NEW HOLLAND
1120
1220

REPAIR MANUAL

NEW HOLLAND

SERVICE

42112020 (SE4601)

Reprinted

PART 1
ENGINE SYSTEMS

Chapter 1
ENGINE AND LUBRICATION SYSTEM

A. DESCRIPTION AND OPERATION

This chapter describes the overhaul and repair of the Ford 1120 and 1220 diesel engines.

The engines, Figure 1, are of the same basic design and repair procedures are essentially the same except as noted in the repair procedures.

The Ford Model 1120 and 1220 tractors are equipped with three-cylinder in-line, liquid cooled, four cycle, overhead valve engines.

The engine model is identified by a code number cast into the side of the engine block as shown in the following chart.

IDENTIFICATION CHART

ENGINE CODE	TRACTOR MODEL	HORSEPOWER
S723	F1120	14
S753	F1220	17

CYLINDER HEAD AND VALVE TRAIN COMPONENTS

The cylinder head incorporates the valve assemblies, rocker shaft, rocker arm components and precombustion chambers.

The intake manifold is incorporated into the left hand side of the valve cover assembly.

Standard size only valves are utilized with valve guides. Only standard size valves are available for service.

Models 1120 and 1220 have a one piece rocker shaft assembly.

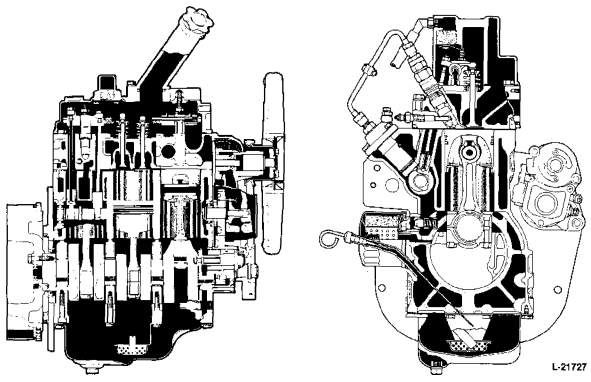

Figure 1
Three Cylinder — Models 1120 and 1220

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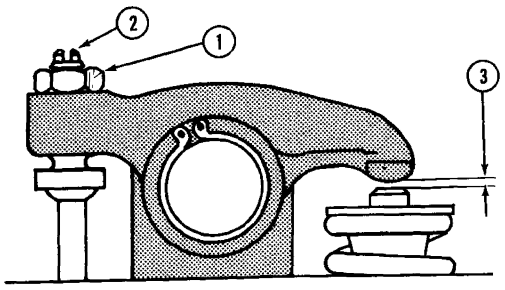

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Figure 26
Valve Lash Adjustment

1. Locknut
2. Adjusting Screw
3. Valve Clearance 0.008 in. (0.2 mm)

ENGINE FRONT COVER, TIMING GEARS, CAMSHAFT AND OIL PUMP

REMOVAL

For detailed description of radiator removal, see Chapter 2.

1. Drain the radiator.
2. Drain the engine crankcase oil.
3. Remove the upper and lower radiator hoses and drain hose together.
4. Remove the upper radiator support.
5. Remove the radiator mounting bolts and remove the radiator, Figure 27.
6. Remove the coolant fan and fan pulley, Figure 28.
7. Disconnect the wiring harness from the alternator assembly.
8. Remove the alternator assembly and mounting brackets, Figure 29.
9. Remove the hydraulic pump mounting bolts.
10. Remove the throttle control cable (4) from the governor lever, Figure 30.
11. Remove the injector lines and cap all openings.
12. Remove the injection pump mounting bolts. Raise the injection pump sufficiently to remove the snap pin and separate the link from the control rack, Figure 31.
13. Remove the crankshaft pulley, Figure 32.
14. Remove the timing gear cover and gasket, Figure 33.

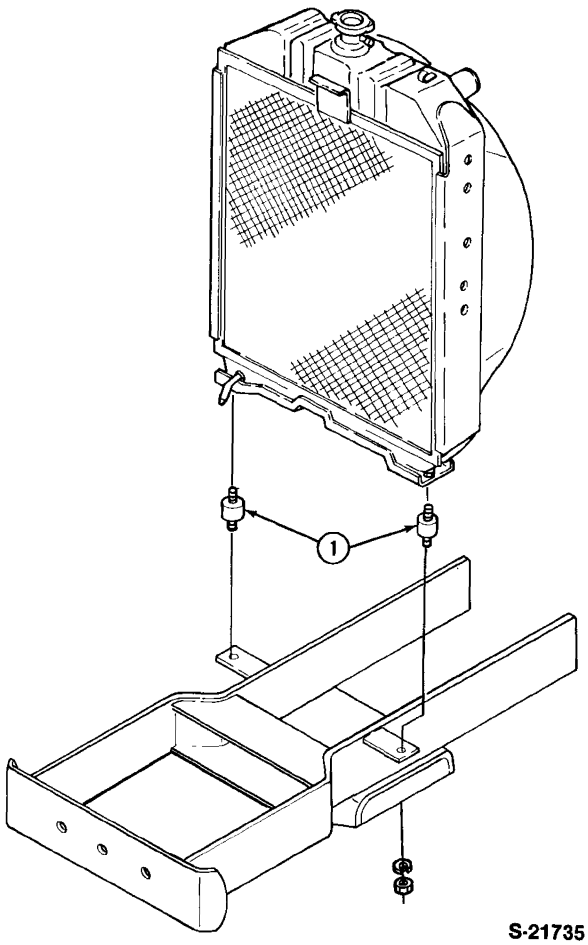

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Figure 27
Radiator Removal

1. Mounting Studs

OIL PUMP REMOVAL

The oil pump is located inside of the idler gear at the front of the block. It is located to the left of the crankshaft as viewed from the front.

The idler gear is driven by the crankshaft gear and is pinned to the outer oil pump rotor, Figure 34.

3. Use a suitable ring expander to remove the piston rings, Figure 56.

4. Remove the piston pin retainer rings and drive the pin out of the connecting rod using the special piston pin driver, Tool No. 1585, Figure 57.

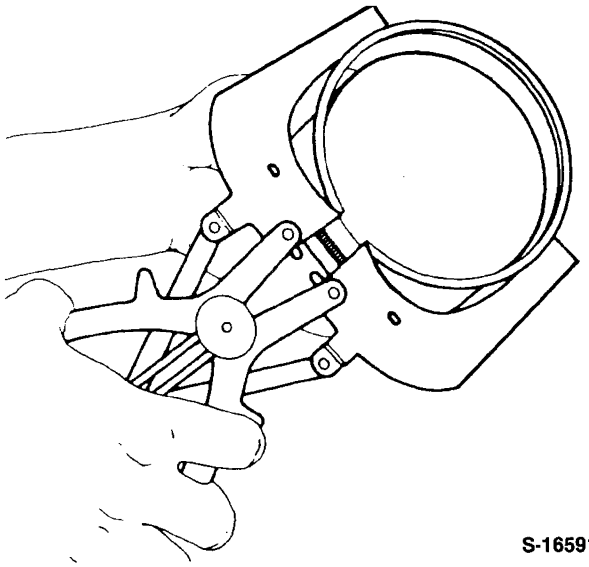

Figure 56
Piston Ring Removal

INSPECTION AND REPAIR

PISTONS

1. Wash the piston and connecting rod assembly in a suitable solvent and dry with a lint free cloth or compressed air.

   Using a ring groove cleaner, remove the carbon deposits from the ring grooves. Be careful to avoid cutting any metal from either the side or the botom of the grooves, Figure 58.

2. Inspect the piston ring lands for excessive wear.

   Using a new ring and feeler gauge check the side clearance, Figure 59.

   Replace pistons that exceed the following wear limits:

	Wear Limit
Compression Ring	0.010 in. (0.25 mm)
Oil Control Ring	0.006 in. (0.15 mm).

3. Using a micrometer, check the piston diameter at 90° from the piston pin bore, Figure 60.

   Replace pistons that are worn to less than the following piston diameter dimensions.

   Model 1120 ..... 2.823 in. (71.7 mm)
   Model 1220 ..... 2.941 in. (74.7 mm)

4. Using a small hole gauge and micrometer, measure the piston bore diameter and the pin diameter, Figure 61.

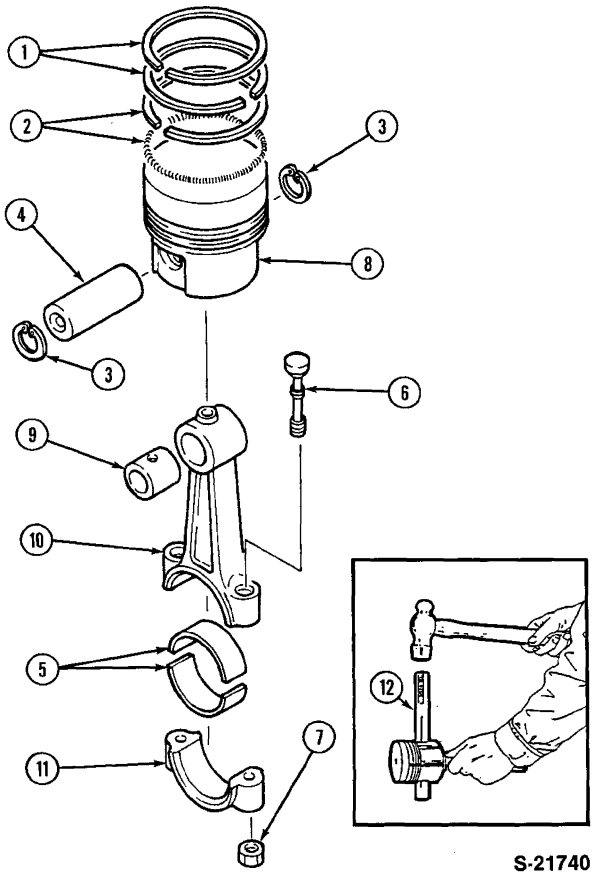

Figure 57
Piston Pin Removal

1. Compression Rings
2. Oil Control Ring
3. Piston Pin Retainer
4. Piston Pin
5. Bearing Shells
6. Cap Attaching Bolt
7. Cap Attaching Nut
8. Piston
9. Piston Pin Bushing
10. Connecting Rod
11. Connecting Rod Cap
12. Piston Pin Driver — Tool No. 1585

If the end play is within specifications, install the remaining bearing holder retaining bolts and tighten to the specified torque, Figure 81.

10. Position the rear crankshaft oil seal on the shaft.
11. Apply liquid gasket sealer to the rear plate attaching surface and install the rear plate, Figure 82.
12. Tighten the retaining bolts to 34-40 lbs. ft. (46-54 Nm) torque.

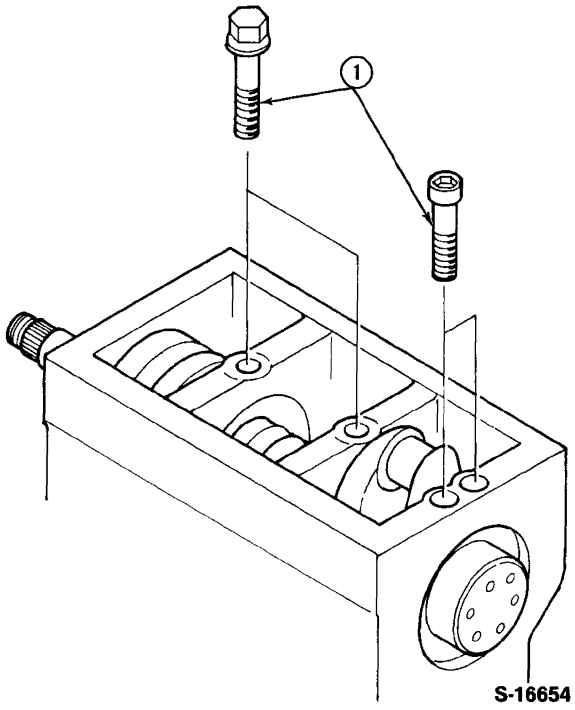

Figure 81
Main Bearing Holder Installation
1. Bearing Holder Retaining Bolts

FLYWHEEL RING GEAR

INSPECTION

1. Inspect the ring gear for cracked, broken, chipped or worn starter gear teeth. If found defective, replace the ring gear.
2. Remove the defective ring gear using a hammer and chisel to crack the gear ring.
3. Heat the new ring to 248-300°F (120-150°C) from the inside only. Be careful not to overheat the ring gear teeth. Use temperature sensitive crayon to mark the inside of the ring gear.

Quench the ring gear quickly to obtain a good shrink fit.

CRANKSHAFT JOURNAL WEAR LIMIT AND BEARING USAGE

	Wear Limit	Remarks
Taper	.002 in. (0.025 mm)	Regrind to .010 in. or 0.020 in. (.25 or .50 mm) Undersize
Out-of-Round	.002 in. (0.025 mm)	Regrind to 0.010 in. or 0.020 in. (.25 or .50 mm) Undersize
Journal Diameter — Main Bearing	1.7998-1.8002 in. (45.714-45.72 mm) 1.7899-1.7904 in. (45.464-45.475 mm) Less than 1.787 in. (45.4 mm)	Use 0.010 in. (.25 mm) Undersize Bearings Use 0.020 in. (.50 mm) Undersize Bearings
Journal Diameter — Crankpin	1.5242-1.5246 in. (38.714-38.725 mm) 1.5143-1.5148 in. (38.464-38.475 mm) Less than 1.512 in. (38.4 mm)	Use 0.010 in. (.25 mm) Undersize Bearings Use 0.020 in. (.50 mm) Undersize Bearings Replace Crankshaft

PART 1
ENGINE SYSTEMS

Chapter 3
TROUBLE SHOOTING, SPECIFICATIONS AND SPECIAL TOOLS

A. TROUBLE SHOOTING

CONDITION	POSSIBLE CAUSE
Engine Does Not Develop Full Power	1. Clogged air cleaner. 2. Fuel line obstructed. 3. Improper injection timing. 4. Improper nozzle injection pressure and angle. 5. Low cylinder compression. 6. Insufficient fuel injection. 7. Improper valve lash adjustment. 8. Burned, worn or sticking valves. 9. Blown head gasket. 10. Worn or sticking piston ring. 11. Faulty engine stop solenoid.
Engine Will Not Stop	1. Faulty engine stop solenoid. 2. Faulty key start switch.
Low Cylinder Compression	1. Burned, worn or sticking valves. 2. Bent valve stem. 3. Broken or weak valve spring. 4. Blown cylinder head gasket. 5. Worn or sticking piston ring. 6. Blown piston.

