CONTENTS

ENGINE SYSTEMS
ENGINE AND LUBRICATION SYSTEM .............................................. 3-50
COOLING SYSTEM ........................................................................ 51-56
TROUBLE SHOOTING .................................................................. 57-59
SPECIFICATIONS .......................................................................... 60-70
SPECIAL TOOLS ........................................................................... 70

FUEL SYSTEMS
FUEL SYSTEMS GENERAL — GASOLINE ........................................ 71-79
FUEL SYSTEMS GENERAL — DIESEL .......................................... 80-88
INJECTORS .................................................................................. 89-94
TROUBLE SHOOTING .................................................................. 95-98
SPECIFICATIONS .......................................................................... 99-100
SPECIAL TOOLS ........................................................................... 100

ELECTRICAL SYSTEM
BATTERY ....................................................................................... 101-104
STARTING SYSTEM ...................................................................... 105-120
IGNITION SYSTEM ........................................................................ 121-139
TROUBLE SHOOTING .................................................................. 140-142
SPECIFICATIONS .......................................................................... 143-146
SPECIAL TOOLS ........................................................................... 146
Camshaft
A new camshaft with higher cam lift and wider timing is used with the new model diesel engine.

Connecting Rod
Heavier I-section connecting rods are used on all new model Ford 4000 and 5000 engines. While these may be installed in service in a previous type engine they must not be mixed with the previous type connecting rods in an engine.

FORD 4000 GAS ENGINE
Increased power has been obtained by increasing the stroke from 4·2 in. (106·68 mm) to 4·4 in. (111·76 mm).

Cylinder Head and Gasket
A new cylinder head has been introduced which differs from that used on previous Ford 4000 gas engines in that the valve seats are located 0·020 in. (0·52 mm) deeper. There is no change to the cylinder head gasket.

Crankshaft
The crankshaft used in the new model Ford 4000 gas engine is common with the Ford 4000 diesel crankshaft and provides a stroke of 4·4 in. (111·76 mm).

Pistons
New pistons are used which have a piston pin to piston crown height of 2·523/2·525 in. (64·08/64·14 mm). Previous Ford 4000 gas pistons had a piston pin to crown height of 2·741/2·743 in. (69·62/69·67 mm). See Figure 2.

FORD 5000 DIESEL ENGINE
Increased power from the new model Ford 5000 diesel engine has been achieved by increasing the cylinder bore diameter, introducing a new cylinder head with modified porting, a new camshaft and new pistons, new injection pump and new injectors.

Cylinder Block
The new model Ford 5000 cylinder block has piston bores which are 4·4 in. (111·76 mm) diameter whereas the previous Ford 5000 bores were 4·2 in. (106·68 mm) diameter.

Pistons
While the pistons have been increased to the same diameter as those of the Ford 4000 they are not identical with the Ford 4000 pistons in that the Ford 5000 piston pin to piston crown height is greater.

<table>
<thead>
<tr>
<th>Piston Pin to Crown Height—Diesel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ford 4000</td>
</tr>
<tr>
<td>2·661/2·663 in.</td>
</tr>
<tr>
<td>(67·59/67·64 mm)</td>
</tr>
</tbody>
</table>

Specified piston to bore clearance with these new Ford 5000 pistons is 0·0080/0·0090 in. (0·2032/0·2286 mm).
2. CYLINDER HEAD, VALVES AND RELATED PARTS

CYLINDER HEAD
The cylinder head can be removed from the engine for service with the engine installed in the tractor. The following procedure applies to all models of the 3- and 4-cylinder engines.

A. Removal
1. Remove the vertical muffler if so equipped and disconnect the main wiring harness from the hood panel assembly. Remove the hood panel assembly.
2. Remove the battery. Remove the air cleaner assembly and related components in gasoline units. Remove the battery tray support bolts from the head and remove the radiator shell support. Disconnect the exhaust pipe from the exhaust manifold on units that are equipped with horizontal exhaust systems. Drain the radiator and cylinder block.
3. Bend the lock tabs back, Figure 6, and remove the bolts that secure the exhaust manifold to the cylinder head.
4. Remove the exhaust manifold and metal gasket, Figure 6.
5. Remove the injector lines from the injection pump and from the injectors. Cap the exposed openings in the pump and in the injectors, and all tube ends to prevent the entry of dirt.
6. Disconnect cold start equipment where equipped.
7. Disconnect the air inlet hose at the clamp at the intake manifold (diesel), or at the carburetor on gasoline models.
   NOTE: On gasoline engines, disconnect the fuel line and linkage from the carburetor. Remove the carburetor from the intake manifold. Disconnect the vacuum advance line from the intake manifold.
8. Shut off the fuel at the tank. Remove the fuel filters from the manifold by disconnecting the fuel lines and removing two bolts and flat washers and cap the openings.
9. Remove the bolts and lock washers that retain the intake manifold, Figure 6, to the cylinder head and remove the manifold and gasket.
10. Disconnect the ventilation tube from the rocker cover. Remove the bolts that attach the rocker arm cover to the cylinder head and remove the rocker arm cover and gasket.
5. CONNECTING RODS, BEARINGS, PISTONS, RINGS, AND CYLINDER BLOCK

PISTON AND CONNECTING ROD ASSEMBLY

A. Removal
1. Remove the cylinder head assembly as outlined “Cylinder Head Removal”.
2. Remove the oil pan sump and oil pump assembly as outlined “Oil Pan Sump Removal” and “Oil Pump Removal”.

