NEW HOLLAND 1920 2120

REPAIR MANUAL

NEW HOLLAND

SERVICE

Reprinted

40192020 (SE4603)

PART 1
ENGINE SYSTEMS
MODELS 1920 AND 2120

Chapter 1
ENGINE AND LUBRICATION SYSTEM

A. DESCRIPTION AND OPERATION

This chapter describes engine overhaul and repair procedures for the Models 1920 and 2120 tractor engines. The engines are of the same general design and repair procedures are essentially the same except as noted in the repair procedures.

Both engines are four cylinder, four cycle, overhead valve, liquid cooled engines, Figures 1 and 2.

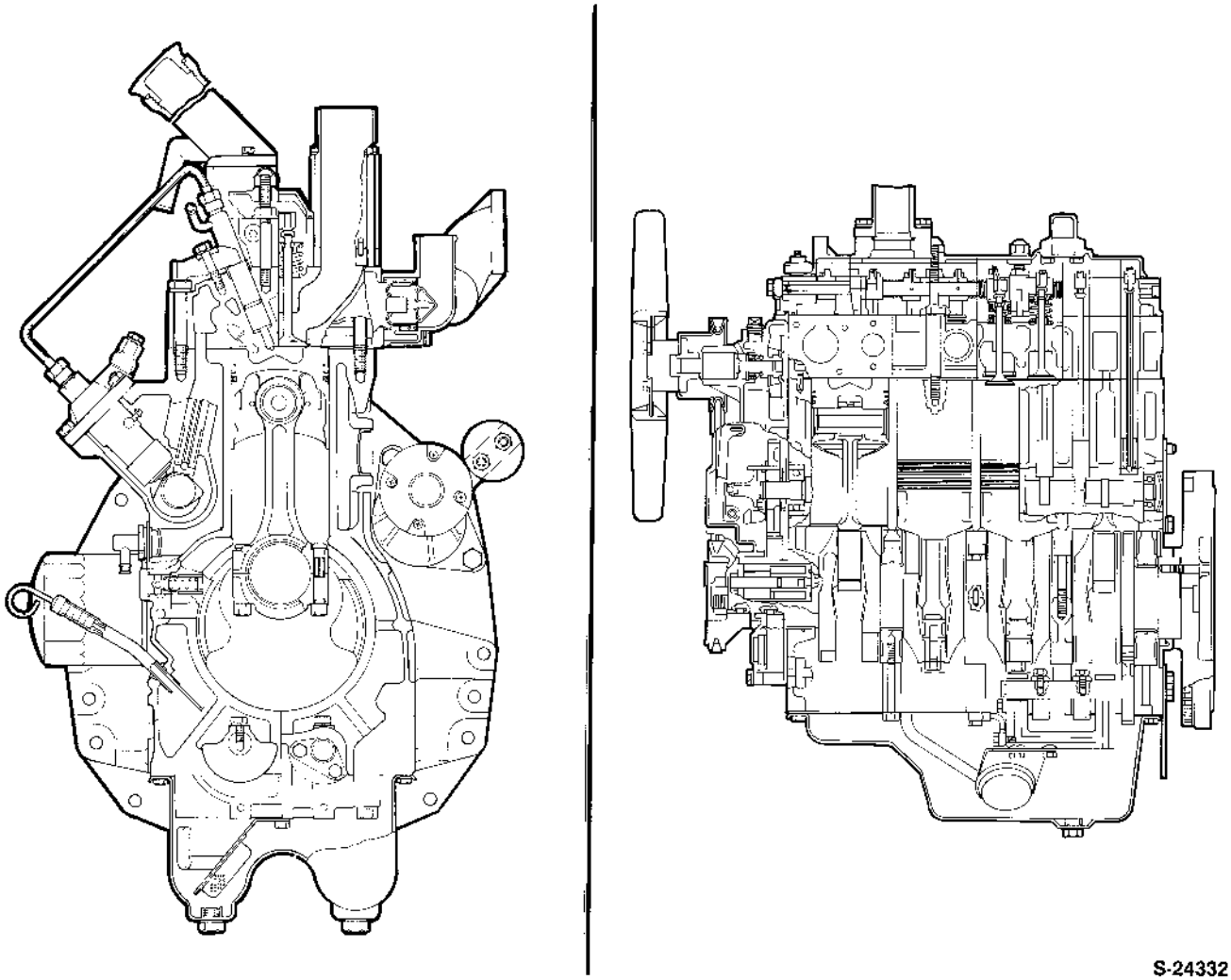

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Figure 1
Engine Assembly — Model 1920

