# 1965 - 1975 FORD TRACTOR Service Manual

TRACTORS Ford EQUIPMENT

## Tractor Series 2000, 3000, 4000, 5000, 7000 3400, 3500, 3550, 4400, 4500, 5500, and 5550


Part 1 – Engine Systems
Part 2 – Fuel Systems
Part 3 – Electrical System
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Part 5 – Four-Speed Transmission
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Part 7 – Seven and Eight-Speed Transmission
Part 8 – Select-O-Speed Transmission
Part 9 – Power Take-Off
Part 10 – Rear Axle and Brakes
Part 11 – Hydraulic Systems
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Part 13 – Front Axle
Part 14 – Wheels and Tyres
Part 15 – Separating the Tractor
Part 16 – Accessories and General
Part 17 – Tractor Maintenance Schedule


This three-volume manual provides information for the proper servicing of the Ford 2000, 3000, 4000, 5000, and 7000 agricultural tractors Keep this manual readily available for reference at all times.

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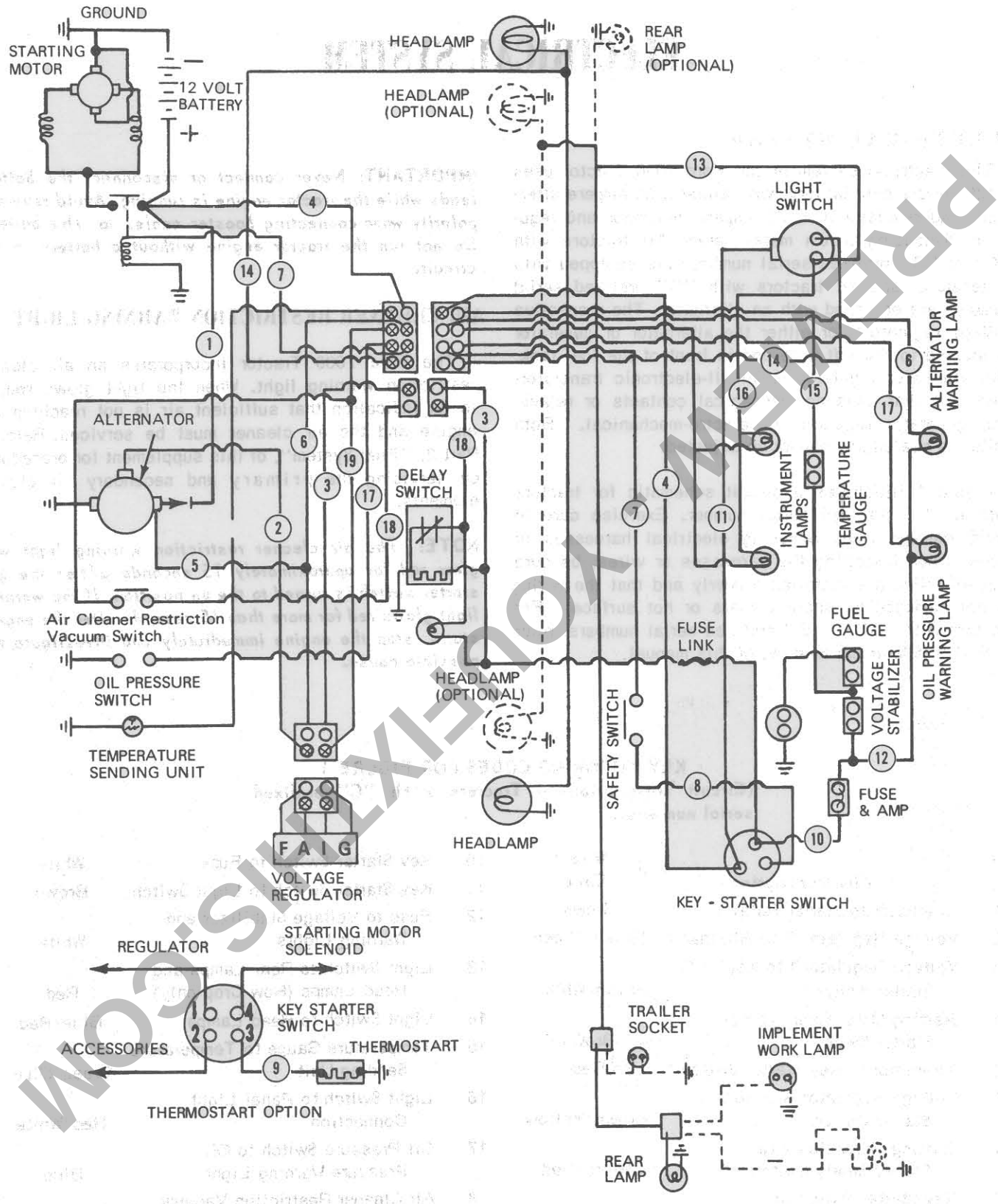



**Figure 1**
**Electrical System Schematic**

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# NEW MODELS

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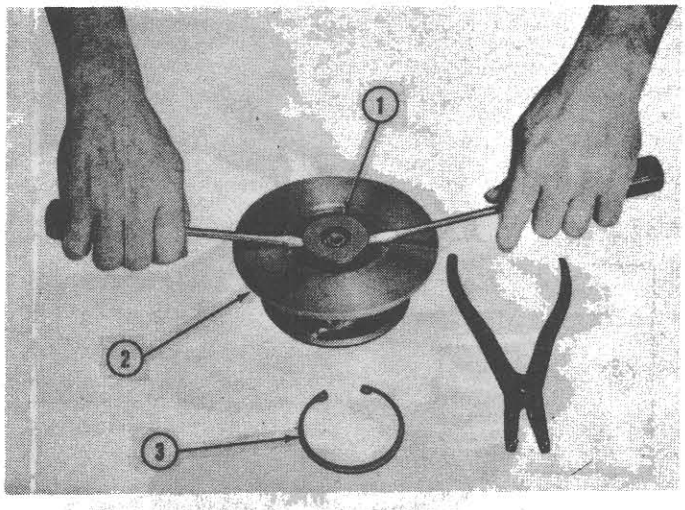



**Figure 6**
**Compressor Insert Removal**

1. Compressor Insert
2. Bearing Housing
3. Insert Snap Ring

*on the bearing housing or the hub of the turbine wheel.*

4. Clamp a 5/8 inch twelve-point box end wrench in a vise as shown in Figure 5. Place the hub of the turbine wheel in the wrench socket.

5. Remove the lock nut retaining the compressor wheel and discard the nut. Remove the compressor wheel.

6. Remove the turbine wheel and shaft assembly and the bearing from the bearing housing. Identify the compressor end of the bearing with a piece of string so that it may be installed in the same position during assembly.

**NOTE:** *Take care to avoid dropping the bearing or the turbine wheel and shaft assembly. Both will slip easily from the bearing housing.*

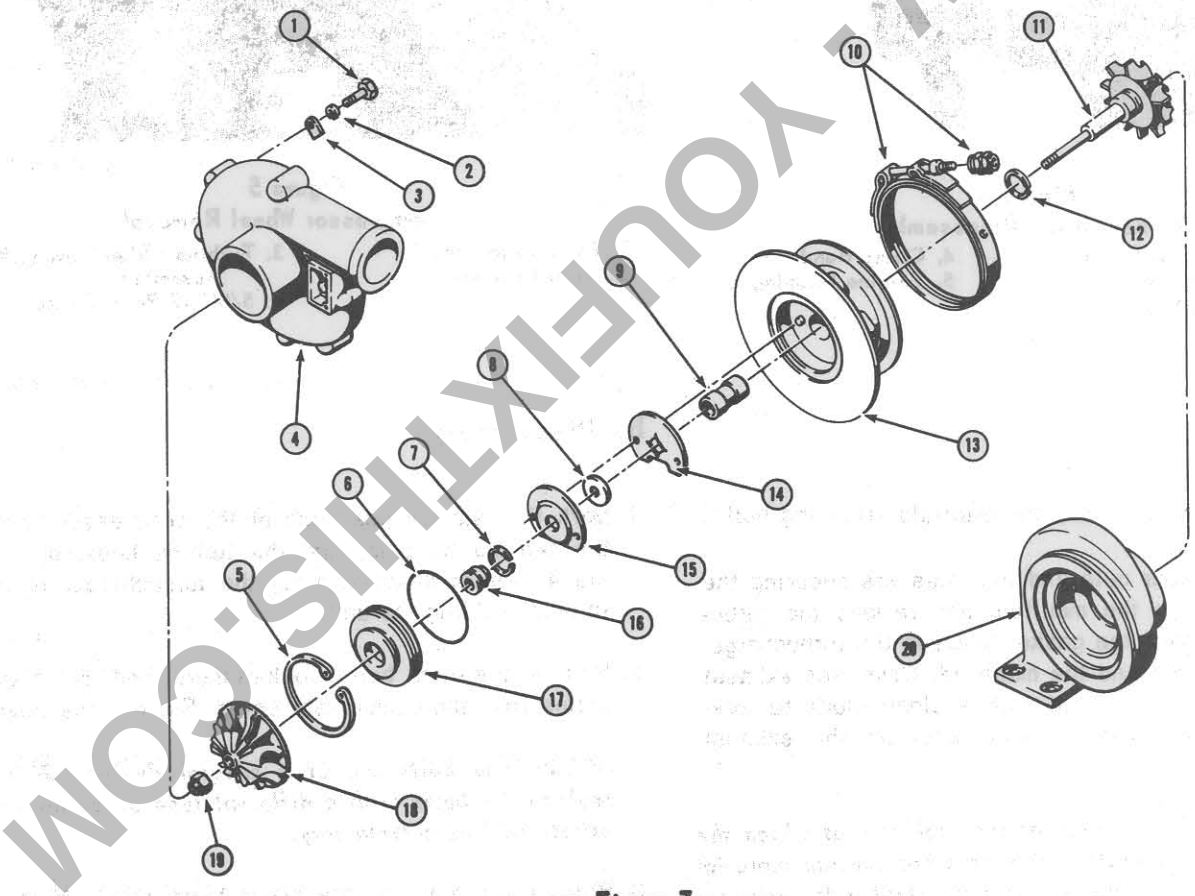



**Figure 7**
**Turbocharger – Exploded View**

1. Bolt
2. Lock Washer
3. Clamp Tab
4. Compressor Cover
5. Snap Ring
6. "O" Ring
7. Sealing Ring
8. Thrust Ring
9. Bearing
10. Clamp and Nut Assy.
11. Turbine Wheel & Shaft Assy.
12. Sealing Ring
13. Bearing Housing Assy.
14. Thrust Bearing
15. Deflector-Oil
16. Flinger Sleeve
17. Insert
18. Compressor Wheel
19. Locknut
20. Turbine Housing

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# 7000 SUPPLEMENT

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Place the housing on a clean flat surface with the compressor side up as shown in Figure 6. Remove the snap ring retaining the compressor insert. Place a hand over the snap ring while removing it to prevent either loss of the ring or personal injury.

8. Using two screwdrivers, gently lift the insert from the bearing housing as shown in Figure 6. Remove and discard the O-ring from the insert.

9. Remove the flinger sleeve, the oil deflector, the thrust ring, and the thrust bearing. Refer to Figure 7. Do not remove the two dowel pins from the bearing housing.

10. Remove the sealing ring from the flinger sleeve and the copper-coated sealing ring from the turbine wheel and shaft assembly.

**NOTE:** ***The sealing rings have different diameters and must not be interchanged. Identify each ring with a tag so that they will be properly installed at assembly.***

Refer to the exploded view illustration, Figure 7, and to the following Turbocharger Diagnosis Guide during the inspection and repair of the turbocharger parts.

## TURBOCHARGER DIAGNOSIS GUIDE

| PROBLEM | POSSIBLE CAUSE | CORRECTION |
|---|---|---|
| DAMAGED COMPRESSOR BLADES | Foreign object | Determine source and correct. |
| DAMAGED TURBINE BLADES | Foreign object | Determine source and correct. |
| DAMAGED TURBINE AND COMPRESSOR BLADES | Turbine shaft and/or bearing worn (possibly due to cold start) | Install necessary new parts. |
| CARBONIZED CRUST ON BEARING | Excessive heat (due to hot shut-down) | Install necessary new parts. |
| BEARING DISCOLORED TO BLUE (OR BLACK) | Excessive exhaust temperatures | Determine cause and correct. |
| BEARING WEAR ON ENDS OF OUTER SURFACES | Damage due to dirty oil | Install necessary new parts, change oil and filter. |
| BEARING BRONZE WIPED ONTO SHAFT | Due to cold start (oil lag) | Possibly require new bearing and shaft. |
| END OF BEARING WORN | Excessive end play | Install new wear parts. |
| DIRT BUILD-UP COMPRESSOR WHEEL AND/OR COVER | Air leak between air cleaner and compressor | Locate and repair leak. |
| | Operating without air cleaner | Install clean air filter. |

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## Part 2

# FUEL SYSTEMS–DIESEL

### FORD 2000 and 3000

The fuel injection pumps and injectors of new model Ford 2000 and 3000 tractors are identical to those used on the previous model Ford 2000 and 3000 tractors.

