. Belt alignment. | 7. Check for improper pulley locations. |
| **Temperature lamp on or Gauge Reads Hot, But Temperature is OK** | 1. Wrong sending unit. | 1. Install correct sending unit. |
| | 2. Sending wire shorted to ground. | 2. Locate area of contact and repair insulation. |

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| Condition | Cause | Remedy |
|---|---|---|
| **Spray pattern distorted** | 1. Obstructed needle valve. | 1. Check for carbon or foreign matter on needle valve tip. Flush clean or replace nozzle assembly. |
| | 2. Obstructed needle valve holes. | 2. Check for carbon in needle valve holes. Flush clean or replaze nozzle assembly. |
| | 3. Damaged nozzle or needle valve. | 3. Replace nozzle assembly. |

## B. SPECIFICATIONS

| Tractor Model | 1110 | 1210 |
|---|---|---|
| **Injection Pump** | | |
| Pump Manufacturer Assembly Number | 094500-2380 | 094500-2800 |
| Type | In-Line | In-Line |
| Timing (Before TDC) | 23°-24° | 20°-21° |
| Timing (Piston Displacment Before TDC) | 0.133-0.146 in. (3.39-3.72 mm) | 0.112-0.1236 in. (2.85-3.14 mm) |
| Injection Nozzle<br>Nozzle Type<br>Needle Valve Diameter<br>Pintle Diameter | <br>Throttle<br>.236 in. (6 mm)<br>.040 in. (1 mm) | <br>Throttle<br>.236 in. (6 mm)<br>.040 in. (1 mm) |
| Injection Pressure | 1706 PSI (120 kg/cm²) | 1706 PSI (120 kg/cm²) |
| Spray Angle | 12° | 12° |
| Service Adjustments<br>Idle Speed | <br>750-850 RPM | <br>750-850 RPM |
| Maximum No-Load Speed | 2750-2800 RPM | 2850-2900 RPM |

## TORQUES

| | Model 1110 | Model 1210 |
|---|---|---|
| Injection Pump Retaining Bolts | 10-14 lbs.-ft. (13.8-19.3 Nm) | 10-14 lbs.-ft. (13.8-19.3 Nm) |
| Injector Assembly Retaining Bolts | 43.2-50.4 lbs.-ft. (37.6-67.2 Nm) | 43.2-50.4 lbs.-ft. (57.6-67.2 Nm) |
| Pre-Chamber Retaining Nut | 93.6-100.8 lbs.-ft. (124.8-134.4 Nm) | — — |
| Delivery Valve Holder | 29-33 lbs.-ft. (39-44 Nm) | 29-33 lbs.-ft. (39-44 Nm) |
| Injector Nozzle Nut | | |



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1. Using an ohmmeter, touch one lead to the armature commutator bar.
2. Touch the remaining lead to the armature shaft.
3. Repeat the test on each commutator bar.

- High Resistance Reading = Good
- Low Resistance Reading = Replace

**BRUSH HOLDER GROUND TEST**
Figure 53




**Figure 53**
**Brush Holder Ground Test**

1. Using an ohmmeter, touch one lead to the insulated brush holder.
2. Touch the remaining lead to the brush holder plate and observe the ohmmeter.
3. Repeat the test on the remaining brush holder.

- High Resistance Reading = Good
- Low Resistance Reading = Replace

**FIELD COIL CONTINUITY TEST**
Figure 54




**Figure 54**
**Field Coil Continuity Test**

1. Using an ohmmeter, connect one lead to the brush field coil connector.
2. Connect the remaining lead to the other brush field coil connector and observe the ohmmeter.

- Low Resistance Reading = Good
- High Resistance Reading = Replace

**FIELD COIL GROUND TEST**
Figure 55

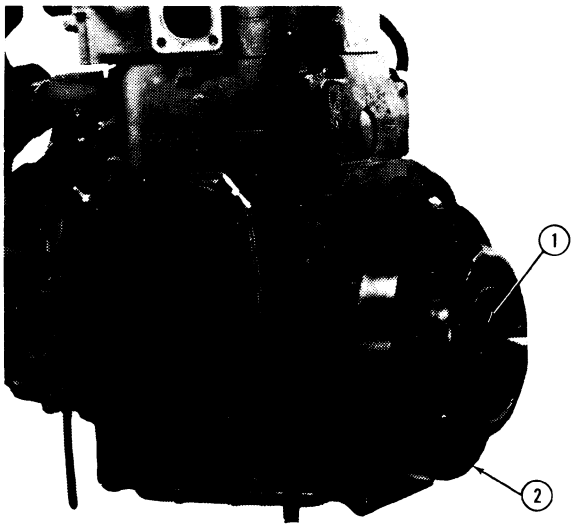
1. Using an ohmmeter, connect one lead to the brush field coil connector.
2. Connect the remaining lead to the starter frame and observe the ohmmeter.