B. SPECIFICATIONS (Cont'd)

CAMSHAFT	1120	1220
Cam Height-Valve		
Standard	1.041-1.043 in. (26.445-26.5 mm)	1.041-1.043 in. (26.445-26.5 mm)
Minimum	1.027 in. (26.1 mm)	1.027 in. (26.1 mm)
Bend		
Standard	.001 in. (.03 mm)	.001 in. (.03 mm)
Maximum	.004 in. (0.1 mm)	.004 in. (0.1 mm)
Cam Height-Fuel		
Standard	1.335-1.341 in. (33.94-34.06 mm)	1.335-1.341 in. (33.94-34.06 mm)
Minimum	1.33 in. (33.8 mm)	1.33 in. (33.8 mm)

VALVES	1120	1220
Stem Diameter-Intake		
Standard	0.2738-0.2744 in. (6.955-6.97 mm)	0.2738-0.2744 in. (6.955-6.97 mm)
Minimum	0.271 in. (6.89 mm)	0.271 in. (6.89 mm)
Stem Diameter-Exhaust		
Standard	.273-.274 in. (6.94-6.96 mm)	.273-.274 in. (6.94-6.96 mm)
Minimum	.269 in. (6.84 mm)	.269 in. (6.84 mm)
Guide Clearance-Intake		
Standard	0.001-0.002 in. (0.03-0.06 mm)	0.001-0.002 in. (0.03-0.06 mm)
Maximum	0.008 in. (0.2 mm)	0.008 in. (0.2 mm)
Guide Clearance-Exhaust		
Standard	0.002-0.003 in. (0.04-0.065 mm)	.0019-.0029 in. (0.05-0.075 mm)
Maximum	0.010 in. (0.25 mm)	0.010 in. (0.25 mm)
Valve Margin		
Standard	.0364-.0423 in. (0.925-1.075 mm)	0.0364-0.0423 in. (0.925-1.075 mm)
Minimum	.0197 in. (0.5 mm)	.0197 in. (0.5 mm)
Valve Lash Cold Condition	0.008 in. (0.2 mm)	0.008 in. (0.2 mm)

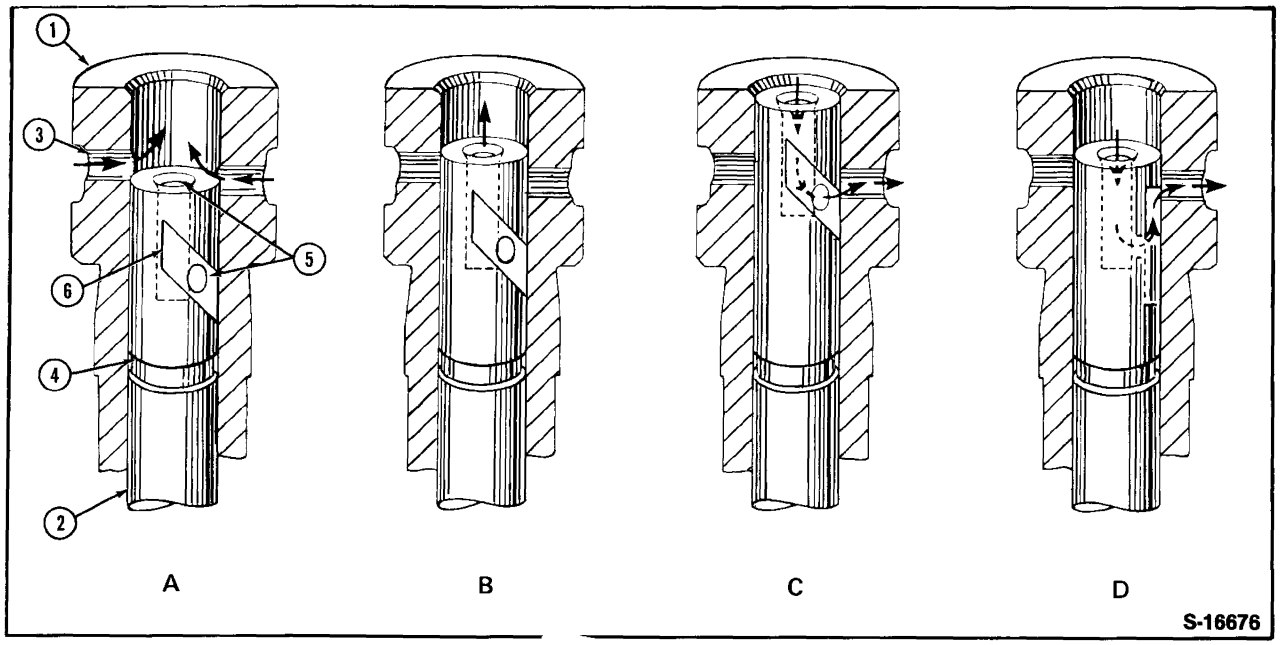

Figure 3
Pump Element Operation

1. Barrel
2. Plunger
3. Fuel Inlet
4. Annular Groove
5. Fuel Port — Center Drilling
6. Helical Groove

Position C

Injection ceases when the upper edge of the helical groove just uncovers the lower edge of the inlet port. The pressurized fuel is allowed to escape through the drilling to the low pressure area of the inlet port.

This pressure drop causes the injector needle valve to close and injection to cease. The plunger continues to the top of the stroke and is returned by a spring for the next cycle.

The effective pumping stroke is the distance between the top of the plunger and the point on the helical groove which uncovers the inlet port.

If the plunger is rotated clockwise so the helical groove uncovers the inlet port at a lower point on the plunger, the pump stroke and the amount of fuel injected will be increased.

Conversely, if the plunger is rotated counter-clockwise, the effective pumping stroke and the amount of fuel injected will be reduced. The rotation of the plunger is effected by an arm at the base of the plunger which engages with a fork on the control rod. Movement of the control rod towards the rear of the engine turns the plungers clockwise and increases the fuel flow.

NOTE: *Engine stop solenoid (2), Figure 1, information is covered in Part 3 — Electrical Section.*

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 ports 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.

NOTE: *The plungers have a slot machined across the crown. When the excess fuel device is operated and the control rod is in the maximum fuel position, the slots align with the inlet ports of the barrel to retard inlet port closure and assist easy starting.*

6. Check the contacting area between the push rod and spring.

ASSEMBLY AND ADJUSTMENT

1. Clean and lubricate all parts in a clean fuel oil and assemble while still wet.

2. Check and adjust the injection pressure of the nozzle. Adjust the opening pressure by adding or deleting shims.

   Opening Pressure.....1706 psi (120 kg/cm²)

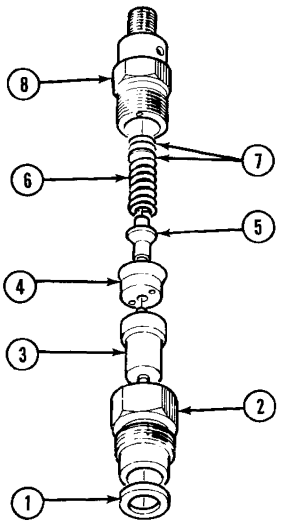

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Figure 18
Injector Assembly

1. Gasket
2. Nozzle Nut
3. Nozzle
4. Distance Piece
5. Rod
6. Spring
7. Shims
8. Body

PART 3
ELECTRICAL SYSTEMS

Chapter 1
WIRING, SWITCHES, GLOW PLUGS AND INSTRUMENTATION

A. WIRING, SWITCHES, GLOW PLUGS AND INSTRUMENTATION — DESCRIPTION AND OPERATION

WIRING

A variety of wiring components are utilized in making up the wiring harness. Figure 1 shows the various components and their locations in the wire harness assembly.

See Figure 2 for trouble shooting and tracing wiring components.

SWITCHES

KEY START SWITCH

See Chapter 3, Section E.

SAFETY START SWITCH

See Chapter 3, Section C.

LIGHT SWITCH

The light switch, Figure 3, is a dial switch. Turn the dial counterclockwise to turn the switch off: Turning the dial clockwise energizes the headlights and taillight. The light switch also energizes the flasher switch when in the on position.

FLASHER WARNING SWITCH

The switch for the warning light is located on the instrument panel, Figure 3.

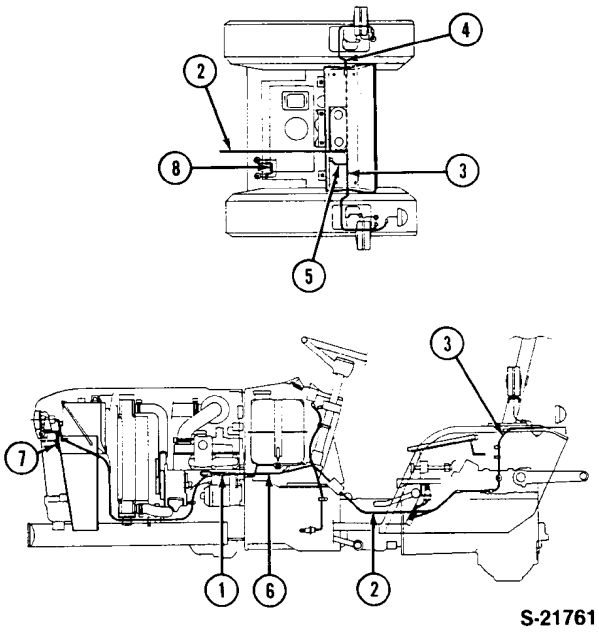

Figure 1
Wiring Harness — Model 1120 and 1220

1. Harness — Fusible Link
2. Harness — Connector to Safety Switch (Mid.), Safety Switch (Rear PTO) and Flasher Lamp
3. Harness — Fender — Right
4. Harness — Fender — Left
5. Harness — Ground
6. Harness — Main Battery to Safety Start Switch, Key Switch and Starter Assy.
7. Harness Lamp — Ground
8. Harness Safety Start Switch (Mid & Rear PTO)

7. Clean the outside of the battery case if the original battery is to be installed. Flush the top cover with soda solution to remove acid film. Be careful to prevent soda solution from entering the cells. Remove corrosion from the terminals with a wire brush. Inspect the case for cracks or other damage which would result in leakage of electrolyte.

SPECIFIC GRAVITY — HYDROMETER TEST

The hydrometer test indicates the battery state of charge by measuring the specific gravity of the electrolyte in the battery cells. The specific gravity will vary according to the amount of unused sulphuric acid remaining in solution. The quantity of sulphuric acid in solution determines the battery state of charge.

The hydrometer used for this test should be equipped with a thermometer and the float scale should be graduated to read from 1.160 to 1.320 in graduations of .005 specific gravity. The graduated marking should be accurate within .002, Figure 18.

1. Check the electrolyte level in each cell. Add water to any low cells and charge the battery for ten minutes at twenty amperes to mix the water with the electrolyte.

2. Draw electrolyte in and out of the hydrometer barrel to equalize the temperature of the float and thermometer to that of the acid in the cell.

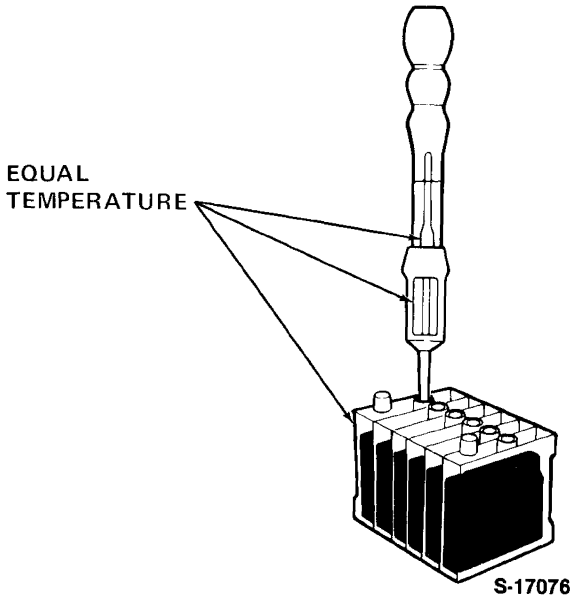

Figure 18
Hydrometer Testing

3. Draw in enough electrolyte to raise the float in the barrel with the bulb fully floating. Do not draw in so much electrolyte that the float is forced against the top of the barrel.

4. With the hydrometer at eye level, read the float scale at the electrolyte level. Hold the hydrometer straight so that the float does not stick to the side of the barrel, Figure 19.

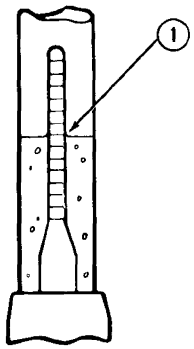

Figure 19
Hydrometer Reading
1. Electrolyte Level

5. Read the specific gravity of each cell.

6. Correct the specific gravity reading for temperature variations, Figure 20.

   a. Add .004 points for each 10° above 80°F.

   b. Subtact .004 points for each 10° below 80°F.

TEST RESULTS

1. If the average specific gravity of all cells is above 1.225, but the variation between cells is more than 50 points (.050), the battery is unserviceable. Remove the battery for further testing.