### FUEL INJECTORS

The fuel injectors used in new model Ford 4000 and 5000 engines differ from those used in previous Ford 4000 and 5000 engines. The outward appearance of the new injector is the same as those used on the previous tractors. The difference between current and previous injectors is in the size and angle of the nozzle holes which, without accurate gauges, cannot be readily recognized.

For this reason, when re-conditioning injectors in service, special attention should be given to the identification code numbers which are etched on the body of the nozzle. This number in conjunction with the following chart will enable each nozzle to be identified with the actor it was designed for.

| Previous New Range Tractors | Nozzle Identification | Current New Model Tractors | Nozzle Identification |
|---|---|---|---|
| Ford 2000 | BDLL150S6443 | Ford 2000 | BDLL150S6443 |
| Ford 3000 | NL 413 | Ford 3000 | NL 413 |
| Ford 4000 | BDLL150S6476 | Ford 4000 | BDLL140S6422 |
| Ford 5000 | NL 413 | Ford 5000 | BDLL140S6422 |

### FORD 4000 DIESEL – AIR CLEANER

The air cleaner specified for use with the new Ford 4000 diesel engine is the same as that used on the previous and current Ford 5000 tractor. The diameter of this cleaner is 7 in. (178 mm) as compared to the 6.5 in. (165 mm) diameter cleaner previously used on the Ford 4000. The inlet and outlet ports are 2.25 in. (57.15 mm) diameter as compared to the 2 in. (50.8 mm) diameter ports in the previous cleaner. The air cleaner hoses have been changed accordingly.

## Part 2

# FUEL SYSTEMS–GAS

### FORD 5000 (GAS) – AIR CLEANER

A new air cleaner is used with the new model Ford 5000 gas engine. This cleaner has a diameter of 7 in. (178 mm) compared to the 6.5 in. (165 mm) diameter cleaner used on the previous Ford 5000 gas tractor. It has an inlet ort diameter of 2.25 in. (57.15 mm) as compared to the 2.0 in. (50.8 mm) diameter inlet port in the previous cleaner used on Ford 5000 gas tractors.

### ALL GAS ENGINES – NO LOAD AND IDLE SPEEDS

The following no load and idle speeds are specified for new model gasoline engines.

| Model | No Load Speed | Idle Speed |
|---|---|---|
| Ford 2000 | 2065–2165 | 600–700 |
| Ford 3000 | 2285–2385 | 600–700 |
| Ford 4000 | 2395–2495 | 600–700 |
| Ford 5000 | 2285–2385 | 600–700 |

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***Reference to "ground" indicates that a good ground is necessary. The alternator ground stud would be the best grounding point.***

## Battery Voltage and Shorted Isolation Diode Test

**Conditions:** Key Starter Switch OFF, Engine NOT Running

1. This test will determine if the tractor battery is properly installed and if the isolation diode is functioning properly by keeping battery voltage off of the alternator auxiliary terminal, Figure 15. A shorted isolation diode will allow the battery to discharge through the voltage regulator. The charge indicator light will "burn" when the key is off if the isolation diode is shorted.

2. Connect the voltmeter negative lead to ground and the positive lead to the output terminal at the isolation diode heat sink, Figure 15. The voltmeter should indicate battery voltage.

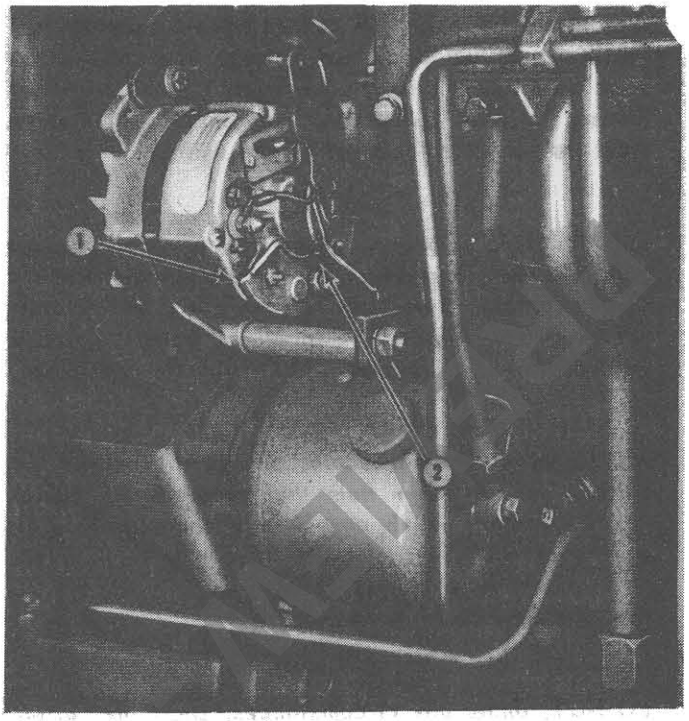


**Figure 16**
**Output Lead Position**

1. Heat Sink
2. Do Not Allow Output Lead To Touch Heat Sink

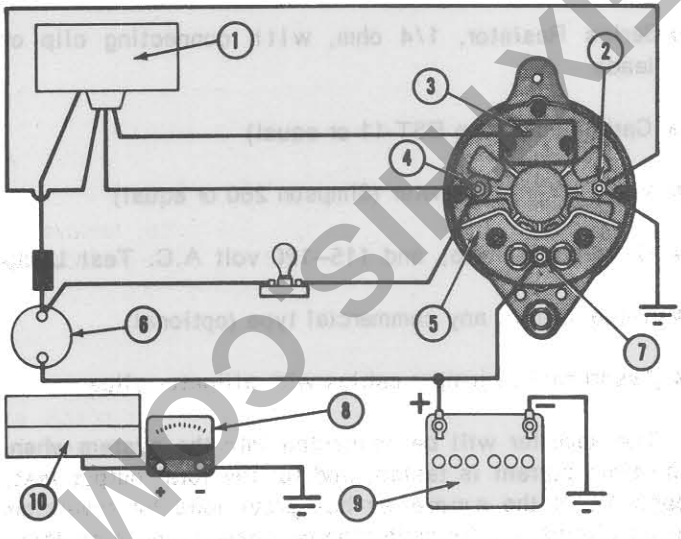



**Figure 15**
**Battery Voltage and Shorted Isolation Diode Test**

1. Regulator
2. Ground
3. Field
4. Auxiliary
5. Isolation Diode Heat Sink
6. Key-Switch
7. Output
8. Test Voltmeter
9. Battery
10. Auxiliary Output

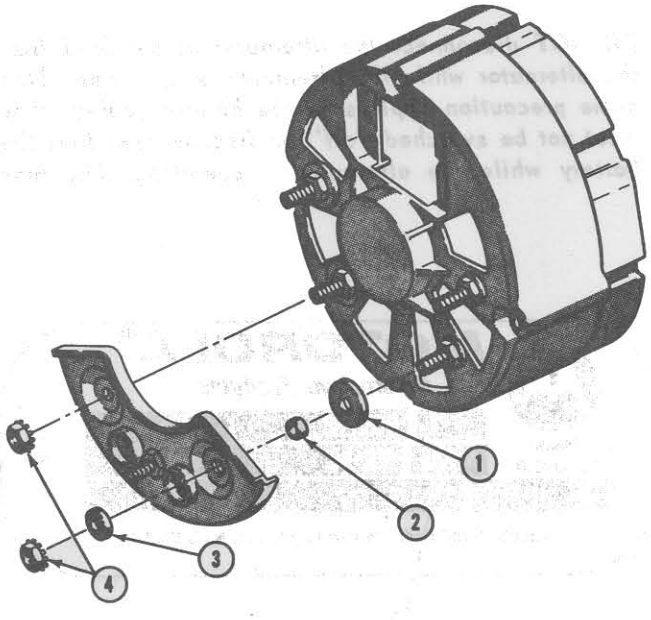



**Figure 17**
**Insulators for Isolation Diode Assembly**

1. 3/4" O.D. Washer
2. Nylon Sleeve
3. 1/2" O.D. Fiber Washer
4. Lock Nuts

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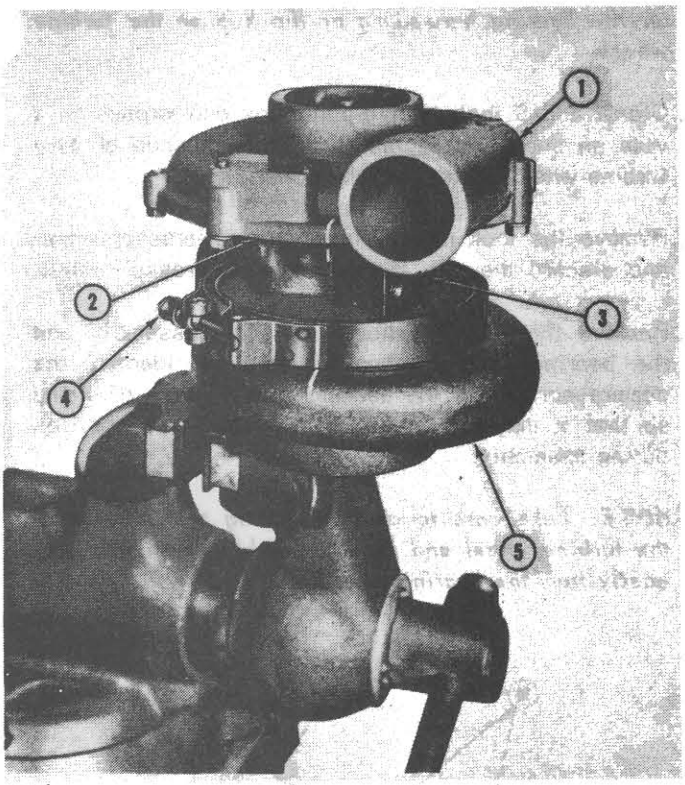



Figure 4
Turbocharger Disassembly

1. Compressor Cover
2. Clamp Plate
3. Bearing Housing
4. Clamp Band
5. Turbine Housing

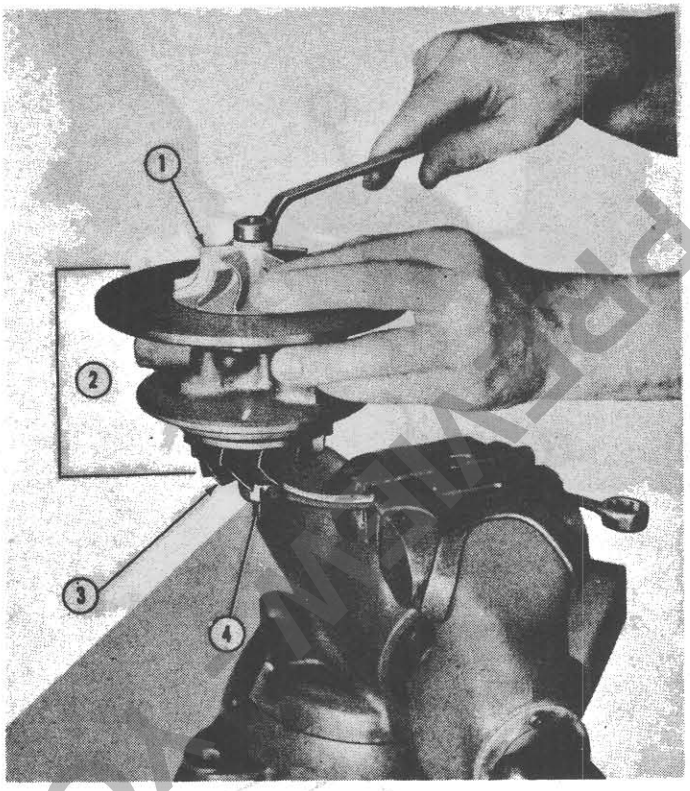



Figure 5
Compressor Wheel Removal

1. Compressor Wheel
2. Core Assembly
3. Turbine Wheel and Shaft Assembly
4. 5/8" 12-Point Socket

6. Remove the heat shield and manifold attaching bolts.

7. Remove the four nuts and lock washers securing the turbocharger to the manifold and remove the turbocharger. Remove the gasket between the turbocharger mounting flange and the manifold. Cover the exhaust opening in the manifold with a clean cloth to prevent foreign material from entering the exhaust manifold.

