FORD

Service Manual

Lawn and Garden Tractor
GT65 and GT75 Diesel
GT85 and GT95 Gasoline

Section 1 – Engine Systems
– Kohler Engine Service Manual
Section 2 – Fuel Systems

Vol. 1

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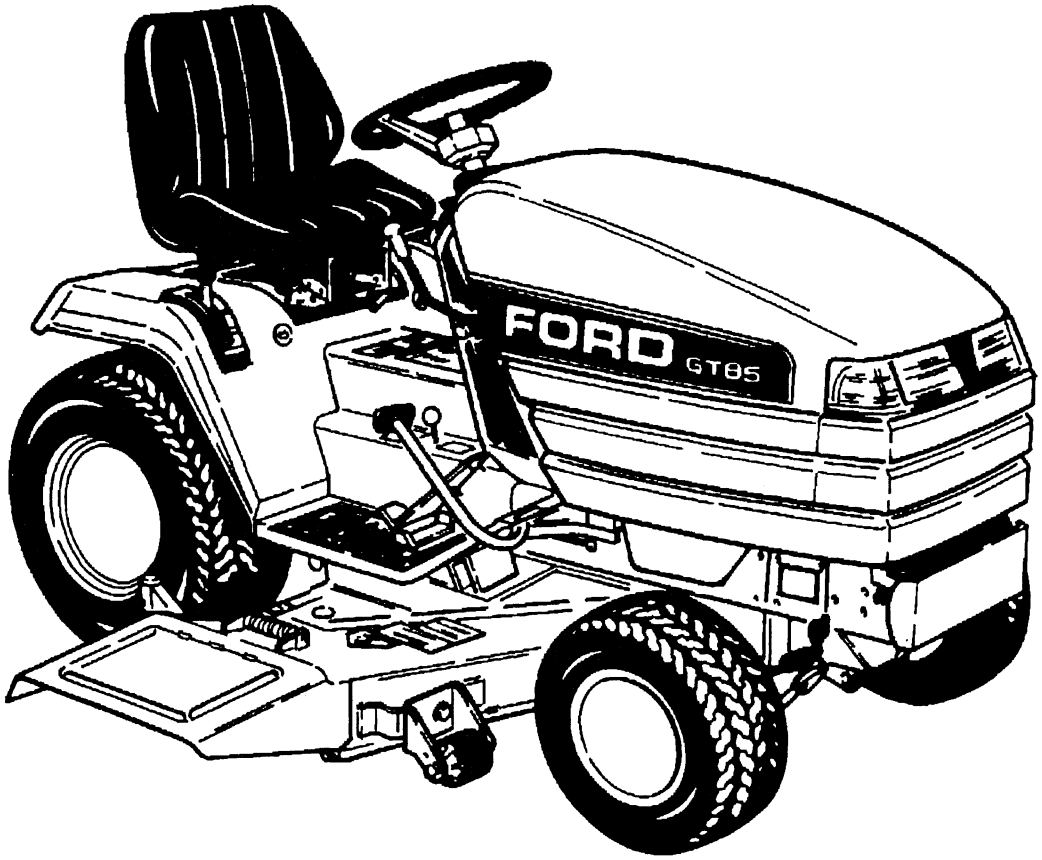

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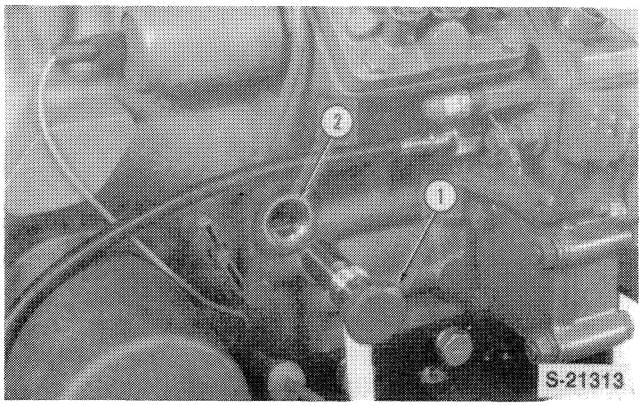

FIGURE 1-3

Engine Oil Relief Valve Location

1 Relief Valve
2 Main Oil Gallery

LUBRICATION SYSTEM

The gerotor type oil pump is an integral part of the idler timing gear and is driven by the crankshaft gear. It is located in the front of the engine block and to the left of the crankshaft as viewed from the front of the engine.

OIL FLOW

Engine lubrication oil is picked up from the crankcase sump through a screen by the pump intake tube and drawn into a lower side drilling in the engine block to the oil pump. Oil pressurized by the pump then flows through passages in the block, past the relief valve, through the oil filter and returns to the main oil gallery in the block in the area of the drilled bolt located on the side of the block. Oil flow in the main oil gallery extends to the four main bearing journals through passages in the crankshaft to the three connecting rod bearing journals. The remaining portion of the oil flow is directed though the external tube to the cylinder head. Oil flows from the external tube into a passage in the cylinder head to the front rocker shaft pedestal. The oil flows upward into the pedestal, through a roll pin that extends into the rocker shaft.

The roll pin serves to hold the rocker shaft in a fixed position and it also acts as a restrictor to maintain adequate oil pressure in the main oil gallery.

Oil seepage through the clearance between the rocker arms and the shaft overflows into the valve cover area and lubricates the valve stems, push rods and tappets. The relief valve, 1, Figure 1-3, is mounted in the side of the engine block and intersects the main oil gallery. When the oil pressure exceeds the rated pressure, oil is by-passed through the relief valve directly to sump through a passage in the engine block.

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

ENGINE OIL FILTER

Because engine oil becomes contaminated with dust, carbon particles, metal and sludge it is first directed through a filter before entering the lubrication system. The filter is a full flow type, whereby all the oil from the pump is routed through the filter. To protect the engine from loss of lubrication in the event of a plugged or restricted filter, a relief valve in the filter opens and permits unfiltered oil to flow through the system to maintain engine lubrication.

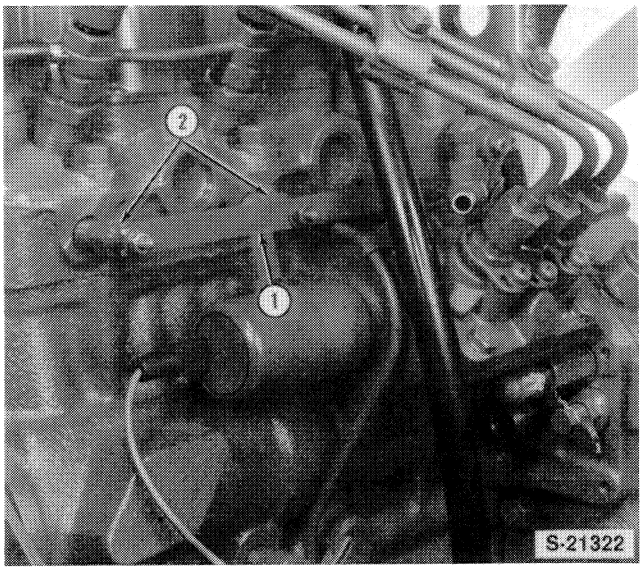

FIGURE 1-28

Glow Plug Removal

1 Connector Strap
2 Glow Plugs

6. Disconnect the glow plug connector strap, 1, and remove the glow plugs, Figure 1-28.
7. Remove the thermostat housing, 1, and remove the thermostat, spring and gasket, Figure 1-29.
8. Remove the oil pressure sensor switch from the head, Figure 1-30.

INSPECTION AND REPAIR

1. Clean all carbon deposits from the combustion chambers, pre-combustion chambers and valve ports using a soft wire brush and scraper.
2. Clean all deposits and residue from the gasket surface using care to not scratch or nick the machined surface.
3. Wash the cylinder head in a suitable solvent and air dry.

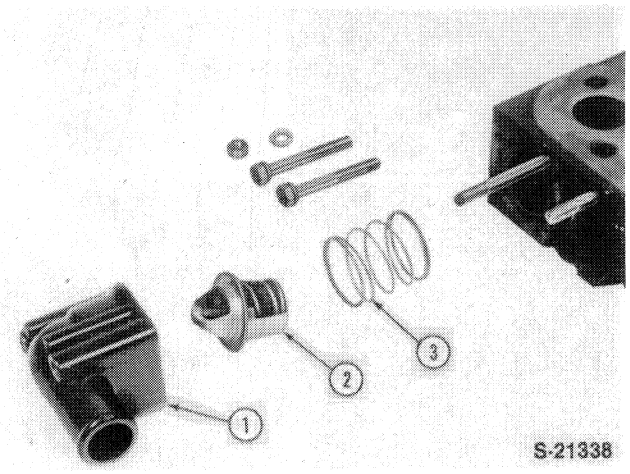

FIGURE 1-29

Thermostat Removal

1 Housing
2 Thermostat
3 Spring

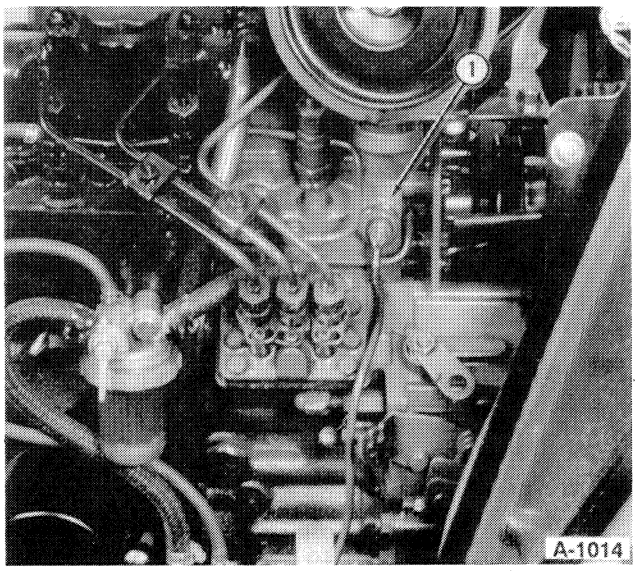

FIGURE 1-30

Oil Pressure Switch Location

1 Oil Pressure Switch

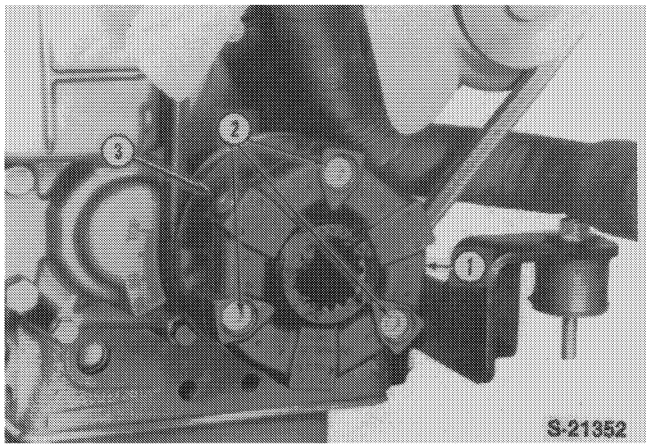

FIGURE 1-53

Transmission Drive Coupler

1 Coupler
2 Mounting Bolts - Coupler
3 Mounting Bolts - Boss

11. Using a new gasket, install the water pump and fan as an assembly.

12. Install the injector assemblies using new sealing washers and tighten to the specified torque.

    Injector Torque ..... 43-51 lbs. ft. (58-69 N·m)

13. Install the fuel leak-off line and injector lines.

14. Install the oil pressure sensor switch and tighten to the specified torque.

    Sender Switch Torque ..... 7-11 lbs. ft. (9-14 N·m)

15. Complete the assembly of the electrical wiring, fuel lines, controls and sheet metal following the removal procedure in reverse order.

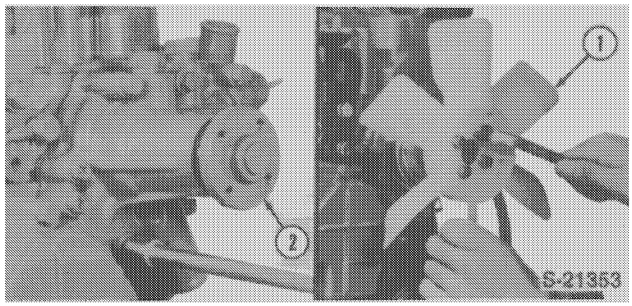

FIGURE 1-54

Water Pump Removal

1 Coolant Fan
2 Water Pump

ENGINE FRONT COVER, TIMING GEARS, OIL PUMP AND CAMSHAFT

The engine must be removed from the tractor to service these components. Refer to steps 1-31, "Engine Removal," this section.

1. Remove the three coupler bolts, 2, and remove the coupler, 1, from the crankshaft pulley, Figure 1-53.

   IMPORTANT: Coupler and boss retaining bolts, 6, have a special coating, they can not be reused. If removed, install new special coated bolts. Torque the bolts to 17-19 lbs. ft. (23-25 N·m).

2. Remove the coolant fan, Figure 1-54.

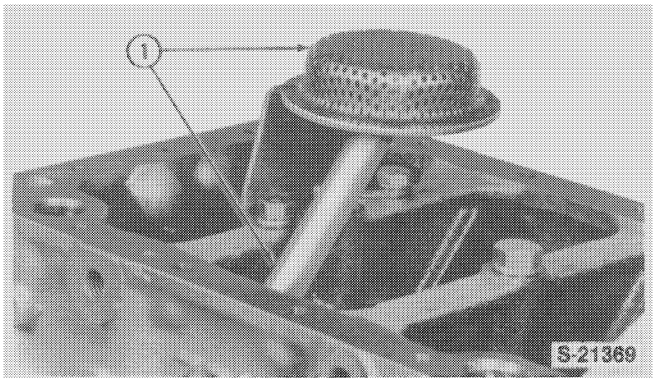

FIGURE 1-78

Oil Pickup Screen and Tube Removal

1 Screen and Tube Assembly

3. Remove the oil pump suction tube and screen, Figure 1-78.
4. Remove the connecting rod caps, Figure 1-79.
5. If necessary, remove any ridge from the top of the cylinder bores with a suitable size ridge reamer. Then push the piston and rod assemblies out the top of the cylinder block, Figure 1-80.

   NOTE: Be sure to keep the connecting rod and piston components together for reassembly in their original locations.

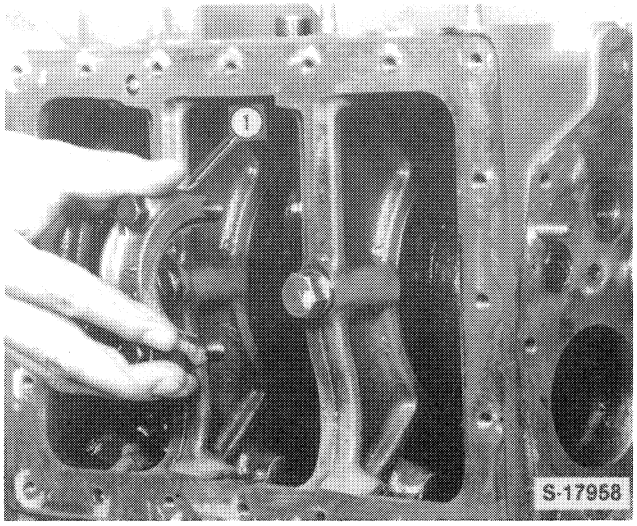

FIGURE 1-79

Connecting Rod Removal

1 Rod Cap

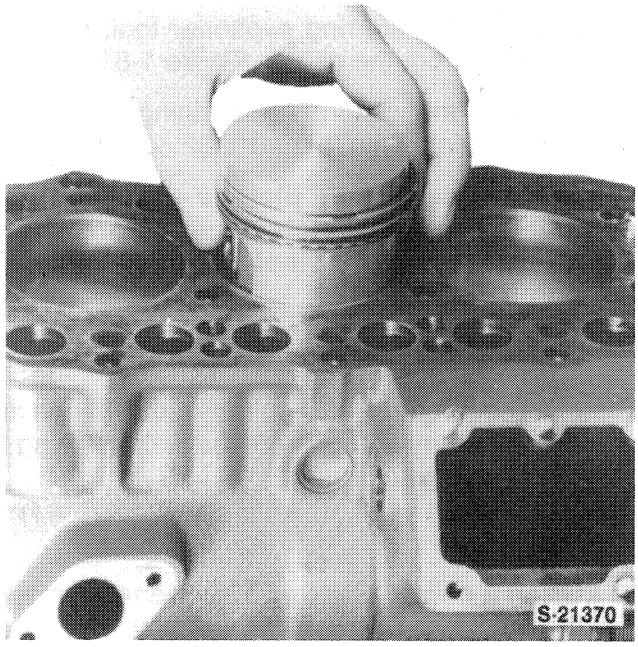

FIGURE 1-80

Piston and Rod Removal

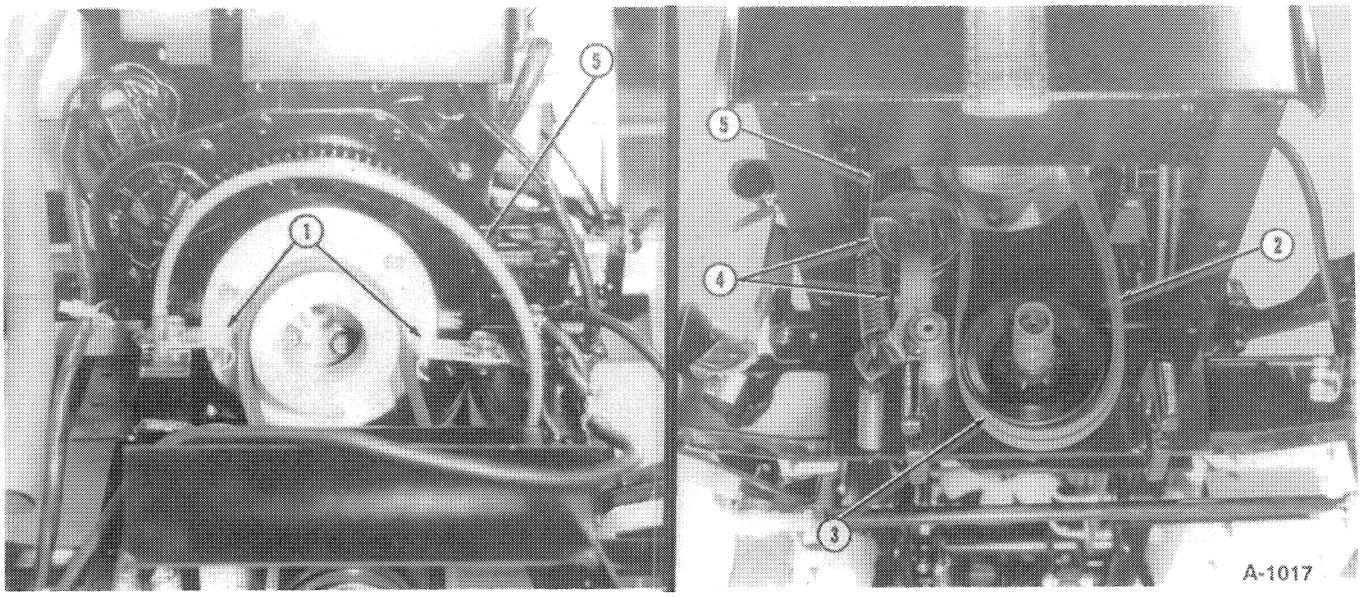

FIGURE 1-100

PTO Drive Assembly

1 Belt Guides
2 Belts
3 PTO Drive Sheave
4 Tightener Pulley and Bracket
5 PTO Control Cable

3. Remove the cover.
4. Remove the two belt guides, Figure 1-100.
5. Loosen the PTO control cable nut and slacken the conduit to provide maximum cable play and unhook the tightener tension springs.
6. Remove the PTO drive belts.
7. Remove the lower PTO drive sheave, 4, Figure 1-100.
8. Rotate the belt tightener pulley to clear the flywheel.
9. Remove the three bolts, 2, retaining the PTO drive pulley, 1, to the flywheel, 3, and remove the pulley, Figure 1-101.
10. Remove the four flywheel retaining bolts, 4, and remove the flywheel from the crankshaft.