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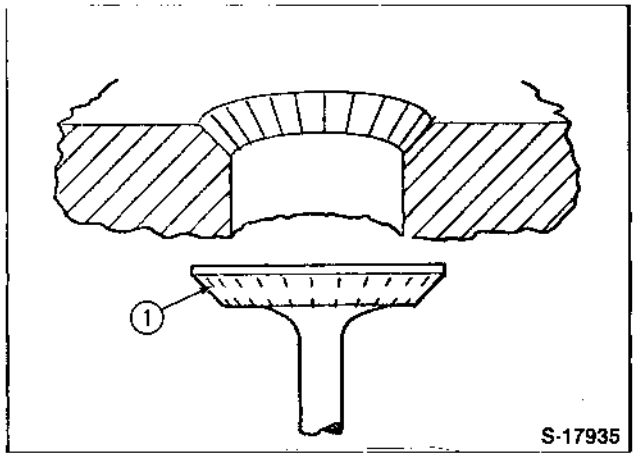

Figure 26
Valve Seat Contact Location
1. Seat

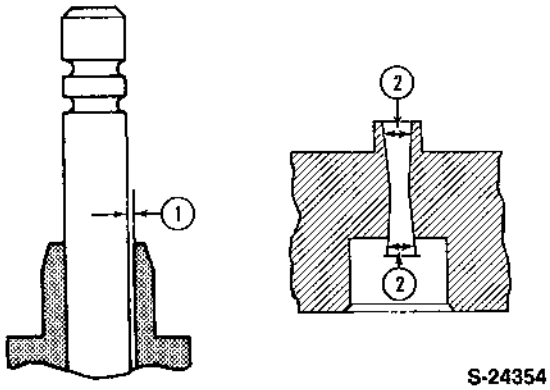

Figure 27
Valve Stem-to-Guide Clearance Check
1. Stem-to-Guide Clearance
2. Wear Points — Valve Guide

2. Determine the stem-to-guide clearace by subtracting the stem diameter from the valve guide. Replace the valves if the clearance is more than the specified limits:

	Clearance
Model 1920	.008 in. (0.2 mm) max.
Model 2120	.012 in. (0.3 mm) max.

3. Replace the cylinder head if excessive clearance is determined. See "Specifications," Chapter 3 for wear limits.

VALVE SPRINGS

1. Place the valve springs on a flat surface. Measure the free-length of the spring and squareness, Figure 28.

   Replace springs that do not meet the following specifications:

	Maximum Out of Square	Minimum Free-Length
Model 1920	.079 in. (2.0 mm)	1.319 in. (33.5 mm)
Model 2120	.063 in. (1.2 mm)	1.732 in. (44 mm)

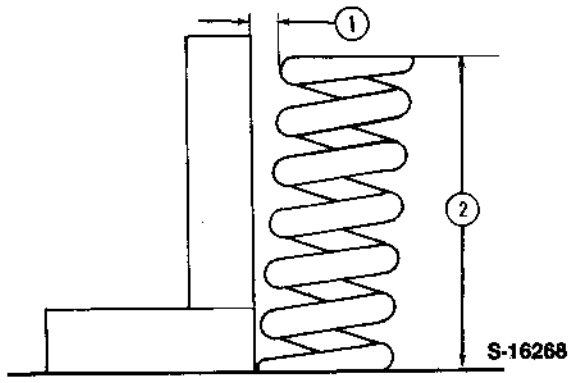

Figure 28
Valve Spring Length and Squareness Check
1. Squareness
2. Free Length

2. Place the springs in a suitable spring load tester and measure the spring load rating. Replace the srpings that do not meet the following load specifications:

	Load Rating
Model 1920	28 lbs. (min.) at 1.2 in. height (7 kg at 30.4 mm)
Model 2120	29 lbs. (min. at 1.2 in height (13 kg at 30.4 mm)

ROCKER ARM PIVOTS

DISASSEMBLY
Model 1920

1. Screw a 8M bolt into the front end of the rocker shaft and pull the rocker shaft out of the support, Figure 29.

Figure 52
Port Block and Shaft Installation
1. Guide Pins — Tool No. 11063

- Use a suitable driver and install the port block assembly as shown, Figure 54. The installer must bottom against the engine block when fully positioned.