IMPORTANT: *Because of the high rpm at which the turbocharger operates, dirt or other foreign material which may enter the exhaust manifold will seriously damage the turbine wheel blades. Take care to prevent foreign material from entering the exhaust system.*

8. Remove the oil return tube and gasket.

## B. Disassembly

1. Mark the relative positions of the compressor cover, the bearing housing, and the turbine housing, Figure 4, before disassembling the turbocharger to aid in reassembling the unit.

2. Remove the eight bolts, lockwashers, and four clamp plates from the compressor cover. Remove the cover.

NOTE: *The bolts are of a special design. Do not replace the bolts with a different type since no substitute will be satisfactory.*

3. Remove the nut from the clamp band screw. Remove the clamp band and the core assembly, Figure 5, from the turbine housing.

NOTE: *If the core assembly is frozen in the turbine housing, hold the core assembly and drive the housing down and away from the core. DO NOT hammer*

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## PRODUCTION CODES

| Year | Month | Day | Shift |
|---|---|---|---|
| 1965 – 5 | Jan – A | Numerical | Midnight – A |
| 1966 – 6 | Feb – B | Date | Day – B |
| 1967 – 7 | Mar – C | 1 through 31 | Afternoon – C |
| 1968 – 8 | Apr – D | | |
| 1969 – 9 | May – E | | |
| 1970 – 0 | June – F | | |
| 1971 – 1 | July – G | | |
| 1972 – 2 | Aug – H | | |
| 1973 – 3 | Sept – J | | |
| 1974 – 4 | Oct – K | | |
| | Nov – L | | |
| | Dec – M | | |

**Example of Production Code: 5A2B**

| | |
|---|---|
| 5 _ _ _ | Year – 1965 |
| A _ _ | Month – Jan |
| 2 _ | Day – 2nd |
| B | Shift – Day |

## SERIAL NUMBERS

| Manufacturing Codes | Tractor | Fuel Type |
|---|---|---|
| A | L – 2000 | D – Diesel |
| B | N – 3000 | G – Gasoline |
| C | P – 4000 | P – Liquid Petroleum |
| | R – 5000 | |

**Example of Engine Serial Number and Production Code: LG001005A5**

| | |
|---|---|
| L _ _ _ _ _ _ _ _ _ | Ford 2000 |
| G _ _ _ _ _ _ _ _ _ | Gasoline Engine |
| 001005 _ _ _ _ | Serial Number |
| A5 _ _ | Production Code – Built January, 1965 |

**Example of Tractor Serial Number and Production Code: C1010025A2**

| | |
|---|---|
| C _ _ _ _ _ _ _ _ _ | Manufacturing Code |
| 101002 _ _ _ | Serial Number |
| 5A2 _ _ | Production Code – Built 1965 January 2nd |

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- Insulation test, Point A to D, no circuit indicates no short circuit, assembly correct.

- Continuity test, Point A to C and D to E, continuous circuit indicates no open connection, assembly correct.

**NOTE:** *In each of the above tests, resistance should not vary when the brush and connecting lead wire is moved around.*

**Isolation Diode Inspection:**

1. Test the isolation diode with a commercial diode tester according to the manufacturer's instructions.

**NOTE:** *A 9 to 12 volt battery operated test lamp may be used if a commercial tester is not available.*

2. Connect one test lead to the output terminal stud of the diode and the other to the exposed metal area on the auxiliary terminal of the heat sink. See Figure 39.

3. Repeat the test with the leads reversed as shown in Figure 40.

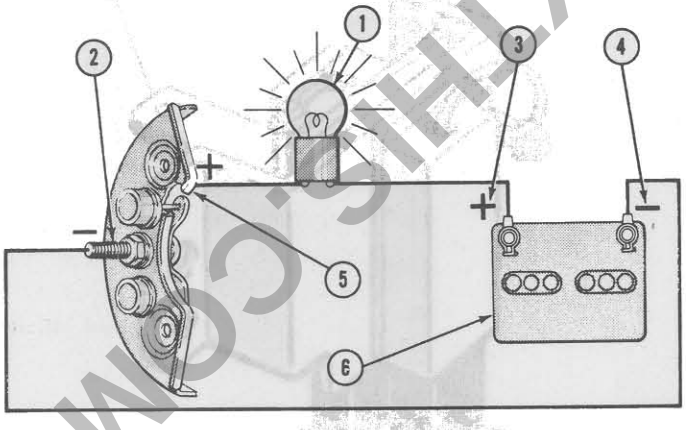



**Figure 39**
**Isolation Diode Test, Red or Yellow Diode Plate (Lamp Should Light)**

1. Lamp Should Light
2. Positive Output Terminal
3. Positive
4. Negative
5. Bare Metal Input Area of Heat Sink
6. Battery 12V

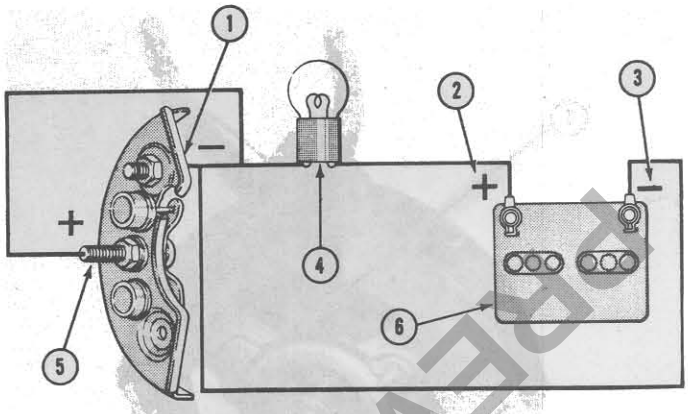



**Figure 40**
**Isolation Diode Test, Red or Yellow Diode Plate (Lamp Should Not Light)**

1. Bare Metal Input Area of Heat Sink
2. Positive
3. Negative
4. Lamp Should Not Light
5. Positive Output Terminal
6. Battery 12V

**NOTE:** *The lamp should light when the leads are connected as shown in Figure 39. If the lamp fails to light, the diode is open and it must be replaced. The lamp should not light when the leads are reversed, as in Figure 40. If the lamp does light, the diode is shorted and it must be replaced. Replace a defective isolation diode as a complete assembly. Do not immerse the isolation diode in a severe cleaning chemical as it may remove the special corrosion resistant paint.*

**Rear Housing Inspection:**

1. Check the rear housing for cracks around the drilled openings.

2. If the rear bearing bore has been scuffed from the bearing turning in the casting, the housing must be replaced with a new housing.

3. Clean the housing in solvent if it is to be re-used.

4. Install a new rear bearing retainer (O-ring) in the bore recess. See Figure 41.

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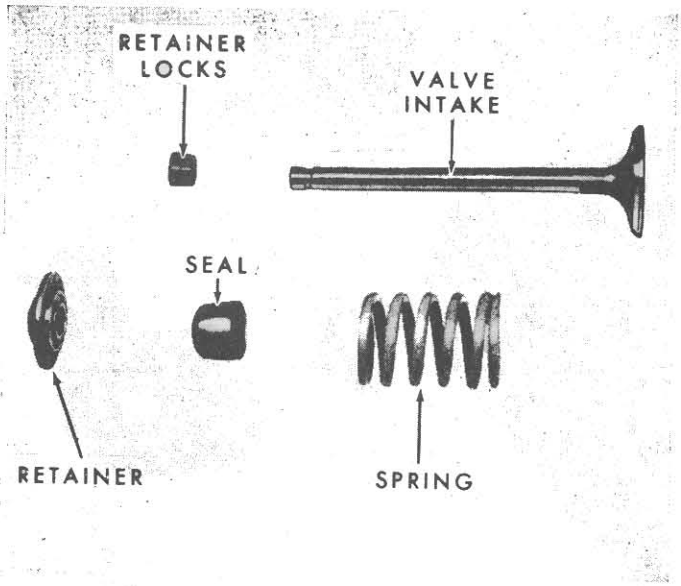



**Figure 11**
**Intake Valve Assembly**

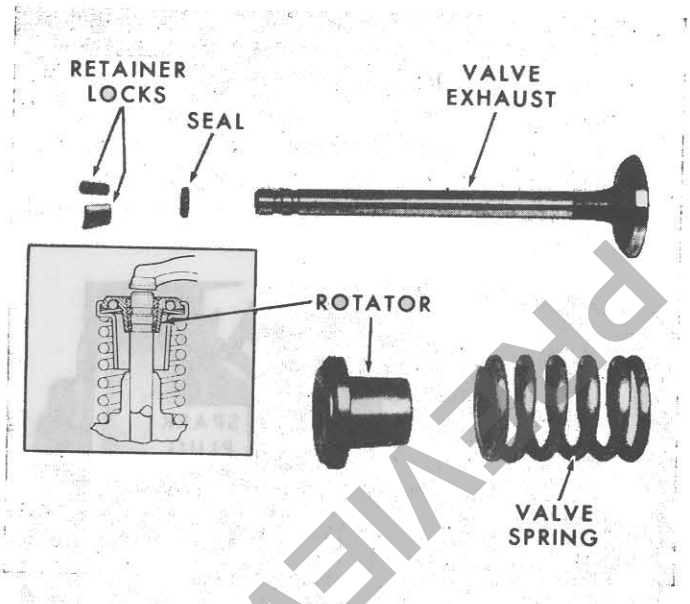



**Figure 12**
**Exhaust Valve Assembly**

**B. Disassembly**

1. On diesel, LP gas and 4-cylinder gasoline engines, remove the two bolts that attach the water outlet connection to the cylinder head. Remove the connection, thermostat, and gasket, as shown in Figure 9.
   **NOTE:** ***On 3 cylinder gasoline engines, the water outlet connection is incorporated in the intake manifold and a water outlet cover and gasket are used to cover the hole in the front of the cylinder head. The water outlet cover and gasket are used to cover the hole in the intake manifold on the LP gas engine.***
2. Before removing the valves from the cylinder head, clean any carbon deposits from the area of the valve heads.
3. Position the valve spring compressor over the valve and spring, as shown in Figure 10, and compress the spring.
   Intake Valves: Remove the retainer locks, spring retainer, spring, and valve stem seal. The parts are shown in Figure 11.
   Exhaust Valves: Remove the retainer locks, the seal from its groove, and the valve rotator and spring. The parts are shown in Figure 12.
4. Lift the valves from the cylinder head and place them in a numbered rack so they can be reinstalled in their respective guides. Keep the exhaust valve rotators with the valves from which they were removed.

**C. Cleaning**

1. After the valves are removed, clean the valve guide bores with a valve guide cleaning tool.
2. Remove all dirt, grit, and grease from the cylinder head with cleaning solvent.
3. Scrape all gasket surfaces clean. If necessary, soak the head gasket surface with paint remover to loosen the gasket material. Carefully scrape the gasket from the head, applying the paint remover as required.
   Caution: Be careful when working with paint remover, as it is highly combustible.
   Diesel Engines: Be sure to remove any injector washers that may have remained in the bores.