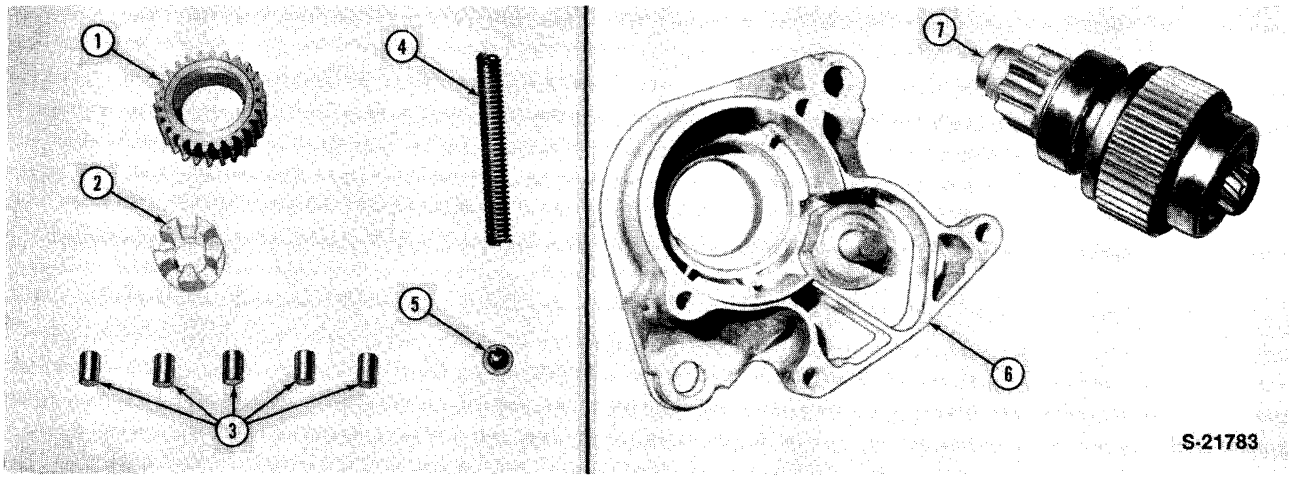

Figure 35
Starter Disassembly

1. Idle Gear
2. Retainer
3. Roller
4. Spring
5. Steel Ball
6. Housing
7. Clutch

INSPECTION AND REPAIR

1. Use a shop towel lightly dampened in solvent and low air pressure to clean all starter parts.

2. Clean the commutator using sandpaper.

   NOTE: *Never use emery cloth to clean the commutator.*

3. Inspect the bearings in the housing. Replace any found with excessive looseness, discolored, failing to rotote smoothly, producing abnormal noise, or having other defects.

4. Inspect the armature windings for broken or burned insulation and unsoldered connections.

5. Inspect the field coils for burned or broken insulation and for broken or loose connections.

6. Inspect the brush holders for broken springs or loose rivets.

7. Check the movement of the brushes in their holders. If the brushes are sticking, clean them with suitable solvent and if necessary, smooth the side of the brushes with a fine cut file.

8. Check the commutator carefully for burned spots which indicate an open armature coil.

9. Measure the brush length, Figure 36. Replace the brushes if worn. See chart.

A (New)	B (Wear Limit)
.53 in. (13.5 mm)	.35 in. (9 mm)

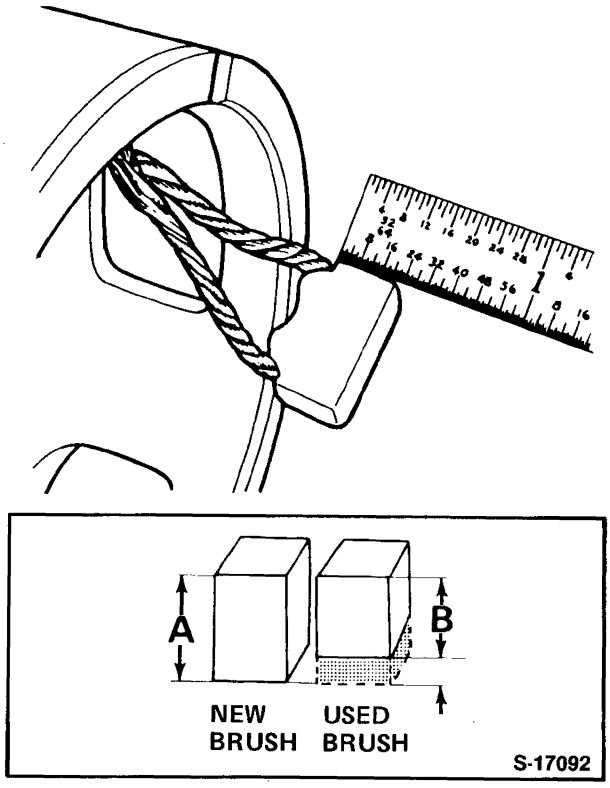

Figure 36
Brush Wear Check

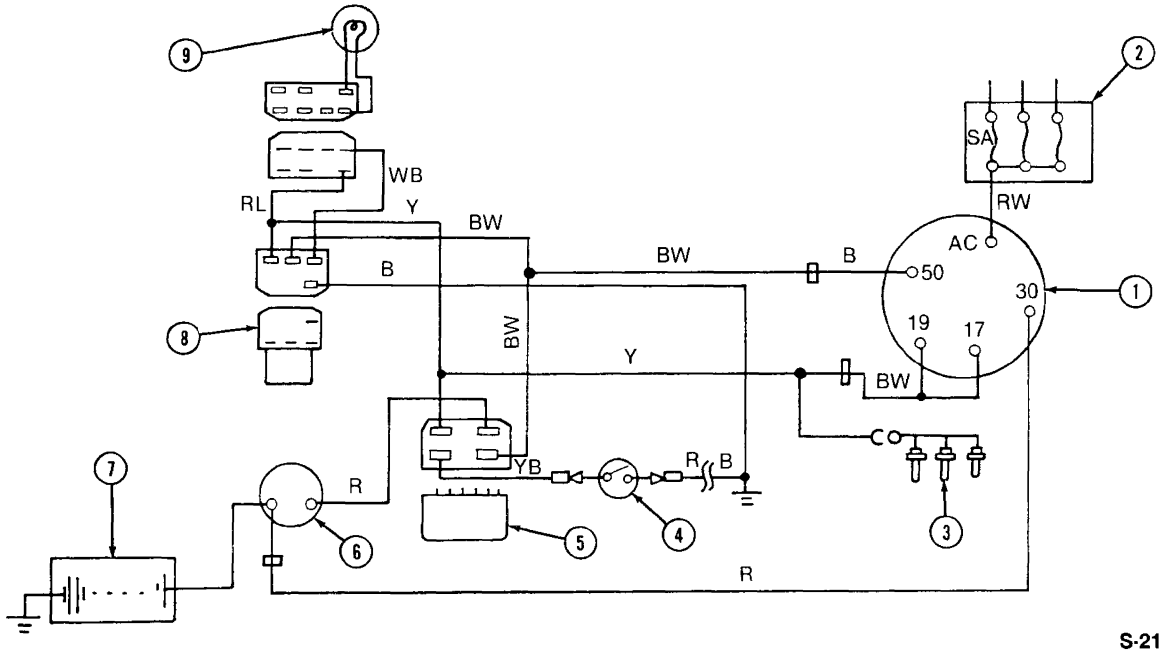

Figure 57
Key Start Switch Wiring Diagram

1. Key Switch
2. Fuse Box
3. Glow Plugs
4. Safety Start Switch (Clutch)
5. Relay
6. Starter Solenoid
7. Battery
8. Glow Indicator (Controller)
9. Glow Signal Lamp

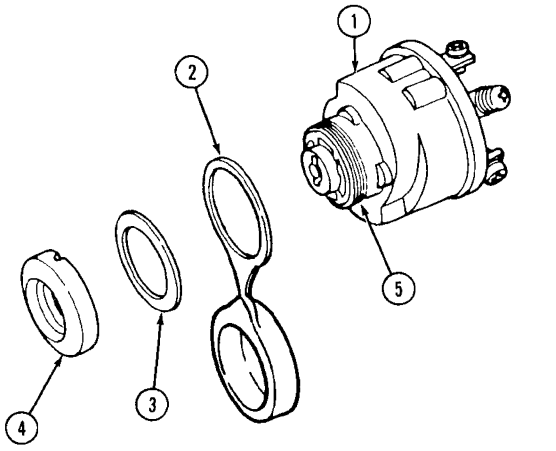

Figure 58
Key Start Switch Assembly

1. Switch
2. Weather Cap
3. Seal Ring
4. Retaining Nut
5. Alignment Tab

5. Disconnect the wires and remove the switch.

INSTALLATION

1. Position the switch and connect the wires as shown, Figure 59.
2. Position the switch in the instrument panel. For proper alignment, engage the tab on the switch with the notch in the instrument panel.
3. While holding the switch in alignment, install the weather cover, seal ring and retaining nut.
4. Inspect the wiring for proper installation.
5. Connect the cable to the battery negative terminal and check for proper operation of the switch.

3. Connect the remaining lead to the alternator F terminal and observe the ohmmeter reading.

TEST RESULTS

- High Resistance Reading = Repair open or cause of high resistance in the F wire
- Low Resistance Reading = Proceed to F circuit continuity — in regulator

REGULATOR TO F CIRCUIT CONTINUITY TEST
Reference — Figure 71

INDICATOR LAMP ON — ENGINE RUNNING

1. Disconnect the regulator from the wiring harness.
2. Connect one ohmmeter lead to regulator F terminal.
3. Connect the remaining lead to the IG terminal and observe the ohmmeter reading.

TEST RESULTS

- High Resistance Reading = Replace Regulator
- Low Resistance Reading = Proceed to B circuit continuity check — alternator to regulator

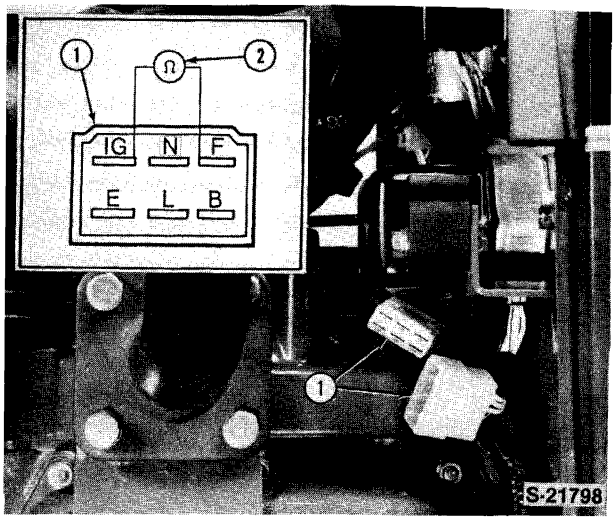

Figure 71
Regulator F Circuit Continuity Test
1. Regulator Wire Connector
2. Ohmmeter

ALTERNATOR TO REGULATOR B CIRCUIT CONTINUITY TEST
Reference — Figure 72

INDICATOR LAMP ON — ENGINE RUNNING

1. Disconnect the cable from the battery negative post.
2. Turn the starter switch to the ON position.
3. Disconnect the regulator from the wiring harness.
4. Connect one ohmmeter lead to the wiring harness B terminal.
5. Connect the remaining lead to the B terminal of the alternator and observe the ohmmeter reading.

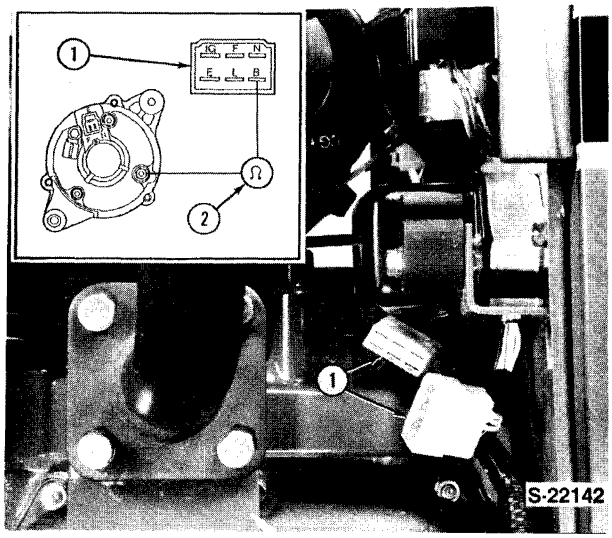

Figure 72
Alternator to Regulator B Circuit Continuity Test
1. Regulator Wire Connector
2. Ohmmeter

TEST RESULTS

- High Resistance Reading = Repair open or cause of high resistance in the B circuit
- Low Resistance Reading = Replace Regulator

FUSE TO REGULATOR L TERMINAL CIRCUIT CONTINUITY TEST
Reference — Figure 73

PART 3
ELECTRICAL SYSTEMS

Chapter 5
SPECIFICATIONS

A. SPECIFICATIONS

Starter Motor	Model 1120 and 1220
Armature Shaft Runout (Maximum)	0.002 in. (0.05 mm)
Brush Length (Minimum)	0.354 in. (9 mm)
Clutch System	Overrunning
Commutator Diameter (Minimum)	1.142 in. (29 mm)
Commutator Insulation Depth (Minimum)	0.008 in. (0.2 mm)
Current Draw No-Load Bench Test	90 Amps
Under Load	300 Amps
RPM (No-Load Bench Test)	3000
Commutator Runout	0.008 in. (0.2 mm)

Alternator	
Model	NIPPON DENSO 021000-4560 12V-20A
Rating	20 Amps at 14 Volts (Maximum)
Regulator	Electromechanical
Rotor Coil Resistance	4.2 Ohms at 68°F (20°C)
Brush Length — New — Wear Limit	.492 in. (12.5 mm) .217 in. (5.5 mm)
Drive Belt Tension	.43-.56 in. (10-15 mm) Deflection
Stator Coil Primary Resistance	1 Ohm at 68°F. (20°C.)
Slip Ring Diameter — New	1.260 in. (32 mm)
Slip Ring — Wear Limit	.012 in. (0.3 mm) Maximum
Slip Ring Runout	.002 in. (0.05 mm) Maximum

PART 4
CLUTCHES

Chapter 2
SERVICING CLUTCH ASSOCIATED COMPONENTS

A. CLUTCH PILOT BEARING — DESCRIPTION AND OVERHAUL

(STANDARD 9 x 3 GEAR TRANSMISSION ONLY)

DESCRIPTION

PILOT BEARING

Reference — Figure 6

A pre-lubricated ball bearing assembly is installed at the rear end of the engine to support the front end of the transmission input shaft.