1. Install a new gasket and the front adaptor plate to the engine block.

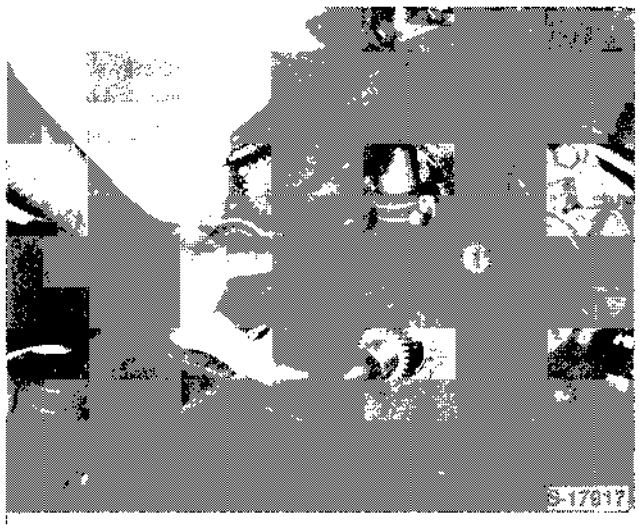

Figure 53
Port Block and Shaft Installation
1. Port Block Installer — Tool No. 11063

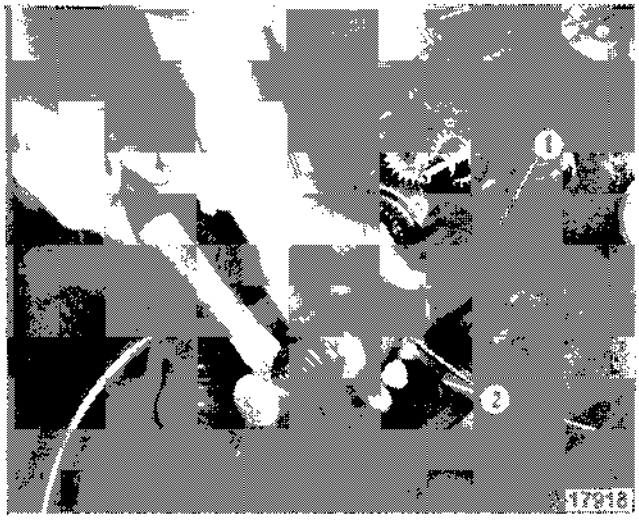

Figure 54
Port Block and Shaft Installation
1. Installer — Tool No. 11063
2. Driver

2. Install the tachometer drive gear and plate, Figure 55.

3. Position the two spacers, tachometer drive gear, camshaft, gear key, flyweight assembly, pins, slider, bearing, Figure 56.

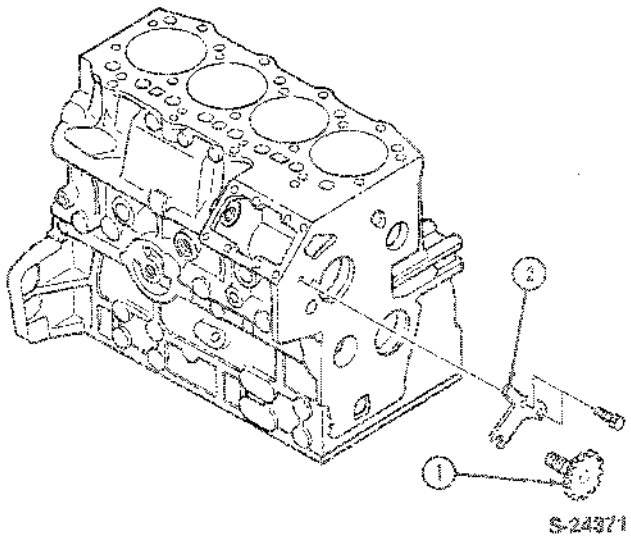

Figure 55
Tachometer Drive Shaft and Plate Installation — Model 1920
1. Tachometer Drive Gear
2. Plate