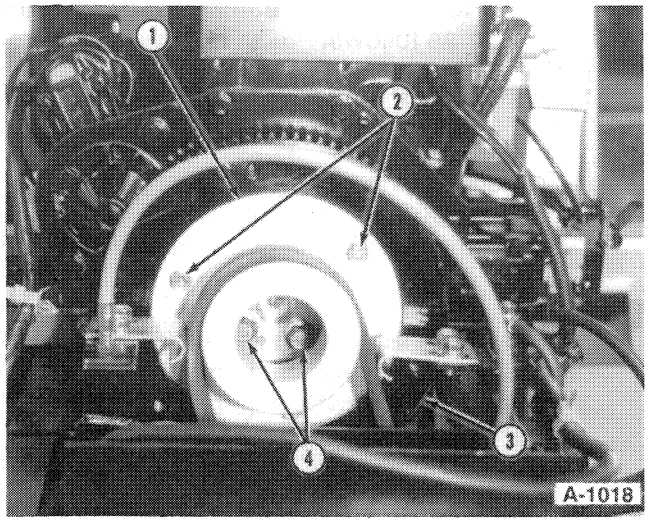

FIGURE 1-101

PTO Pulley and Flywheel

1 Drive Pulley
2 Pulley Retaining Bolts
3 Flywheel
4 Flywheel Retaining Bolts

OVERHAUL

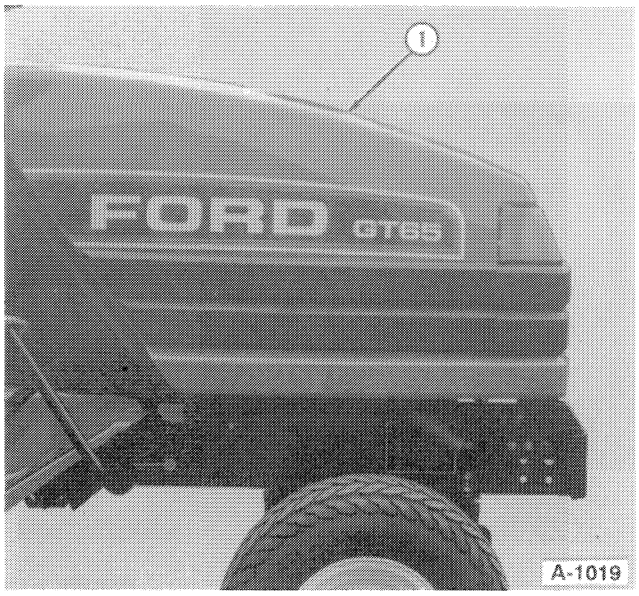

FIGURE 1-116

Radiator Removal

1 Hood

RADIATOR REMOVAL

1. Remove the hood, 1, Figure 1-116, from the tractor.
2. Drain the radiator.
3. Using a punch, drive out the roll pins and remove the PTO and the hydrostatic speed control levers, Figure 1-117.
4. Remove the center panel, 5, and both air intake screens, 4, Figure 1-117.
5. Remove the upper radiator hose, Figure 1-118.
6. Remove the alternator assembly, 2, Figure 1-118, to provide access to the lower radiator hose. Then remove the lower radiator hose, 3,

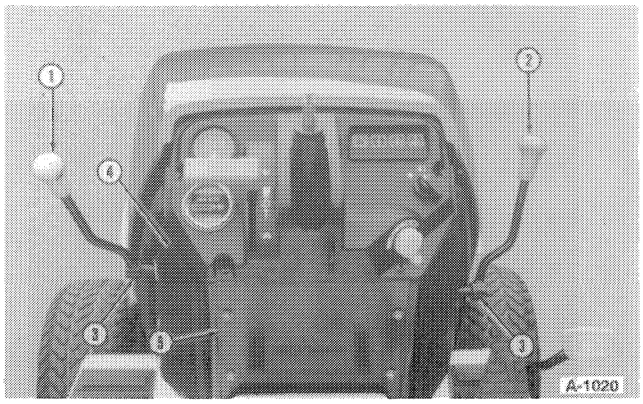

FIGURE 1-117

Radiator Removal

1 PTO Control Lever
2 Hydro Speed Control Lever
3 Roll Pin
4 Air Intake Screen
5 Center Panel

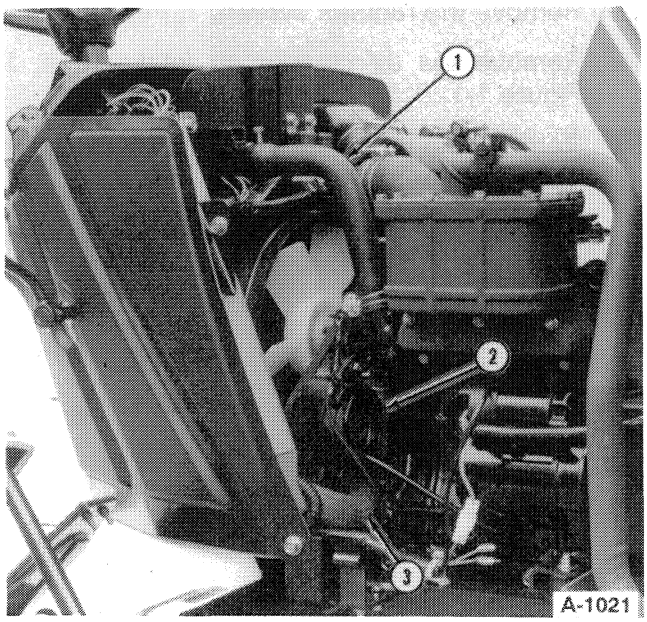

FIGURE 1-118

Radiator Removal

1 Upper Radiator Hose
2 Alternator Assembly
3 Lower Radiator Hose

SPECIFICATIONS

GENERAL (On Model GT65)

Tractor Model	14 HP Diesel
Engine Model	E643
Number of Cylinders	3
Bore x Stroke	2.5 in. x 2.5 in. (64 x 64 mm)
Displacement	37.6 cu. in. (617 cc)
Compression Ratio	23:1
Engine Compression	
Standard	426 psi (29 bar)
Low Limit	355 psi (24 bar)
Rated Speed (rpm)	3200
Firing Order	1-2-3
Idle Speed (rpm)	1400-1450
Maximum No-Load Speed	3350-3450 rpm
Cylinder Arrangement	In-Line Vertical
Valve Arrangement	Overhead

GENERAL (On Model GT75)

Tractor Model	16 HP Diesel
Engine Model	E673
Number of Cylinders	3
Bore x Stroke	2.6 in. x 2.5 in. (67 x 64 mm)
Displacement	41.2 cu. in. (676 cc)
Compression Ratio	24:1
Engine Compression	
Standard	426 psi (29 bar)
Low Limit	355 psi (24 bar)
Rated Speed (rpm)	3200
Firing Order	1-2-3
Idle Speed (rpm)	1400-1450
Maximum No-Load Speed	3350-3450 rpm
Cylinder Arrangement	In-Line Vertical
Valve Arrangement	Overhead

CYLINDER HEAD

Head Warp	
Standard	0.002 in. (0.05 mm)
Maximum	0.005 in. (0.12 mm)
Valve Seat Width	
Standard	0.062-0.07 in. (1.59-1.80 mm)
Maximum	0.098 in. (2.5 mm)
Valve Head Recess	
Standard	0.026-0.037 in. (0.65-0.95 mm)
Maximum	0.070 in. (1.8 mm)
Valve Angle	45°

GASOLINE ENGINE (GT85 AND GT95)

ENGINE AND LUBRICATION SYSTEM

DESCRIPTION AND OPERATION

FIGURE 1-128

GT Gasoline Tractor

This chapter describes the overhaul and repair of the Ford GT85 and GT95 Kohler Magnum gasoline engine.

The Ford GT85 and GT95 GT tractors, Figure 1-128, are equipped with a 2-cyilnder, four cycle, air cooled, side valve engine. The GT85 and GT95 engine identification numbers appear on a decal affixed on the engine shrouding.

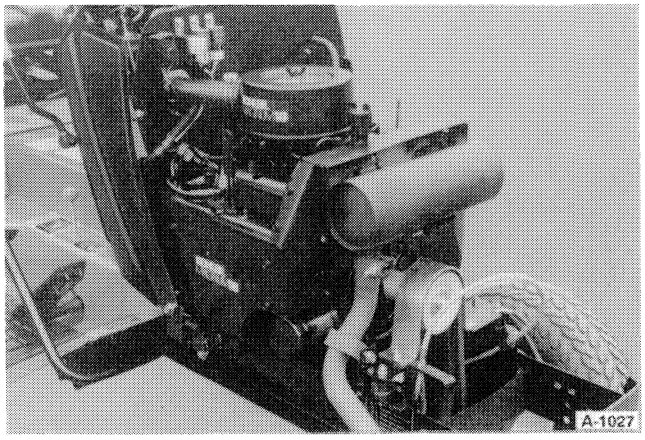

FIGURE 1-129

LGT Gasoline Engine

The GT85 GT engine has a 42.18 cu. in. (691 cc) displacement with a compression ratio of 6.0:1.

The GT95 GT engine has a 46.98 cu. in. (769.8 cc) displacement with a compression ratio of 6.6:1.

The engine is positioned in the tractor chassis.

MAGNUM

Twin Cylinder Engine
Service Manual
Models M18 & M20
TP-2204-A 3/86

KOHLER engines

GENERAL INFORMATION

ENGINE IDENTIFICATION NUMBERS

When ordering parts, or in any communication involving an engine, always give the model, specification, and serial numbers of the engine.

The engine identification numbers appear on a decal (or decals) affixed to the engine shrouding. Refer to Figure 1-1. The significance of these numbers is shown below:

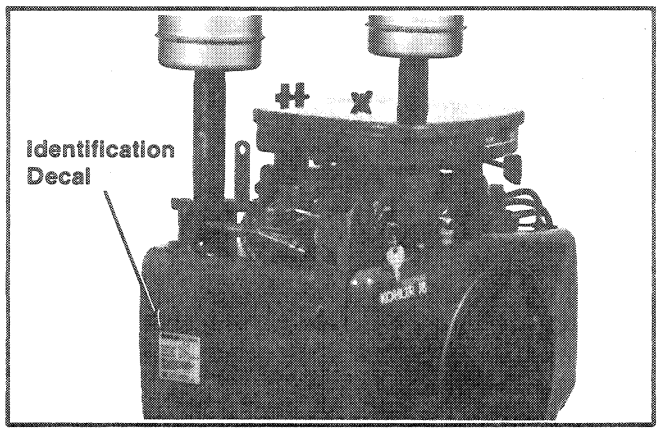

Figure 1-1. Location of Engine Identification Decal.

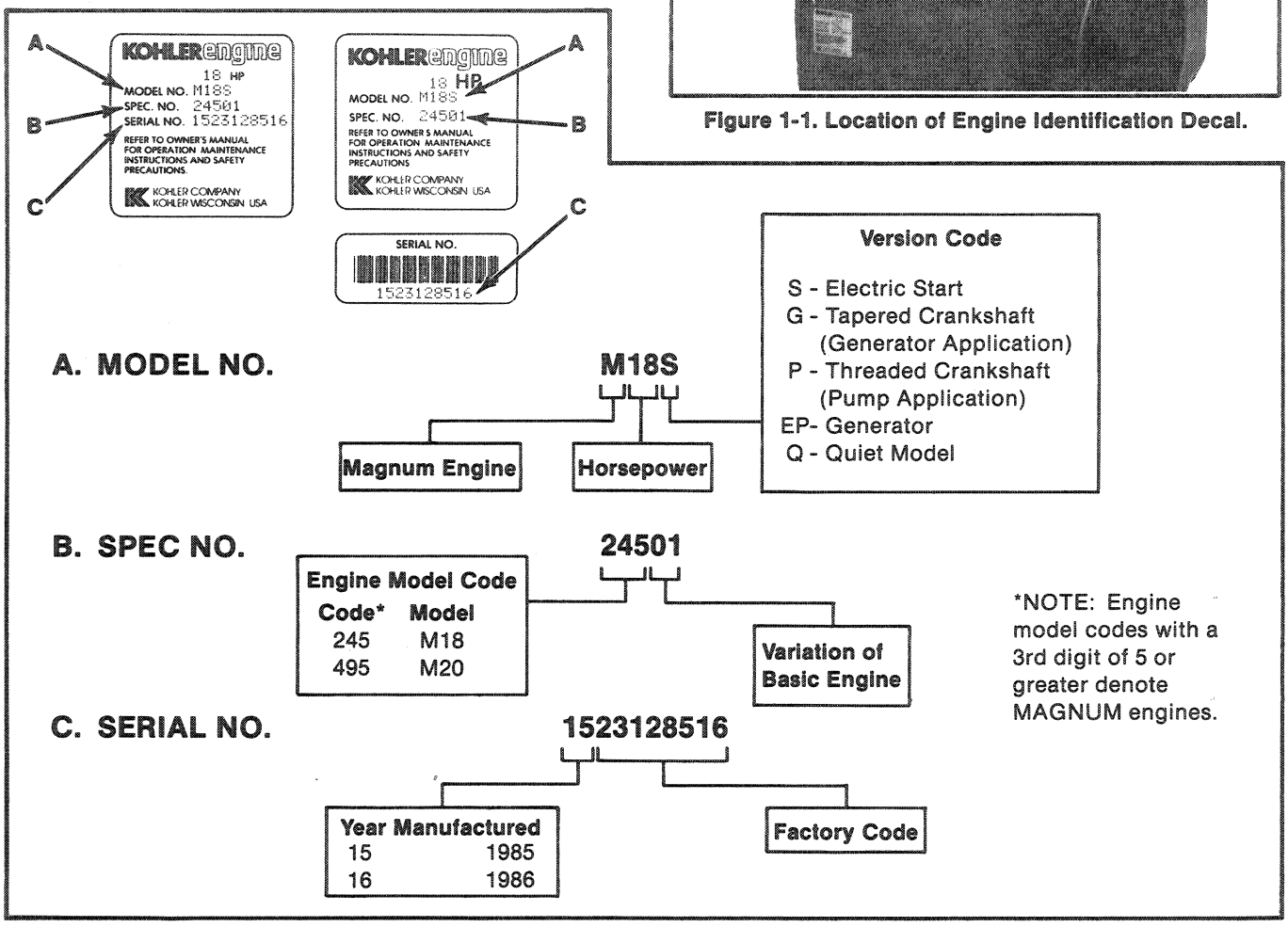

Figure 1-2. Engine Identification Decals.

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KOHLER engines

SPECIAL TOOLS

SPECIAL SERVICE TOOL KIT NO. 3211

These quality tools are designed to help you perform specific disassembly, repair, and reassembly procedures. By using tools designed for the job, you can service engines easier, faster, and safer! In addition, you'll increase your service capabilities and customer satisfaction by decreasing engine down time.

The Special Service Tool Kit No. 3211 can be ordered complete as shown (Refer to Figure 2-1), or the tools can be ordered individually. Contact your Kohler Distributor for price and availability.

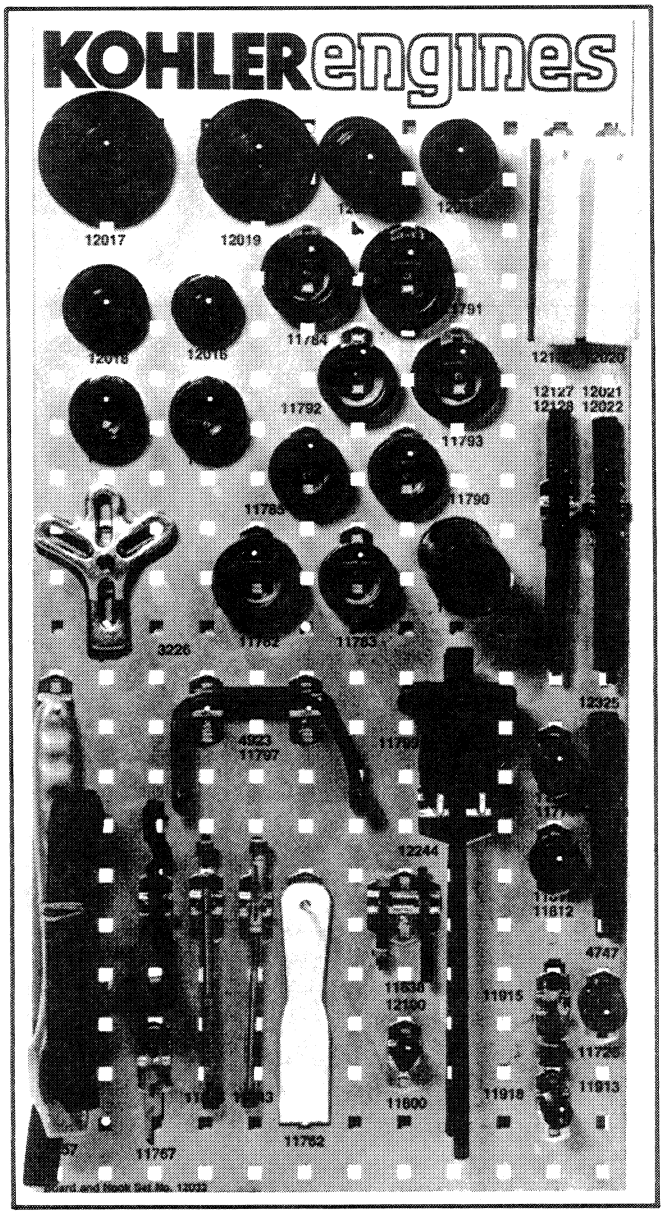

Figure 2-1. Special Service Tool Kit—No. 3211.

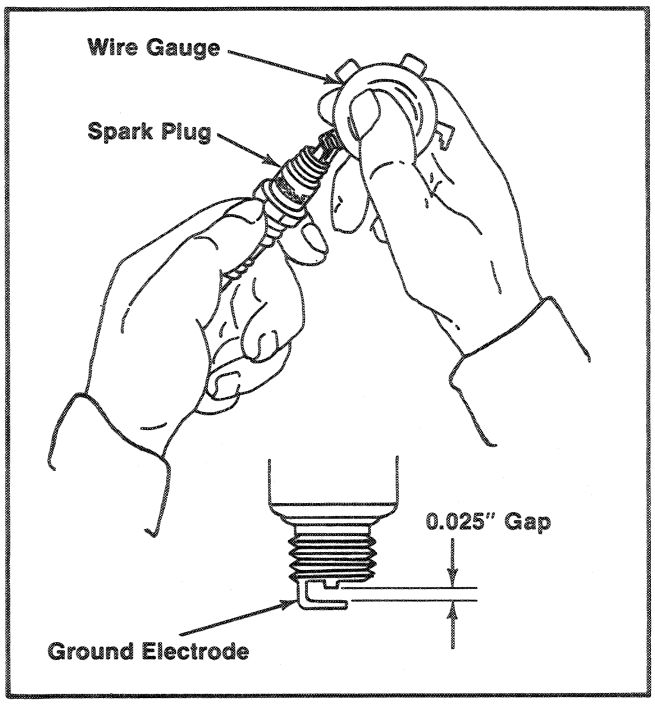

Figure 3-6. Servicing Spark Plugs.

1. Before removing spark plugs, clean the area around the base of plugs to keep dirt and debris out of engine.
2. Remove the plugs and check condition. Replace the plugs if worn or if reuse is questionable.

   Use Champion® Type RV15YC or equivalent spark plugs.

CAUTION: Do not clean the spark plugs in a machine using abrasive grit. Some grit could remain in spark plugs and enter the engine causing extensive wear and damage.

3. Check gaps using a wire feeler gauge. Adjust gaps to **0.025"** by carefully bending the ground electrode.
4. Reinstall spark plugs into cylinder heads. Torque plugs to **10/15 ft. lb.**

IGNITION SYSTEM SERVICE

Magnum engines are equipped with a dependable electronic magneto ignition system. Other than periodically checking/replacing the spark plugs, no maintenance, timing, or adjustments are necessary or possible with this system.

CHECK FUEL FILTER

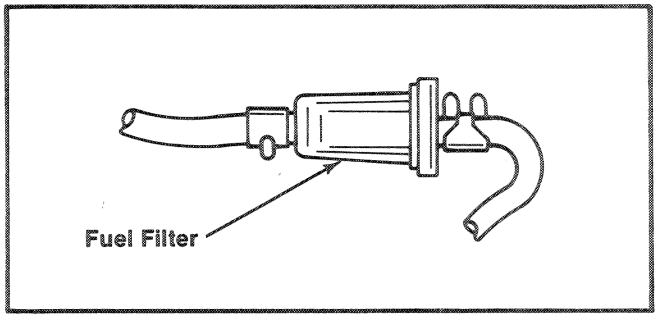

Figure 3-7. In-line Fuel Filter.

Some engines are equipped with an in-line fuel filter. Visually inspect the filter periodically. Replace when dirty with a genuine Kohler filter.

SERVICE STARTER MOTOR DRIVE

Every 500 operating hours, or annually (whichever occurs first), clean and lubricate the drive splines of the Bendix-drive electric starter motor. Refer to Figure 3-8.

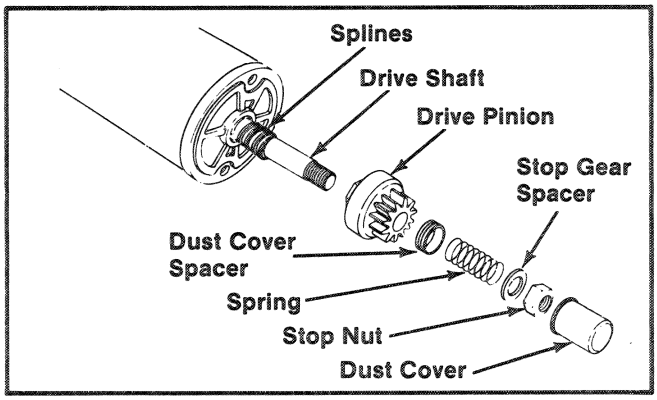

Figure 3-8. Starter Drive Components.