- High Resistance Reading = Good
- Low Resistance Reading = Replace



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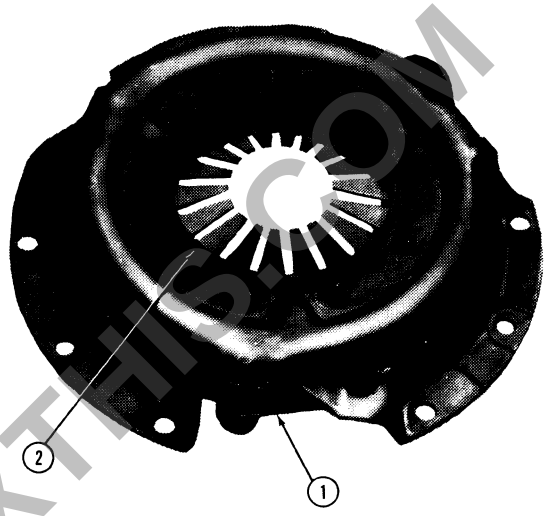
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S-17203

**Figure 3**
**Clutch Removal**

1. Single Clutch Assy.
2. Clutch Retaining Bolts




S-17204

**Figure 4**
**Single Clutch Pressure Plate Assembly**

1. Pressure Plate
2. Release Fingers

## INSPECTION

1. Check the pressure plate face for cracks, scoring or distortion. Minor imperfections can be removed by resurfacing presure plate face, Figure 4.

2. Inspect the pressure plate release levers for wear or damage. Check pivot pins and pin holes and springs for damage. Replace the pressure plate if any damage is apparent, Figure 4.

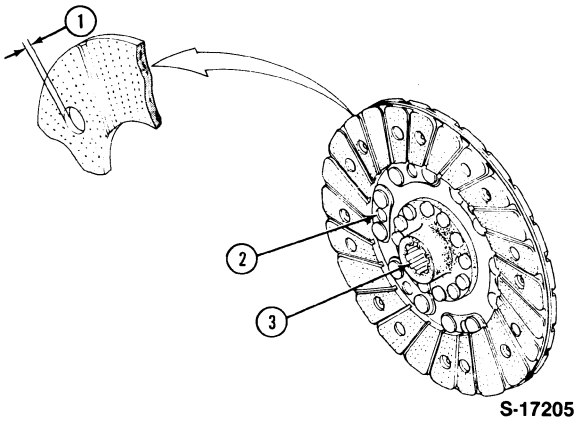
3. Inspect the clutch disc for signs of overheating, distortion, scored or loose linings.

4. Check the facing wear. Depth from the top of facing to the top of rivet should not be less than 0.012 in. (0.3 mm), Figure 5.

5. Inspect the clutch disc hub for excessive spline wear.

6. Check the cushioning springs for cracks, or loose rivets.

   If any damage or excessive wear is evident, replace the disc assembly.




S-17205

**Figure 5**
**Clutch Disc Assembly**

1. Disc Lining Wear
2. Cushioning Springs
3. Hub



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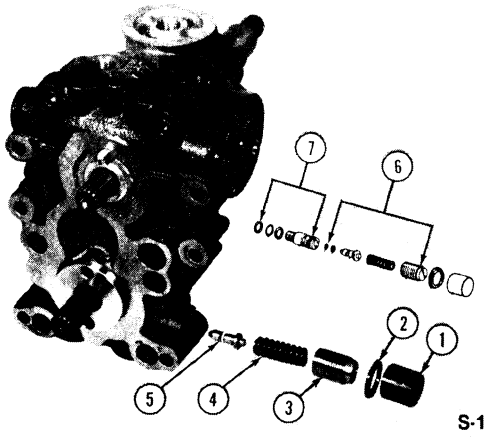