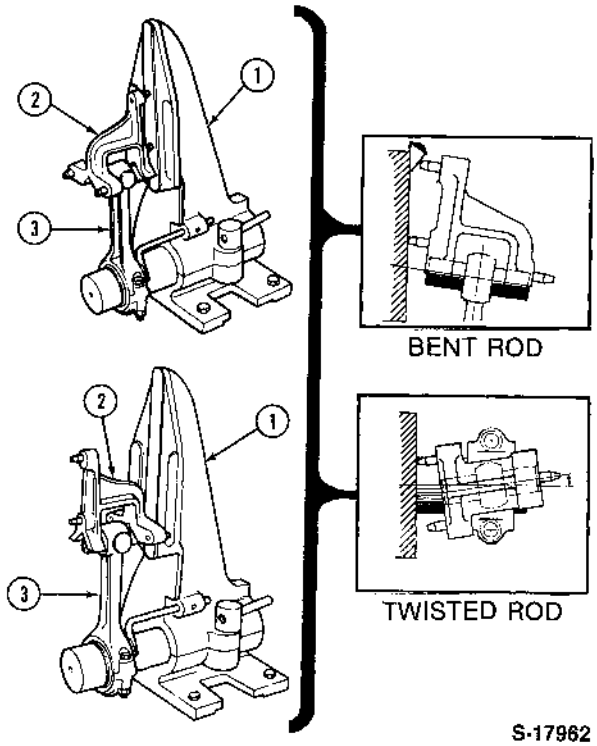

Figure 84
Connecting Rod Alignment Check

1. Alignment Fixture
2. Gauge
3. Connecting Rod

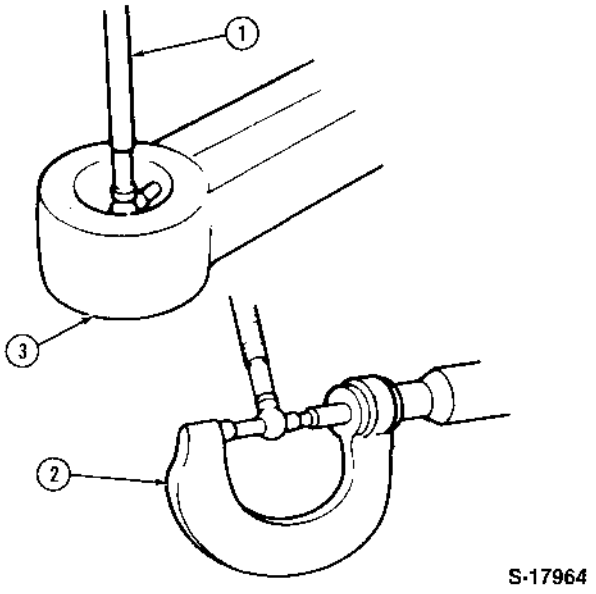

Figure 85
Connecting Rod Bushing Wear Check

1. Hole Gauge
2. Micrometer
3. Connecting Rod

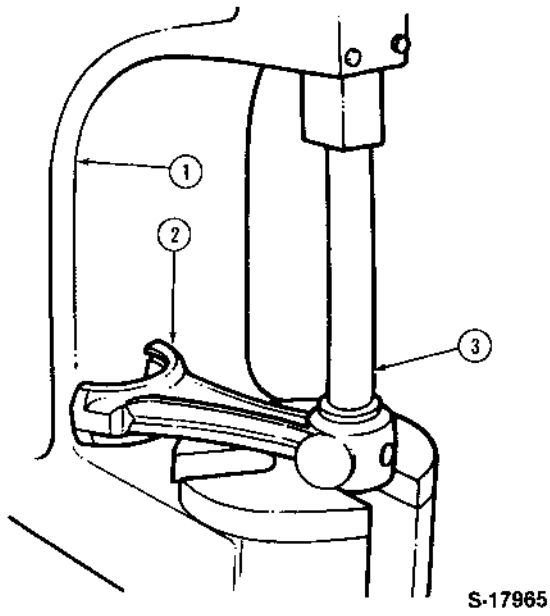

Figure 86
Connecting Rod Bushing Removal and Installation

1. Press
2. Connecting Rod
3. Bushing — Driver

Using a bushing driver and press, install a new bushing in the rod.

4. Ream and hone the bushing to the following finished size:

Model	Pin to Bushing Clearance Standard	Maximum
1920	.00039-.00098 in. (.010-.025 mm)	.0031 in. (.08 mm)
2120	.0008-.0016 in. .020-.040 mm)	.006 in. (.15 mm)

5. When installing a new pin bushing, use the hole in the rod as a guide and drill a lube hole in the new bushing, Figure 87.

6. Check the connecting rod side clearance on the crankshaft as follows:

   - Install the connecting rod on the crankshaft and torque the bolts to the specified torque.

   - Push the rod from side to side and check the clearance between the connecting rod and crankshaft with a feeler gauge, Figure 88.