1. Remove starter from crankcase. (Refer to the "Disassembly" section.)
2. Remove dust cover, stop nut, stop gear spacer, spring, dust cover spacer, and drive pinion.
3. Clean the drive shaft splines with solvent. Dry splines thoroughly.
4. Apply a small amount of Kohler electric starter drive lubricant (Part No. 52 357 01) to splines.

CAUTION: Kohler starter drive lubricant (Part No. 52 357 01) must be used on all Kohler electric starter drives. The use of other lubricants can cause the drive to stick or bind.

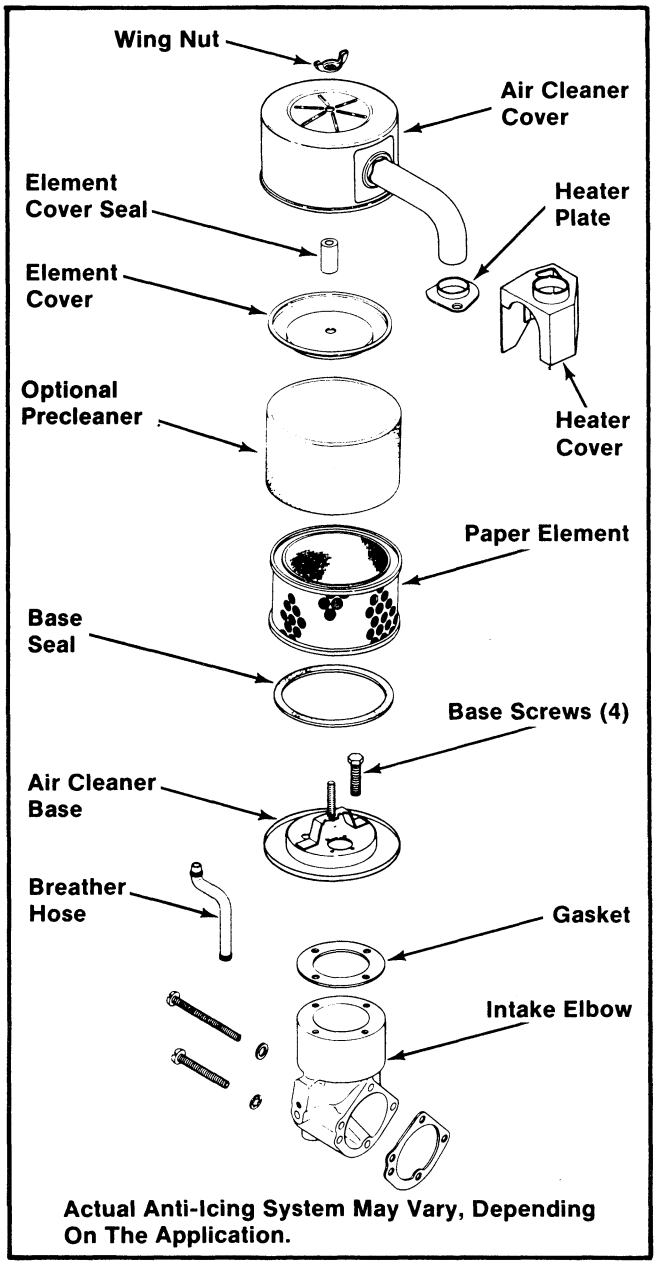

Figure 5-4. Anti-Icing Air Cleaner Assembly.

Disassembly

1. Remove the wing nut and air cleaner cover.
2. Remove the element cover seal, element cover, paper element, precleaner, and air cleaner base seal.
3. Remove the base screws, air cleaner base, breather hose, and gasket.
4. Remove the heater plate or heater cover, if so equipped.

Reassembly

1. If so equipped, install the heater plate or heater cover over the exhaust outlet on the #2 side of crankcase.
2. Install the gasket, air cleaner base, breather hose, and base screws.

   CAUTION: Make sure breather hose seals tightly in the air cleaner base and breather cover to prevent unfiltered air from entering engine.
3. Install the air cleaner base seal, paper element, precleaner (cleaned and oiled), element cover, and element cover seal.
4. Install the air cleaner cover with the inlet duct positioned for the season of operation. Refer to the decal on the air cleaner cover (Figure 5-5).

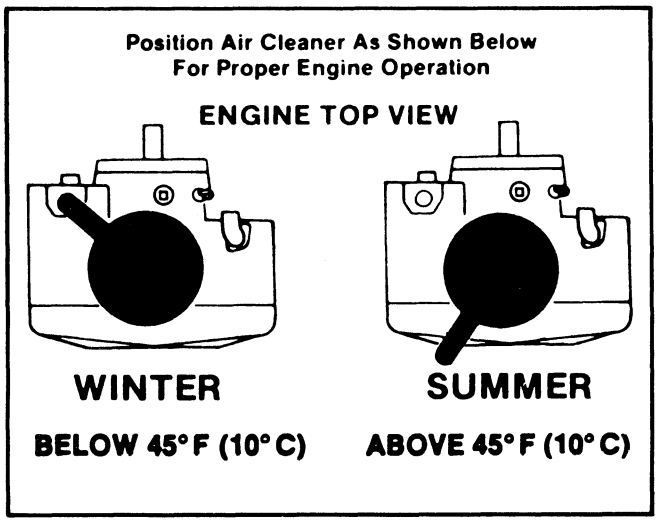

Figure 5-5. Typical Decal - Anti-Icing Air Cleaner Cover Positions.

For "Winter" Position - Make sure the inlet duct fits completely over heater plate or heater cover. Refer to Figure 5-6. Make sure the air cleaner cover is sealed tightly around the entire perimeter of air cleaner base.

CAUTION: Proper sealing around base is necessary to prevent unfiltered air from entering the engine.

To prevent vapor lock and to ensure proper engine operation, do not operate the engine during "summer" season with the air cleaner cover in the "winter" position. Always refer to the decal on the air cleaner cover for proper position.

5. Remove choke shaft and allow Loctite to "set" for an additional 30 minutes before proceeding.

6. Wipe away all excess Loctite from bushings and choke shaft.

Install Throttle Shaft Bushing

1. Make sure the dust seal counterbore in carburetor body is thoroughly clean and free of chips and burrs.

2. Install a throttle shaft (without throttle lever) into carburetor body to use as a pilot. (Use one of the remaining new throttle shafts from kit.)

3. Coat the outside surface of throttle shaft bushing with Loctite from kit. Slip bushing over shaft. Using installation tool from kit and vise, press bushing into counterbore until it bottoms in carburetor body. Refer to Figure 6A-11.

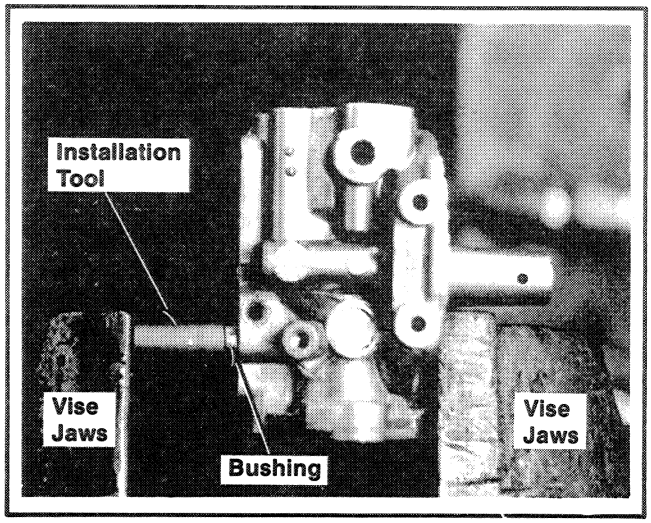

Figure 6A-11. Installing Throttle Shaft Bushings.

4. Allow Loctite to "set" for 5-10 minutes then remove throttle shaft.

5. Install new throttle shaft with lever into carburetor body. Rotate shaft and check for binding.

   CAUTION: If binding occurs, locate cause and correct before proceeding. Use throttle shaft to align bushing if necessary.

6. Remove shaft and allow Loctite to "set" for an additional 30 minutes before proceeding.

7. Wipe away all excess Loctite from bushing and throttle shaft.

Install Detent Spring And Ball, Choke Shaft, And Choke Plate

1. Install new detent spring and ball into carburetor body in the side opposite choke lever.

2. Compress detent ball and spring and insert choke shaft through bushings. Make sure the choke lever is on the correct side of carburetor body. Refer to Figure 6A-12.

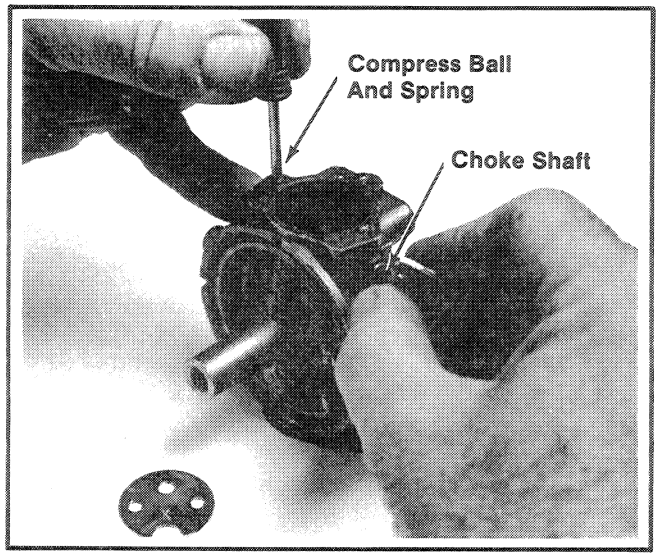

Figure 6A-12. Installing Choke Shaft.

3. Install choke plate to choke shaft. Make sure marks are aligned and plate is positioned properly in bore. Apply Loctite to threads of (2) #3-48x7/32" screws. Install screws so they are slightly loose.

4. Operate choke lever. Check for binding between choke plate and carburetor bore. Loosen screws and adjust plate as necessary; then tighten screws securely.

Install Throttle Shaft And Throttle Plate

1. Install throttle shaft into carburetor with cutout portion of shaft facing out.

2. Install throttle plate to throttle shaft. Make sure marks are aligned and plate is positioned properly in bore. Apply Loctite to threads of (2) #3-48x7/32" screws. Install screws so they are slightly loose.

3. Apply finger pressure to throttle shaft to keep it firmly seated against pivot in carburetor body. Rotate the throttle shaft until throttle plate fully closes the bore around its entire perimeter; then tighten screws.

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KOHLER engines

SECTION 8

ELECTRICAL SYSTEMS AND COMPONENTS

MAGNUM ELECTRONIC MAGNETO IGNITION SYSTEM

This engine is equipped with a state-of-the-art electronic magneto ignition system. The system consists of the following components (refer to Figure 8-1):

- A magnet assembly, which is PERMANENTLY affixed to the flywheel.
- An electronic magneto ignition module, which is mounted to the #1 side cylinder barrel.
- A kill switch (or keyswitch) which stops the engine by grounding the ignition module.

Operation

As the flywheel rotates and the magnet assembly moves past the ignition module, a low voltage is induced in the primary windings of the module. When the primary voltage is precisely at its peak, the module induces a high voltage in its secondary windings. This high voltage creates a spark at the tip of the spark plugs, igniting the fuel-air mixture in the combustion chambers. The timing of the spark is automatically controlled by the module. Therefore, no ignition timing adjustments are necessary or possible with this system.

CAUTION: Do not connect 12 volts to the ignition system or to any wire connected to the ignition module.

The ignition system operates independently of the battery, starting, charging, and other auxiliary electrical systems. Connecting 12 volts to the ignition module can cause the module to burn out. This type of damage is not covered by the engine warranty.

A break-before-make type keyswitch is required to prevent damage to the ignition module.

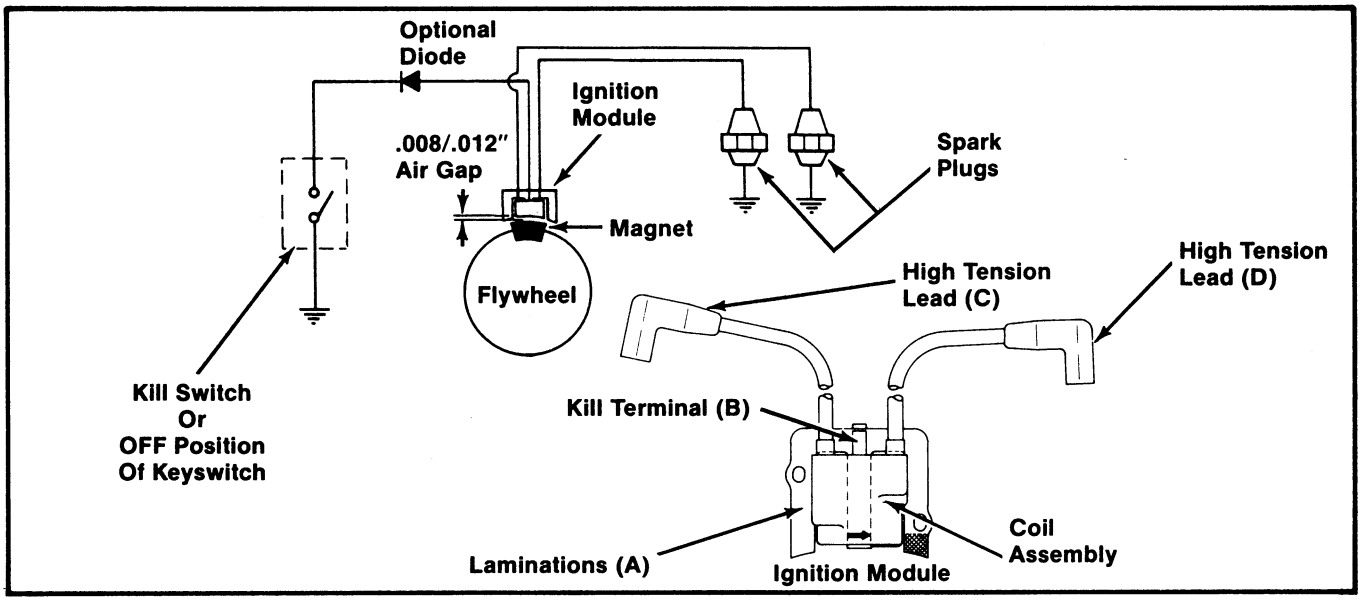


Figure 8-1. Magnum Electronic Magneto Ignition System.

BATTERY

Batteries are supplied by the equipment manufacturer. A 12-volt battery with a rating of 32 amp. hr. is normally used. Refer to the equipment manufacturer's instructions for specific information.

Battery Test

If the battery charge is not sufficient to crank the engine, recharge the battery.

CAUTION: Do not attempt to "jump start" the engine with another battery. Starting the engine with batteries larger than those recommended can burn out the starter motor.

Test the battery voltage by connecting D.C. voltmeter across the battery terminals—crank the engine. If the battery drops below 9 volts while cranking, the battery is discharged or faulty. Refer to Figure 8-13.

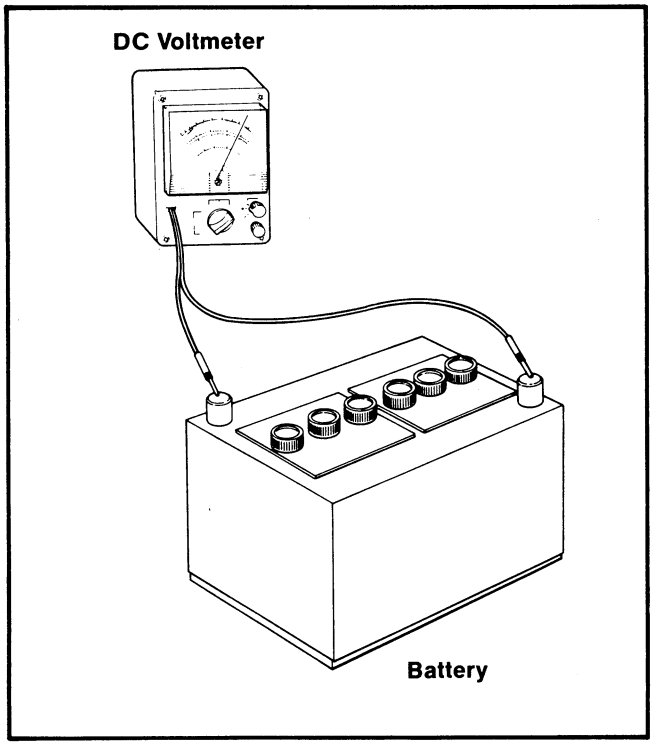


Figure 8-13. Checking Battery Voltage.

Battery Charging

WARNING: Dangerous Acid, Explosive Gases!

Batteries contain sulphuric acid. To prevent acid burns, avoid contact with skin, eyes, and clothing.

Batteries produce explosive hydrogen gas while being charged. Charge the battery in well ventilated areas. Keep cigarettes, sparks, open flame, and other sources of ignition away from battery at all times.

To prevent accidental shorting and the resulting sparks, remove all jewelry when servicing the battery.

When disconnecting battery cables, always disconnect the negative (-) (ground) cable first. When connecting battery cables, always connect the negative cable last.

Before disconnecting the negative (-) ground cable, make sure all switches are OFF. If ON, a spark will occur at the ground cable terminal which could cause an explosion if hydrogen gas or gasoline vapors are present.

Keep batteries and acid out of the reach of children.

Battery Maintenance

Regular maintenance will ensure the battery will accept and hold a charge.

1. Regularly check the level of electrolyte. Add **distilled** water as necessary to maintain the recommended level.

   CAUTION: Do not overfill the battery. Poor performance or early failure due to loss of electrolyte will result.

2. Keep the cables, terminals, and external surfaces of battery clean. A build-up of corrosive acid or grime on the external surfaces can self-discharge the battery. Self-discharging happens rapidly when moisture is present.

   Wash the cables, terminals, and external surfaces with a baking soda and water solution. Rinse thoroughly with clear water.

   CAUTION: Do not allow the baking soda solution to enter the cells as this will destroy the electrolyte.

KEYSWITCH

The keyswitch used on Magnum engines equipped with instrument panels is shown in Figure 8-14. It is a three position (OFF, RUN, START), break-before-make type switch.

1. Remove the truss head screws, fuel pump, and gasket. Refer to Figure 9-14.

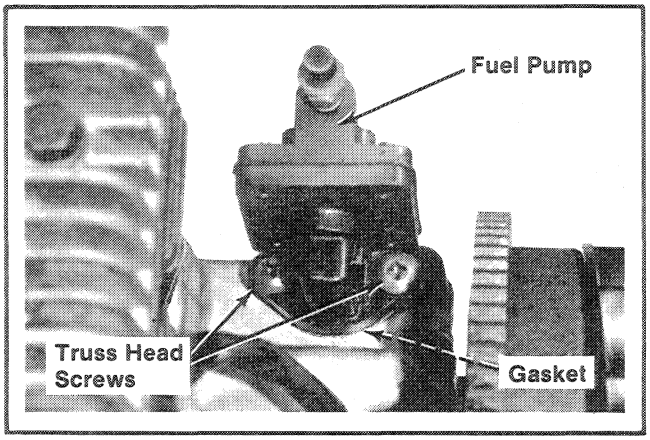


Figure 9-14. Removing Fuel Pump.

REMOVE IGNITION MODULE AND BRACKET

1. Remove the hex flange screws and ignition module. Refer to Figure 9-15.

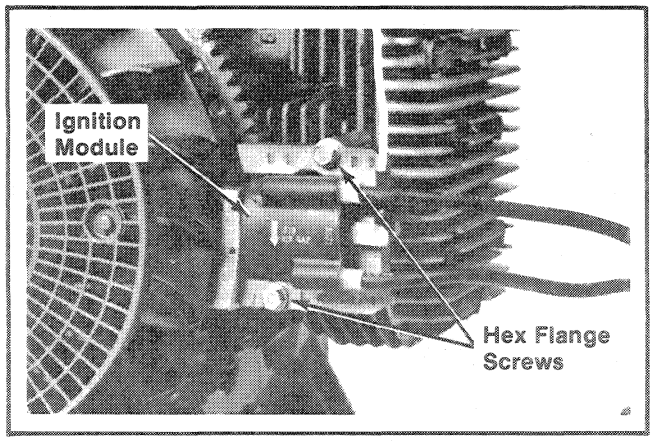


Figure 9-15. Removing Ignition Module.