**D. Inspection and Repair**

1. Inspect the cylinder head for cracks, nicks, or burrs. Install a new head if necessary. Remove all burrs or nicks from the gasket surface with an oil stone.
2. With a straight edge and feeler gauge, check the flatness of the cylinder head lengthwise, diagonally and crosswise as shown in Figure 13. Specifications for flatness are 0·006 in. (0·15mm.) maximum overall or 0·003 in. (0·076 mm.) in any six inches (152·40 mm.).
   **NOTE:** ***If the cylinder head bottom face is not within the flatness specification, it may be skimmed provided the depth from the lower face of the valve seat insert to the cylinder head face after skimming is not less than 0·117 in. (2·97 mm.).***
3. If the head has been skimmed, check to determine whether the head bolts will bottom. To do this, place the cylinder head, less gasket, on the block and install and finger tighten all the head bolts (rocker arm shaft supports and washers should be used under the long bolts). Using a feeler gauge, check the clearance between the

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**Piston Rings**

| | |
|---|---|
| Oil: | |
| Type | Slotted with Expander |
| Number and Location | 1 Above Piston Pin |
| Material | Cast Iron |
| Finish | Chrome Plate |
| Width | 0·1859–0·1866 in. (4·7219–4·7396 mm.) |
| Gap Width | 0·013–0·033 in. (0·330–0·84 mm.) |
| Compression: | |
| Number and Location—Diesel | 1 Top and 2 Intermediate above Piston Pin |
| —Gasoline | 1 Top and 1 Intermediate above Piston Pin |
| Type—Top | Barrel Face |
| —Intermediate | Straight Face—Inner Bevel |
| Material | Cast Iron |
| Finish—Diesel—Top | Chrome Plate |
| —Intermediate | 1 Chrome Plate, 1 Plain |
| Finish—Gasoline—Top | Chrome Plate |
| —Intermediate | Plain |
| Width—Top | 0·0929–0·0936 in. (2·36–2·37 mm.) |
| —Intermediate | 0·0925–0·0935 in. (2·25–2·37 mm.) |
| Radial Wall Thickness—Top | 0·178 in. (4·521 mm.) Maximum (4·200 in. (106·680 mm.) Bore) |
| | 0·184 in. (4·673 mm.) Maximum (4·400 in. (111·760 mm.) Bore) |
| Diesel—Intermediate | 0·178 in. (4·521 mm.) Maximum (4·200 in. (106·680 mm.) Bore) |
| | 0·184 in. (4·673 mm.) Maximum (4·400 in. (111·760 mm.) Bore) |
| Gasoline—Intermediate | 0·165 in. (4·191 mm.) Maximum (4·200 in. (106·68 mm.) Bore) |
| | 0·165 in. (4·191 mm.) Maximum (4·400 in (111·76 mm.) Bore) |
| Side Clearance | |
| Gasoline: | |
| Top compression | 0·0046–0·0029 in. (0·117–0·074 mm.) |
| 2nd compression | 0·0045–0·0025 in. (0·114–0·064 mm.) |
| Oil control ring | 0·0031–0·014 in. (0·079–0·036 mm.) |
| Diesel: | |
| Top compression | 0·0044–0·0061 in. (0·1117–0·1548 mm.) |
| 2nd compression | 0·0039–0·0056 in. (0·099–0·1422 mm.) |
| 3rd compression | 0·0039–0·0056 in. (0·099–0·1422 mm.) |
| Oil control ring | 0·0024–0·0041 in. (0·0609–0·1041 mm.) |
| Gap Width—Top | 0·012–0·038 in. (0·305–0·965 mm.) |
| —Intermediate | 0·010–0·035 in. (0·254–0·889 mm.) |

Detailed installation instructions and specifications are furnished with each set of piston rings.

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5. Screw the Proof-Meter drive cable into the Proof-Meter drive housing.

6. Polarize the generator as outlined on page 23.

7. Perform the generator output test as outlined on page 15.

8. If removed, install the perforated metal safety guard over the fan belt and generator pulley.

## DISASSEMBLY

Both the 11-amp. and the 22-amp. generators are covered in the disassembly procedure. Refer to Figures 11 and 12 to identify the components.

1. Secure the generator in a vise equipped with soft jaws. Do not overtighten the vise.

2. Unscrew the through bolts and remove the commutator end plate assembly. The Proof-Meter drive can be removed by loosening the two retaining screws.

3. Remove the armature and drive end plate assembly.

4. Place the armature in a vise equipped with soft jaws. Do not overtighten. Remove the following parts:

- Nut, lock washer, and pulley on 11-amp. models.
- Nut, lock washer, pulley and fan on 22-amp. models.
- Woodruff key and spacer.

5. Press the drive end plate assembly off the armature shaft using a press as shown in Figure 13. After removing the end plate, remove the stop ring and thrust collar from the armature shaft.

## BENCH TESTS

### A. Checking Armature for Open Circuits

Burned spots on the surface of the commutator indicate that the armature has an open circuit. The burned spots are caused by an arc that is formed when the commutator segment, attached to an open circuit winding, passes under a brush. If burned spots are detected, install a new armature.

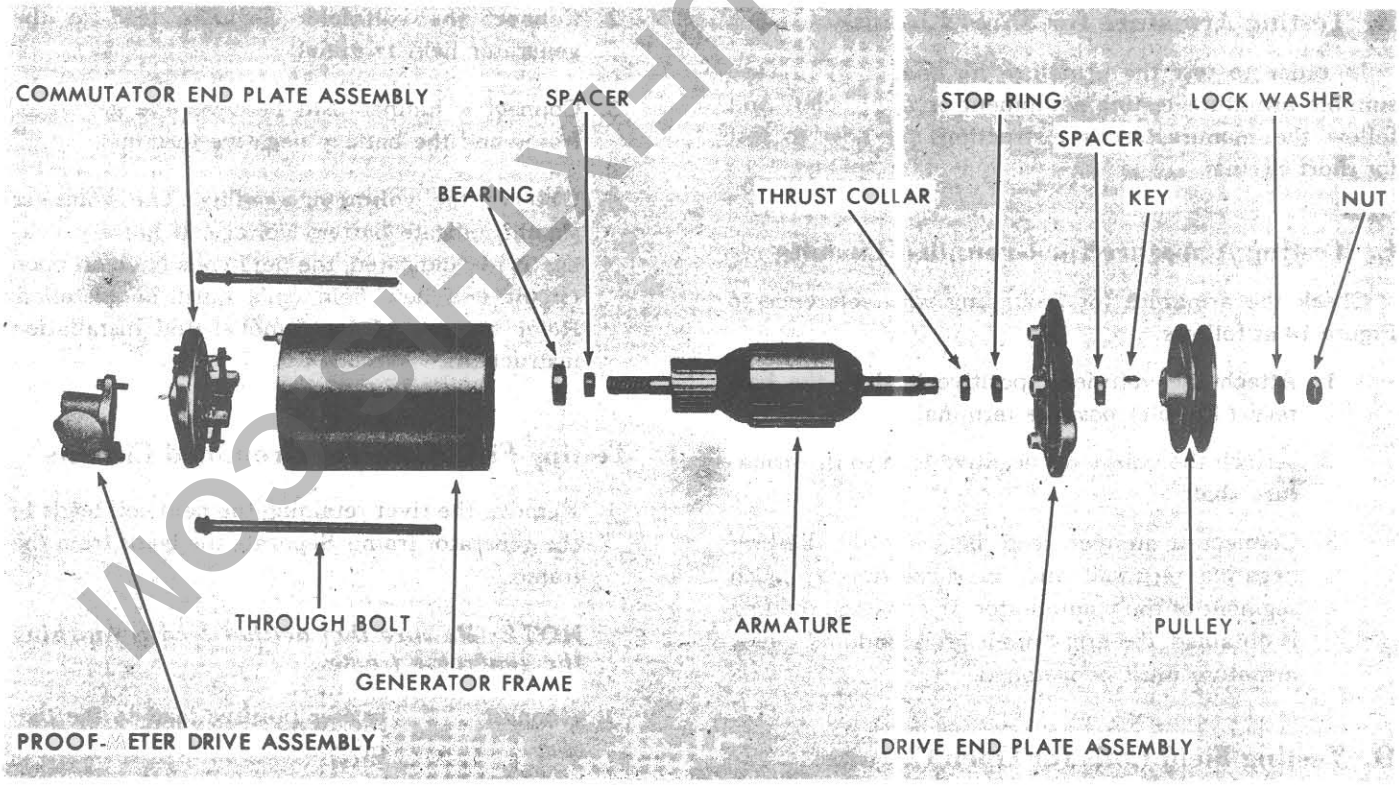



**Figure 11**
**11 Amp. Generator—Disassembled**

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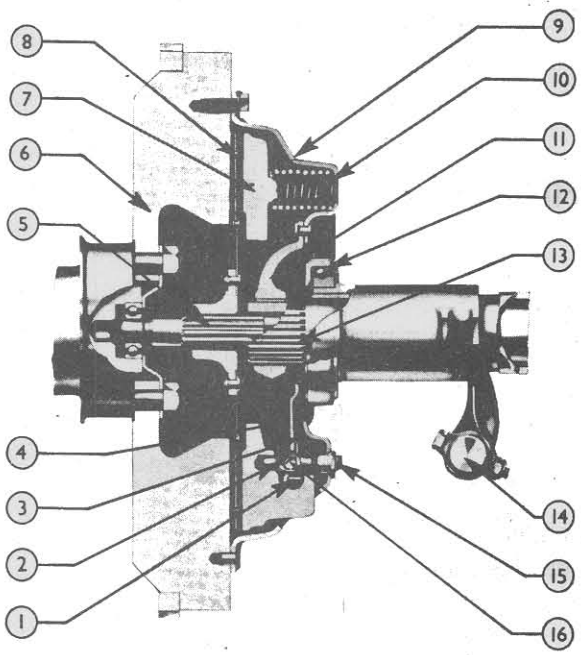


**Figure 1**
**Ford 4000 Clutch with Independent P.T.O. Drive (Previous Type)**

1. Strut
2. Eyebolt
3. Anti-rattle Spring
4. Release Lever
5. Transmission Input Shaft
6. Flywheel
7. Pressure Plate
8. Clutch Disc
9. Clutch Cover
10. Pressure Plate Springs
11. P.T.O. Drive Hub
12. Release Bearing
13. P.T.O. Input Shaft
14. Cross-shaft
15. Nut
16. Pivot Pin

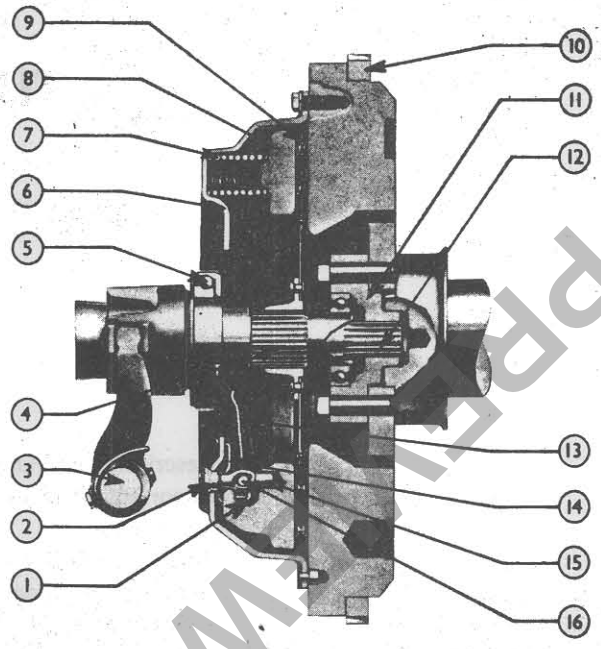


**Figure 2**
**Ford 5000 Clutch with Independent P.T.O. Drive (Previous Type)**

1. Strut
2. Nut
3. Cross-shaft
4. Transmission Input Shaft
5. Release Bearing
6. Cover
7. Pressure Plate Springs
8. Pressure Plate
9. Clutch Disc
10. Flywheel
11. P.T.O. Drive Plate
12. P.T.O. Input Shaft
13. Release Lever
14. Anti-rattle Spring
15. Eyebolt
16. Pivot Pin

## 2. IMPORTANT CHANGES

The type of clutch disc and pressure plate assembly used depends upon the tractor model concerned and when it was manufactured. Two distinct basic designs have been used and they are not interchangeable. The dates when the change was made from the previous to the current design varies for different models and different Assembly Plants, but a tractor may be identified externally as having a current design clutch if it has an external clutch pedal return spring as shown in Figure 3.