REMOVAL

If any of the above conditions are noted, replace the bearing as follows:

1. Remove the locking plate (3), Figure 6.
2. Using a suitable puller, remove the pilot bearing.

INSPECTION

1. Inspect the pilot bearing by rotating the inner race by hand for the following conditions:
   - Abnormal noise
   - Uneven rotation
   - Excessive free play

INSTALLATION

1. Apply a few drops of sealer to the outer race and install the bearing with a driver.

   NOTE: *Be sure the driver contacts only the outer race to avoid damaging the bearing during installation.*

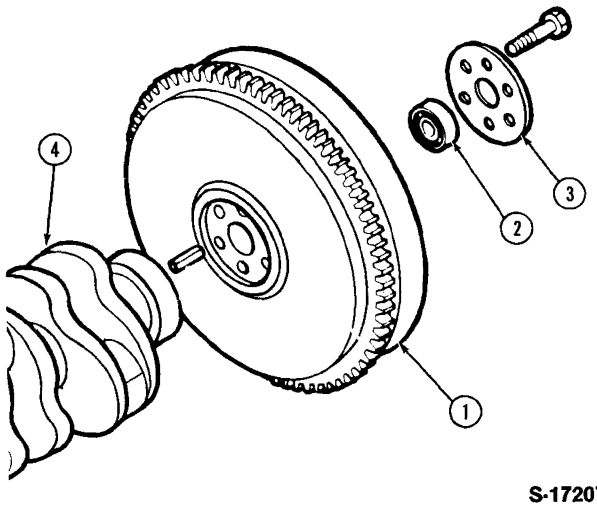

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Figure 6
Pilot Bearing Installation

1. Flywheel
2. Pilot Bearing
3. Locking Plate
4. Crankshaft

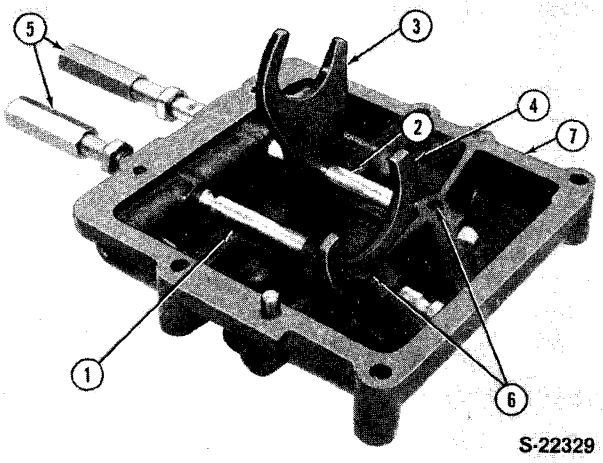


Figure 6
Transmission Cover Shift Components

1. Shifter Rail — 2nd-Rev
2. Shifter Rail — 1st-3rd
3. Shift Fork — 1st-3rd
4. Shift Fork — 2nd-Rev.
5. Turn Buckle
6. Detent Spring and Ball
7. Cover

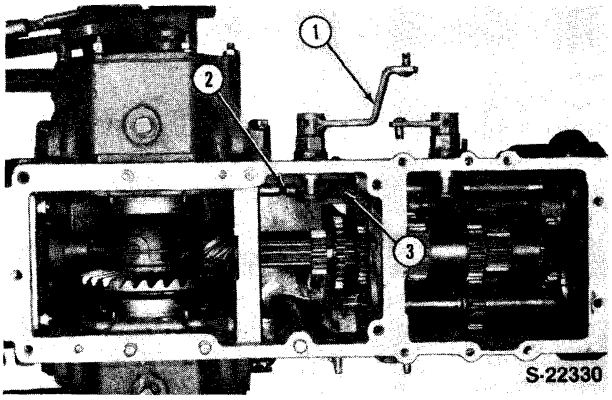


Figure 7
Mid-Range Shift Components

1. Shift Lever 2. Shifter Rail 3. Shift Fork

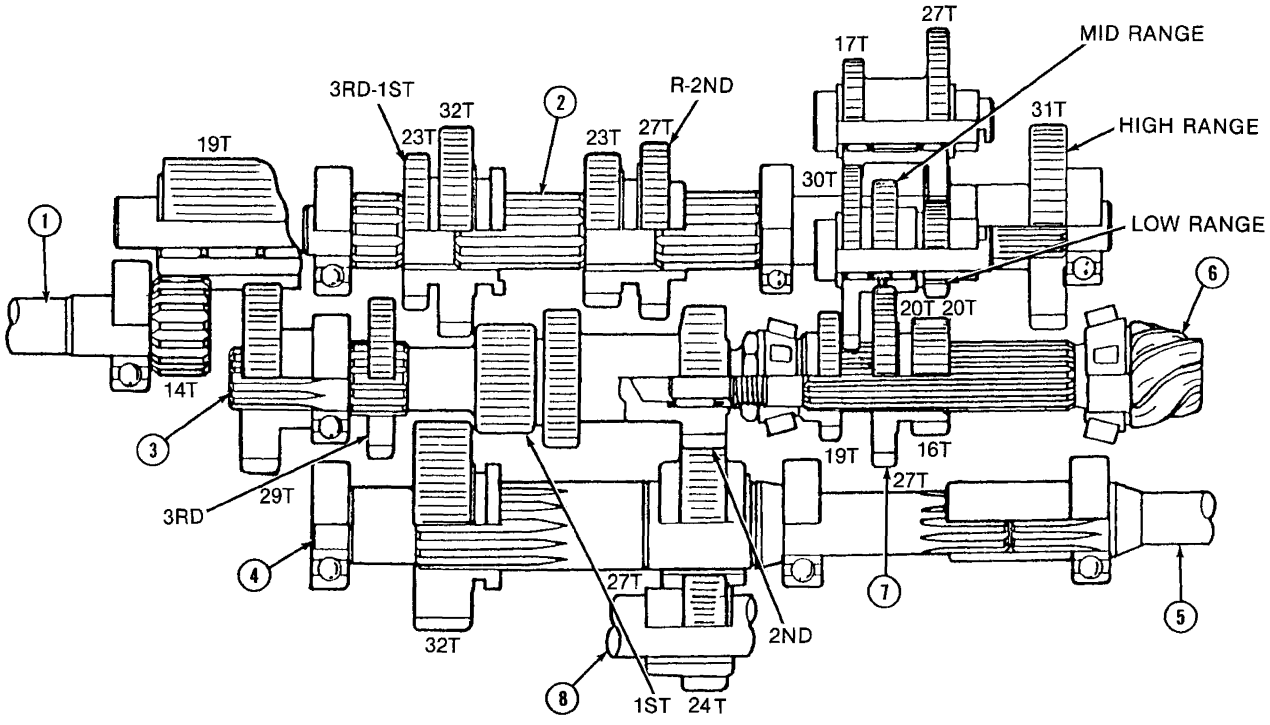


Figure 8
Standard 9 x 3 Gear Transmission

1. Input Shaft
2. Main Shaft
3. Countershaft
4. PTO Shaft (Front)
5. PTO Countershaft (Rear PTO)
6. Pinion Shaft
7. High-Middle-Low Sliding Gear
8. PTO Countershaft (Mid-Mount PTO)

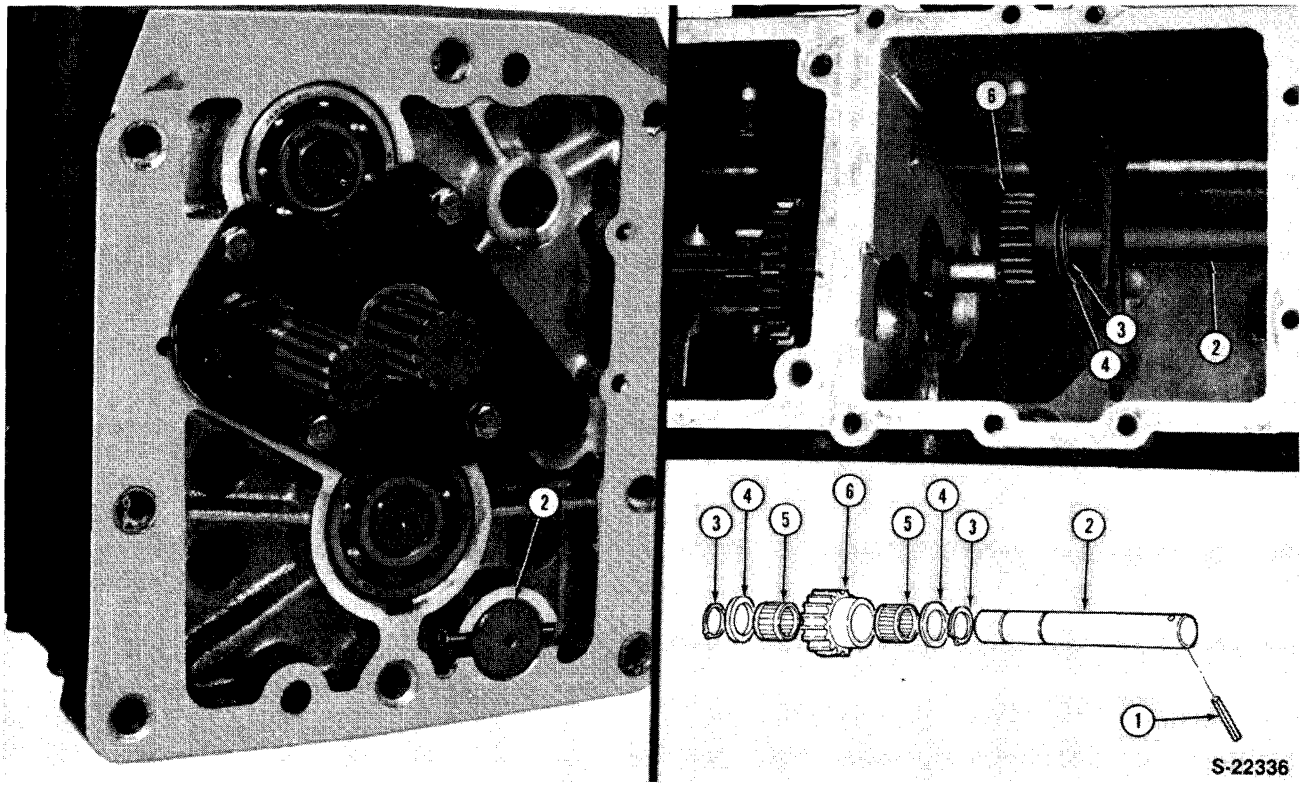


Figure 28
Mid-Mount PTO Idler Shaft Removal

1. Roll Pin
2. Shaft
3. Snap Ring
4. Thrust Washer
5. Needle Bearing
6. Gear

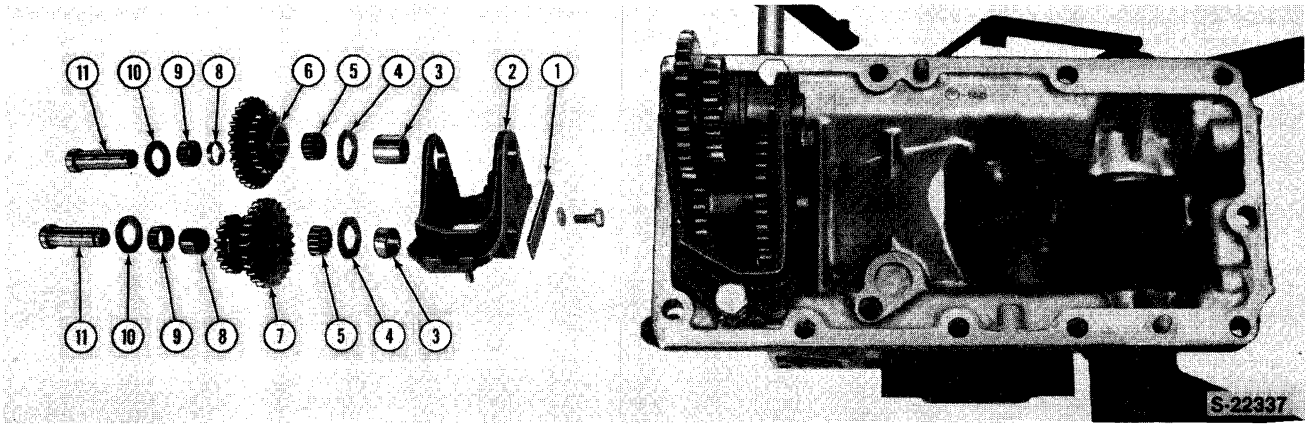


Figure 29
Mid-Range Gear Case Disassembly

1. Plate
2. Case
3. Collar
4. Thrust Washer
5. Needle Bearing
6. Gear Cluster — Lower
7. Gear Cluster — Upper
8. Spacer
9. Needle Bearing
10. Thrust Washer
11. Shaft