**Figure 43**
**High Pressure Relief Valve**

1. Shroud
2. Washer (Gasket)
3. Adjusting Screw
4. Spring
5. Valve Assy.
6. Relief Valve Components
7. Seat Components

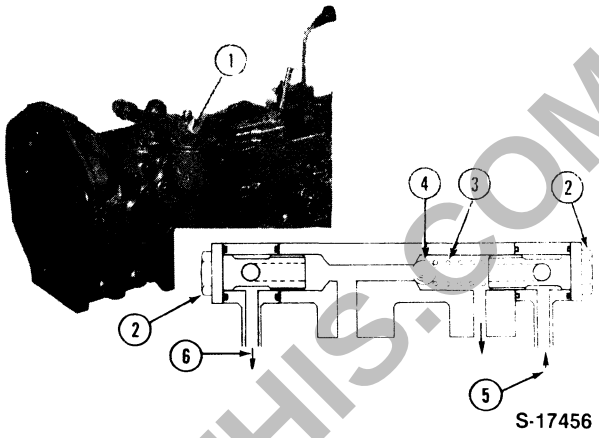



**Figure 45**
**Check Valve Assembly**

1. Check Valve Location
2. Banjo Bolt
3. Spring
4. Ball
5. Oil Tube from Cooler
6. Oil Tube to Cooler

## CHECK VALVE

Figure 45

A check valve, located in the filter manifold, protects the cooler from excess pressure due to high oil viscosity or a restriction in the cooler circuit.

## DISASSEMBLY

1. Remove the left hand banjo bolt (cooler to manifold tube) and remove the spring and ball.

## INSPECTION

1. Inspect the spring and ball for excess wear or damage. Replace faulty components if required.

2. Inspect the ball seat in the manifold housing. Replace the manifold if required.

## ASSEMBLY

Assemble the check valve components as shown in Figure 46.

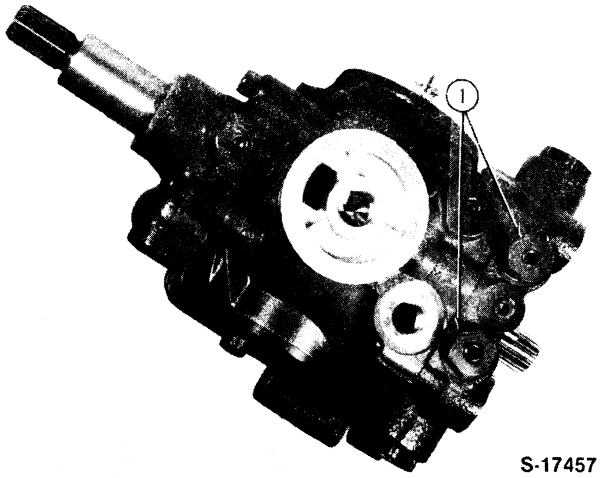



**Figure 46**
**High Pressure Relief Valve Test**

1. Test Ports



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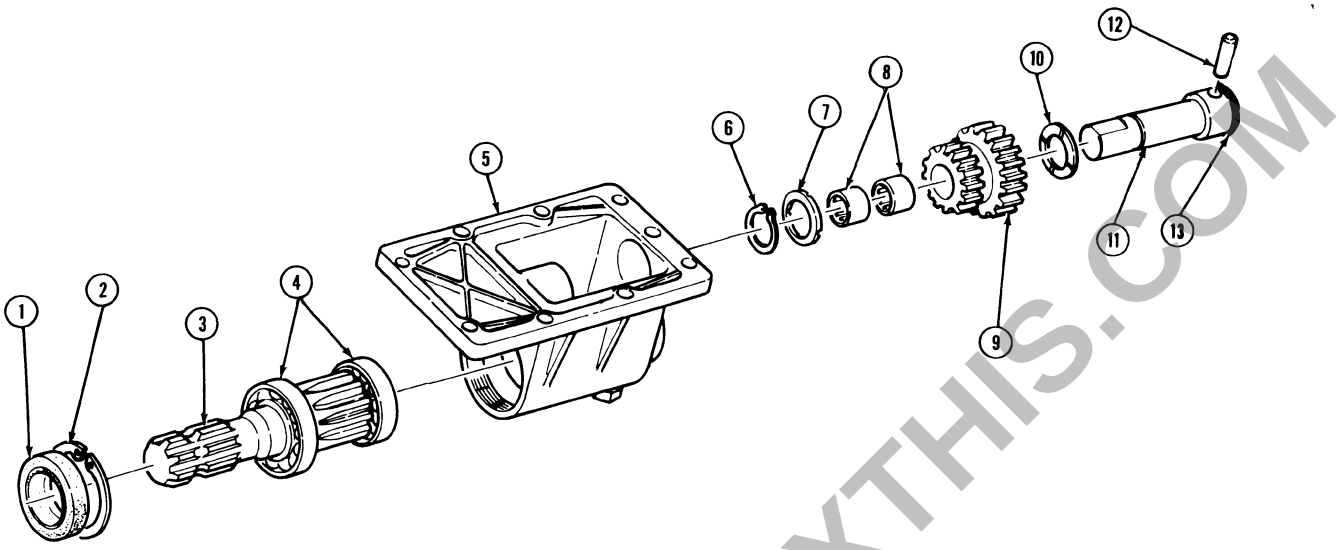