*NOTE – Tractors with a previous design clutch had a clutch pedal return spring located inside the front compartment of the front transmission.*

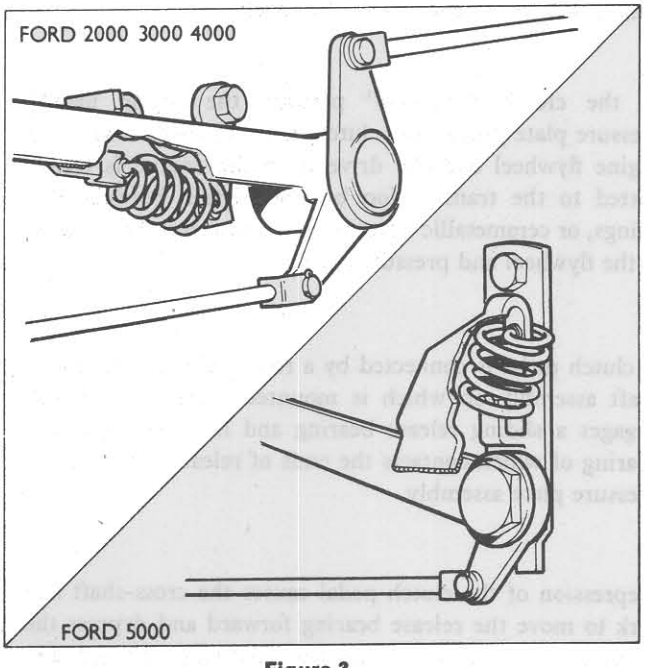



**Figure 3**
**Clutch Pedal Return Springs (Current Tractors)**

### Clutch Discs (Previous Design)

Previous design clutch discs had continuous band linings of pressed or woven organic material and various types were used. Irrespective of the type used in original production the disc which should be installed in service on tractors where the pressure plate assembly is secured to the

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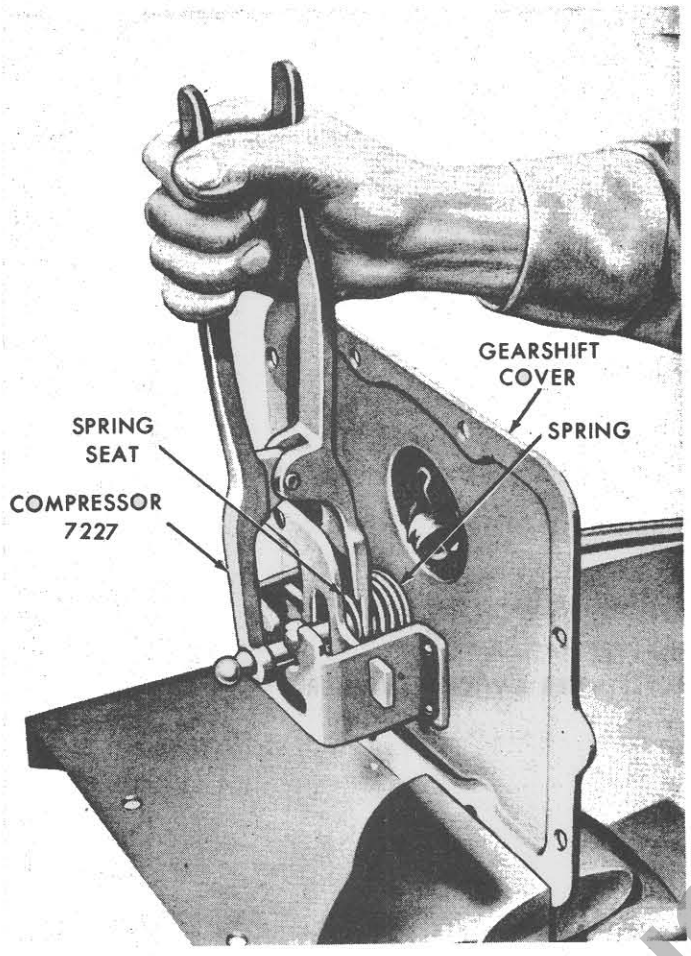



**Figure 8**
**Removing Shift Lever Spring**

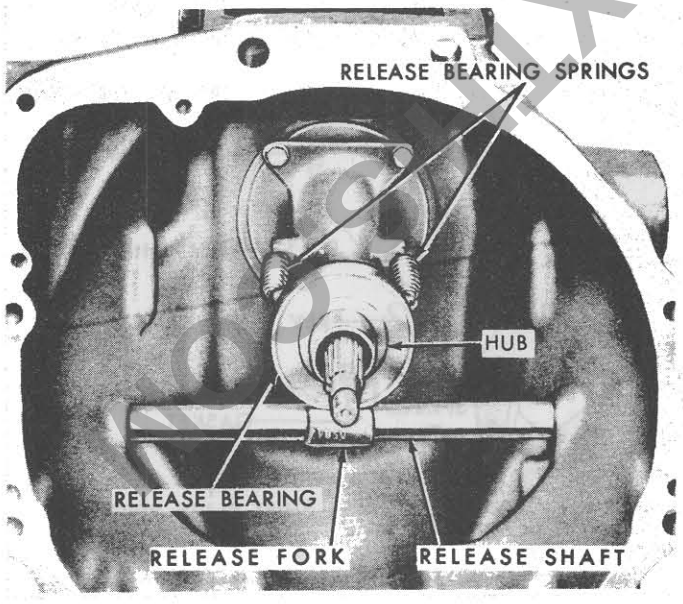



**Figure 9**
**Removing Clutch Release Bearing**

## B. Assembly

1. Place a 1⅜ in. (34.925mm) I.D. x 3 in. (76.199mm) long sleeve on two arbor press split plates. Place the bearing in position on the input shaft and insert the splined end of the shaft through the sleeve until the inner race of the bearing rests on top of the sleeve. Place a suitable driver on the face of the shaft, then press the shaft into the bearing until the bearing bottoms on the shaft.
2. With Driver No. 630-9, install a new oil seal in the retainer with the lip of the seal facing toward the rear. Coat the sealing surface of the seal with grease. With Driver No. 630-15, install the bearing cup into the retainer.
3. Coat the splines of the input shaft with grease and slide the shaft assembly into the bearing support. Rotate the shaft during assembly to prevent damage to the oil seal.

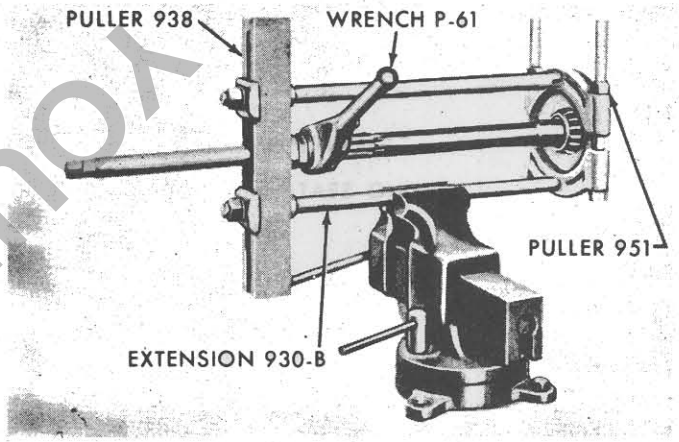



**Figure 10**
**Removing Input Shaft Bearing**

4. Position the input shaft and support assembly at the front end of the case and install the four bolts and lock washers. Tighten the bolts to the specified torque, page 15.
5. Install the clutch release bearing and hub assembly, and connect the clutch release bearing springs.

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**NOTE:** ***If a new P.T.O. countershaft gear is being installed, the small thrust washer and snap ring must be positioned inside the hub, at the front of the gear prior to installation.***

b. Using a sleeve 1 in. (25·4 mm) I.D. and $1\frac{3}{8}$ in. (34·9 mm) O.D. of convenient length drive the front bearing onto the P.T.O. countershaft to seat firmly against the countershaft gear in the front compartment.

8. Install the P.T.O. coupling sleeve onto the rear of the P.T.O. countershaft and secure with the appropriate snap ring.

**Major 4000–Independent P.T.O. Only**

a. Install the hydraulic pump driving gear to the P.T.O. countershaft and secure with the appropriate snap ring.

b. Install the shroud round the gear, retaining it with the two support plate retaining bolts, one on either side of the P.T.O. countershaft.

c. Tighten the two bolts to the same torque as the other eight rear support plate retaining bolts. (See Specifications, Chapter 3.) Secure all ten bolts with suitable locking wire.

**NOTE:** ***When servicing Major 4000 transmissions–Less P.T.O., ignore Steps 7, 7a, 7b, 8, 8a, 8b, and 8c.***

**Output Shaft and Mainshaft End-float Elimination**

9. It is necessary to eliminate all end-float in the mainshaft and output shaft taper roller bearings. This is effected by installing shims of appropriate thickness between the rear support plate and the output shaft retainer, using the following procedure:—

a. Locate the output shaft retainer assembly in the rear support plate, installing shims totalling approximately 0·060 in. (1·58 mm).

b. Install the four self-locking retaining bolts and tighten to the specified torque. (See Specifications, Chapter 3.)

c. Using a standard dial indicator, calibrated in 0·001 in., or 0·01 mm divisions, Figure 40, set the indicator plunger against the end face of the output shaft. Move the shaft in and out, noting the end-float reading on the indicator.

d. Remove the indicator, and the four self-locking retainer bolts. Withdraw the retainer and shims.

e. Remove a number of shims whose total thickness corresponds with the reading obtained on the dial indicator.

**NOTE:** ***The total thickness of shims removed can be up to 0.002 in. (0.0508 mm) more than the reading obtained on the indicator, (i.e. 0.002 in. (0.0508 mm) pre-load is achieved), but must not be less than the reading obtained on the indicator. Shims are available in thicknesses of 0.003 in., 0.005 in., and 0.012 in., (0.076 mm, 0.127 mm, and 0.305 mm).***

f. Having selected the correct shims, install the retainer, shims and four self-locking bolts. Tighten the bolts to the specified torque. (See Specifications, Chapter 3.) Reposition the indicator and recheck for end-float.

10. Refer to Part 15, for instructions for joining the tractor at the transmission to rear axle centre housing flange.

**Major 4000–Independent and Transmission P.T.O.; Dexta 2000, Super Dexta 3000–Live P.T.O.**

a. Install front support plate, the release bearing hub support assembly, and the clutch operating linkage, as previously detailed in Section 3C.

b. Refer to Part 15 for instructions on joining the transmission to the engine and front axle assembly.

## 5. COMPLETE OVERHAUL

### A. Disassembly

1. Refer to Part 15 for instructions on separating the transmission from the engine and front axle assembly, and also for separating the transmission from the rear axle assembly, thus removing the transmission assembly from the tractor.

2. Remove the shift levers and cover assembly as detailed in Section 2A, Step 1.

3. See Section 3A to remove the clutch operating components, the release bearing hub support assembly, the front support plate , the P.T.O. countershaft front bearing and gear (where applicable), and the main drive input shaft assembly.

4. See Section 4A to remove the rear support plate assembly, the output shaft assembly, and the secondary countershaft assembly.



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## TRANSMISSION LUBRICATION PRESSURE TEST

*NOTE: To perform this pressure test it will first be necessary to make a special tool by drilling and tapping a 1/8 Dry Seal NPTF or 1/8 BSP female thread in the end of a lubrication tube elbow. This modified tube elbow facilitates installation of a pressure gauge in the lubrication circuit, as shown in Figure 24.*

1. With the engine stopped, slacken the transmission oil cooler feed and return tube clamps.

2. Disconnect the transmission lubrication and pressure line control tubes at the transmission housing.

3. Remove the lubrication tube elbow and replace with the modified elbow.

4. Reconnect the transmission lubrication and pressure line control tubes at the transmission housing.

5. Connect an N–774 pressure gauge and tube into the modified elbow.

6 Start the engine and set the speed at 1000 rev/min.

7. The pressure gauge reading should be 0,69–1,38 bar (10–20 lbf/in$^2$). If the reading is above or below the specified figures, refer to Dual Power Trouble Shooting Chapter 5, for possible causes.

*IMPORTANT: At completion of this test coat all tube threads with a proprietary sealing compound.*

*NOTE: Both of these pressure tests can be conducted simultaneously using two pressure gauges If only one pressure gauge is available then both the modified elbows can still be installed and the tests performed individually. However, in this case the circuit elbow not being utilised must be plugged with an adaptor plug, Part No. 87650–S8.*

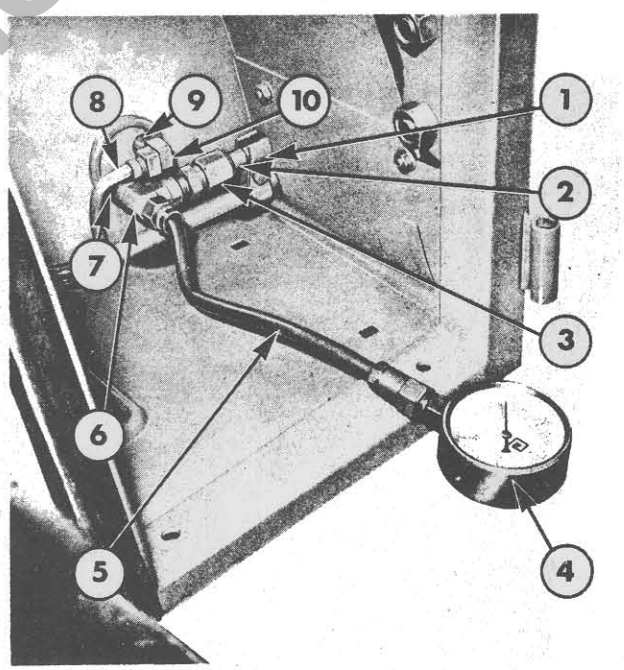



**Figure 24**
**Transmission Lubrication Pressure Test**

1. Clamp
2. Transmission Lubrication Tube
3. Connector
4. N-774 Pressure Gauge
5. Pressure Gauge Tube
6. Modified Elbow
7. Nipple
8. Pressure Line Control Tube
9. Nipple
10. Elbow

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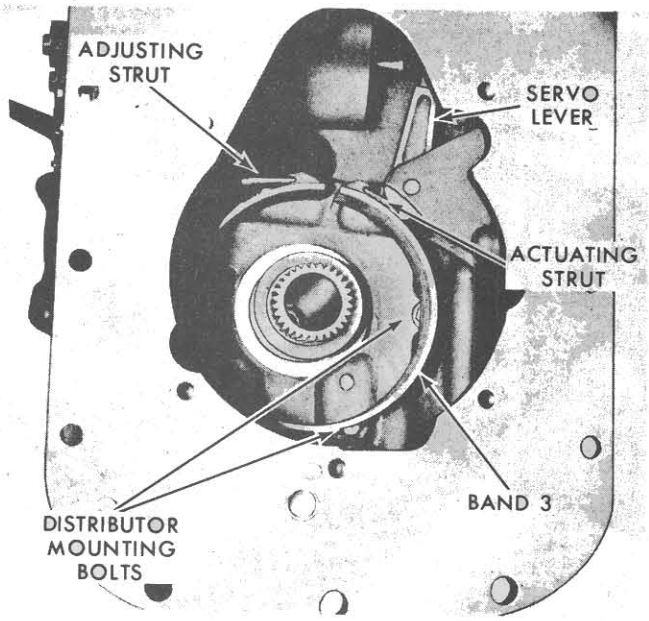



**Figure 71**
**Band 3 Position**

attaching bolts and remove the cover and gasket, shown in Figure 72.