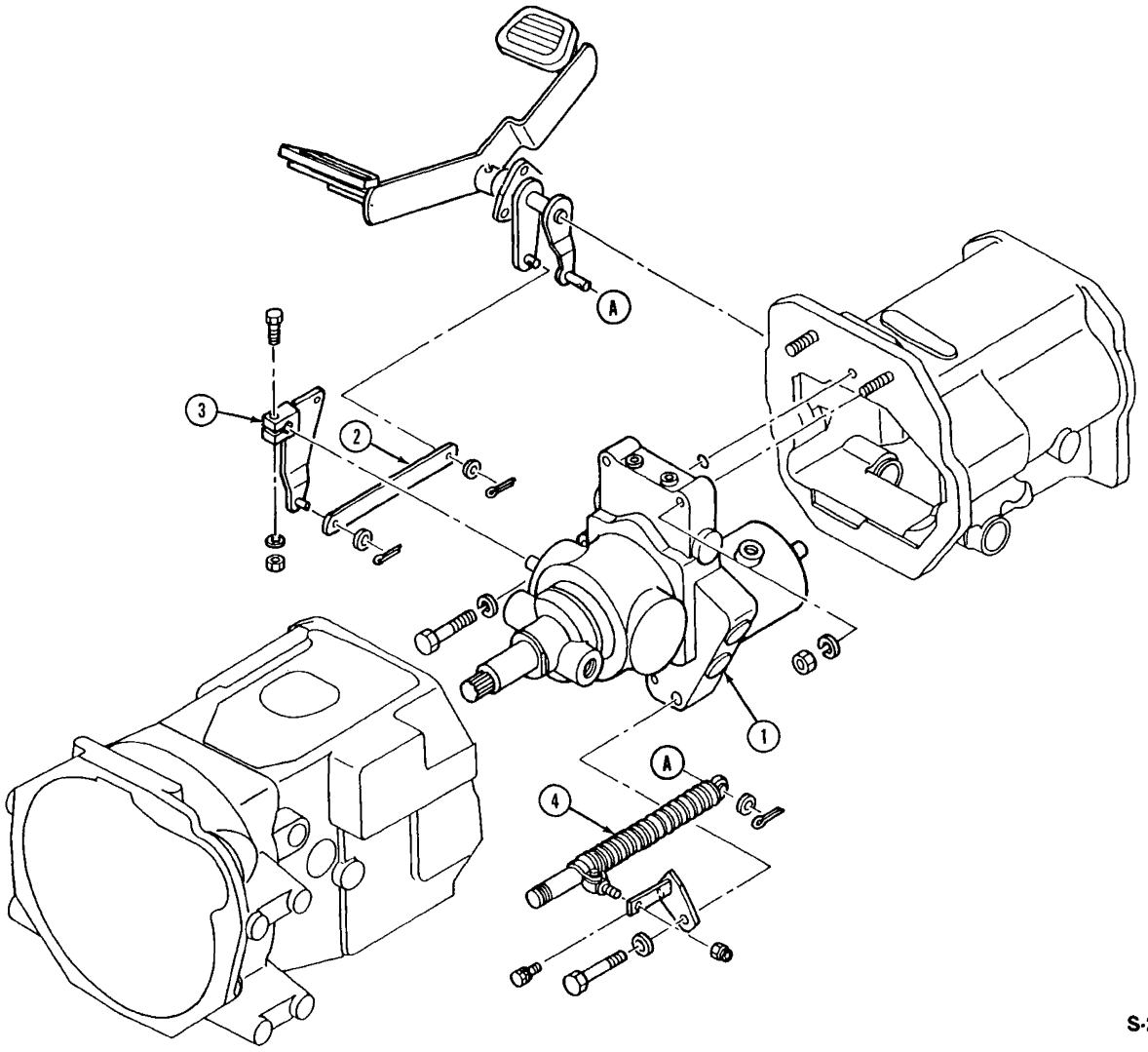


Figure 40
Hydrostatic Unit Removal

1. Hydrostatic Unit
2. Link
3. Lever Arm
4. Damper

HYDROSTATIC PUMP DISASSEMBLY

1. Remove the four socket head bolts retaining the port block to the HST housing, Figure 41.

2. Raise the pump housing slightly from the side of the port block and confirm on which side of the port block or cylinder block the valve plate adheres to.

3. Carefully remove the cylinder block and piston assembly and valve port plate, Figure 42.

NOTE: *Use care in separating the pump block and port plate so as to not drop or damage the valve plate and matching surfaces.*

4. Remove the pump cylinder block assembly from the shaft, Figure 43.

NOTE: *Use care to not lose the three pins (2), Figure 44.*

5. Remove the thrust plate (2), Figure 45.

MOTOR AND PORT BLOCK ASSEMBLY

1. Measure the depth of the cylinder block to the housing surface to assure having approximately 0.059 in. (1.5 mm) clearance, Figure 72.

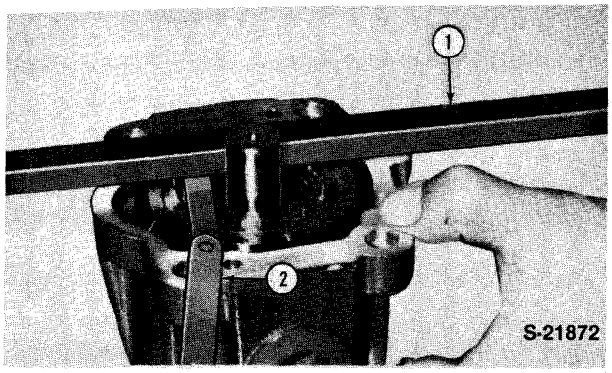


Figure 72
Motor and Port Block Assembly
1. Straight Edge 2. Feeler Gauge

If insufficient clearance, disassemble the cylinder block and recheck the positioning of the piston thrust plate. Recheck the assembly procedure.

2. If removed, install the two dowel pins in the motor housing, Figure 73.

3. Position the gasket on the housing.

4. Position the valve plate on the port block using a lithium base grease to hold it in place.

5. Install the motor and housing assembly to the port block, Figure 74.

6. Install the four socket head bolts and tighten to the specified torque.

Tightening Torque .....25.3 ± 2.5 lbs. ft.
(34.3 ± 3.4 Nm)

7. After assembly, make sure the input and output shaft rotate smoothly and that the variable swash plate moves freely.

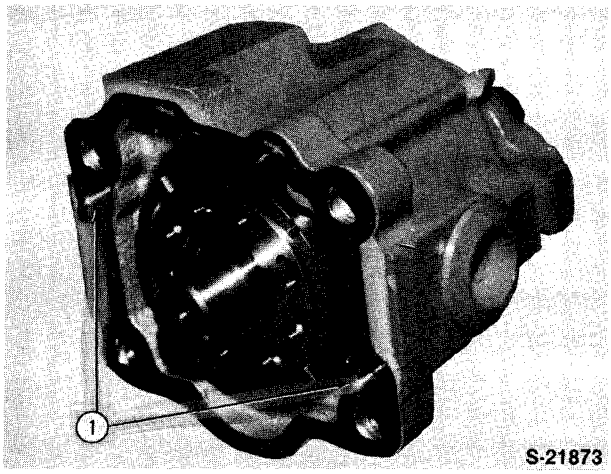


Figure 73
Motor and Port Block Assembly
1. Dowel Pins

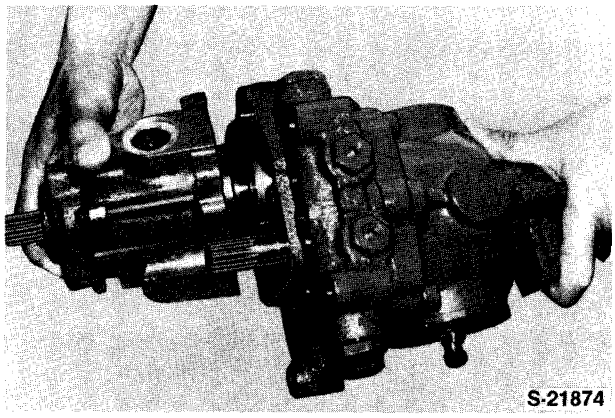


Figure 74
Motor and Port Block Assembly

CHECK VALVE
Reference — Figure 75

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

DISASSEMBLY

1. Remove the right hand banjo bolt (2) (cooler to pipe tube) and remove the spring and ball (3 and 4), Figure 76.

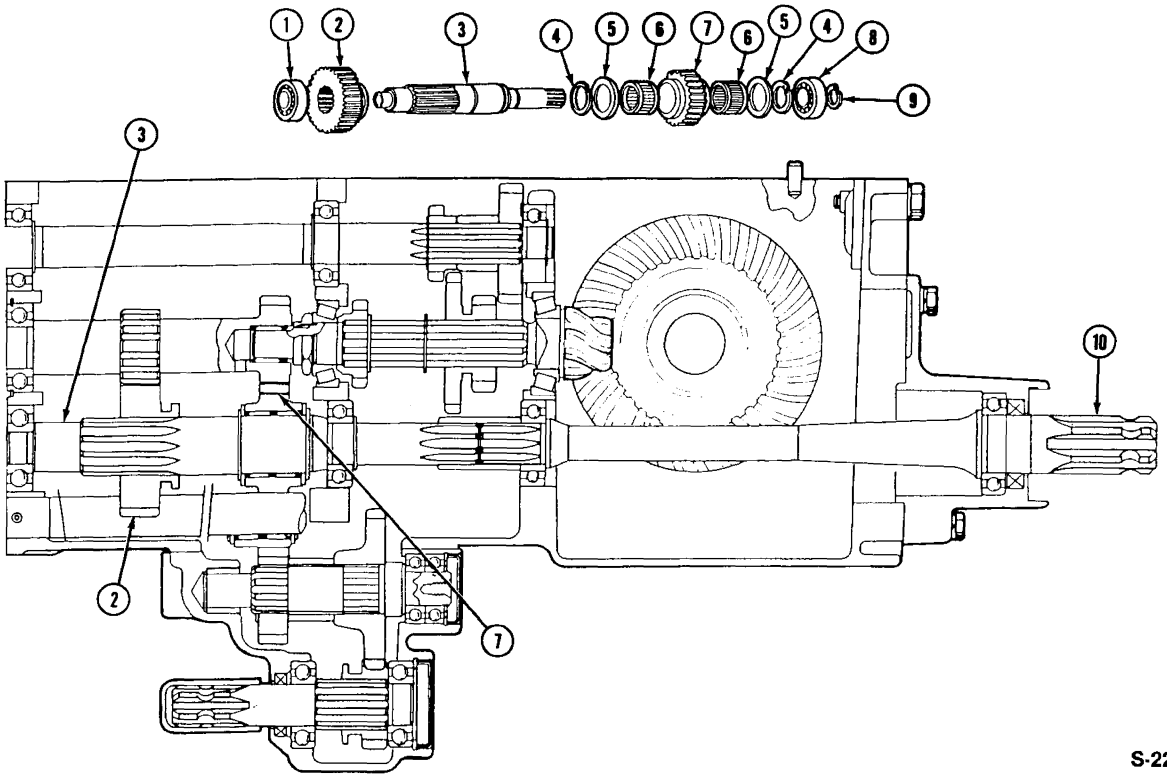


Figure 92
Front PTO Shaft Removal

1. Bearing
2. Sliding Gear
3. PTO Countershaft — Front
4. Snap Ring
5. Thrust Washer
6. Needle Bearing
7. Idler Gear
8. Bearing
9. Snap Ring
10. Output Shaft Assembly

MID-MOUNT PTO COUNTERSHAFT REMOVAL

1. Remove the snap ring (2) from the groove of the countershaft (1), Figure 93.
2. While supporting the snap rings (2), thrust washers (3), needle bearing (4) and counter gear (5), slide the shaft forward and remove it from the case.

INSPECTION

1. Wash all components in a suitable cleaning solvent and air dry.
2. Inspect all bearings for excess wear, score marks, discoloration or other damage. Check the bearings for roughness while slowly rotating the bearings by hand.
3. Lubricate all bearings with a clean lubricant before installation.
4. Check the detent springs for wear, chipped or weak spring tension.
5. Inspect the detent balls for excess wear.
6. Inspect the shift rail for worn detent grooves.
7. Inspect all gears for excess wear, chipped teeth or other damage.
8. Inspect the shift forks for excess wear, bent or other damage.
9. Inspect the case for cracks, worn bearing bores or other damage.

PART 6
POWER TAKE-OFF

Chapter 1
STANDARD POWER TAKE-OFF

Chapter 2
MID-MOUNT POWER TAKE-OFF

Chapter 3
SPECIFICATIONS

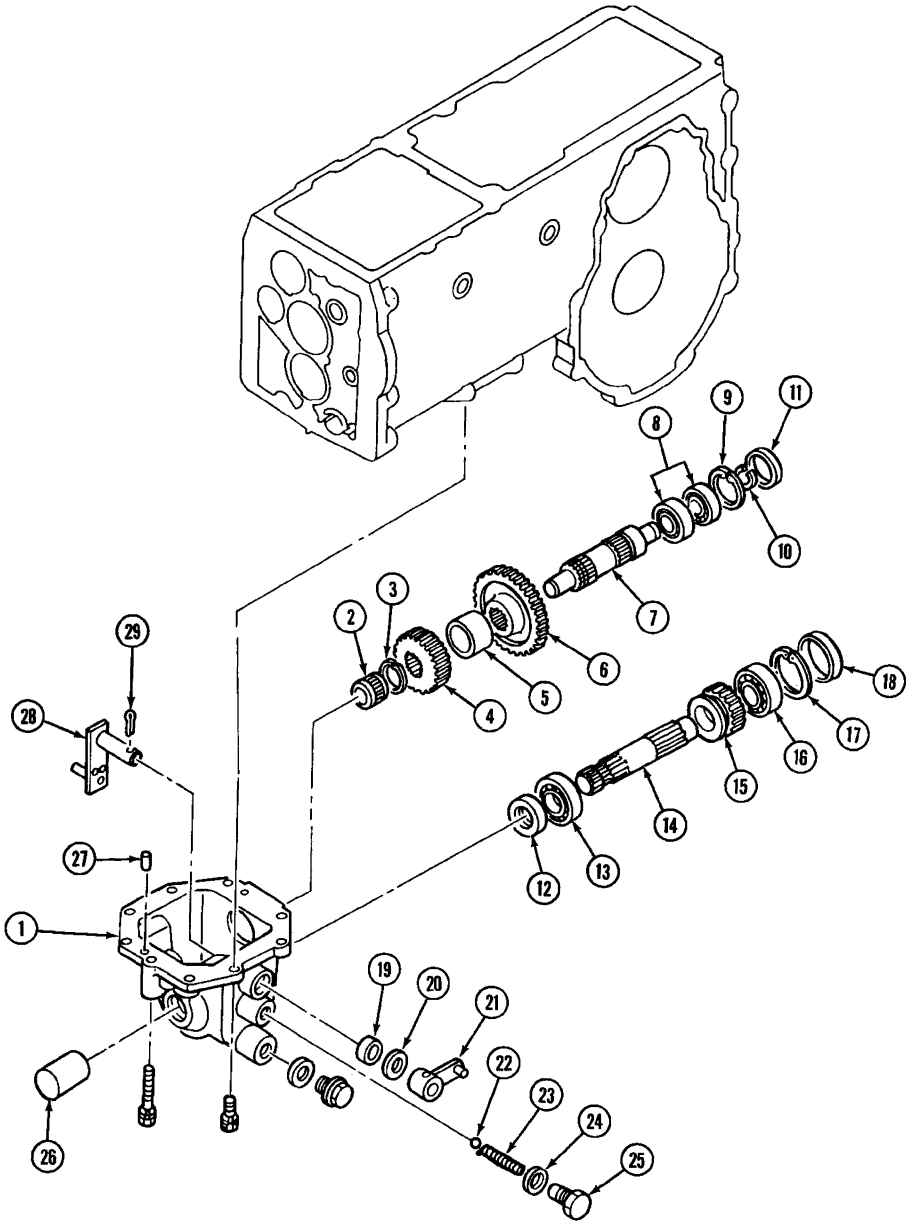


Figure 12
Mid-Mount Gearbox Assembly —
HST Transmission

1. Housing
2. Needle Bearing
3. Snap Ring
4. Fixed Gear
5. Collar
6. Fixed Gear
7. Countershaft
8. Bearings
9. Snap Ring
10. Snap Ring
11. Seal Cover
12. Seal
13. Bearing
14. Output Shaft
15. Sliding Gear
16. Bearing
17. Snap Ring
18. Seal Cover
19. Seal
20. Spacer
21. Change Lever
22. Ball
23. Spring
24. Sealing Washer
25. Bolt
26. Cover
27. Dowel Pin
28. Shift Arm
29. Roll Pin