2. Remove the hex flange screws and bracket from #1 cylinder barrel. Refer to Figure 9-16.

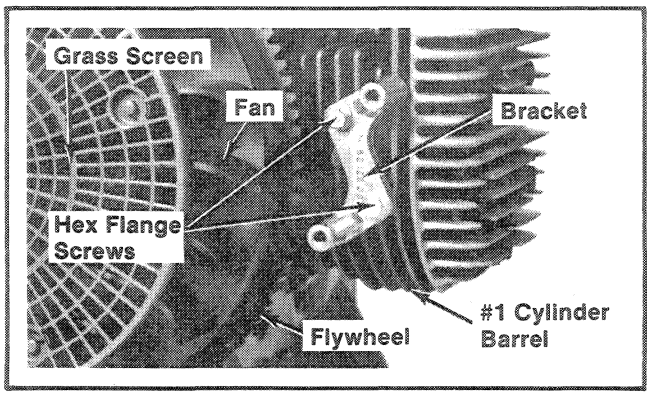


Figure 9-16. Removing Ignition Module Bracket.

REMOVE GRASS SCREEN, FLYWHEEL, AND FAN

CAUTION: Always use the flywheel strap wrench to hold the flywheel when loosening or tightening flywheel and fan retaining fasteners. Do not use any type of bar or wedge between fins of cooling fan, as the fins could become cracked or damaged.

Always use a puller to remove flywheel from crankshaft. Do not strike the crankshaft or flywheel, as these parts could become cracked or damaged.

Refer to Section 2, Special Tools for recommended tools.

1. Remove the grass screen from fan. Refer to Figure 9-16.

2. Hold the flywheel with the strap wrench and loosen the hex cap screw. Remove hex cap screw, split lock washer, and plain washer. Refer to Figure 9-17.

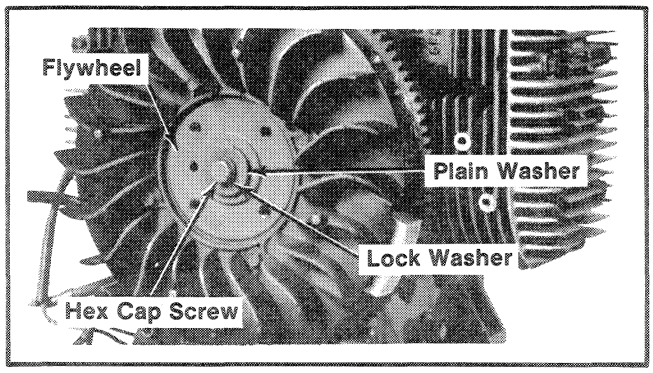


Figure 9-17. Removing Flywheel Fastener.

3. Remove the flywheel from crankshaft using a puller. Refer to Figure 9-18.

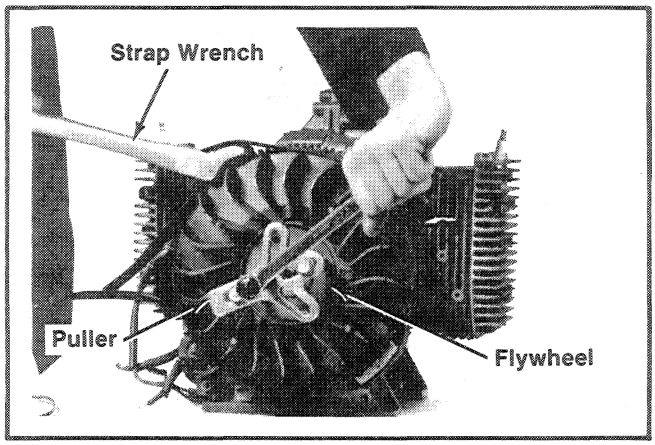


Figure 9-18. Removing Flywheel Using A Puller.

The following procedures should be used to accurately measure the piston-to-bore clearance:

1. Use a micrometer and measure the diameter of the piston, 1/2" above bottom of piston skirt, perpendicular to the piston pin (see Figure 10-4).

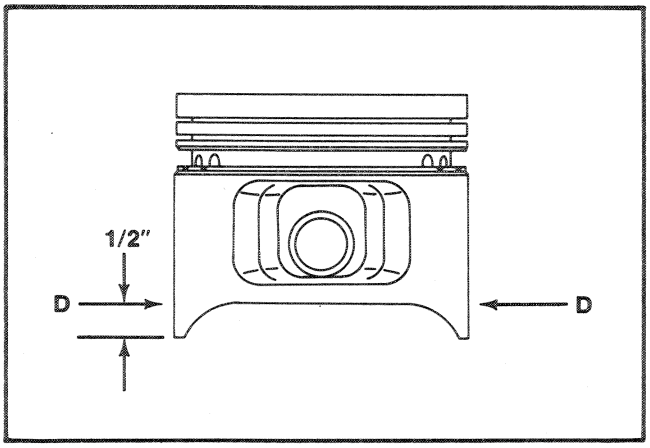


Figure 10-4. Measuring Piston Diameter (Style "D" Piston)

2. Use an inside micrometer, telescoping gauge, or bore gauge and measure the cylinder bore. Take the measurement approximately 2-1/2" below the top of the bore and perpendicular to the piston pin.
3. Piston-to-bore clearance is the difference between the bore and the piston diameter (step 2 minus step 1).

VALVES

Inspection And Service

Carefully inspect valve mechanism parts. Inspect valve springs and related hardware for excessive wear or distortion. Valve spring free height should be approximately **1.68" (1-11/16")**. Check valves and valve seat area or inserts for evidence of deep pitting, cracks, or distortion. Check clearance of valve stems in guides. See Figure 10-5 for valve details and specifications.

Hard starting, or loss of power accompanied by high fuel consumption may be symptoms of faulty valves. Although these symptoms could also be attributed to worn rings, remove and check valves first. After removal, clean valve head, face, and stem with power wire brush and then carefully inspect for defects such as warped valve head, excessive corrosion, or worn stem end. Replace valves found to be in bad condition. A normal valve and valves in bad condition are shown in the accompanying illustrations.

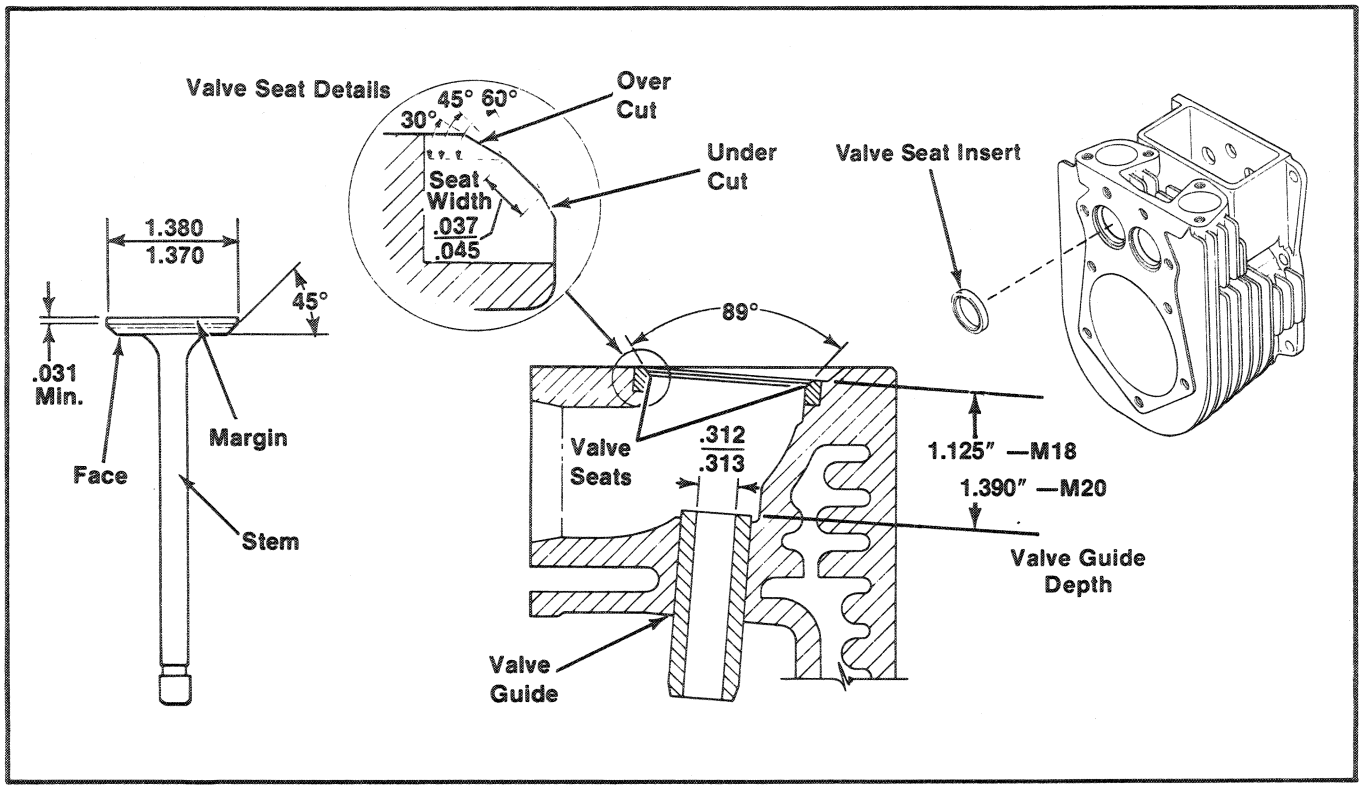


Figure 10-5. Valve Details.

MAGNUM

Twin Cylinder Engine
Service Manual
Models M18 & M20
TP-2204-A 3/86

KOHLER engines

SECTION 11

REASSEMBLY

The following sequence is suggested for complete engine reassembly. This procedure assumes that all components are new or have been reconditioned, and all component subassembly work has been completed. This procedure may have to be varied slightly to accommodate options or special equipment.

CAUTION: Make sure the engine is assembled using all specified torque values, tightening sequences, and clearances. Failure to observe specifications could cause severe engine wear or damage.

Always use new gaskets.

1. Install oil pump and oil pickup.
2. Install cross shaft and governor gear.
3. Install connecting rods.
4. Install bearings and crankshaft.
5. Install tappets and camshaft.
6. Install camshaft bore plug and seal crankcase.
7. Install front oil seal.
8. Install oil filter adapter.
9. Install oil pressure relief valve, closure plate, and rear oil seal.
10. Install piston rings.
11. Install pistons in cylinder barrels.
12. Install cylinder barrels.
13. Measure valve-to-tappet clearance.
14. Install valves.
15. Install cylinder heads and spark plugs.
16. Install stator.
17. Install electric starter.
18. Install fan, flywheel, and grass screen.
19. Install bracket and ignition module.
20. Install fuel pump.
21. Install valve cover and breather.
22. Install blower housing, cylinder head baffles, and top baffle.
23. Install solenoid, keyswitch, rectifier regulator, and connect wiring.
24. Install carburetor and intake manifold.
25. Install air cleaner.
26. Install exhaust elbows and mufflers.
27. Install oil filter.

INSTALL OIL PUMP AND OIL PICKUP

Oil Pump

1. Install the shim spacer (next to support rib), oil pump drive gear (slotted end of gear hub towards spacer and rib), and oil pump drive shaft (through support rib and into pump cavity). Refer to Figures 11-1 and 11-2.

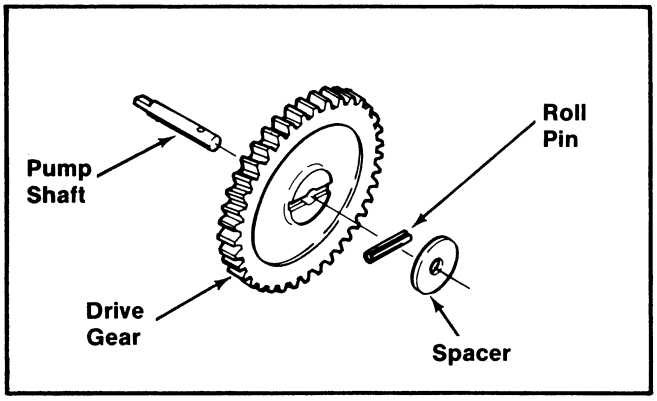


Figure 11-1. Installing Oil Pump Drive Gear.

2. Rotate the drive shaft and drive gear until hole in shaft is aligned with slot in gear hub.

3. Lubricate a new roll pin with grease. Drive the roll pin until it is flush with gear hub. Refer to Figure 11-2.

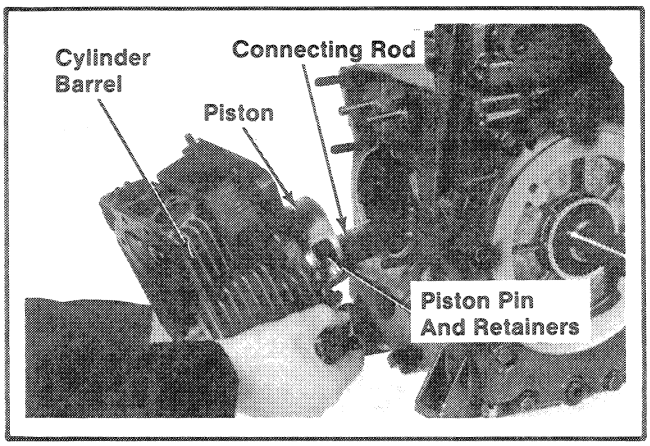


Figure 11-31. Installing Pistons/Cylinder Barrels To Connecting Rod.

CAUTION: To prevent damage to the connecting rods when reinstalling the cylinder barrels, make sure the barrels and connecting rods are supported at all times. Do not allow the connecting rods to drop against the edges of crankcase.

5. Slide the cylinder barrels over pistons and crankcase studs.

6. Install the plain washers and hex nuts. Torque hex nuts #1 and #2 to **100 in. lb.** Torque the remaining hex nuts to **100 in. lb.** in the most expedient sequence. Refer to Figure 11-30.

7. Torque all hex nuts to **200 in. lb.** in the sequence shown.

MEASURE VALVE-TO-TAPPET CLEARANCE

IMPORTANT:
The piston must be at top dead center (TDC) of the compression stroke to measure valve-to-tappet clearance. By rotating the crankshaft and observing the tappets for movement, it can be determined if a cylinder is at TDC.

If, for example, the crankshaft is rotated and movement is observed in the #2 side valve box—the opposite cylinder (#1 side) will be at TDC and valve-to-tappet clearance can be measured.

Rotating the flywheel one complete revolution (360°) will then cause movement in the #1 side valve box. The #2 side cylinder will be at TDC, enabling measurement of valve to tappet clearance for that side.

The valve faces and seats must be lapped-in before checking/adjusting valve-to-tappet clearance.

1. Rotate the crankshaft and look into the valve boxes. The tappets will move in only one of the boxes.

2. Install valves into valve guides for the cylinder in which **no movement** was observed. Hold valves firmly against seat and measure valve-to-tappet clearance with a flat feeler gauge. Refer to Figure 11-32.

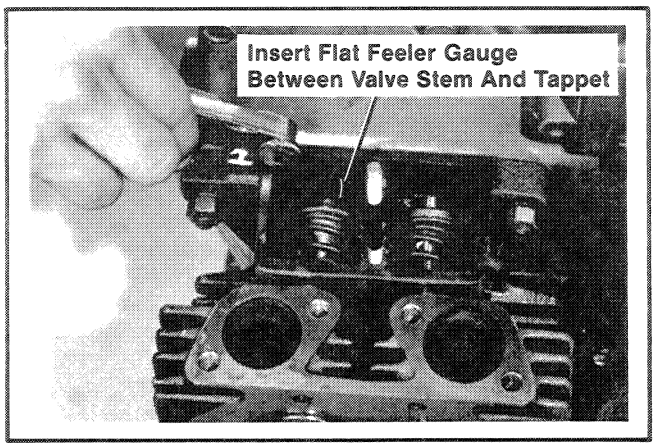


Figure 11-32. Measuring Valve-To-Tappet Clearance.

Clearance Specifications -

Intake Valve (Closest to Flywheel)	**.003"/.006"**
Exhaust Valve (Closest to PTO)	**.016"/.019"**

3. Rotate the crankshaft 360° and measure the valve-to-tappet clearance for the remaining cylinder. Refer to "Clearance Specifications.".

4. If the clearance is insufficient, grind the valve stems until the correct clearance is obtained. Make sure the valve stems are ground perfectly flat and smooth.

   If the clearance is excessive, replace the valves and recheck clearance.

INSTALL VALVES

1. Install the intake valve seals to valve guides.

2. Install the valve springs (close coils towards cylinder head surface), exhaust valve rotators, lower intake valve spring retainers, and valves.

3. Compress the springs using a valve spring compressor and install keepers. Refer to Figure 11-33.

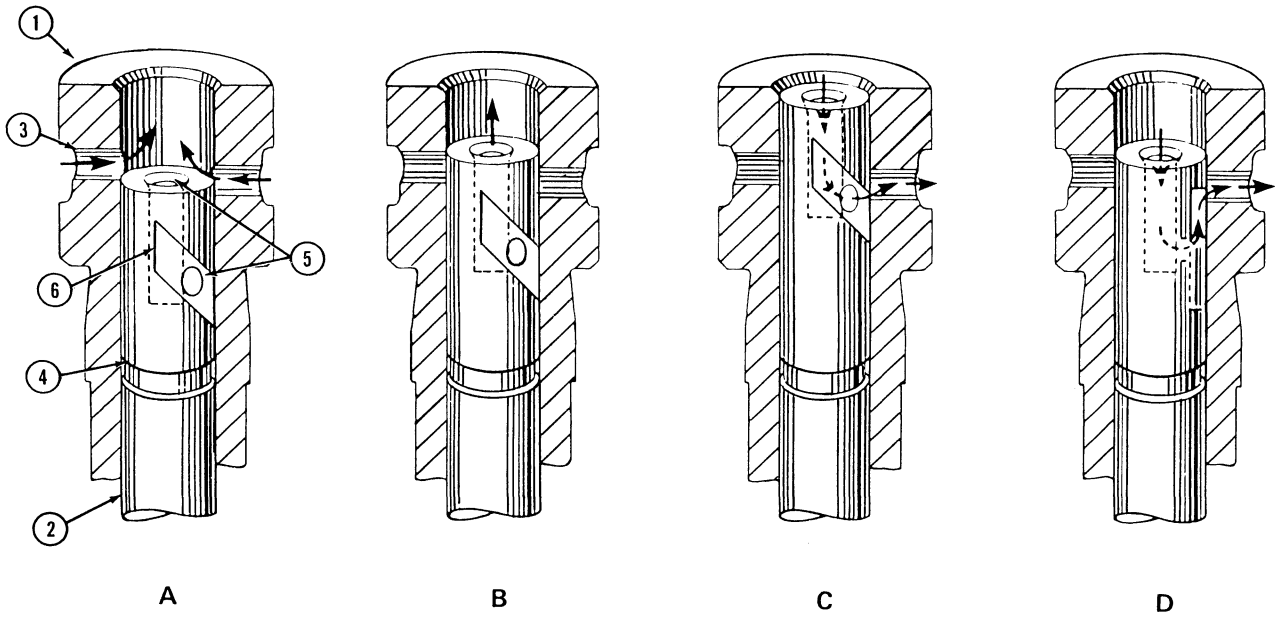


FIGURE 2-3

Pumping Element

1 Barrel
2 Plunger
3 Fuel Inlet
4 Angular Groove
5 Fuel Port - Center Drilling
6 Helical Groove

Position D

At this stage the plunger has rotated to a position where the helical groove has reached the bottom of the inlet port before the plunger has risen sufficiently to close both inlet ports.

During the remainder of the plunger stroke the helical groove remains in contact with the inlet port so no pressure is produced and no injection can take place.

This is the "no delivery" or "stop" position which occurs when the stop lever moves the control rod to the fully forward position.

DELIVERY VALVES

Reference Figure 2-2

Located above each pumping element is a delivery valve assembly which consists of a piston and stem assembly operating within a cylindrical guide which terminates in a conical seat. The lower part of the stem has four vertical flutes which accurately locate within the guide while permitting fuel to pass. Above the flutes is a piston which is a lapped fit in the bore of the valve guide.

The delivery valve serves as a non-return valve and also as a means of rapidly reducing the fuel pressure in the injector line when injection ceases. Rapid pressure reduction is required to be sure the injector needle valve "snaps" shut to prevent fuel "dribble," a condition which can cause carbon formation on the injector tip.

12. Slowly rotate the crankshaft clockwise until the fuel flow stops and observe the dial indicator reading.

    A dial indicator reading of between 0.064-0.081in. (1.638-2.067 mm) indicates 16°-18° BTDC injection timing and no further adjustment is required.

    If the timing angle is not correct, use the following chart and adjust the shim thickness as required to obtain 16°-18° injection timing.

NOTE: Changing the shim thickness by 0.004 in. (0.1 mm) will change the timing approximately one degree. Adding shims decreases the angle while subtracting shims increases the angle.