NOTE: On 4-cylinder diesel engines, remove the balancer.

3. If necessary, remove the ridge from the top of each cylinder with a cylinder ridge reamer or a hand scraper, Figure 43. (Ridge removal is not necessary when reboring or if the old pistons are not to be used. However, it may be necessary to remove a ridge in order to remove an old piston). When removing the cylinder ridge do not cut down into the ring travel more than \( \frac{1}{32} \) in. (0.793 mm.). It is possible to cut so deeply into the cylinder wall and so far down into the ring travel that reboring, or the installation of a new engine block is necessary. Do not attempt to remove and reuse a piston from a cylinder with an excessive ridge. Forcing the piston past the ridge may break the lands on the piston or the rings.
4. Remove the nuts from the connecting rod bearing cap bolts of the piston that is at the bottom of its stroke. Remove the rod bearing cap and liner, Figure 44, from the rod. Push the piston and rod assembly away from the crank pin and remove the bearing liner from the rod. Push the rod and piston assembly out of the top of the cylinder, using the handle end of a hammer. Be careful not to scratch the crank pin or the cylinder. Turn the crankshaft to bring each piston to the bottom of its stroke and repeat this procedure. Keep the bearing caps and liners with their respective connecting rods.

5. Remove the piston rings from the pistons with a piston ring expander or other suitable means, as shown in Figure 45.

B. Disassembly
1. Remove the piston pin snap ring (circlip) from each side of the piston and remove the pin.
2. Identify each piston to be sure it will be reassembled onto the rod from which it was removed.

C. Cleaning
Clean the piston ring grooves with a piston ring groove cleaner, Figure 46. Be careful not to scratch or remove metal from the groove sides. Place the piston assembly in liquid cleaner, if available, to soften carbon and lead deposits. Clean the rod bore and the back of the connecting rod bearing liners thoroughly. Dry the parts with compressed air. Do not use a wire brush.
The idle system, the main metering system, the power system, and the pump system are contained in a cluster in the middle of the carburetor body and are entirely surrounded by fuel. By having these metering components positioned in this manner, the fuel tends to keep the components cool, thus assisting in the metering of liquid fuel rather than vapors. The location and fact that the metering components are surrounded by fuel, permits operation of the tractor at extremely steep angles on hillsides. The carburetor is equipped with a brass float and stainless steel float lever and hinge pin.

A. Float System

The float system, Figure 3, controls the level of fuel in the fuel bowl and admits fuel as required to maintain the proper level. The position of the fuel inlet needle is controlled by the float. As the fuel level in the bowl drops, the float drops, allowing the fuel inlet needle to admit fuel. As the fuel level rises, the float rises, closing the fuel inlet needle which shuts off the fuel supply.

B. Idle System

The idle system, Figure 4, controls the flow of fuel at idle and at minimum power operation when the manifold vacuum is relatively high. The fuel used during idle and minimum power operation enters through the main fuel jet which is connected by a passage in the metering cluster cover to the main well. From there the fuel flows through the idle feed restriction and up the idle well. Air enters the idle air bleed in the lower skirt of the venturi and partially vaporizes the fuel. This mixture travels up the idle passage to the idle orifice where it is regulated by the idle adjusting screw. The flow of fuel is the result of a differential in pressure created by the intake vacuum. As the throttle plate is opened, the idle transfer orifice is exposed to the reduced pressure and the fuel and air mixture is discharged out of both ports.

C. Main Metering System

The main metering system, Figure 5, supplies fuel during all phases of engine operation above the operating
Figure 45
Installing Intermediate Plate Bushing

NOTE: 4½-Inch Starting Motor: A tool can be fabricated by welding a 5/16" x 1" (7.94 x 25.40 mm) piece of square bar stock to a nut if Tool No. CP. 9504 is not available.

NOTE: 5-Inch Starting Motor: A tool can be fabricated by welding the end of a Phillips head screwdriver to a nut if Tool No. CP. 9504 is not available.

6. 5-Inch Starting Motor: Remove the insulation band.

Figure 46
Field Coil Assembly

Figure 47
Pole Shoe Screw Removal and Installation

7. Remove the pole shoes and field coils from the starting motor frame.

8. 4½-Inch Starting Motor: Remove the terminal nut, washer, insulator, and screw, Figure 46. Clean excessive solder from the slot in the terminal screw.

9. 4½-Inch Starting Motor: Reinstall the starter terminal insulator, washers, and retaining nut in the frame. Position the slot in the terminal perpendicular to the frame end surface, Figure 46. Place the field coil leads in the terminal screw slot.

10. Position the new field coils over the pole shoes and place the coils in the starting motor frame.

11. 5-Inch Starting Motor: Place the insulation band in position.

12. Install the pole shoes retaining screws, Figure 47. While tightening the screws, tap the starting motor frame with a soft-faced hammer to align and set the pole shoes. Once installed, stake the screws to prevent them from loosening.

13. Resolder the field coil leads to the starting motor field terminal using resin core solder.

14. 5-Inch Starting Motor: Resolder the eyelet cable connections.

15. 4½-Inch Starting Motor: Install the starting motor actuating field coil retainer, Figure 46.