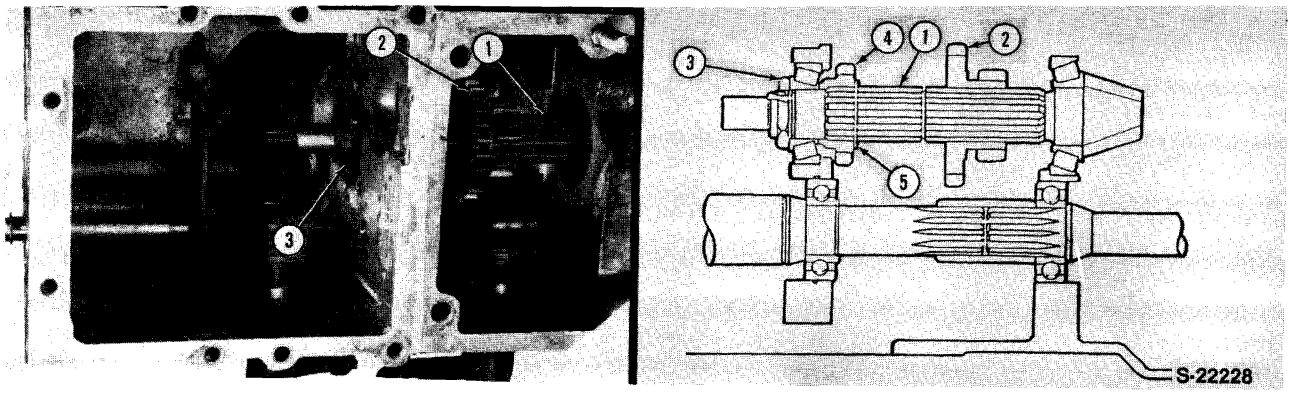


Figure 11
Pinion Removal

1. Pinion Shaft
2. Range Slide Gear
3. Locknut
4. FWD Gear
5. Snap Ring

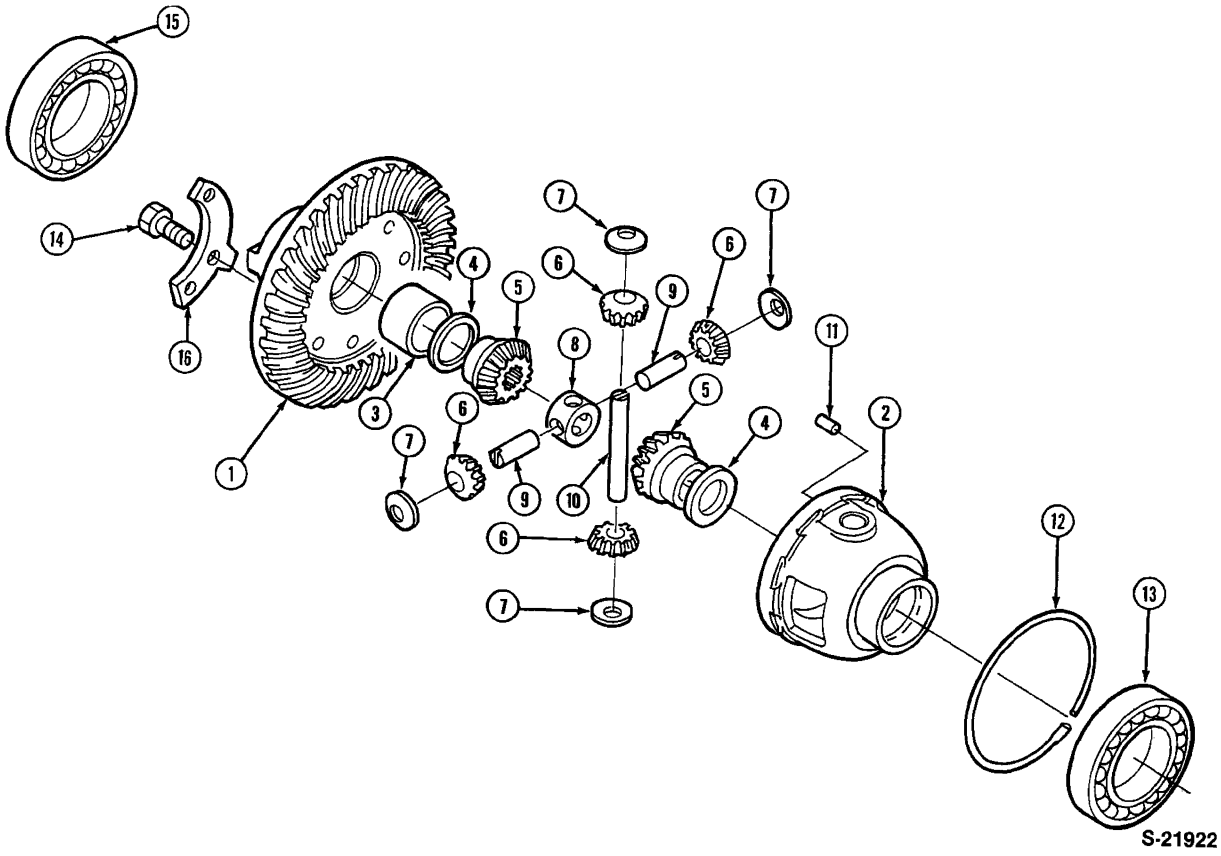


Figure 12
Differential Disassembly

1. Ring Gear
2. Case
3. Bushing
4. Thrust Washer
5. Side Gear
6. Pinion Gear
7. Thrust Washer
8. Joint
9. Pinion Shaft
10. Pinion Shaft
11. Dowel Pin
12. Clip
13. Bearing
14. Bolt
15. Bearing
16. Locking Plate

PART 8
HYDRAULIC SYSTEM

Chapter 1
HYDRAULIC SYSTEM CIRCUITS

A. HYDRAULIC SYSTEM CIRCUITS — DESCRIPTION AND OPERATION

The tractor hydraulic system consists basically of an oil reservoir, hydraulic pump, control valve, lift cylinder and piston and lift arms.

The rear axle center housing and transmission housing serve as a reservoir and supplies oil to the hydraulic pump.

A gear type pump supplies oil to a control valve that directs oil to effect a raise, neutral or lowering action of the lift arms.

The pump is mounted on the right side of the engine and is driven by the idler timing gear, Figure 1.

The oil is drawn from the rear axle center housing through an external tube to the hydraulic pump inlet filter (2), Figure 1. The oil is pressurized by the hydraulic pump and flows through the combination system relief-diverter valve manifold (6), mounted on the right-hand side of the tractor, and to the control valve (7) which is located outside the hydraulic lift cover assembly, Figure 1.

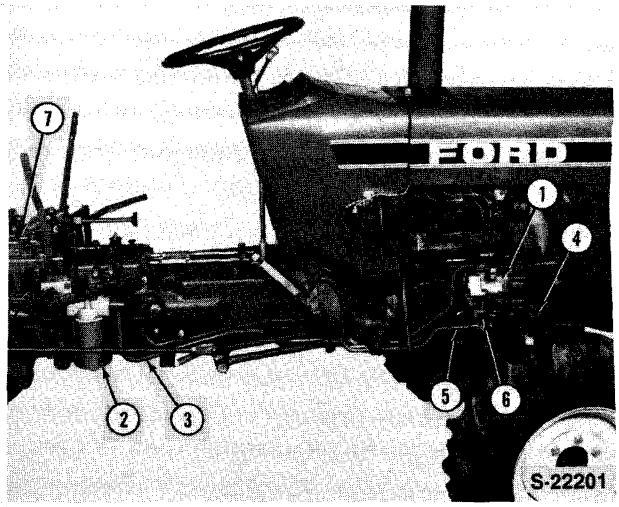


Figure 1
Hydraulic System — 4WD Model

1. Hydraulic Pump
2. Inlet Filter
3. Suction Tube
4. High Pressure Tube
5. Return to Sump Tube
6. Diverter Valve/Relief Valve Manifold
7. Hydraulic System Control Valve

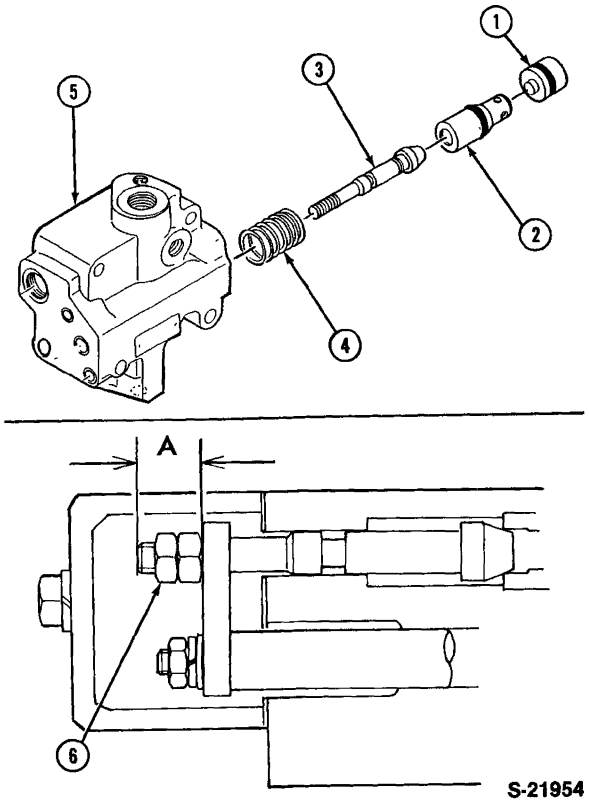


Figure 22
Lowering Valve Removal

1. Plug
2. Seat
3. Lowering Valve
4. Spring
5. Housing
6. Locknut

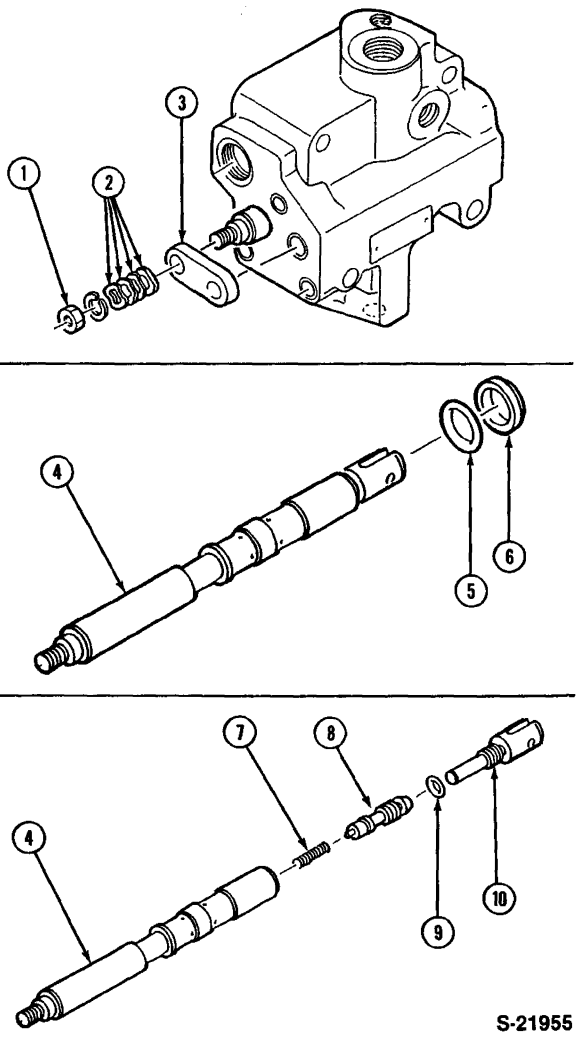


Figure 23
Control Valve Spool Removal

1. Locknut
2. Wave Washer
3. Plate
4. Control Valve Spool
5. O-Ring
6. Wiper
7. Spring
8. By-Pass Spool
9. O-Ring
10. Spool Head

3. Inspect the unload valve for uneven wear or scratches. Replace if necessary.

4. Inspect the check valve and seat for excessive wear or damage. If necessary, replace the check valve and seat as a set.

ASSEMBLY

Assembly of the control valve generally follows the disassembly procedure in reverse order.

On assembly, observe the following requirements.

If the original components of the lowering valve are used, adjust the lowering valve spool nuts to the distance "A," as was determined during disassembly, Figure 26.

If the lowering valve was replaced (spool, seat or plug), adjust the lowering spool as follows:

- Install the nuts loosely to a distance "A" of less than .55 in. (14 mm), Figure 26.

PART 8
HYDRAULIC SYSTEM

Chapter 4
REMOTE CONTROL VALVES

A. REMOTE CONTROL VALVES — DESCRIPTION AND OPERATION

The Model 1120 and 1220 tractors may be equipped with either a single spool control valve, Figure 36, or a double spool control valve, Figure 37, as optional equipment to the standard hydraulic system.

The single spool control valve, Figure 38, is mounted on the right-hand side of the hydraulic lift cover between the lift cover and the main control valve, Figure 36.

The valve spool is equipped with a self-centering spring so that after the operator has moved the spool to the "raising" or "lowering" position it will automatically return to neutral when the lever is released.