**NOTE:** ***Do not allow the band 2 adjusting screw to loosen when removing the lock nut or the actuating strut may fall out.***

11. Loosen the four distributor mounting bolts shown in Figure 71, and remove the two servo tubes from the distributor (but not from the transmission case), by twisting and pulling at the same time as shown in the Insert, Figure, 72.

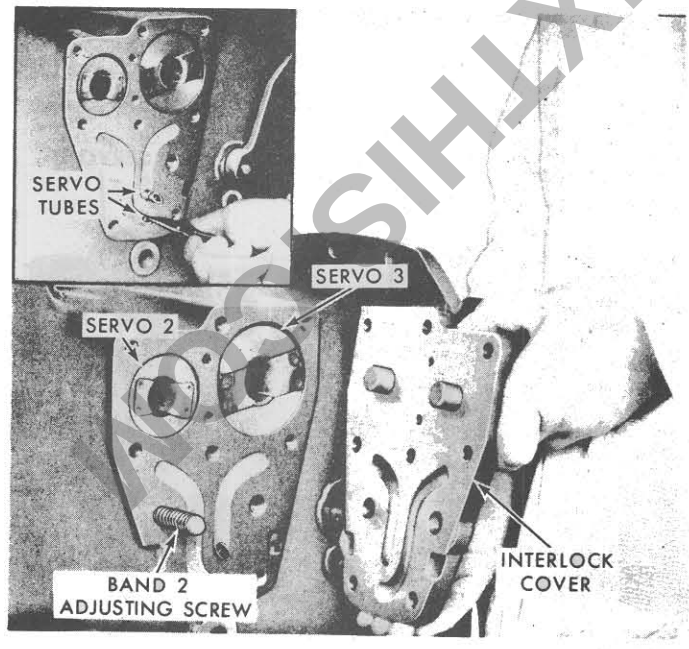



**Figure 72**
**Removing the Servos 2 and 3 Cover**

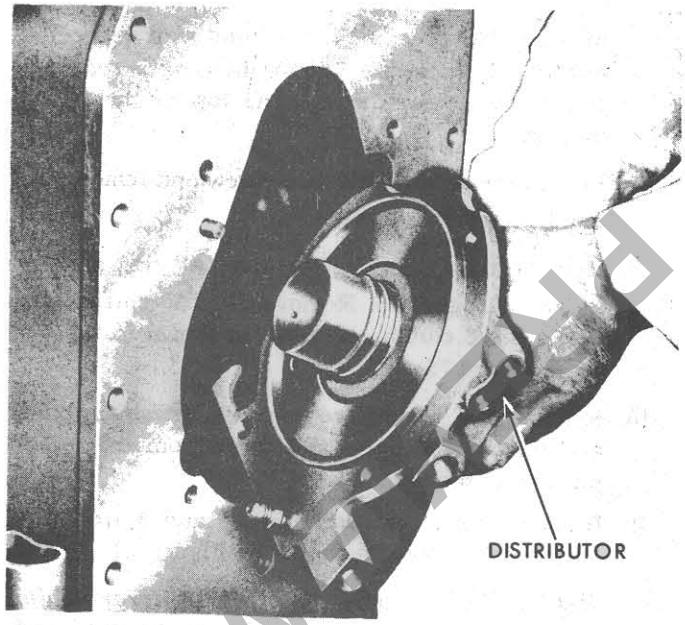



**Figure 73**
**Removing the Distributor**

12. Disconnect the fitting that attaches the servo 1 tube to the distributor. Remove the four distributor attaching bolts.

13. Remove the distributor as shown in Figure 73.

14. Remove the clutch 1, "B" ring gear, and "B" carrier as an assembly, as shown in Figure 74.

15. Tighten band 2 adjusting screw to hold the band

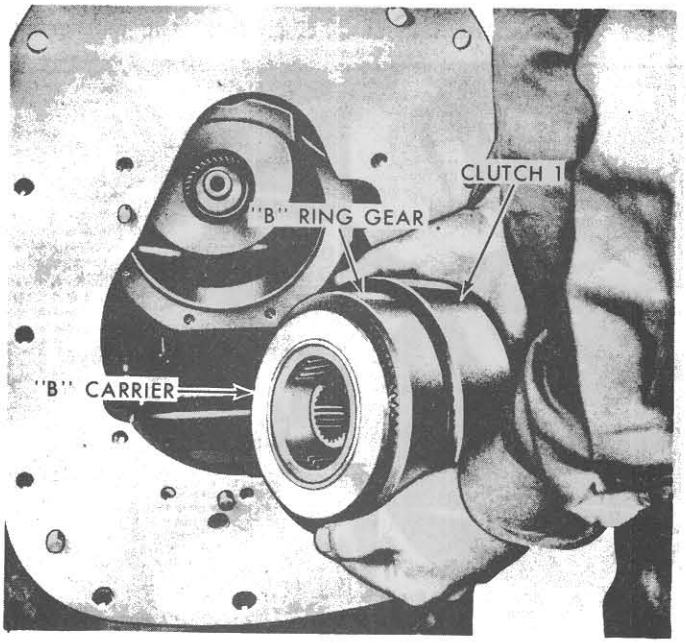



**Figure 74**
**Removing the Clutch 1, "B" Ring Gear, and "B" Carrier**

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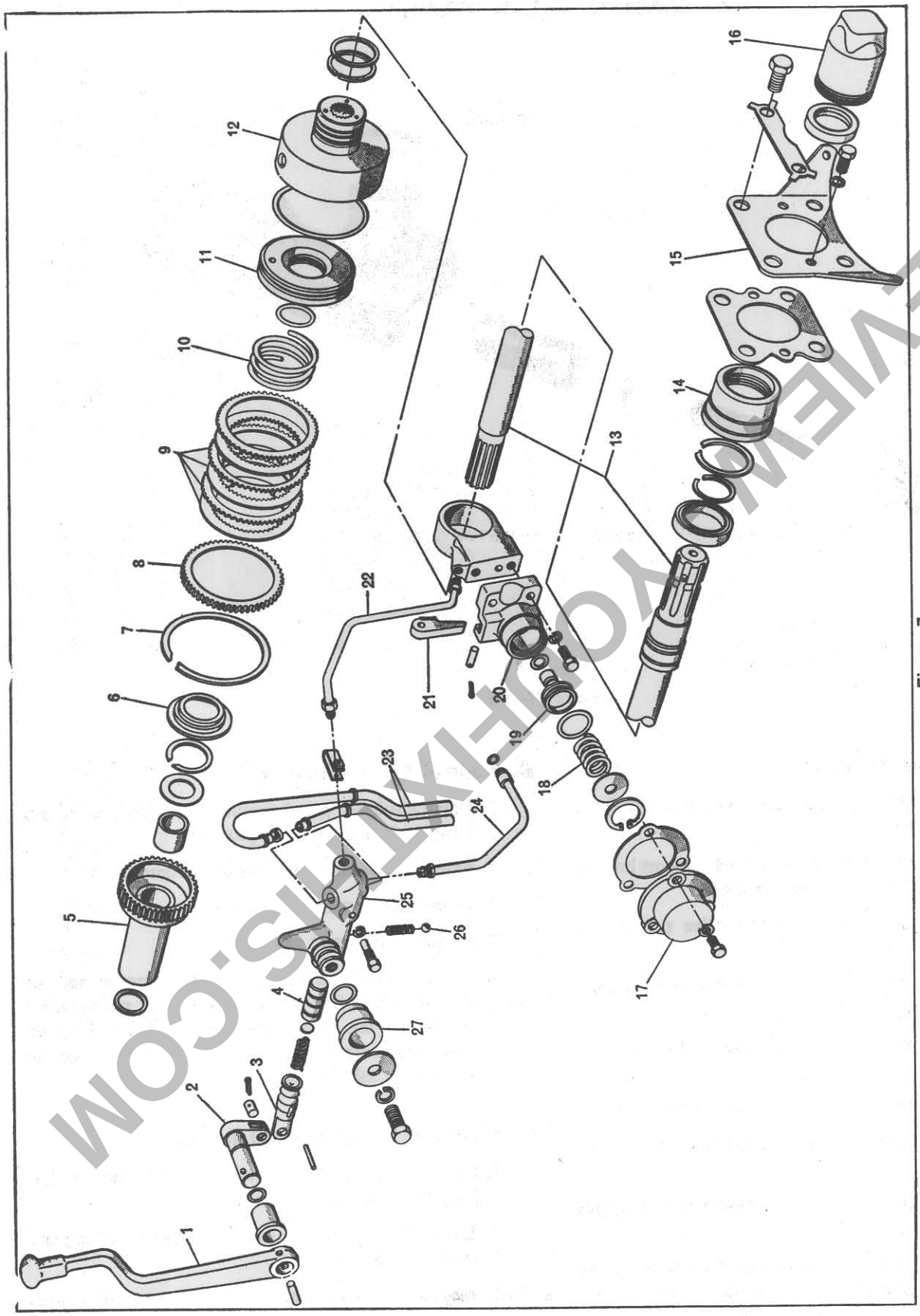


Figure 7

1. Handle
2. Link
3. Control Valve Plunger
4. Control Valve Piston
5. Coupling Shaft
6. Retainer
7. Snap Ring
8. Pressure Plate
9. Clutch Plates
10. Piston Return Spring
11. Clutch Piston
12. Clutch Housing
13. P.T.O. Shaft
14. Bearing Retainer
15. Plate
16. Cover
17. Brake Cover Plate
18. Brake Spring
19. Brake Piston
20. Support
21. Brake Arm and Pad
22. Tube (Control Valve to Support)
23. Exhaust Tubes
24. Tube (Pump to Control Valve)
25. Control Valve Housing
26. Detent Ball
27. Bush Valve Locating