NOTE: *Undersize bearings are available in 0.010-0.020 in. (0.25-0.50 mm) for both main and crank pin journals. See "Specifications," Chapter 3, for journal wear limits and bearing usage.*

4. Mount the crankshaft in a set of V-blocks and measure the amount of the runout, using a dial indicator as shown, Figure 104.

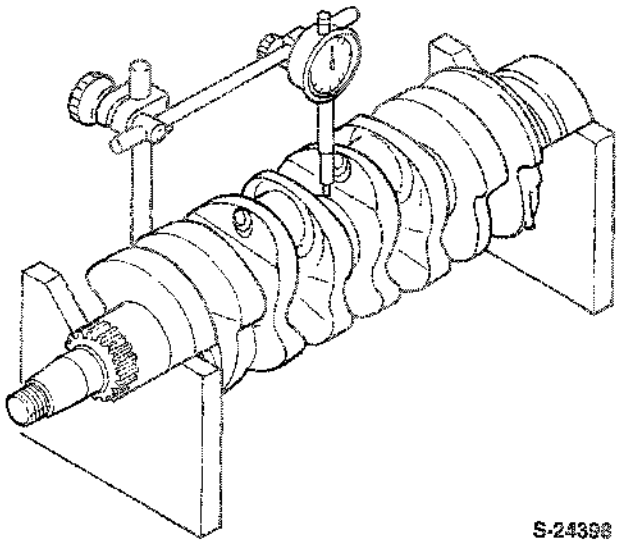

Figure 104
Crankshaft Runout Check

- If the crankshaft requires regrinding, grind the crankshaft to fit one of the two undersize bearings.
- Straighten or replace crankshafts that exceed runout specifications. See "Specifications," Chapter 3.

ASSEMBLY

1. Before installing the crankshaft in the block, use a dial indicator to measure the crankshaft bushings for wear and clearance. A full circle bushing is located in the bore in the front of the engine block.

   On the Model 2120 tractor a full circle crankshaft bearing is also used on the crankshaft rear main journal. See Figure 105.

   Replace bushings that are in excess of the following dimensions:

	Bushing Wear Limit
Inside diameter	2.684 in. (68.17 mm)

   To determine the bushing liner to crankshaft clearance, subtract the crankshaft journal diameter from the inside of diameter measurement of the bushing liner.