13. Recheck the pump timing after adjusting the shim thickness.

14. Reassemble the delivery valve, spring and holder. Tighten the holder to the specified torque. See "Specifications."

15. After assembly, check and adjust valve clearances as shown under engine repair.

16. Assemble valve cover.

ANGLE	PISTON HEIGHT
Degree	Inch (mm)
20°	0.100 (2.543 mm)
21°	0.110 (2.799 mm)
22°	0.120 (3.066 mm)
23°	0.130 (3.345 mm)
24°	0.143 (3.635 mm)
25°	0.155 (3.936 mm)
26°	0.167 (4.248 mm)
27°	0.180 (4.571 mm)
28°	0.193 (4.904 mm)

INJECTION PUMP SHIMS

SHIM THICKNESS	PART NUMBER
0.008 in. (0.2 mm)	131437240
0.012 in. (0.3 mm)	131437242
0.020 in. (0.5 mm)	131437246
0.039 in. (1.0 mm)	131437248

DIESEL FUEL SYSTEMS - GENERAL (Continued)

CONDITION	POSSIBLE CAUSE	CORRECTION
Erratic engine operation (surge, misfiring, poor governor regulation)	1. Fuel leakage. 2. Fuel starvation. 3. Incorrect pump timing. 4. Contaminated fuel. 5. Air in system. 6. Faulty or sticking injector nozzles. 7. Incorrect engine timing.	1. Check the injector lines and connectors for leakage. 2. Check and flush clean restricted fuel lines or filters. 3. Check the pump timing. 4. Check for water in the fuel. 5. Bleed the fuel system. 6. See injector troubleshooting. 7. Check for faulty engine valves.
Engine does not develop full power or speed.	1. Incorrect maximum no-load speed. 2. Fuel starvation. 3. Air in system. 4. Low compression. 5. Incorrect engine valve timing.	1. Replace pump. 2. Check and flush clean restricted fuel lines and filters. 3. Check for air leaks on the suction side of the system. 4. Check engine compression. 5. Check for improper valve adjustment or faulty valves.
Engine emits black smoke.	1. Restricted air intake. 2. Faulty injectors. 3. Low compression. 4. Incorrect engine valve timing.	1. Check for a restricted air intake. 2. Clean or replace. 3. Check the engine compression. 4. Check the engine valve timing.
Pump fails to deliver fuel to all injectors	1. Blocked fuel lines to pump. 2. Air in fuel lines to injectors. 3. Control rod seized in OFF position. 4. Defective stop solenoid.	1. Remove fuel lines and flush to all injectors or replace. 2. Bleed fuel lines. 3. Repair or replace control rod. 4. Test solenoid. See Part 3.

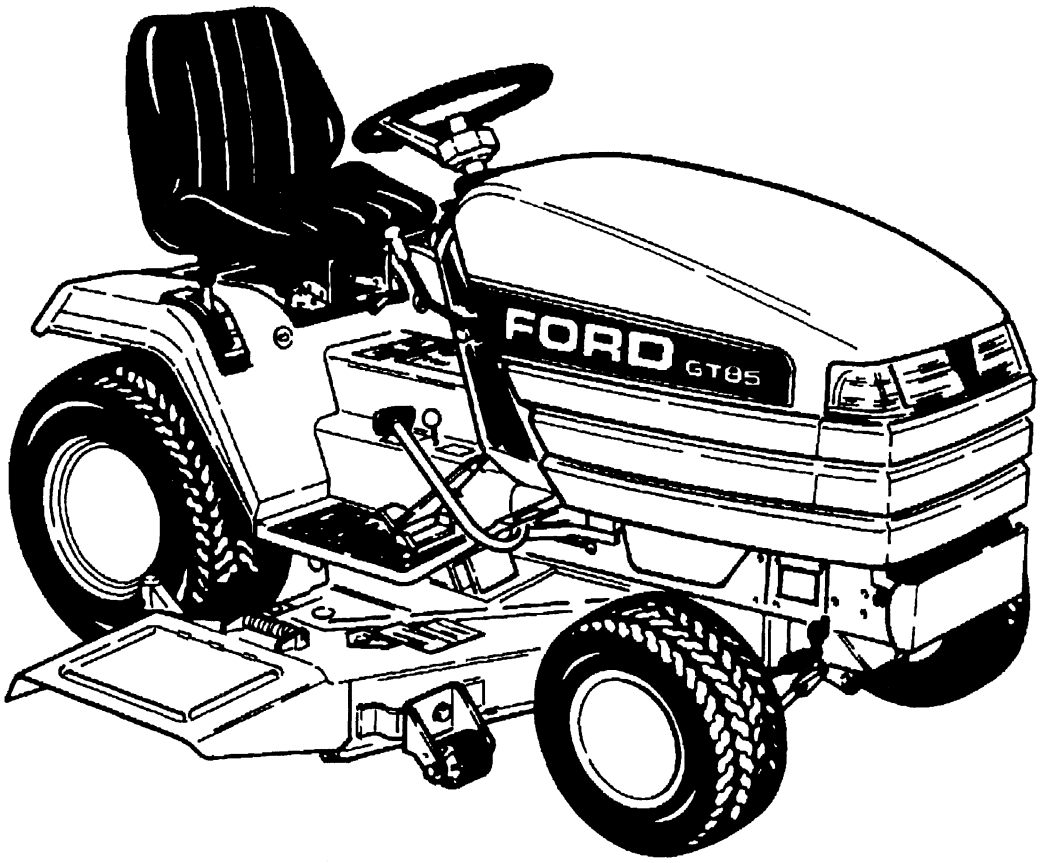
FORD

Service Manual

Lawn and Garden Tractor
GT65 and GT75 Diesel
GT85 and GT95 Gasoline

Vol. 2

40006540



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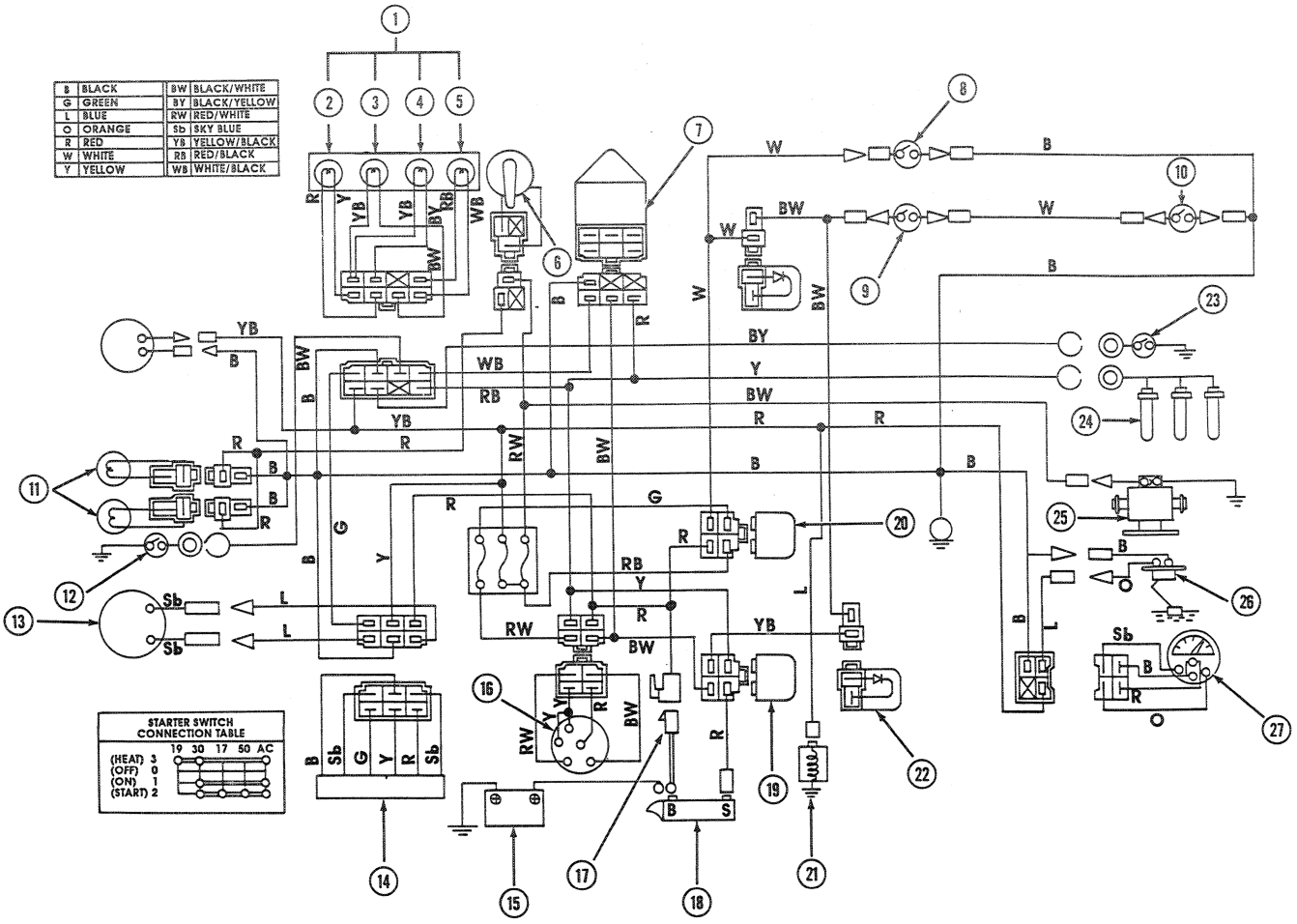


FIGURE 3-4

Wiring Diagram

1	Indicator Lamp Assembly	10	Neutral Switch - Brake	19	Relay - Starter
2	Charge Lamp	11	Headlamps	20	Relay - Neutral Start
3	Temperature Lamp	12	Water Temperature Sensor	21	Fuel Stop Solenoid
4	Oil Lamp	13	Alternator	22	Diode - Connector
5	IQS Lamp	14	Regulator	23	Oil Pressure Sender
6	Light Switch	15	Battery	24	Glow Plugs
7	Controller (Lamp Timer)	16	Starter Switch	25	Fuel Pump
8	Neutral Switch - Seat	17	Fuse Link	26	Fuel Gauge Sender
9	Neutral Switch - PTO	18	Starter	27	Fuel Gauge

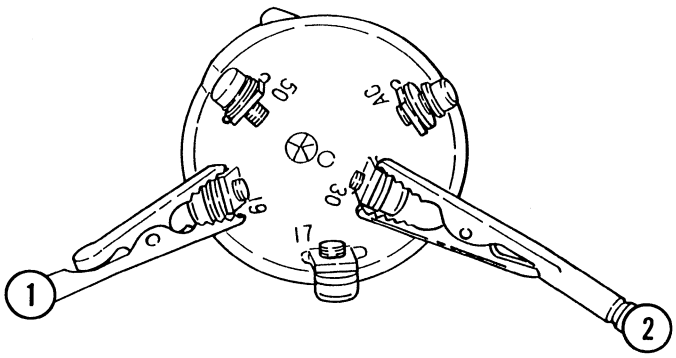


FIGURE 3-25

Key Switch Heat Position Check

1 Terminal No. 19
2 Terminal No. 30

TEST NO. 2

PARALLEL CONNECTOR

- Connect one ohmmeter lead to the glow plug nut.
- Connect the remaining ohmmeter lead to each of the other glow plug nuts and observe the ohm meter reading.

  Low or zero resistance = Good .

  High resistance = Bad connections. Remove parallel connector and clean connections.

TEST NO. 3

STARTER SWITCH TO GLOW PLUG

- Connect one ohmmeter lead to the glow plug with the wire terminal.
- Connect the other ohmmeter lead to the key switch terminal number 17, Figure 3-24 and observe the ohmmeter reading.

  Low or zero reading. = Good

  High reading = Faulty wire from switch to glow plug. Replace.

TEST NO. 4

KEY SWITCH HEAT POSITION

Reference Figure 3-25

- Connect one ohmmeter lead to the terminal marked 19 on the starter switch.
- Connect the other ohmmeter lead to the key switch terminal number 30. Rotate the key to the "heat" position and observe the ohmmeter reading.

  Low or zero reading = Good

  High reading = Faulty switch – Replace.

TEST NO. 5

KEY SWITCH TO INDICATOR

- Connect one ohmmeter lead to the switch terminal number 19 or 17.
- Connect the other ohmmeter lead to the glow plug indicator connector and observe the ohmmeter reading.

  Low or zero reading = Good.

  High reading = Faulty wire Replace.

- Connect one ohmmeter lead to the switch terminal number 17.
- Connect the other ohmmeter lead to the glow plug indicator terminal and observe the ohmmeter reading.

  Low or zero reading = Good

  High reading = Faulty wire Replace.

TEST NO. 6

GLOW PLUG INDICATOR LIGHT

- Connect one ohmmeter lead to each of the indicator light terminals and observe the ohmmeter reading.

  Low or zero reading = Good

4. Remove one fuse at a time until voltmeter drops to zero.

   NOTE: If removing the fuses does not cause the voltmeter to drop to zero, disconnect the wires from the electrical accessories (alternator, regulator, etc.) until the needle drops to zero.

SLOW CHARGING

If time allows, the slow charge method of recharging the battery should be used. A slow charge is the only method to fully charge a battery. A high rate charger can be used to boost the capacity of a battery quickly, but must be followed by a slow charger to bring a battery to full charge.

There are many types of battery charging equipment available. Be sure to follow the instructions of the equipment manufactured for the necessary preparations and precautions. However, the following items should be observed when slow charging the battery with any type of equipment.

1. If the battery is to remain in the vehicle, disconnect the cables at the battery to prevent damage to the electrical system during charging.
2. Thoroughly clean the battery.
3. Make sure the electrolyte is at the proper level.
4. The battery is to be charged at a rate of seven amps.
5. Battery electrolyte temperature must never exceed 125°F (52°C). If this temperature is reached, the battery should be cooled by reducing the charge rate or by disconnecting the battery from the charger.

   The average length of time necessary to charge a battery by the slow charge method at the indicated rates is from 12-16 hours; however, when a battery continues to show an increase in specific gravity, battery charge should be continued even if it takes 24 hours or more.

   A battery is in a maximum charged condition when all cells are gassing freely and three corrected specific gravity readings, taken at hourly intervals, indicate no increase in specific gravity.

FAST CHARGING

A battery may be charged at any rate which does not cause the electrolyte temperature of any cell to exceed 125°F (51.7°C) and which does not cause excessive gassing and loss of electrolyte. This rule does not apply to badly sulfated batteries. Such batteries should be charged at specified low rates.

A fast charger cannot be expected to fully charge a battery within an hour, but will charge the battery sufficiently so that it may be returned to service. The battery will then be fully charged by the tractor charging system, provided the tractor is operated a sufficient length of time.

The high-rate chargers can inflict irreparable damage on a battery if the safeguards provided by the manufacturer are ignored or circumvented by the operator. Operating instructions on high-rate chargers, as issued by each manufacturer, should be carefully followed.

DRY-CHARGE BATTERIES

WARNING: BEFORE ACTIVATING A DRY-CHARGED BATTERY, CAREFULLY READ THE INSTRUCTIONS AND WARNINGS ON THE ELECTROLYTE CARTON TO AVOID PERSONAL INJURY.

1. Remove and discard the vent cap seals.
2. Fill each cell with electrolyte until the electrolyte level is at the top of the ring in the bottom of the filler well.

   IMPORTANT: The electrolyte should be diluted sulfuric acid, sufficiently pure for storage battery use and should preferably be at a temperature between 70°F (21.1°C) and 90°F (32.2°C). In cold climates it may be necessary to place the electrolyte and battery to be serviced in a warm room until both have attained room temperature.

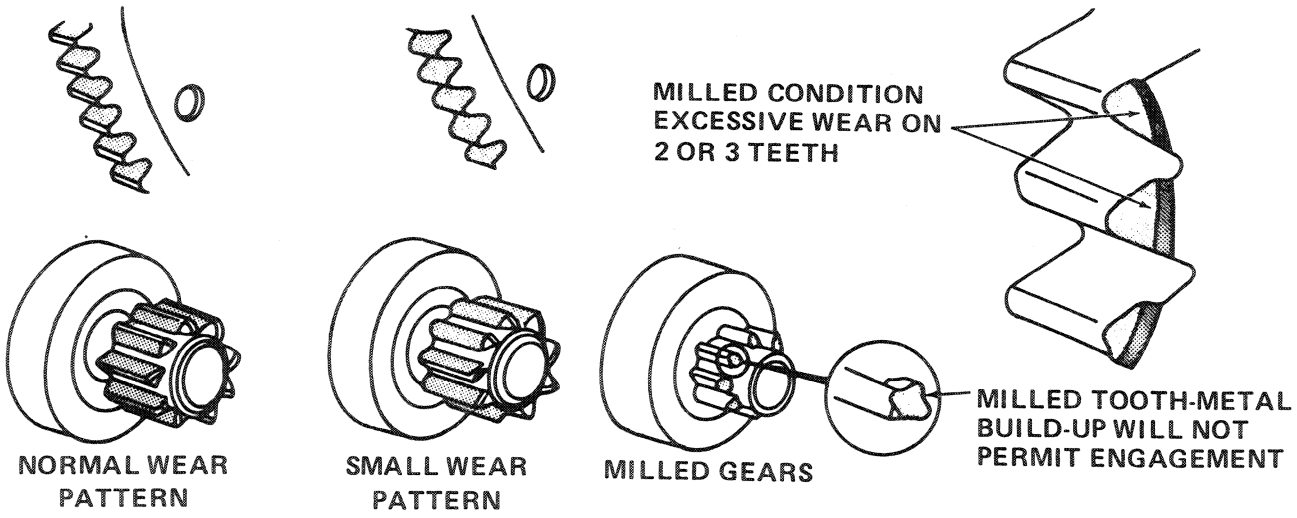


FIGURE 3-59

Pinion Gear Wear Check

14. Inspect the pinion and ring gear teeth for excessive wear or damage. Replace the pinion and ring gear assemblies if they are excessively milled, pitted or have damaged teeth, Figure 3-59.

    Check the pinion clutch action for sticking or binding. Replace the clutch assembly if defective.

ELECTRICAL TESTS

1. ARMATURE COIL CONTINUITY TEST

   Using an ohmmeter, touch one ohmmeter lead to a commutator segment and the other ohmmeter lead to the adjacent segment and observe the ohmmeter reading, Figure 3-60.

   Repeat this procedure on each adjacent set of commutator segments.

   Test Results

   Low resistance reading = Good

   High resistance reading = Faulty armature coil – Replace.

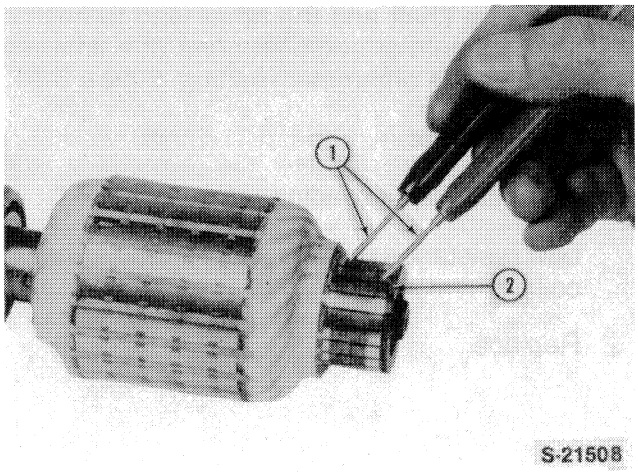


FIGURE 3-60

Armature Coil Continuity Test

1 Ohmmeter Leads
2 Commutator Segment

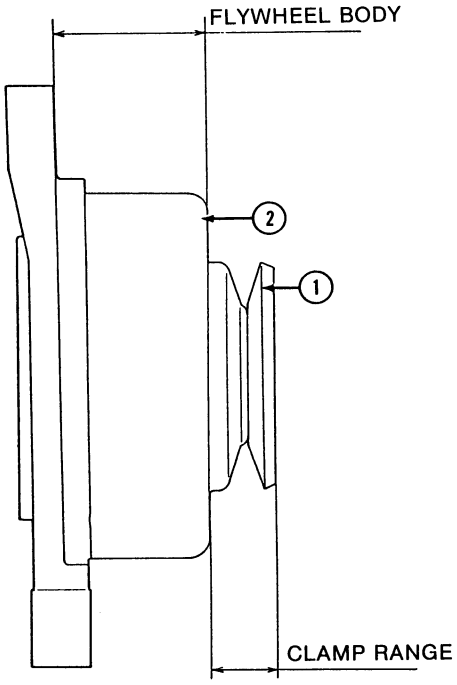


FIGURE 3-79

Alternator Disassembly

1 Pulley
2 Flywheel Body

ALTERNATOR DISASSEMBLY

References Figures 3-79 and 3-80

1. Place the alternator pulley in a vise.

   NOTE: Never clamp the alternator flywheel bodyin a vise.