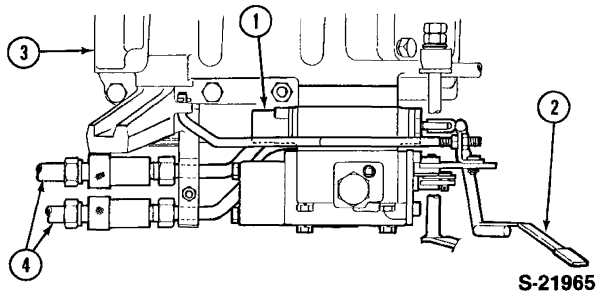


Figure 36
Single Spool Remote Control Valve

1. Single Spool Control Valve
2. Control Lever
3. Hydraulic Lift Cover
4. High Pressure Tubes (Remote)

The two spool control valve, Figure 39, is mounted on the right-hand side of the tractor adjacent to the tractor hood, Figure 37.

The two spool control valve is operated with a single control lever and has the self-centering feature similiar to that of the single spool valve. The valve also contains a spring loaded detent mechanism to provide a "float" position for loader operation. In the "float" position oil is free to flow between the piston and rod sides of the loader lift cylinders allowing the lift arms to float over uneven terrain.

The two spool valve contains check valves (22), Figure 39, located in the valve spool passages. The check valves function to hold the loader lift and bucket cylinders in position while the valve is initially operated to prevent dropping of the load.

In operation, the check valve (8), Figure 43, is retained on its seat by spring force plus the backside pressure of oil contained in the loader cylinder. At initial spool movement, pump pressure oil fills the passage to the check valve as well as returning to sump through the open center passage. As the open center passage is being closed by the spool movement, pump pressure oil overcomes the backside pressure on the check valve and forces the check valve to open allowing pump oil to flow to the cylinder. This action prevents any leakage of oil out of the cylinder during initial pressurization and provides for smooth loader operation.

OIL FLOW — LIFT CYLINDER — RAISING (TWO SPOOL CONTROL VALVE)

Reference — Figure 46

When the lift control lever is moved to the "raise" position, the "lift" spool is pulled outward as shown in Figure 46. Pump pressure oil flows through the lift spool open center passage lifting the check valve (8) off its seat and flows to the piston side of the lift cylinder via passage B^1. Oil contained in the rod side of the cylinder is forced out through passages A1 and C where it returns to sump.

The bucket cylinder spool remains in neutral position and blocks oil flow to and from the bucket cylinder.

If the high pressure in the remote cylinder circuit exceeds 1849 psi (128 bars) the hydraulic system main relief opens.

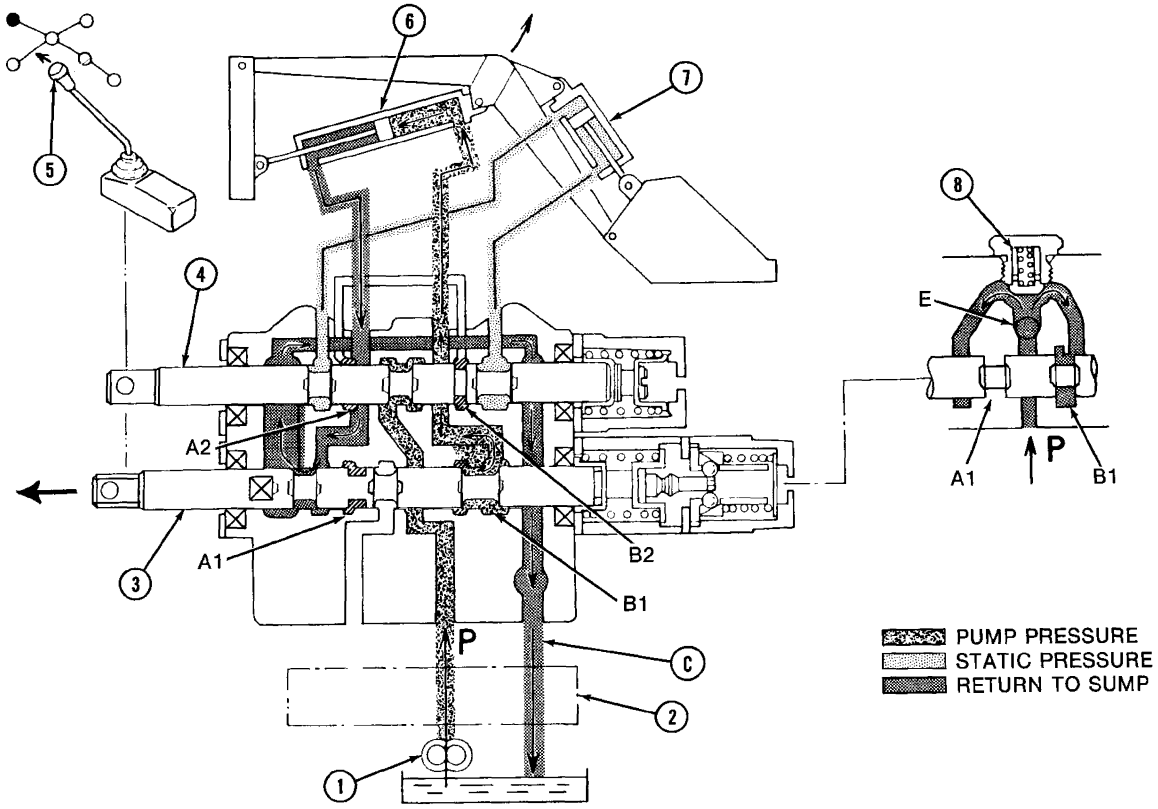


Figure 46
Oil Flow — Lift Cylinder Raising
(Two Spool Control Valve)

1. Oil Pump
2. System Relief Diverter Valve
3. Lift Control Valve Spool
4. Bucket Control Valve Spool
5. Control Lever
6. Lift Cylinder
7. Bucket Cylinder
8. Load Check Valve

P — Pump Pressure
A^1 — To Lift Cylinder — Rod End
B^1 — To Lift Cylinder — Piston End
A^2 — To Bucket Cylinder — Piston End
B^2 — To Bucket Cylinder — Rod End
C — Return to Sump
E — Open Center Passage

PART 9
STEERING SYSTEM

Chapter 1
STEERING SYSTEM — MODELS 1120 AND 1220

A. STEERING SYSTEM — DESCRIPTION AND OPERATION

Manual steering is standard equipment on the Model 1120 and 1220 tractors.

The steering gear assembly is mounted on top of the transmission clutch housing and is connected to the front wheels by a single steering arm and drag link. The drag link is connected to the spindle of the left hand wheel. The left and right hand spindle arms are connected together by an adjustable connecting rod assembly, Figures 1 and 2.

STEERING GEAR ASSEMBLY

The steering gear assembly, Figure 3, uses a recirculating ball nut on the steering shaft. Gear teeth on the ball nut engage the gear sector shaft gear teeth, which extends from the left hand side of the steering gear housing.

The steering shaft is enclosed in the column housing, which is bolted to the steering gear case.

The steering gear case supports the steering shaft lower bearing, the sector shaft and gear lash adjuster.

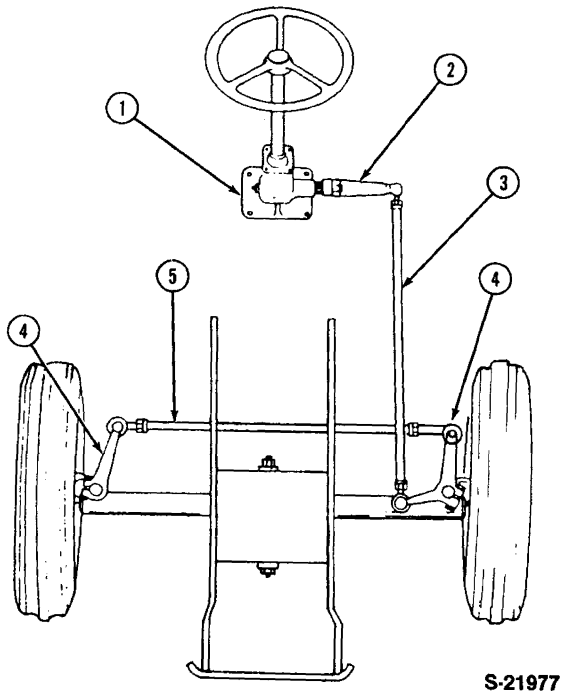


Figure 1
Steering System — 2WD

1. Steering Gear
2. Pitman Arm
3. Drag Link
4. Spindle Arms
5. Connecting Tie Rod

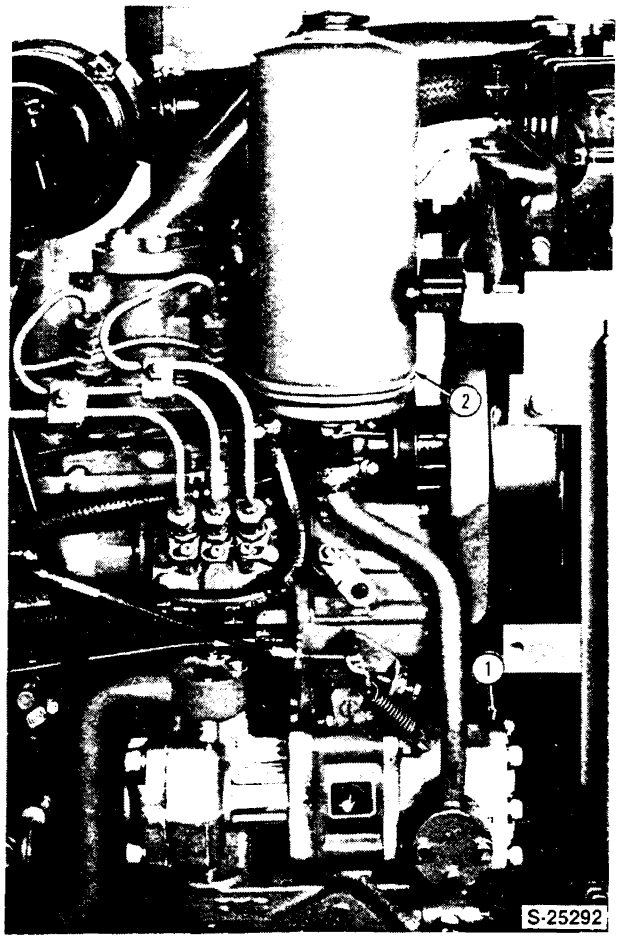


Figure 21
Power Steering Pump and Reservoir

1. Power Steering Pump
2. Reservoir

POWER STEERING CYLINDER
Reference — Figure 22

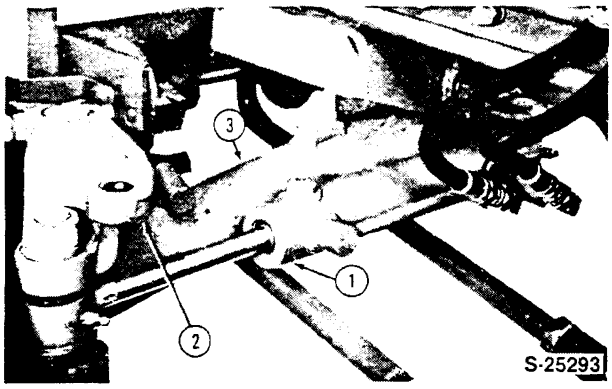


Figure 22
Steering Cylinder (Tie Rod Removed)

1. Power Steering Cylinder
2. Spindle Arm
3. Front Axle

The power steering cylinder is mounted transversely under the tractor with the cylinder end pinned to a fixed member and the rod end attached to the spindle arm.

NOTE: *On FWD tractors the cylinder end is anchored in a bracket that is bolted to the front axle.*

POWER STEERING OPERATION

OIL FLOW — NEUTRAL POSITION
Reference — Figure 23

Pressurized oil from the power steering pump enters the valve body at port "P." The oil flows through the check valve (7), past the relief valve (3) and through radial holes in the sleeve to the center of the valve spool (2).

NOTE: *There are 24 radial holes in the sleeve (1) that index with 12 grooves provided in the spool.*

In neutral position the oil flows through the hollow spool and returns to the reservoir via port "T."

Passage to ports "L" and "R," leading to the cylinder, are blocked by the spool and sleeve. Oil contained in the tubes and cylinder is trapped and the cylinder remains in a fixed position. In this position the front wheels hold at a straight ahead position. The system is fully hydraulic and as such there is no road feel or front wheel reaction transmitted to the steering wheel.

16. Position the spool and sleeve assembly so that it is slightly below the bottom face of the valve body.

    NOTE: *Be sure the mating surfaces of the components are clean and free of dirt and lint.*

17. Install the O-ring (1) and position the spacer plate on the valve body being sure to match the bolt holes and ports to that of the valve body, Figure 41.