**Figure 22**
**Mid-Mount PTO Gear Box Disassembly**

1. Seal
2. Snap Ring
3. Output Shaft
4. Bearings (2)
5. Housing
6. Snap Ring
7. Thrust Washer
8. Needle Bearings (2)
9. Gear Set, Idler
10. Thrust Washer
11. Shaft, Idler
12. Pin
13. O-Ring

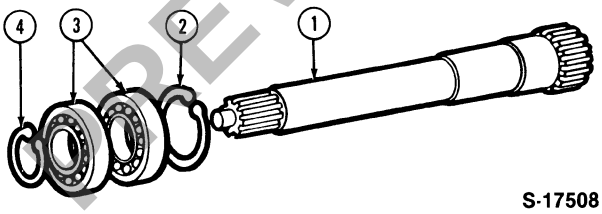



**Figure 23**
**PTO Front Countershaft Assembly (2WD)**

1. PTO Front Countershaft
2. Snap Ring
3. Ball Bearings (2)
4. Snap Ring

**NOTE:** *Be sure the grooved side of thrust washers (5) face toward needle bearings (6).*

3. If removed, install the roller bearing (9), Figure 25, in the center housing.

4. Install the assembled drive shaft in the housing and tighten the bearing holder bolts to the specified torque. See "Specifications", Chapter 3.



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# PART 8
# HYDRAULIC SYSTEM

## Chapter 2
## HYDRAULIC PUMP AND FILTER


| Section | | Page |
|---|---|---|
| A. | HYDRAULIC PUMP AND FILTER — DESCRIPTION AND OPERATION | 13 |
| B. | HYDRAULIC PUMP AND FILTER — OVERHAUL | 14 |


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### A. HYDRAULIC PUMP AND FILTER DESCRIPTION AND OPERATION

The gear driven hydraulic pump and filter used on the Model 1110 tractor is mounted on the left side of the engine and is driven by the camshaft gear, Figure 29.

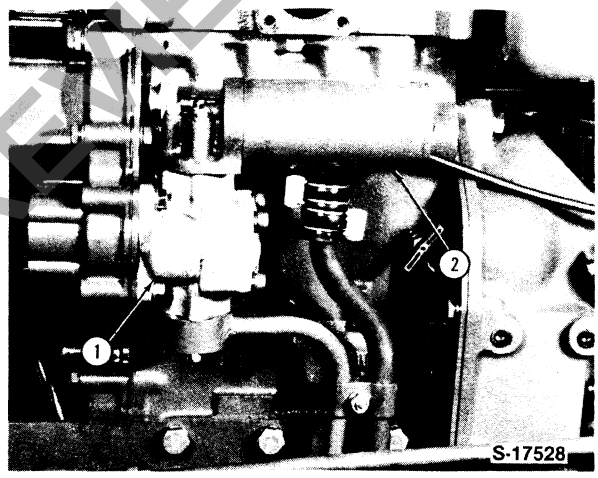



**Figure 29**
**Hydraulic Pump and Filter — Model 1110**
1. Hydraulic Pump
2. Filter Assembly

The filter is mounted on the pump body in the suction side of the pump hydraulic circuit and has a replaceable type element, Figure 30.

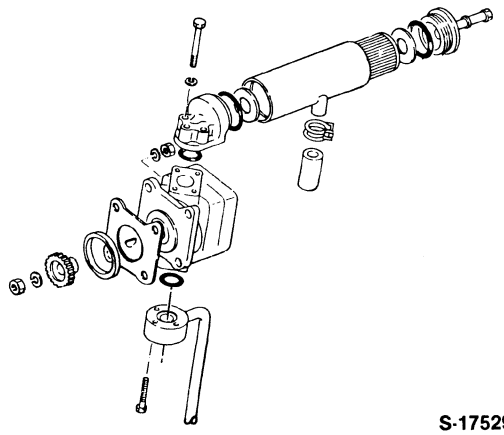



**Figure 30**
**Hydraulic Pump and Filter — Components Model 1110**



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## ASSEMBLY

### DIFFERENTIAL ASSY.

Assembly of the differential assembly generally follows the disassembly procedure in reverse.