2. Loosen the nut, 7.
3. Remove the spring washer, 8, and washer, 9.
4. Remove the alternator from the vise, and remove the flywheel complete, 1, from the coil plate, 3.
5. Remove the coupler, 10, from the wiring harness.

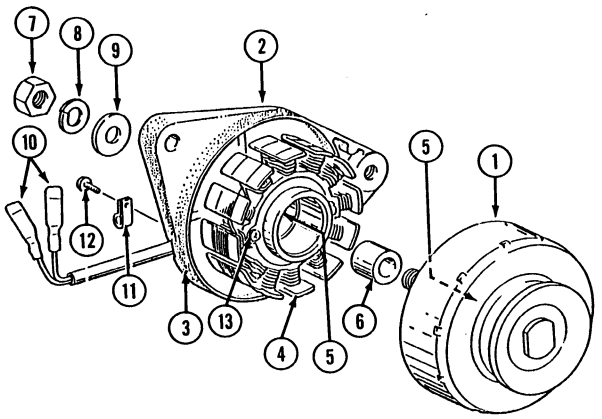


FIGURE 3-80

Alternator Assembly

1	Flywheel - Complete	8	Spring Washer
2	Plate - Complete	9	Washer
3	Coil Plate	10	Connector
4	Stator - Complete	11	Clamp
5	Bearings	12	Screw
6	Collar	13	Screw
7	Nut		

6. Loosen the screw, 12, and remove the clamp, 11.
7. Remove the screw, 13, and pull out the stator complete, 4, from the coil plate, 3.
8. Remove the bearings, 5, from the coil plate, 3, and flywheel complete, 1.

ALTERNATOR REASSEMBLY

Reassemble the alternator in the reverse order of disassembly, paying attention to the following:

Apply pressure on the outer race of the bearing when installing.

Install the nut, 7, Figure 3-80. Torque the nut to 6-7 lbs. ft. (8-9 N·m).

Never clamp the flywheel body in a vise.

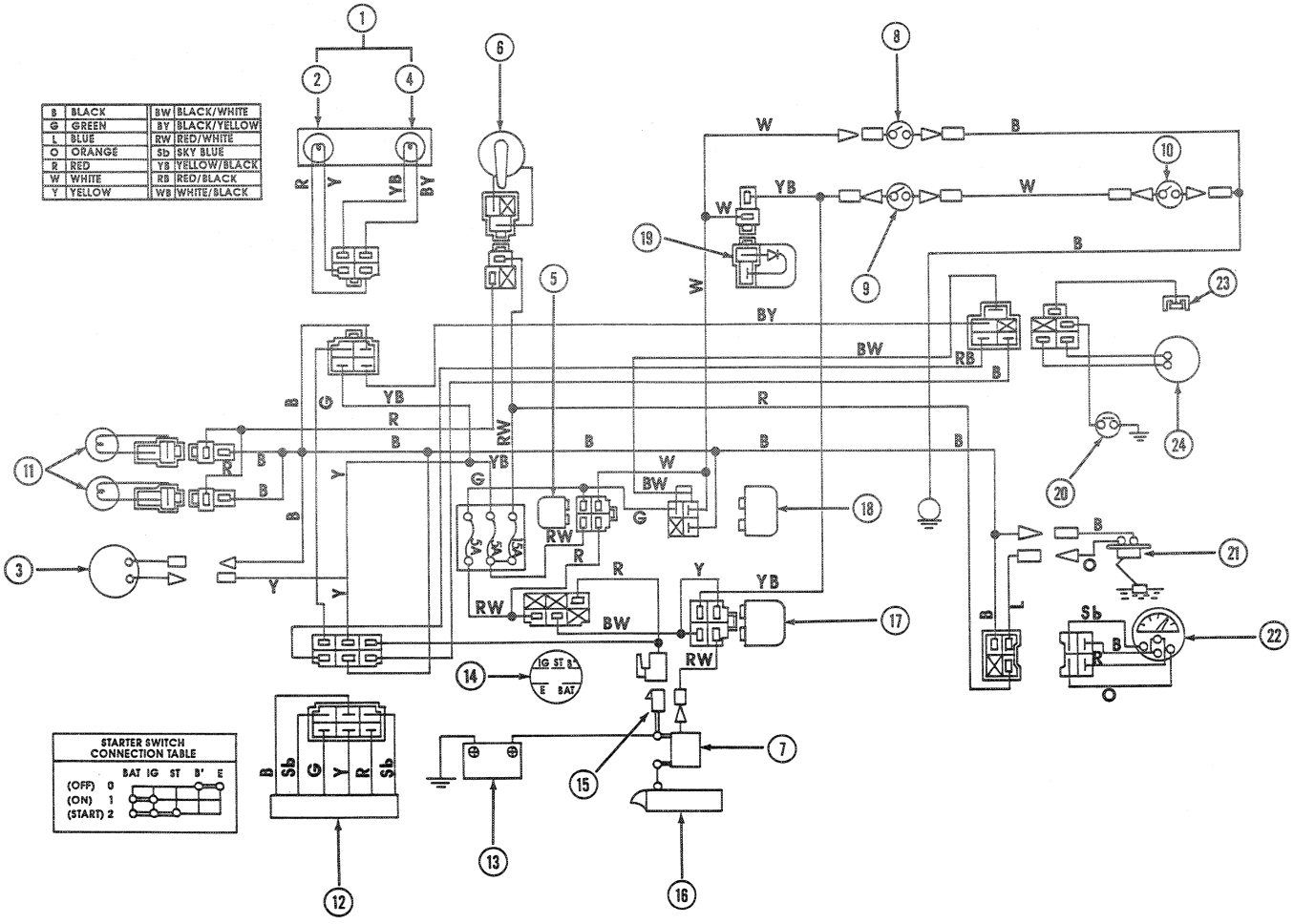


FIGURE 3-88

Wiring Diagram (GT85 and GT95 Models)

1 Indicator Lamp Assembly
2 Charge Lamp
3 Hour Meter
4 Oil Lamp
5 Relay - Neutral
6 Light Switch
7 Solenoid Switch
8 Neutral Switch - Seat
9 Neutral Switch - PTO
10 Neutral Switch - Brake
11 Headlamps
12 Regulator
13 Battery
14 Starter Switch
15 Fuse Link
16 Starter
17 Relay - Starter
18 Relay - Engine Stop
19 Diode - Connector
20 Oil Pressure Sender
21 Fuel Gauge Sender
22 Fuel Gauge
23 Ignition Coil
24 Generator

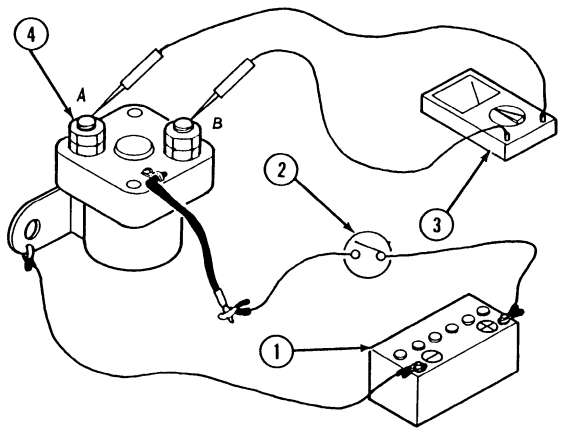


FIGURE 3-103

Solenoid Switch Inspection

1 Battery
2 Switch
3 Circuit Tester
4 Solenoid Switch

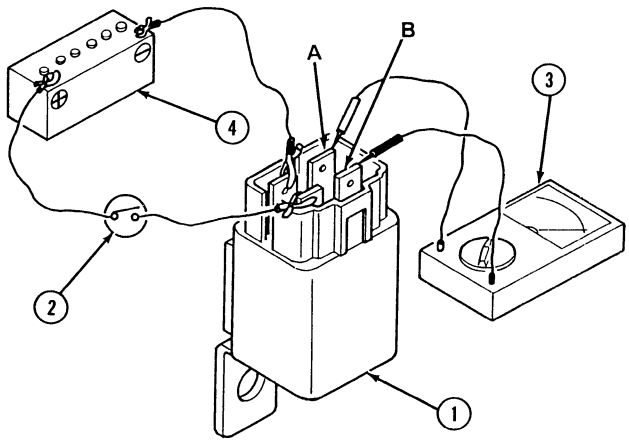


FIGURE 3-104

Relay Inspection

1 Relay
2 Switch
3 Circuit Tester
4 Battery

TEST PROCEDURE - Reference Figure 3-103

Connect the battery, 1, switch, 2, solenoid switch, 4, and circuit tester, 3, Figure 3-103 and inspect the continuity between terminal A and B.

Test Results

When the switch is "OFF" position.

High resistance reading = Good, proceed to next test.

Low resistance reading = Replace the solenoid switch.

When the switch is "ON" position.

High resistance reading = Replace the solenoid switch.

Low resistance reading = Good.

RELAY

Disconnect the connector from the relay and remove the relay.

Test Procedure - Reference Figure 3-104

Test Results

When the switch is "OFF" position.

High resistance reading = Good, proceed to next test.

Low resistance reading = Replace the relay.

When the switch is "ON" position.

High resistance reading = Replace the relay.

Low resistance reading = Good.

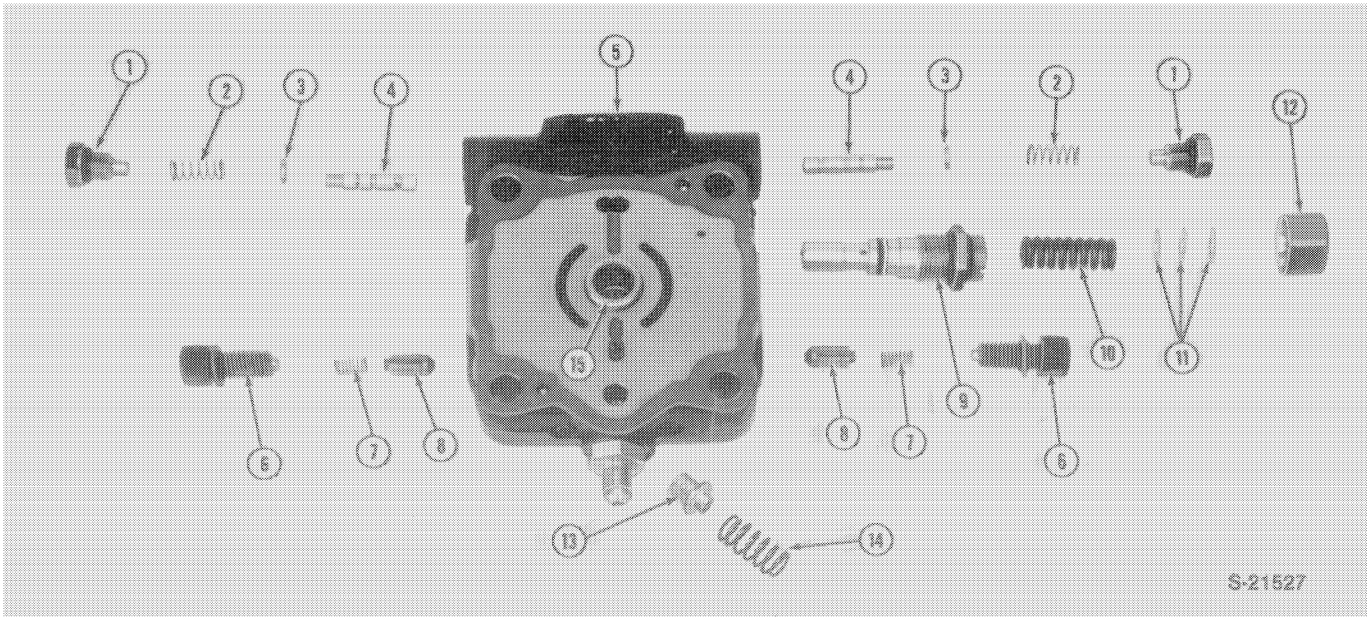


FIGURE 4-5

Hydrostatic Transmission Components

1	Plug	7	Spring	12	Cap
2	Spring	8	Feed Valve Poppet	13	Pressure Regulating Valve Poppet
3	Seat	9	High Pressure Relief Valve	14	Charge Pressure Regulating Valve Springs
4	Neutral Valve Spool	10	Spring	15	Needle Bearings
5	Body	11	Shims		
6	Plug				

The speed control lever will also return to the released position by depressing the brake foot pedal, if the lever is in the set position.

The hydrostatic unit consists of a piston type pump and motor contained within the housings as shown, Figure 4-4. The pump and motor housings are bolted together with the port block assembly sandwiched between the housings. The port block contains the pressure regulating valve, feed valves, neutral valves and high pressure relief valve and connecting passages, Figure 4-5.

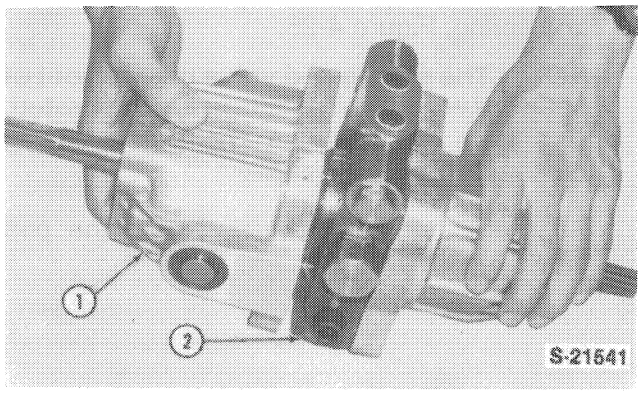


FIGURE 4-23

HST Disassembly

1 Pump Housing
2 Port Block

Observe the location of the valve plate, 3, Figure 4-24, as the pump housing is being removed using care to not drop or damage the valve plate. The valve plate may adhere to either the port block or pump cylinder block, Figure 4-24.

NOTE: Observe that the brass surface of the valve plate is installed facing the rotating cylinder block.

IMPORTANT: The pump cylinder block is free to fall out of the pump housing. Use care in handling to prevent the cylinder block from separating from the pistons.

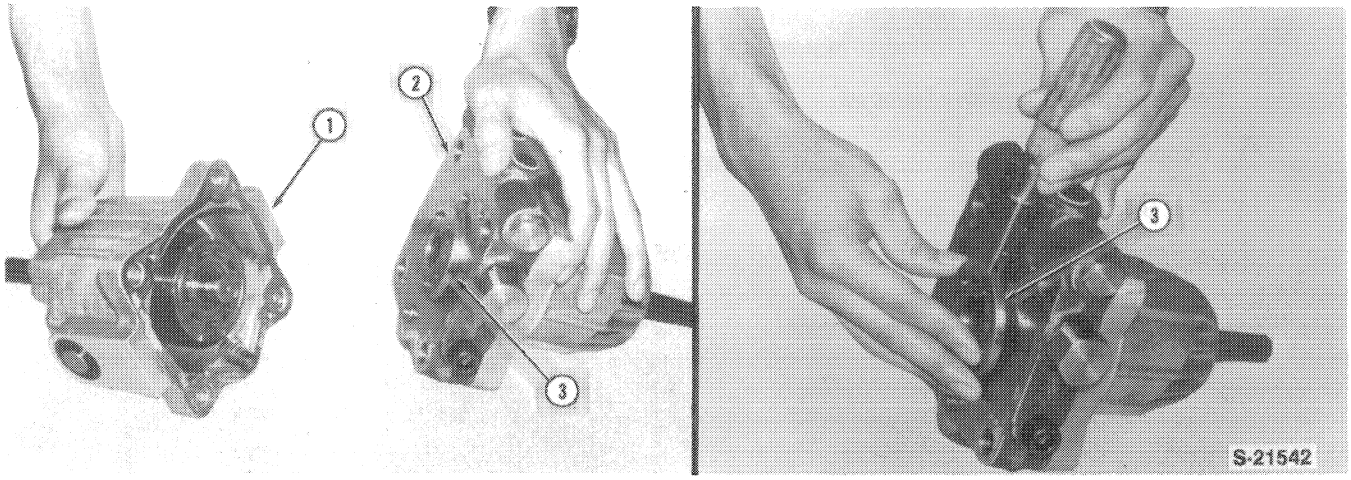


FIGURE 4-24

Separating the Pump and Port Block

1 Pump Assembly 2 Port Block Assembly 3 Valve Plate

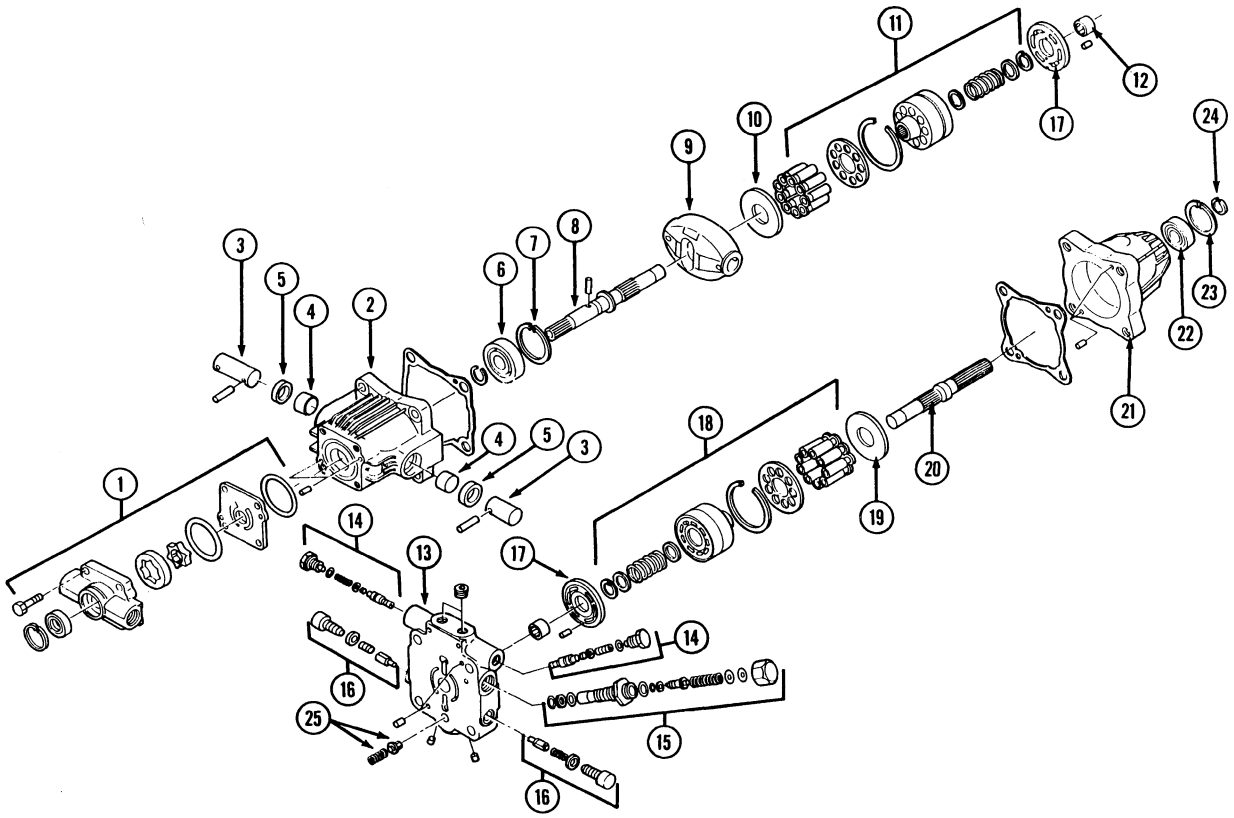


FIGURE 4-45

Hydrostatic Transmission Assembly

1 Charge Pump Assembly
2 Piston Pump Case
3 Trunnion Pin
4 Bushing (2)
5 Seal (2)
6 Bearing
7 Snap Ring
8 Shaft - Input
9 Variable Swash Plate
10 Thrust Plate
11 Piston Pump Assembly
12 Needle Bearing (2)
13 Port Block
14 Neutral Valve Assembly (2)
15 High Pressure Relief Valve
16 Feed Valve Assembly (2)
17 Valve Plate
18 Piston Pump Assembly
19 Thrust Plate
20 Shaft - Output
21 Piston Motor Case
22 Bearing
23 Snap Ring
24 Snap Ring
25 Low Pressure Regulating Valve

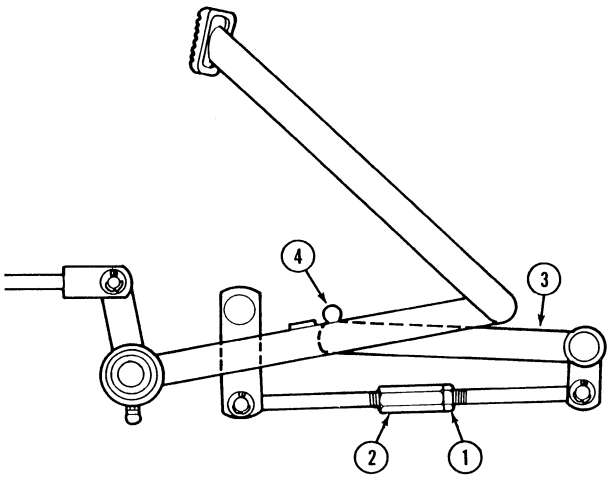


FIGURE 4-63

Brake Pedal HST Speed Control Lock Adjustment

1 Locknut
2 Turnbuckle
3 Lever
4 Brake Pedal Shaft

3. Tighten the brake lining retaining bolts.
4. If the speed control fails to lock, adjust the brake lining 0.039-0.078 in. (1-2 mm) more than the above specification.