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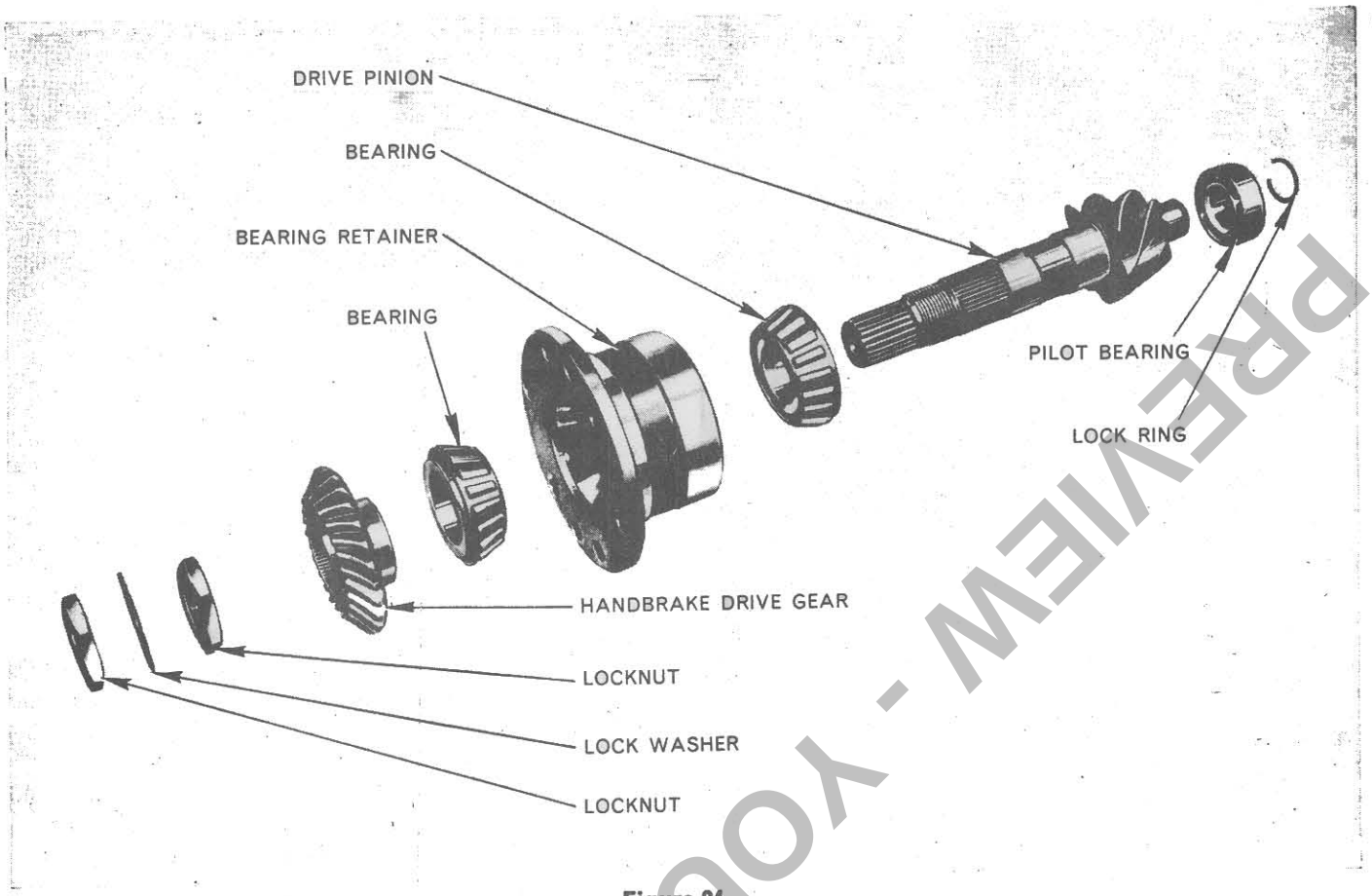



**Figure 24**
**Exploded View of Drive Pinion Assembly**

Prior to disassembling the drive pinion assembly it will be necessary to remove the differential from the rear axle centre housing. (Refer to Section 4A, 'Overhaul Differential and Differential Lock Assembly'.)

## A. Disassembly

1. Remove the three bolts and lockwashers securing the P.T.O. selector lever plate to the left-hand side of the rear axle centre housing. Lift out the P.T.O. selector lever, plate and fork, Figure 25. Slide the selector ring off the splines of the P.T.O. shaft and remove the hydraulic filters. Remove the lower right-hand bolt on the drive pinion retainer, to remove the inlet filter. Remove the handbrake assembly if fitted.
2. Remove the five remaining bolts and lockwashers securing the drive pinion assembly to the rear axle centre housing and, using two $\frac{9}{16}$ in. N.C. bolts as jacking screws, remove the drive pinion assembly, Figure 26.
3. Place the drive pinion assembly in a vice. Using a

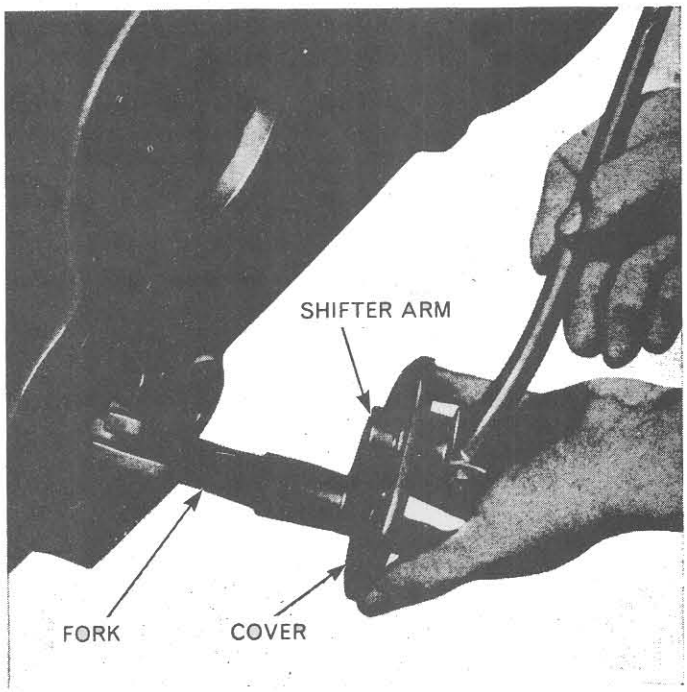



**Figure 25**
**Removing P.T.O. Shifter Lever**

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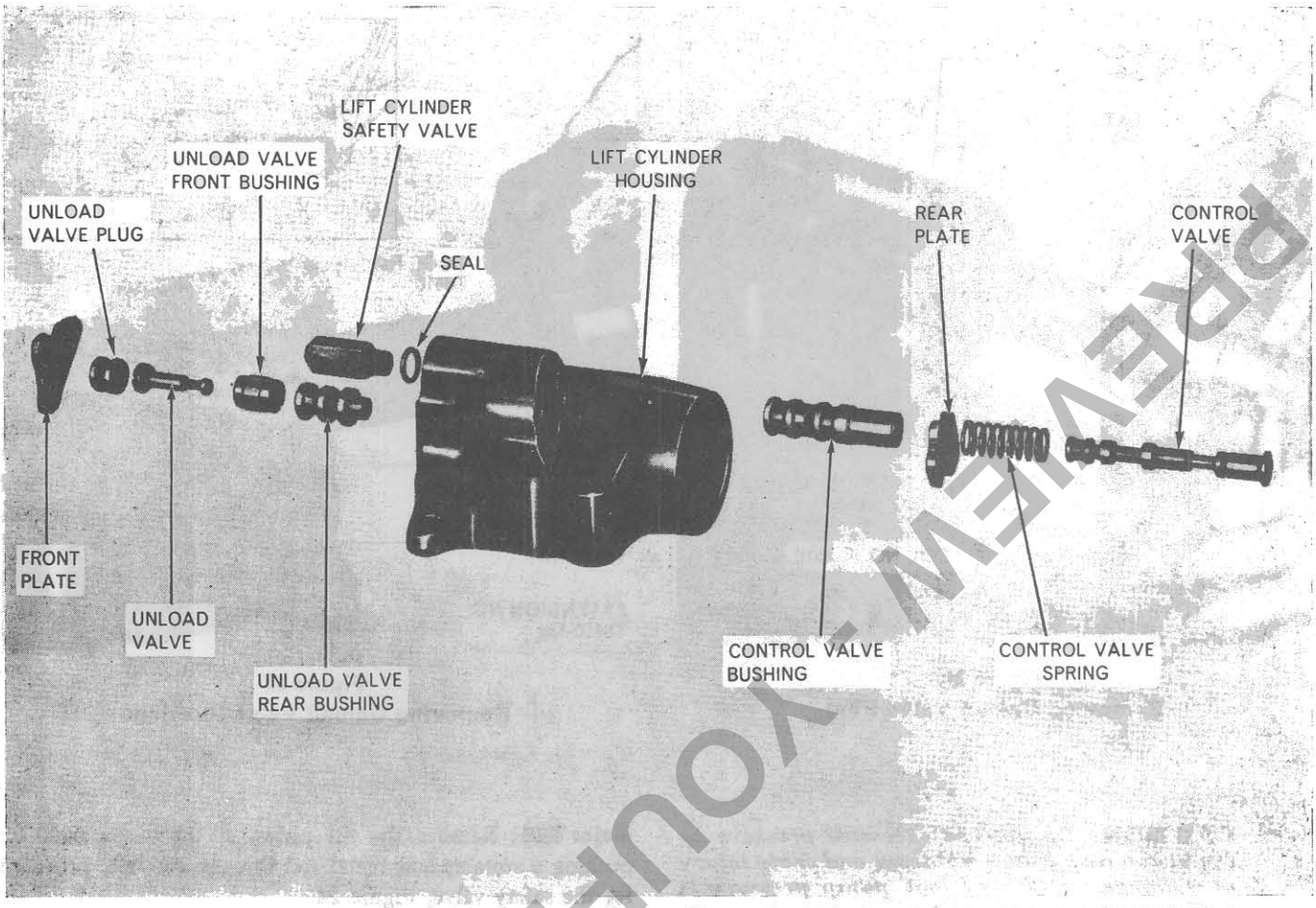



**Figure 20**
**Lift Cylinder Assembly**

(closed end of cylinder), and withdraw the plug, Figure 21. Note the annular recess in the plug which allows exhaust oil from the lift cylinder to by-pass the unload valve. It is important that care is taken to avoid damage to the external surface of the plug as a leak past this plug will affect the operation of the lift.

Alternatively use a slide hammer to remove unload valve plug.

8. Remove the unload valve from the front end of the cylinder and discard the 'O' ring fitted to the large end of the valve.

9. Attach the short threaded end of Extension No. T.8510-1/b to Lift Cylinder Bushing Remover and Replacer No. T.8510 and pass the Extension through the control valve bushing so that the main tool remains at the front end of the cylinder. Screw the Special Nut T.8510-1/h on to the rear threaded end of the extension until it locates squarely on the rear face of the control valve bushing with the small taper on the front face of the nut located within the bushing to centralize the tool, Figure 22. Operate the wing nut of the tool and withdraw the bushing. Unscrew the Special Nut and remove the bushing from the Extension.

Alternatively use Lift Cylinder Bushing Remover and Replacer No. N-508-A to remove the control valve bushing as shown in inset—Figure 22.

10. Pass the Extension No. T.8510-1/b through the unload valve bushings, attach the Nut No. T.8510-1/h, locating it squarely against the rear end of the rear bushing, and withdraw both bushings from the cylinder in one operation, Figure 23.

Alternatively use Lift Cylinder Bushing Remover and Replacer No. N-508-A to remove the unload valve bushings, inset—Figure 23.

**Dexta 2000 and Super Dexta 3000:** Remove the lift piston of the Dexta 2000 and the Super Dexta 3000 by applying air pressure through the safety valve hole while holding the thumb over the hole which is adjacent to it, Figure 24.

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### PRESSURE RELIEF VALVE

| | | |
|---|---|---|
| Minimum Crack-off Pressure | 2100 lb./sq. in. | 147·5 kg./sq. cm. |
| Fully Opening Pressure | 2550–2650 lb./sq. in. | 179·3–186·3 kg./sq. cm. |
| Tightening Torque | 30–60 lb. ft. | 4·15–8·28 m. kg. |
| Shim Thicknesses | 0·01 in., 0·025 in. | 0·254 mm., 0·635 mm. |
| Maximum Permissible Thickness of Shim | 0·08 in. | 2·03 mm. |

### FLOW CONTROL VALVE LINKAGE

| | | |
|---|---|---|
| **Ford 3000 and Ford 4000 only** Actuating Follower Shim Thickness | 0·01 in. | 0·254 mm. |

### DRAFT CONTROL MAIN SPRING

| | | |
|---|---|---|
| **Ford 3000 and Ford 4000 only** Draft Control Spring Shim Thicknesses | 0·015 in., 0·02 in., 0·025 in. | 0·381 mm., 0·508 mm., 0·635 mm. |

### HYDRAULIC PUMP—GEAR TYPE

| | |
|---|---|
| **Ford 5000** | |
| Flow Capacity—Front Pump | 5 Imp. galls, 6 U.S. galls, 22·7 Litres/min. @ 1680 R.P.M. |
| Flow Capacity—Rear Pump | 0·833 Imp. galls, 1 U.S. galls, 3·78 Litres/min. @ 1680 R.P.M. |
| Maximum Speed of Unit | 2200 R.P.M. |
| **Ford 4000** | |
| Flow Capacity—Front Pump | 4·5 Imp. galls, 5·4 U.S. galls, 20·43 Litres/min. @ 1515 R.P.M. |
| Flow Capacity—Rear Pump | 1·37 Imp. galls, 1·64 U.S. galls, 6·23 Litres/min. @ 1515 R.P.M. |
| Maximum Speed of Unit | 2100 R.P.M. |

### HYDRAULIC PUMP—PISTON TYPE

| | |
|---|---|
| **Ford 3000 and Ford 4000** Rated Pump Output | 4·42 Imp. galls, 5·30 U.S. galls, 20·1 Litres/min. @ 2350 R.P.M. (Pump Speed) |
| **Ford 2000** Rated Pump Output | 3·58 Imp. galls, 4·30 U.S. galls, 16·3 Litres/min. @ 2350 R.P.M. (Pump Speed) |

### TORQUE SPECIFICATIONS

**FORD 5000**

| | Pounds feet | Metre -kilogram |
|---|---|---|
| Lift Cover retaining bolts .... | 70–85 | 9·67–11·74 |
| Lift Cylinder retaining bolts .. | 155–190 | 21·42–26·52 |
| Accessory Cover to Lift Cover bolts ..... | 24–31 | 3·31–4·28 |
| Centre Bolt..... | 14–17 | 1·94–2·35 |
| Control Valve Baffle Plate and Rear Plate retaining bolts.... | 25–30 | 3·46–4·15 |
| Quadrant assembly to Lift Cover housing bolts ..... | 20–28 | 2·77–3·87 |
| Exhaust Oil Filter and Tube retaining bolt..... | 14–17 | 1·94–2·35 |
| Lift Control Lever to Control Lever Shaft nut..... | 8–10* | 3·63–4·54* |
| Hydraulic Pump to Rear Axle centre housing bolts ..... | 35–47 | 4·84–6·50 |
| Hydraulic Pump through bolts | 40–45 | 5·53–6·22 |
| Position Control Rod Nut .... | 15–20 | 2·07–2·77 |
| Set Screw-Draft Control Nut .. | 20–25 | 2·77–3·46 |
| Lift Cylinder Safety Valve .... | 75–90 | 10·37–12·43 |

*Measured at ball end of lift control lever.