18. Rotate the spool and sleeve to position the pin slots parallel with the valve body port face, Figure 42.

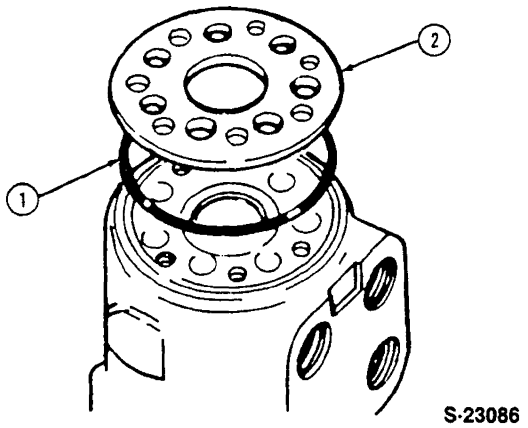


Figure 41
Spacer Plate Assembly

1. O-Ring
2. Spacer Plate

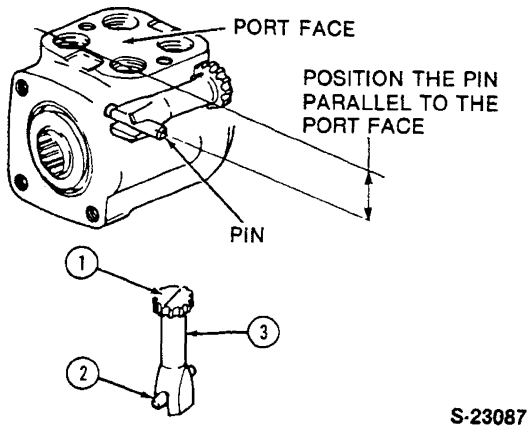


Figure 42
Valve and Gear Assemby and Timing Procedure

1. Reference Scribe Mark
2. Pin
3. Drive Shaft

19. Scribe a reference mark on the splined end of the drive shaft parallel to the pin slot as shown, Figure 42.

20. Position the drive shaft in the valve body engaging the slot with the pin.

21. Install the O-ring (2) and seal (3) on the rotor (1), Figure 43.

    NOTE: *Apply a grease type lubricant to the face of the rotor to make the O-ring and seal adhere to the rotor surface.*

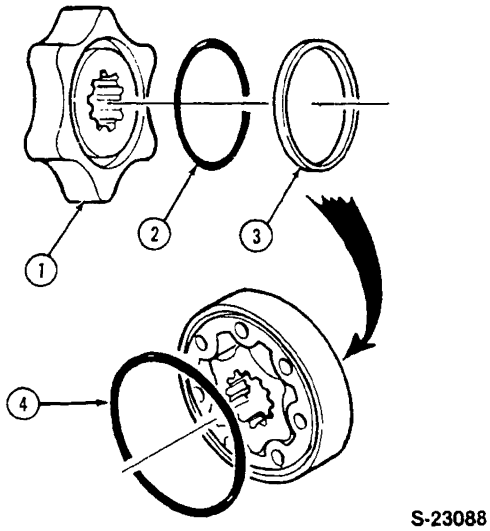


Figure 43
Gerotor Pump Assembly

1. Rotor
2. O-Ring
3. Seal
4. O-Ring

22. Position the rotor in the pump ring and install the O-ring (4) in the pump groove, Figure 43.

23. Position the gerotor pump assembly onto the valve body with the seal side up. Align the drive shaft reference line with a diametrical line running through the center of the pump gear valleys as shown, Figure 44.

    NOTE: *It is important that the pump drive shaft, gear lobes and valve ports are in the corect relationship for proper valve timing as described above and referenced in the parallel lines A, B, C and D, Figure 44.*

E. SPECIFICATIONS — POWER STEERING

Oil Pump	
Rotation	Counterclockwise
Capacity	1.5 gal. (5.8L)
Power Steering Type	Full Hydraulic
Steering Cylinder	
Stroke	6.47 in. (166 mm)
Bore	1.36 in. (35 mm)
Relief Valve	
Flow Rate	2.1 GPM (8 LPM)
Pressure	850-950 psi (59-65 bar)
Reservoir	
Capacity	1.9 Qts. (1.8L)
Oil	Ford 134
Steering Cylinder	
Piston-to-Tube Clearance	0.027 in. (0.7 mm)
Anchor Pin to Bushing Clearance — Both Ends	0.0195 in. (0.5 mm) max.
Cylinder Rod-to-Gland Bushing Clearance	0.0117 in. (0.3 mm) Max.
Torque Specifications	
Power Steering Gland Head	94 lbs. ft. (127 Nm)
Power Steering Cylinder Piston Nut	27 lbs. ft. (37 Nm)
Anchor Pin Retaining Bolts	9-12 lbs. ft. (12-16 Nm)
Power Steering Pump Bolts	16-20 lbs. ft. (21-27 Nm)
Control Valve End Cap Screws	15 lbs. ft. (20.6 Nm)
Tube Fittings	
Reference — Figure 58	
No. 5 Adaptors	43-58 lbs. ft. (58-78 Nm)
No. 6 Adaptor	43-58 lbs. ft. (58-78 Nm)
No. 7 Port P Check Connnector	
No. 1 Tube	22-29 lbs. ft. (30-39 Nm)
No. 2 Tube	22-29 lbs. ft. (30-39 Nm)
No. 3 Tube	22-29 lbs. ft. (30-39 Nm)
No. 4 Tube	22-29 lbs. ft. (30-39 Nm)

PART 10
FRONT AXLE

Chapter 2
FRONT AXLE — FOUR WHEEL DRIVE

A. FRONT AXLE, 4WD — DESCRIPTION AND OPERATION

The four wheel drive option, Figure 17, is available on the Ford 1120 and 1220 tractors.

The four wheel drive front axle is not adjustable and the front wheels must never be reversed. The four wheel drive front tread width is 32.3 in. (82 cm).

The front wheel drive drag link is adjustable for straight-ahead alignment of the steering gear and front wheels, Figure 18.

The spindle arm tie rod is also adjustable for toe-in adjustment, Figure 18.

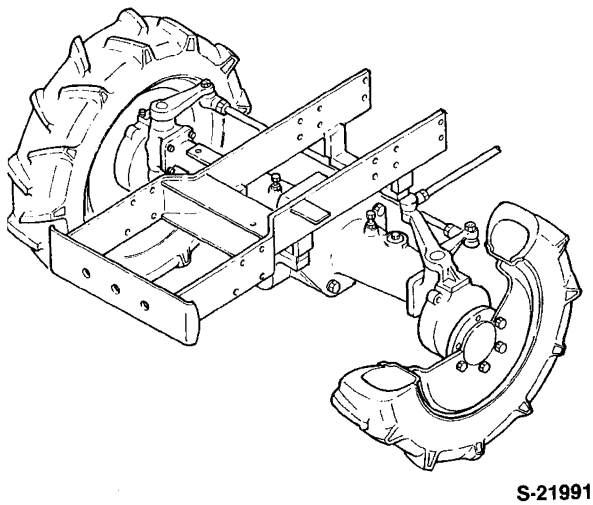


Figure 17
Front Wheel Drive Axle

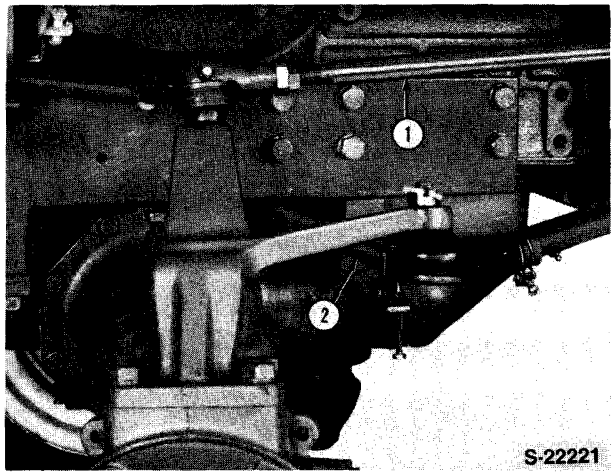


Figure 18
Front Wheel Drive Axle
1. Drag Link 2. Tie Rod

The four wheel drive front wheel is supported by the final wheel shaft, Figure 19.

The front wheel drive engagement is controlled by a lever located at the right of the operator's seat, Figure 20.

B. FRONT AXLE, 4WD — OVERHAUL

REMOVAL

Remove the front axle assembly from the tractor. See "Separating the Tractor," Part 12.

PART 10
FRONT AXLE

Chapter 3
TROUBLE SHOOTING AND SPECIFICATIONS

A. TROUBLE SHOOTING

TROUBLE	POSSIBLE CAUSE
Front Wheel Shimmy	1. Worn spindle and/or bushings. 2. Worn pivot shaft and/or bushings. 3. Loose wheel hub nut (2WD). 4. Loose tie rod. 5. Loose spindle arm.
Hard Steering	1. Spindle bushings lack lubrication. 2. Damaged spindle and/or spindle bushings. 3. Damaged thrust bearing. 4. Faulty steering gear (See Part 9).
Loose Spindle	1. Worn bushings. 2. Worn or damaged thrust bearing. 3. Worn spindle shaft.

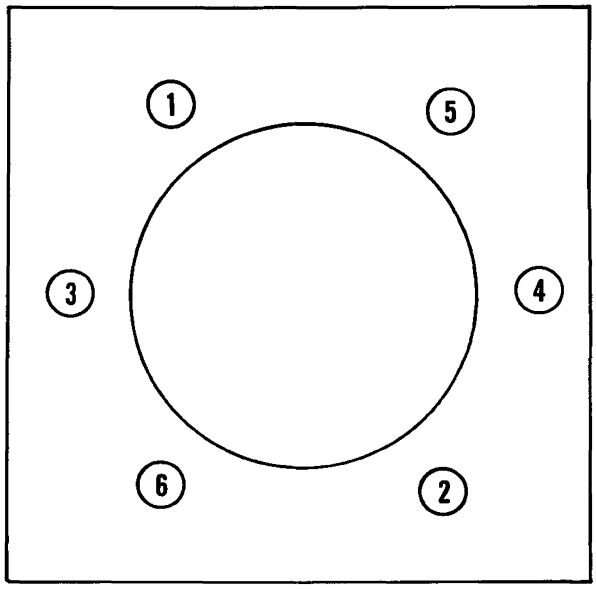
C. WHEELS AND TIRES
LUG BOLT TORQUE

Front Wheel Bolts

2WD ..... 43-54 lbs. ft. (58-73 Nm)
4WD ..... 43-54 lbs. ft. (58-73 Nm)

Rear Wheels

Rim to Disc Bolt-Nuts ..... 137-159 lbs. ft. (186-215 Nm)
Disc to Hub Bolts ..... 137-159 lbs. ft. (186-215 Nm)



FRONT AND REAR WHEEL HUB BOLT TORQUE SEQUENCE

6. On FWD models, disconnect the FWD shaft from the transmission, Figure 12.
7. Remove the seat support platform panel, Figure 14.
8. Remove the right and left side covers, Figure 14.
9. Remove the seat support bracket, Figure 14.
10. Disconnect the high pressure inlet tube (1) to the top cover and plug the openings, Figure 15.
11. Remove the step plates from both sides, of the tractor.
12. Disconnect the rear light wire connectors.
13. Remove the ROPS bar.
14. Using a moveable hoist and sling, support the rear transmission and center housing.
15. Remove the rear wheels.
16. Remove the fenders.
17. Remove the transmission shifter cover plate, Figure 17.
18. Disconnect the shift rods (2) from the shift cover assembly, Figure 15.

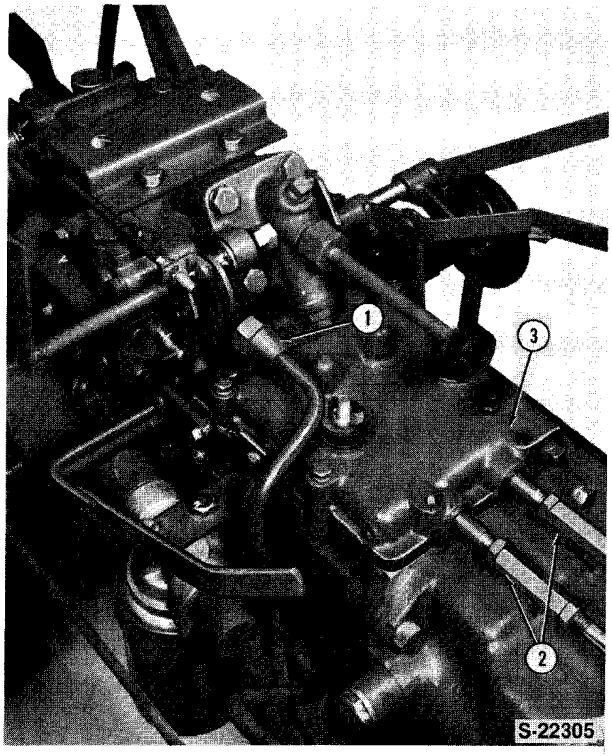


Figure 15
Hydraulic System High Pressure Tube Removal
1. High Pressure Tube
2. Shifter Rods
3. Shifter Cover Assembly

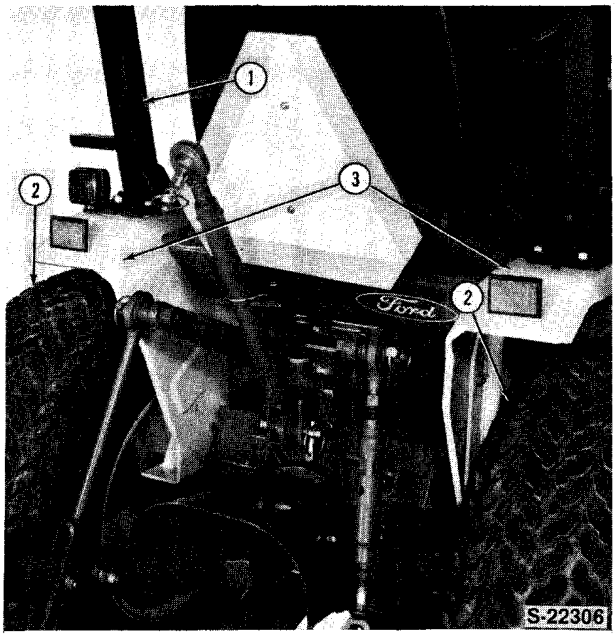


Figure 16
ROPS, Wheels and Fenders Removal
1. ROPS Bar
2. Rear Wheels
3. Fenders

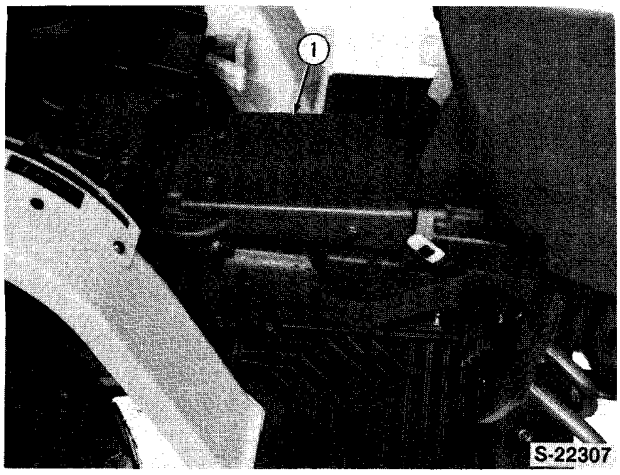


Figure 17
Transmission Case Cover Removal
1. Cover