If the speed control fails to release when the brake pedal is depressed proceed as follows:

1. Loosen the locknut, 1, on the turnbuckle, Figure 4-63.
2. Rotate (shorten) the turnbuckle, 2, until the lever, 3, comes in contact with the shaft, 4, of the brake pedal, Figure 4-63.
3. Tighten the turnbuckle locknut and check the HST speed control for proper operation. The speed control lever must release when the brake pedal is fully depressed.

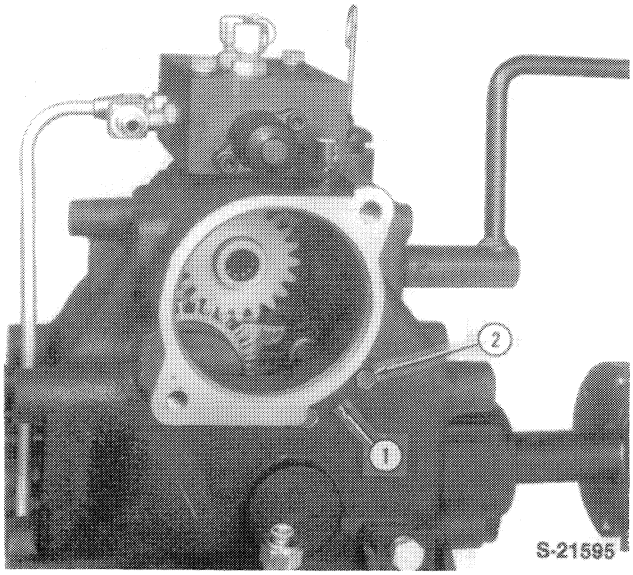


FIGURE 5-21

Shifter Fork and Rod Removal

1 Plate
2 Bolts (2)

11. Remove the two bolts and plate, 1 and 2, Figure 5-21.

12. Slide the shifter rod forward while being careful not to lose the fork detent ball and spring, Figure 5-22.

13. Remove the shift fork, 1, Figure 5-22.

14. Pull the shaft, 1, rearward, Figure 5-23, Remove the shaft, gears and bearings as shown, Figure 5-24.

NOTE: Observe that the position of the large gear hub faces forward on the shaft.

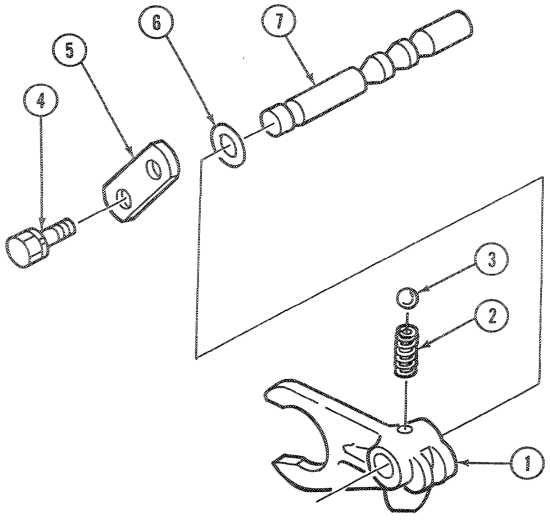


FIGURE 5-22

Shifter Rod and Fork Removal

1 Fork
2 Spring
3 Ball
4 Bolt (2)
5 Plate
6 O-Ring
7 Rod

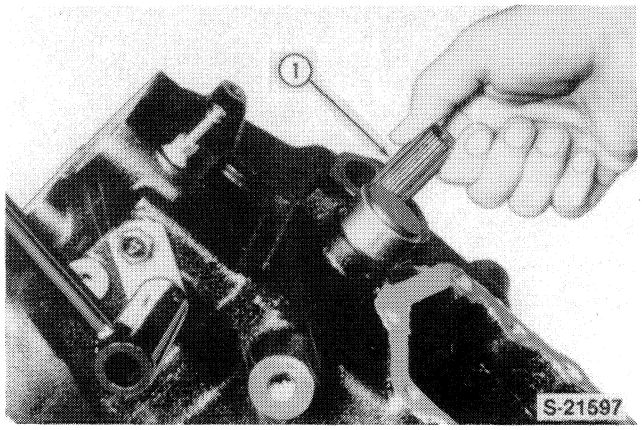


FIGURE 5-23

Countershaft and Sliding Gear Removal

1 Countershaft

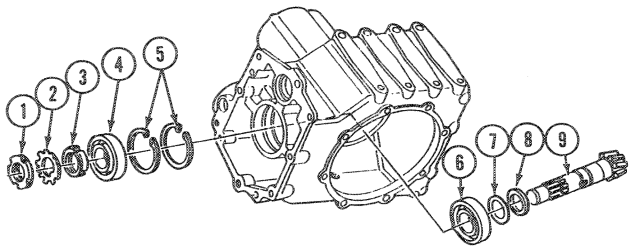


FIGURE 5-43

Drive Pinion Removal

1 Nut
2 Lock Ring
3 Nut
4 Bearing
5 Snap Ring (2)
6 Bearing
7 Shim
8 Washer
9 Pinion Gear Shaft

If the "value of error" is greater on the new part than on the old part, additional shims will be required. If the "value of error" is less on the new part than the old part, the number of shims must be decreased.

EXAMPLE

Replaced pinion ..... - 0.2 mm
New pinion ..... - 0.0 mm
- 0.2 - 0.0 = - 0.2 mm

Decrease shims by 0.2 mm (0.008 in.)

1. Assemble the differential gears, thrust washers and shaft as shown, Figure 5-42.
2. Install the case cover using new lock plates and torque the bolts to the specified torque.
3. If removed, install the ring gear using new lock plates and tighten the bolts to the specified torque.
4. Bend the locking tabs to prevent the bolts from loosening.
5. If removed, install the two drive pinion bearing snap rings in the housing.

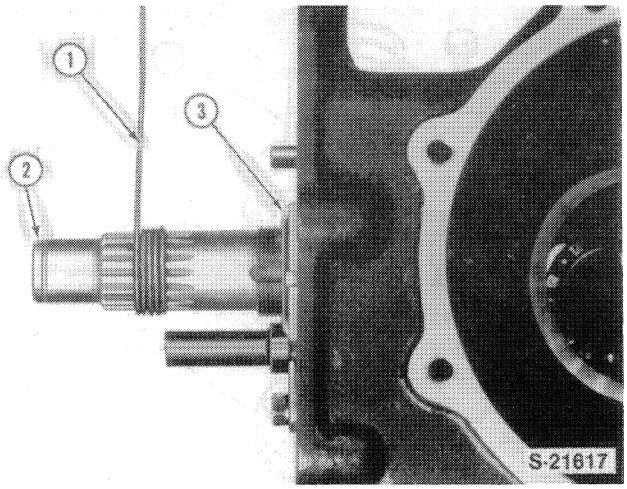


FIGURE 5-44

Drive Pinion Pre-Load Adjustment

1 Cord
2 Pinion Shaft
3 Nut

6. Install the thrust washer, 8, and correct amount of shims, 7, and rear pinion bearing, 6, on the drive pinion shaft, Figure 5-43.
7. Insert the pinion shaft into the housing from the rear and while holding in place install the front bearing, locknuts and locking ring as shown, Figure 5-43.
8. Tighten the locknut, 3, to adjust the pinion pre-load. Using a strong cord wrapped around the pinion shaft and a pull scale, tighten the nut to obtain the specified pounds of constant pull to rotate the pinion assembly, Figure 5-44.

   NOTE: Turn the pinion several turns by hand before performing the pull scale test.

   Pinion pre-load .... 2.4-3.6 lbs. (5.3-8.0 kg)
9. Tighten the front pinion locknut and bend the locking tabs to prevent the nuts from loosening.

OVERHAUL

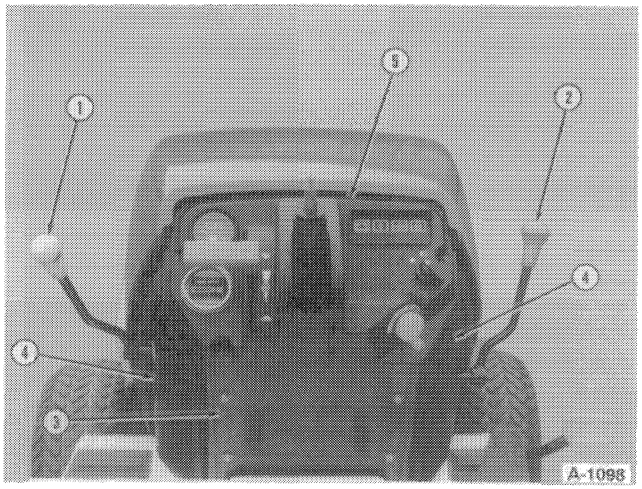


FIGURE 6-4

Instrument Panel Removal

1	PTO Control Lever	4	Air Intake Screens
2	Speed Control lever	5	Instrument Panel
3	Center Panel	6	Grip

STEERING GEAR REMOVAL

Remove the air intake screens, center panel, instrument panel and radiator and support assembly from the tractor. See "Engine Removal," for detailed description.

1. Disconnect the electrical wiring from the tractor.
   - Temperature sender wire.
   - Starter motor wires.
   - Alternator wires.
   - Oil pressure sender wire.
   - Glow plug terminal wire.
   - Injection pump solenoid wire.
   - Headlamp wiring connectors.
2. Remove the "E" clip and disconnect the throttle cable from the engine.
3. Disconnect the PTO cable from the idler pulley bracket. See "Engine Removal," for detailed description.
   - Remove the lower tension spring.
   - Unhook the upper tension spring.
   - Remove the control cable lower conduit nut and remove the cable and conduit from the bracket.

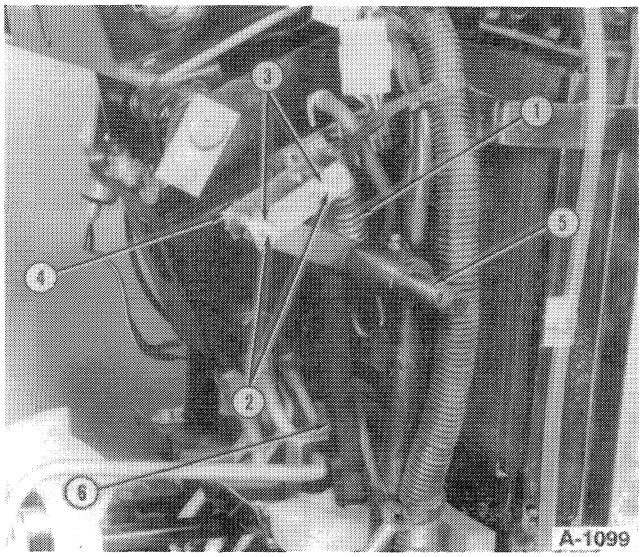


FIGURE 6-5

Speed Control Over-Center Linkage Removal

1	Spring	4	Link
2	Cotter Pins	5	Spring Shaft
3	Pins	6	Speed Control Shaft

4. Remove the steering wheel.
5. Remove the roll pins from the speed control and PTO control levers, 1, and, 2, and remove the levers, Figure 6-4.
6. Remove the center panel, 3.
7. Remove the two air intake screen panels, 4.
8. Disconnect the wiring harness connectors, throttle grip, 6, and instrument panel, 5, Figure 6-4.
9. Drain the coolant from the engine and radiator.
10. Remove the air cleaner assembly.
11. Remove the upper and lower radiator hoses.
12. Remove the speed control over-center link pins, 3, Figure 6-5.

NOTE: Remove the snap ring and move the spring shaft, 5, in sufficient to clear the speed control vertical shaft, 6. Rotate the spring shaft rearward to release the spring tension and remove the spring.

POWER STEERING AND FRONT AXLE

DESCRIPTION AND OPERATION

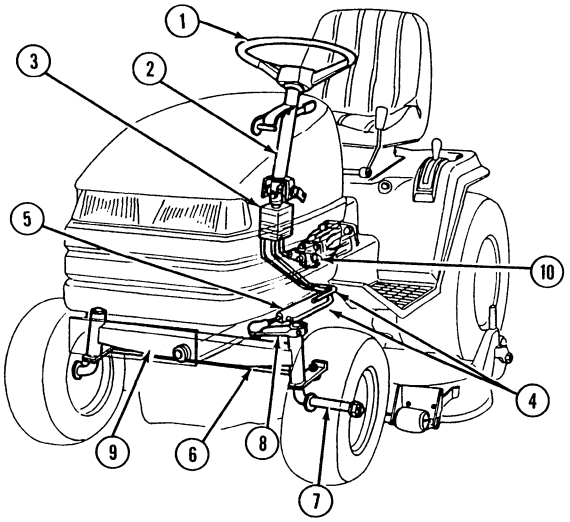


FIGURE 6-23

Power Steering System Components

1	Steering Wheel	6	Tie Rod
2	Steering Shaft	7	King Pin
3	Steering Motor Assembly	8	Knuckle Arm
4	Tubing	9	Front Axle
5	Cylinder Assembly	10	Oil Pump

Reference Figure 6-23

The power steering system consists of the steering wheel, steering shaft, steering motor assembly, tubing, steering cylinder and tie rod components as shown.

The steering shaft, 2, is supported in a tube (pipe handle), Figure 6-23.

The oil pump, 10, used for the power steering system is the same pump that is used for the hydraulic lift and HST transmission system.

The power steering cylinder, 5, is mounted on the left-hand side of the chassis and the rod end is connected to the left knuckle arm, 8, Figure 6-23.

The left-hand and right-hand spindle arms are linked together with a tie rod, 6, Figure 6-23.

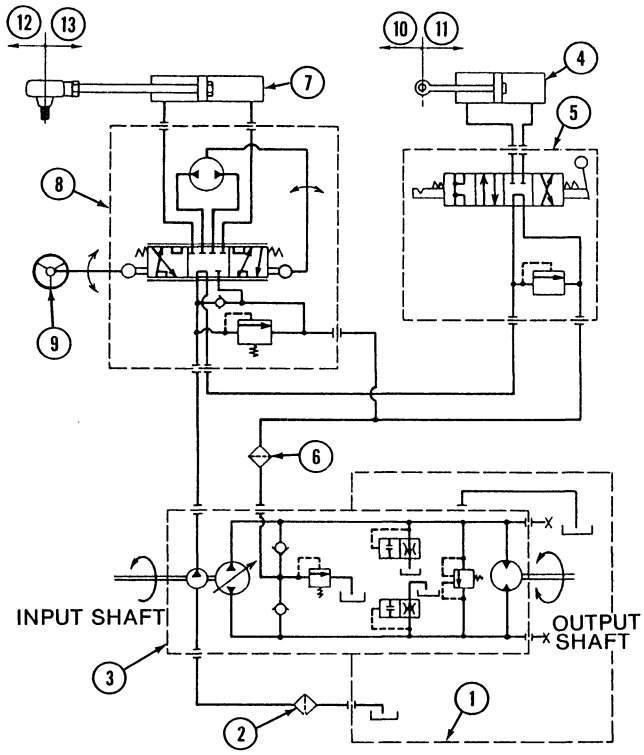


FIGURE 6-24

Oil Flow - Steering - Hydraulic Lift - HST

1	Transmission Case	7	Steering Cylinder
2	Filter	8	Steering Motor Assembly
3	HST Main Body	9	Steering Wheel
4	Hydraulic Lift Cylinder	10	Lifting
5	Hydraulic Control Valve	11	Lowering
6	Filter	12	Left Turn
		13	Right Turn

OIL FLOW

Reference Figure 6-24

Pressured oil from the pump flows to the power steering system, 8, first, then to the hydraulic lift system, 5, and then to the HST transmission, 3, Figure 6-24.

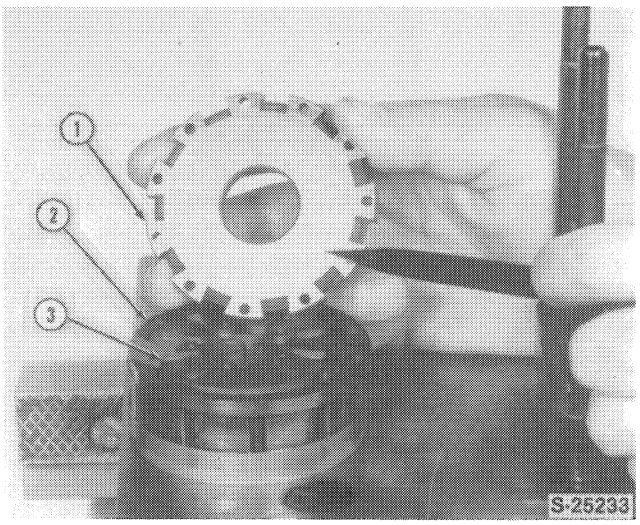


FIGURE 6-44

Commutator Cover and Ring Removal

1 Commutator Cover
2 Commutator Ring
3 Commutator

24. Lift the commutator cover, 1, from the metering package, Figure 6-44.

25. Remove the commutator ring, 2, Figure 6-44.

    NOTE: Handle the commutator ring with care as it is easily broken.

26. Remove the commutator, 1, from the rotor, 3, Figure 6-45.

    NOTE: Do not pry or use force to remove the commutator.

27. Remove the five alignment pins, 2, from the rotor, 3, Figure 6-45.

    NOTE: The commutator is made up of two round plates pinned and bonded together as a permanent assembly and should not be disassembled. The commutator and commutator ring are a matched set.

28. Remove the drive link spacer, 1, Figure 6-46. With the rotor set, 2, and, 3, lying on the drive plate, 4, the rotor should rotate and orbit freely within the stator, 3, Figure 6-46. The rotor and stator are a matched set.

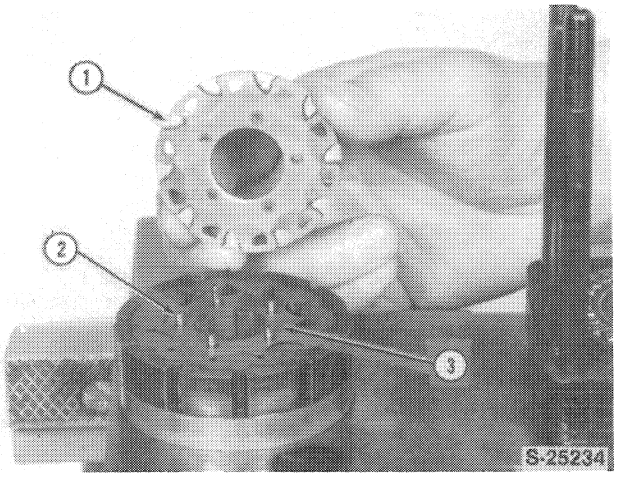


FIGURE 6-45

Commutator and Pin Removal

1 Commutator
2 Pin
3 Rotor

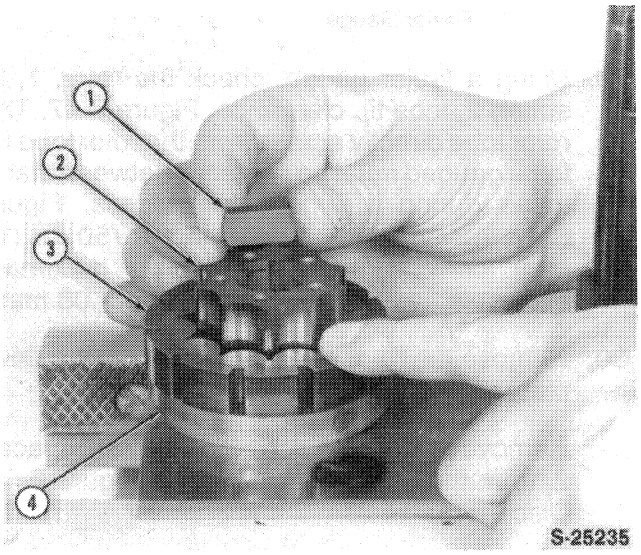


FIGURE 6-46

Spacer and Rotor Set Removal

1 Spacer - Drive Link
2 Rotor
3 Stator
4 Drive Plate

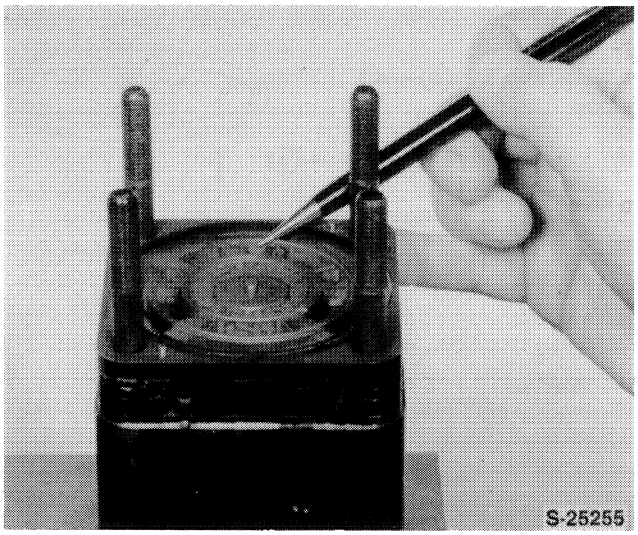


FIGURE 6-66

Valve Plate Assembly

31. Apply a few drops of oil to the valve plate, 5. Align the grooves on the side of the port manifold with the grooves on the side of the isolation manifold and assemble the port manifold with the springs toward the valve plate, 5. Be careful not to pinch a spring during installation. The two alignment pins in the valve plate will engage the holes in the port manifold. The pin on the hex drive assembly, 6, must engage the center hole in the port manifold. See Figure 6-67.