**FORD 2000, FORD 3000 AND FORD 4000**

| | Pounds feet | Metre -kilogram |
|---|---|---|
| Lift Cover retaining bolts .... | 40–45 | 5·53–6·22 |
| Lift Cylinder retaining bolts .. | 50–55 | 6·91–7·60 |
| Accessory Cover to Lift Cover bolts ..... | 40–45 | 5·53–6·22 |
| Centre Bolt..... | 12–15 | 1·70–2·07 |
| Front and Rear Control Valve Retaining Plate bolts..... | 24–30 | 3·31–4·15 |
| Quadrant assembly to Lift Cover housing bolts ..... | 35–47 | 4·84–6·50 |
| Check Valve Plug ..... | 45–55 | 6·22–7·60 |
| Flow Control Plate retaining bolts ..... | 35–47 | 4·84–6·50 |
| Lift Control Lever to Control Lever Shaft nut Ford 2000.. | 4– 5* | 0·55–0·69 |
| Ford 3000 and Ford 4000.... | 8–10* | 1·11–1·38* |
| Hydraulic Piston Pump Cover bolts ..... | 35–40 | 4·84–5·53 |
| Hydraulic Piston Pump Drive Housing bolts..... | 35–45 | 4·84–6·22 |
| Hydraulic Piston Pump Drive Shaft nut ..... | 25–35 | 3·46–4·84 |
| Lift Cylinder Safety Valve 2/3000 | 45–55 | 6·22–7·60 |
| Lift Cylinder Safety Valve 4000 | 75–90 | 10·37–12·43 |

*Measured at ball end of lift control lever.

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when the engine is running, the mechanical action of the drive shaft, outer shaft, and actuator causes the pump oil entering the valve body to be directed to the third groove on the main valve spool. The oil then flows to the rotor vanes and the motor is turned. The metered oil is carried between the vanes and is forced to the fourth groove on the main valve spool and is directed to the reaction valve spool. It then leaves the reaction valve spool and is directed to the cylinders.

**NOTE:** ***The reaction spool is positioned in the same position for both the right and left turn.***

Oil returning from the cylinders passes across the reaction valve to the second groove on the main valve spool, and on to sump.

### Manual Right Turn

If, for some reason, the power steering pump fails to operate, the tractor may be steered manually. As shown in Figure 77, the main valve spool is positioned for a right turn, however, no oil is delivered by the pump. As the steering wheel is turned, the motor is rotated manually, which forces the oil between the vanes out to the cylinders. The motor becomes a vane pump with the tractor operator supplying the power required. There is a change in the hydraulic oil flow in the system and a repositioning of the reaction valve.

As the rotor pumps oil to the cylinders, it draws oil from the high pressure pump circuit. This creates a partial vacuum in the high pressure pump line, and the anti-cavitation check ball lifts off its seat. This allows return oil to pass into the high pressure passage to supply the motor with oil for manual steering. At this time, the light spring, plus hydraulic pressure, holds the reaction spool against the end of the bore in the closed position. The oil in the return-to-sump passage is at a higher pressure than the oil in the high pressure passage. This difference in pressure helps to hold the valve in the closed position.

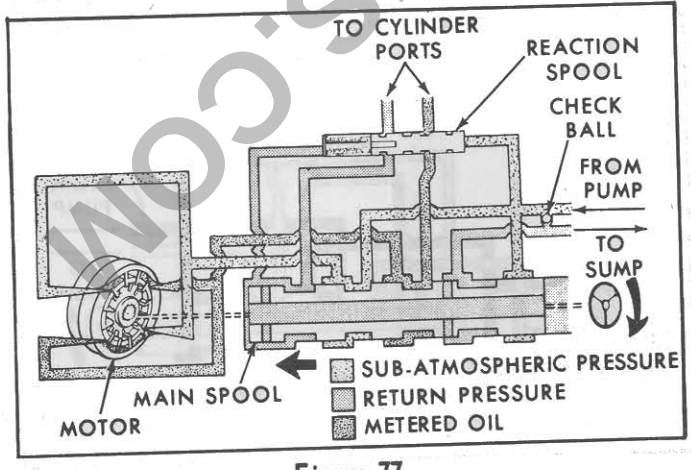



**Figure 77**
**Oil Flow - Manual Right Turn**

### Manual Left Turn

During a manual left turn, as shown in Figure 78, the motor is again operating as a pump, except that it rotates in the opposite direction, and the oil flow to the power steering cylinders is reversed. The oil flow in the high and low pressure lines and the positioning of the reaction spool is the same as shown in Figure 77. It is important to understand that the metered rotor oil is the highest pressure developed in the system during manual steering.

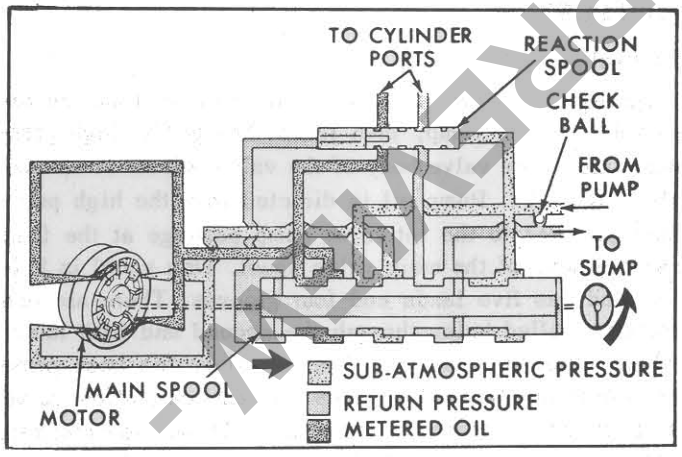



**Figure 78**
**Oil Flow - Manual Left Turn**

### Check Valve Operation

There are two check valves in the cover plate which allow pump pressure oil to be applied to the back side of the cover. This pressure against the plate keeps it in contact with the rotor and vanes to help seal against internal oil leakage.

The left-hand portion of Figure 79 illustrates the check valve operation during a power assist right turn. Pump oil enters the motor and the rotor rotates clockwise. The oil also unseats the check ball and pressurizes the area under the cover. The check ball at the discharge port is held closed by spring and oil pressure.

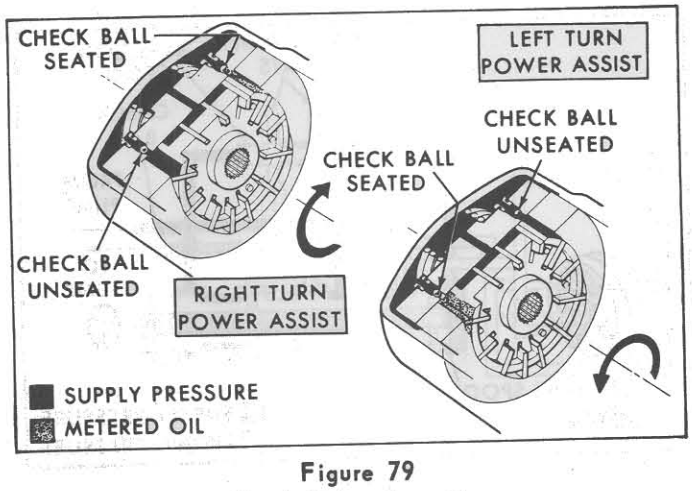



**Figure 79**
**Check Valve Operation**

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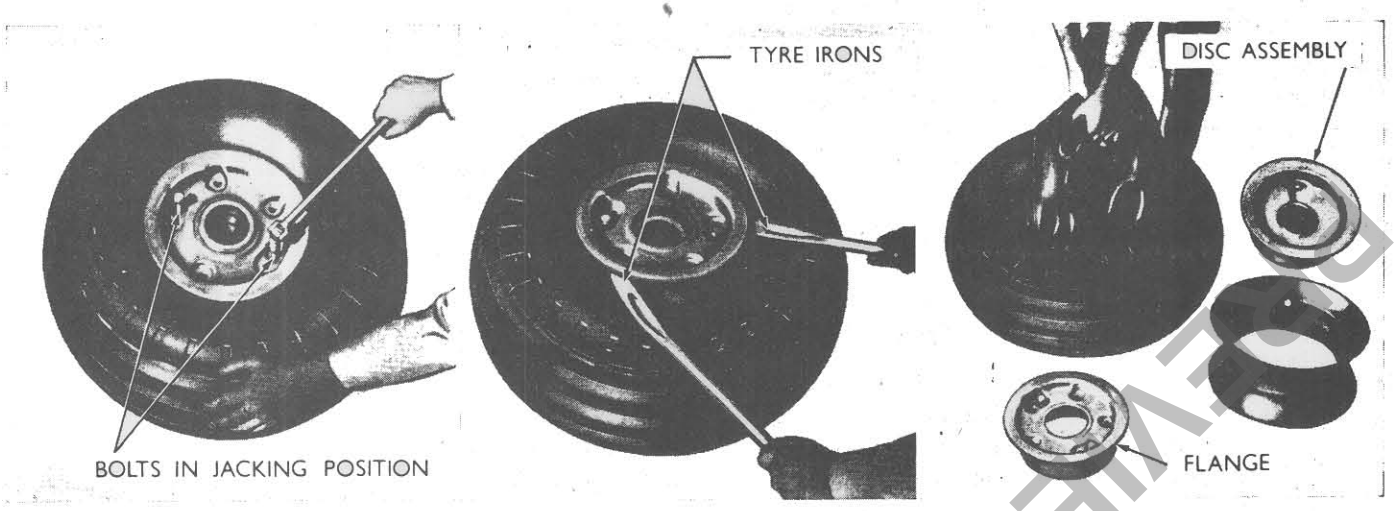



**Figure 5**
**Single Front Wheel Tyre Replacement**

5. Remove the five bolts from the wheel and thread two of the bolts in the opposite side of the wheel. Turn the bolts in until the flange is free of the hub as shown in 'A', Figure 5.
6. Remove the flange from the tyre with tyre irons.
7. Lift the tyre off the hub and remove the tube flap and tube as shown in 'C', Figure 5.
8. Remove the two bolts from the flange.

## D. Tyre Installation—Single Front Wheel

1. Install the valve core in the inner tube. Inflate the tube until it just starts to round out.
2. Install the inner tube and tube flap in the tyre. Place the hub in the tyre while guiding the valve stem through the hole provided in the hub.
3. Install the flange in the tyre and rotate it as necessary to align the five bolt holes.
4. Install the five flange attaching bolts. Tighten the five bolts evenly and alternately to 85–105 ft. lbs. (11·2–14·5 m.kg.).
5. Bend the valve stem outward for easy accessibility. Inflate the tube to 44 p.s.i. (3·09 kg.sq.cm:) pressure.
6. Position the wheel on the spindle being careful not to get dirt on the shaft or bearing. Install the outer bearing, flat washer, and castellated nut.
7. Tighten the nut until a slight drag is felt while rotating the wheel, then back the nut off one castellation (1/6 to 1/4 turn).
8. Install a cotter pin. The cotter pin ends must be flattened against the nut and spindle end. Install the dust cap. Remove the jack.

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