Upon reassembly of the ring gear to the case; tighten the ring gear bolts to the specified torque. See "Specifications", Chapter 3.

Be sure to bend the locking plates to securely lock the bolts.

### PINION ASSY.

Figure 25

1. Assemble the thrust washer (2), shims (3), and bearing (4) onto the pinion shaft (1).
2. Install the snap ring (5) in the differential case.
3. Install the pinion assembly in the case.
4. Install the second snap ring (6) in the case.
5. Install the outer bearing (7), locknuts and lock washer. Tighten the lock nut to obtain a bearing pre-load, Figure 26, as follows:

   New Bearings . . . . . 11-13 lbs. (5-6 Kg)
   Used Bearings . . . . . 5.5-6.5 lbs. (2.5-3 Kg)

   Tighten the pinion locknut.

### AXLE ASSY.

**Ring Gear To Pinion Backlash**
(See Figures 27 and 28)

1. Completely assemble the right side axle assembly including the ring gear. Using a suitable hoist stand the right side axle assembly on the wheel shaft as shown in Figure 28.

**WARNING:** *Be sure the axle assembly is secure and supported properly to prevent it from falling over.*

2. Place a dial indicator on the axle housing as shown in Figure 28, and measure the ring gear to pinion shaft backlash. If the backlash. If the backlash is not .004-.006 (0.1-0.15 mm) add or subtract shims until it comes within the specifications.

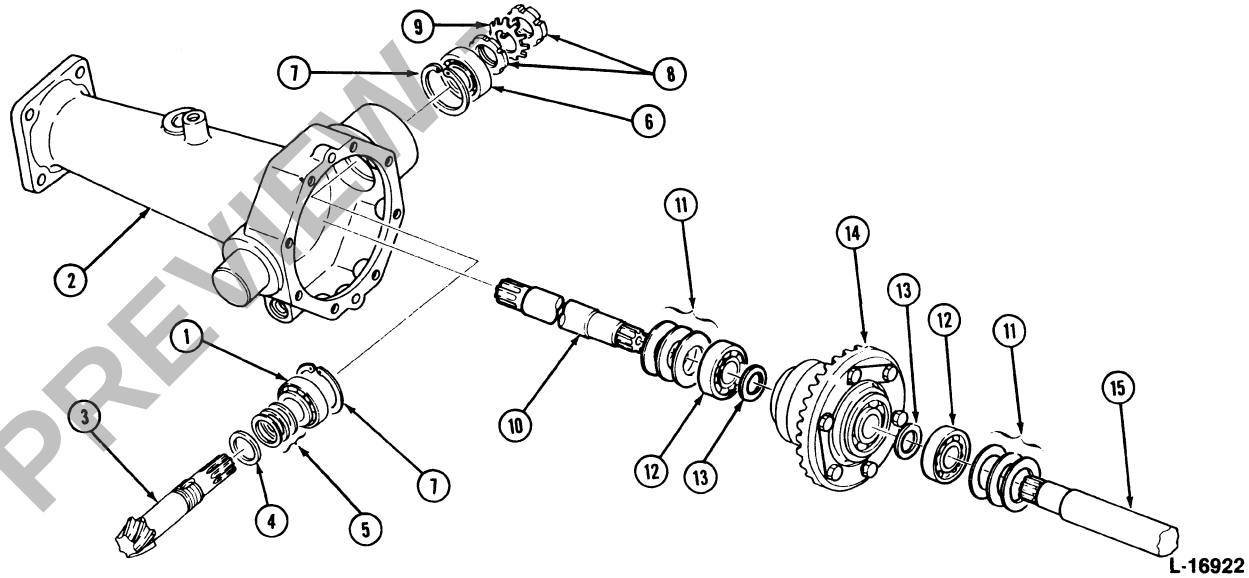



**Figure 25**
**Pinion Shaft — Assembly**

1. Bearing
2. Axle Housing
3. Drive Pinion
4. Thrust Washer
5. Shims
6. Bearing
7. Snap Ring
8. Lock Nut
9. Lock Washer
10. Axle Shaft - Right Hand
11. Shims
12. Bearing
13. Spacer
14. Differential Assembly
15. Axle Shaft - Left Hand



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