32. Lubricate and install five O-rings, 1, and seal ring, 2, into the port cover, 3, and install the port cover aligning the grooves with the port manifold, 4, Figure 6-68.

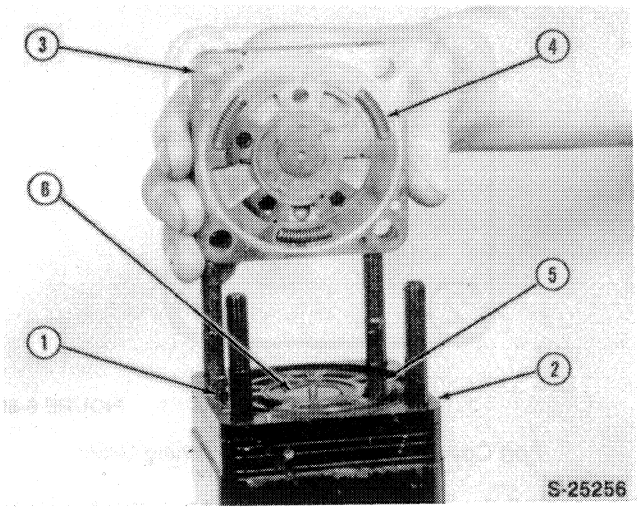


FIGURE 6-67

Port Manifold Assembly

1	Seal Ring	4	Spring
2	Valve Ring	5	Valve Plate
3	Port Manifold	6	Hex Drive Assembly

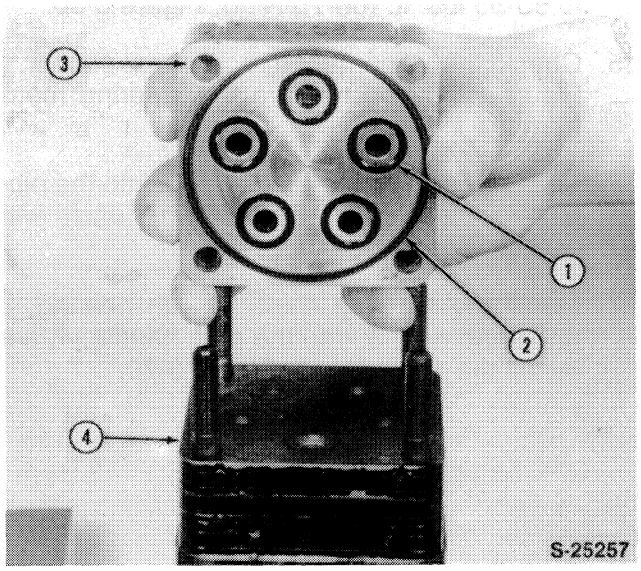


FIGURE 6-68

Port Cover Assembly

1	O-Ring	3	Port Cover
2	O-Ring	4	Port Manifold

SECTION 7

IMPLEMENT DRIVE

IMPLEMENT DRIVE, MID-MOUNT

DESCRIPTION AND OPERATION

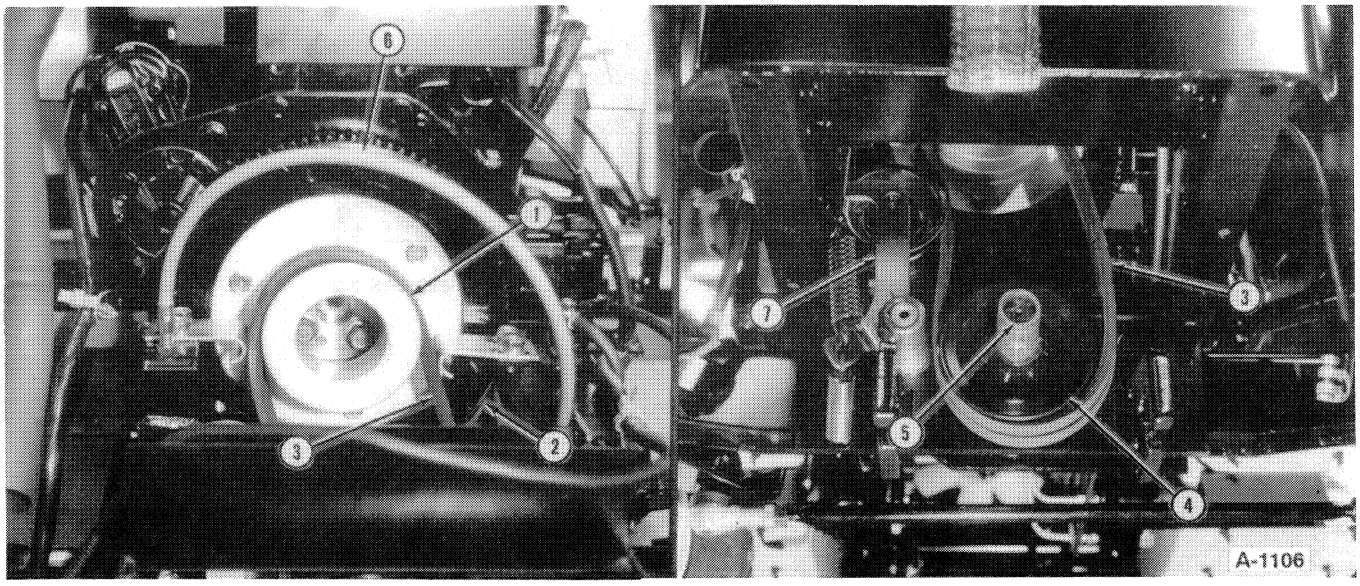


FIGURE 7-1

PTO Mid-Mount Drive

1	Flywheel Pulley	5	PTO Drive Shaft
2	Flywheel	6	Control Cable
3	V-Belt (2)	7	Belt Tightener
4	PTO Drive Pulley		

The PTO drive, Figure 7-1, is belt driven by a double groove pulley attached to the engine flywheel. Two V-belts drive a double groove pulley splined to the implement drive shaft.

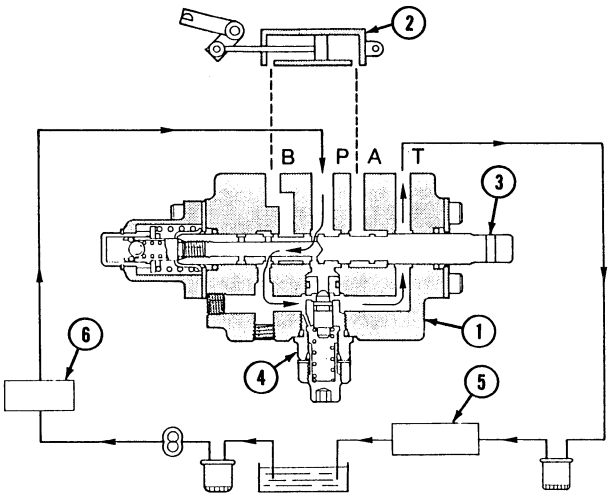


FIGURE 8-5

Oil Flow - Neutral Position

1	Valve Assembly	P	Pump High Pressure Passage
2	Cylinder Assembly	B	"Lowering" Passage (Rod Side)
3	Valve Spool	A	"Raise" Passage (Piston Side)
4	Relief Valve Assembly	T	Return to Sump Passage
5	HST System		
6	Power Steering System		

OIL FLOW NEUTRAL POSITION

Reference Figure 8-5

In neutral position, oil that is contained in the hydraulic cylinder is trapped by lands on the valve spool blocking the oil flow from the cylinder in passages "B" and "A," so that the implement (mower) is held in a fixed position.

Pump pressure oil enters the valve body at passage "P," passes through a drilled passage in the spool to passage "T" where it returns to the HST system.

OIL FLOW RAISING POSITION

Reference Figure 8-6

When the hydraulic lever is shifted to "Raise" position, the control valve spool is moved inward as shown, Figure 8-6.

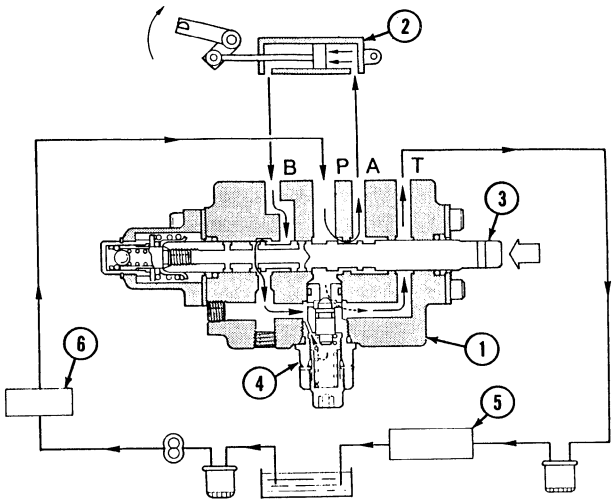


FIGURE 8-6

Oil Flow - Raising

1	Valve Assembly	P	Pump High Pressure Passage
2	Cylinder Assembly	B	"Lowering" Passage (Rod Side)
3	Valve Spool	A	"Raise" Passage (Piston Side)
4	Relief Valve Assembly	T	Return to Sump Passage
5	HST System		
6	Power Steering System		

Oil flow from the pump enters the valve body at passage "P," flows through the drilled passage in the spool to passage "A" to the piston side of the hydraulic cylinder as shown, Figure 8-6.

Oil contained in the rod side of the cylinder is pushed out of the cylinder through passage "B" and returns to the HST system through passage "T."

The high pressure relief valve, 4, extends into the valve body into passage "P" in the area of the drilled passage in the valve spool. When the cylinder reaches the end of its stroke, the relief valve opens and oil flow is then returned to sump via passage "T." The relief valve is adjustable and should be set at 570-640 PSI (39-44 bar) pressure.

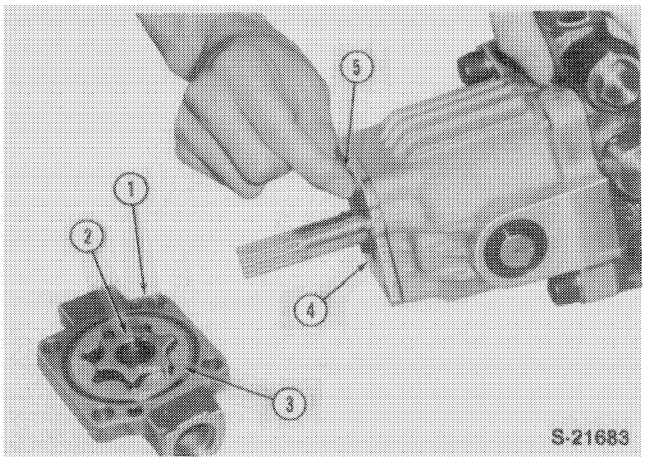


FIGURE 8-27

Hydraulic Pump Removal

1 Pump Assembly
2 Inner Rotor
3 Outer Rotor
4 Plate
5 Dowel Pin (2)

10. Remove the four pump mounting bolts and the pump housing, inner and outer rotors, drive pin and plate from the pump drive shaft, Figures 8-27 and 8-28.

    NOTE: Observe the identification punch marks on the forward face of the inner and outer rotors, Figure 8-28.

11. Remove the pump pressure plate and pin.

12. Remove and discard all O-rings and seals.

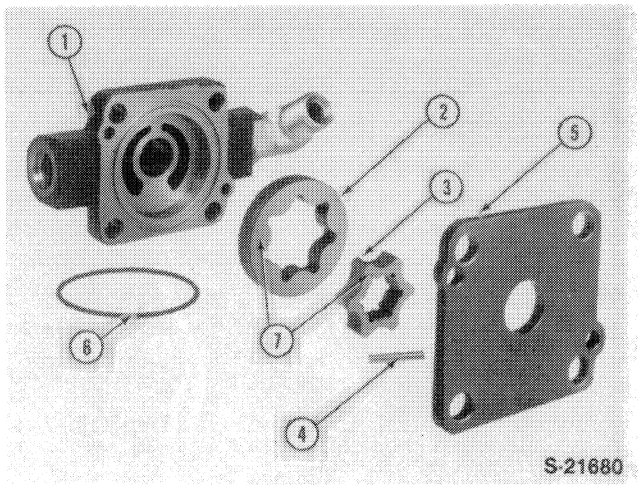


FIGURE 8-28

Hydraulic Pump Components

1 Body
2 Outer Rotor
3 Inner Rotor
4 Drive Pin
5 Plate
6 O-Ring
7 Matching Marks

INSPECTION AND REPAIR

1. Clean all parts in a suitable solvent and air dry.

2. Inspect the side faces of the inner and outer rotors, 2 and 3, and the mating surfaces in the pump body, 1, and end plate, 5, Figure 8-28.

   Light wear pattern marks can be removed from the rotors using a fine grit emery cloth on a flat surface plate.

   If excessive wear or scratches are present on any of the components, replace the pump assembly and end plate with new parts.

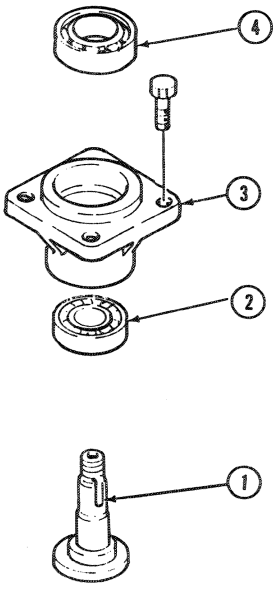


FIGURE 10-9

Carrier Disassembly

1	Shaft	3	Housing
2	Bearing	4	Bearing

Using the wood block to wedge the blade from rotating in the opposite direction (right-hand thread) remove the blade retaining bolt, 12, and remove the blade, Figure 10-8.

Remove the pulley nut, 1, lock washer, 2, and pulley, 5, Figure 10-8.

Remove the key, 7, from the pulley shaft.

Remove the four bolts, 4, Figure 10-8, and remove the carrier housing and shaft assembly from the mower deck.

Using a soft mallet, gently drive the shaft, 1, downward and remove from the housing, Figure 10-9.

Remove the two ball bearings, 2 and 4.

INSPECTION AND REPAIR

- Clean all parts in a suitable solvent and air dry.
- Inspect the ball bearings for excess wear or uneven rotation when rotated by hand.
- Always install a new seal washer.

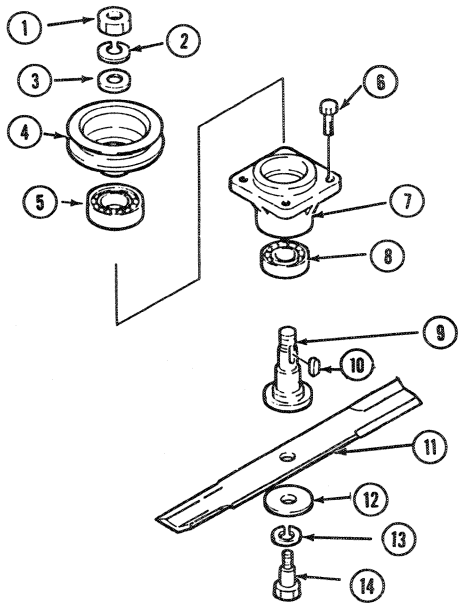


FIGURE 10-10

Blade Carrier Assembly (Outer Blade Only)

1	Nut	8	Bearing
2	Lockwasehr	9	Carrier Shaft
3	Seal Washer	10	Key
4	Pulley	11	Blade
5	Bearing	12	Washer
6	bolt	13	Lockwasher
7	Housing	14	Bolt

ASSEMBLY

Reference Figure 10-10

Assembly of the blade carrier follows the removal and disassembly procedure in reverse order.

GEAR CASE AND CENTER BLADE CARRIER

REMOVAL AND DISASSEMBLY

1. Remove the belt covers, and release the belt tension as previously described.
2. Using a block of wood placed between the end of the center blade and the mower deck to prevent it from rotating, loosen the blade retaining bolt and remove the blade.

OVERHAUL

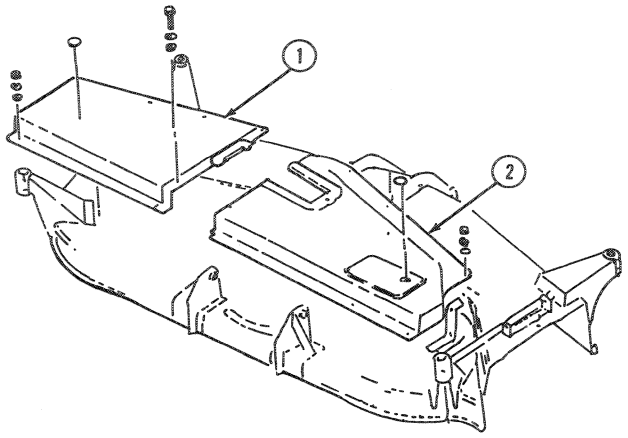


FIGURE 10-25

Covers

1 Left-Hand Cover
2 Right-Hand Cover

REMOVAL

Remove the mower as outlined in the Operator's Manual.

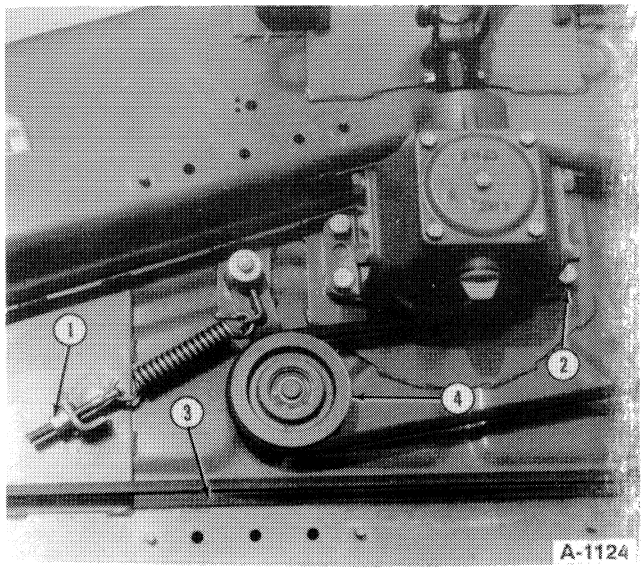
BELT REMOVAL

1. Remove the left and right belt covers, 1 and 2, Figure 10-25.
2. Loosen the spring loaded idler tension nuts, 1 , Figure 10-26, and remove the right gearbox bracket, 2.
3. Remove the belt from the pulley.

BELT INSTALLATION

Figure 10-26

Belt installation follows removal procedures in reverse order.



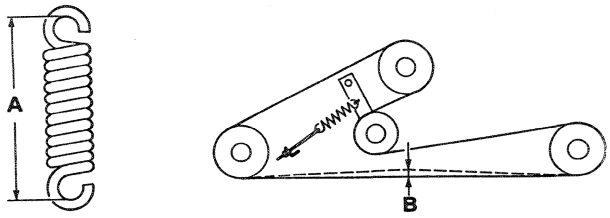


FIGURE 10-26

Belt Removal and Belt Tension Adjustment

1 Adjusting Nuts
2 Right-Hand Bracket
3 Belt
4 Idler Assembly
A Spring Length
B Belt Deflection

On installation observe the following:

- Adjust the belt tightener tension screw to obtain the following spring length 5.6 in. (143 mm).
- Check the belt deflection as shown, Figure 10-26. The belt should have no more than 0.71 in. (18 mm) deflection with 19.6 lbs. (2.0 kg) force applied at the center of the belt span as shown. If the belt deflection is excessive, check for defective spring, defective belt, excessively worn pulleys or frozen tension pulley arm.
- Install the gearbox bracket and belt cover and tighten securely.