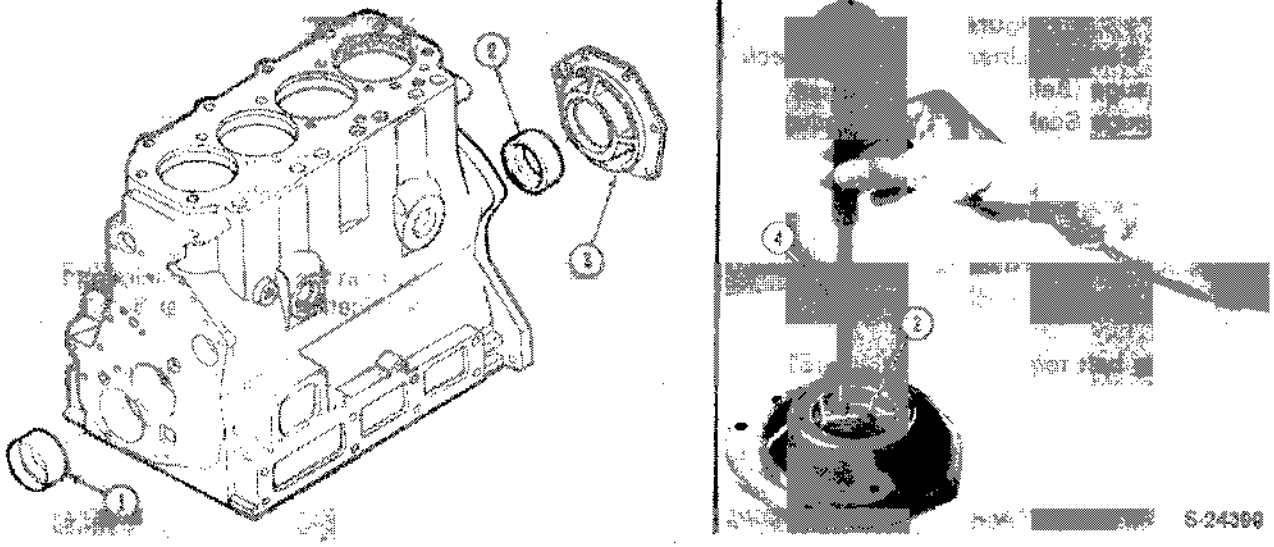

Figure 105
Crankshaft Front and Rear Bushing — Wear Check

1. Front Bearing Liner (1920-2120)
2. Rear Bearing Liner (2120)
3. Rear Bearing Retainer (2120)
4. Dial Indicator

THERMOSTAT

The thermostat is located between the coolant outlet on the engine and the radiator. In this position the thermostat is able to sense the coolant temperature in the engine and regulates the flow of coolant to the radiator. When the engine is cold, only a small amount of coolant flows to the radiator through the thermostat by-pass. As the engine warms up, the thermostat opens to allow sufficient coolant flow to the radiator to maintain a constant engine temperature.

WATER PUMP

The water pump is an impeller attached to a shaft which is belt driven by the engine crankshaft. The impeller circulates coolant by centrifugal force. Coolant entering the pump housing from the radiator through the lower hose is thrown outward against the housing with sufficient force to cause a circulating action.

FAN

A five bladed fan (1920), six bladed fan (2120) is belt driven by the engine crankshaft and is mounted on the water pump shaft. The fan is positioned behind the radiator to draw air over the radiator cooling fins. To increase and concentrate the volume of air flowing through the radiator, a shroud is positioned around the fan.

RADIATOR

The heat of combustion, absorbed by the coolant as it flows through the engine is transferred to the atmosphere by the radiator. Heat is removed from the coolant as it flows down through the radiator cores to the bottom radiator tank before it is recirculated into the engine.

RADIATOR CAP

The radiator cap acts to pressurize the cooling system as a pressure relief valve and also acts as a vent valve. The pressure valve permits a limited pressure build-up in the cooling system as the coolant heats up. This increased pressure increases the boiling point of the coolant. If excess pressure builds up in the system, the pressure relief valve will open until the pressure returns to the proper level.

When the engine is shut off and the coolant cools, a vacuum condition is created in the system. A vent valve in the radiator cap opens to permit outside air pressure to enter the system when this condition exists.

B. OVERHAUL

RADIATOR REMOVAL

1. Raise the hood and remove the side screens (2) and lower panels (3), Figure 123.

2. Remove the lower hood and grille (5), Figure 123.

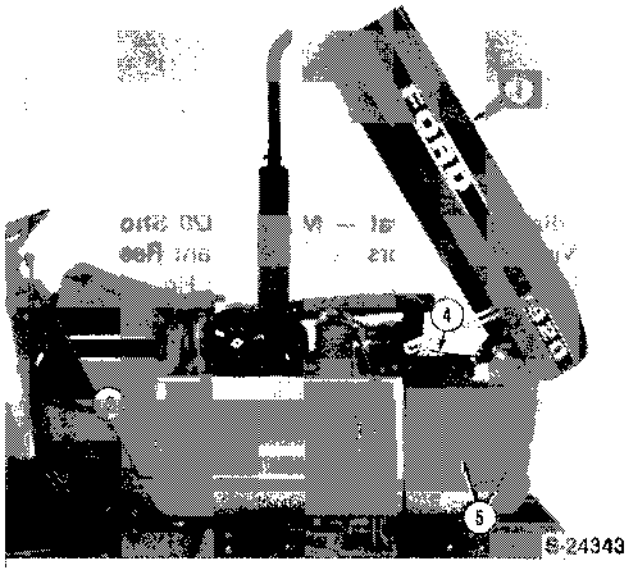

Figure 123
Engine Hood and Side Panel Removal

1. Hood Assembly
2. Side Screen
3. Lower Panel
4. Headlight Wiring
5. Lower Hood and Grill

3. Disconnect the headlight wiring connectors, Figure 124.

4. Loosen the clamp and remove the air intake hose (3), Figure 124.

5. Disconnect the coolant reserve tank hose (4), from the radiator, Figure 124.

6. Remove the radiator cap.

7. Open the drain, Figure 125, and collect the coolant in a clean container.

Engines (Cont'd.)

CONDITION	POSSIBLE CAUSES
Temperature Gauge Fails to Reach Normal Operating Temperature	1. Faulty temperature sender. 2. Faulty thermostat. 3. Faulty temperature gauge.
Excessive Exhaust Smoke	1. Air cleaner dirty or restricted. 2. Excessive fuel delivery. 3. Low cylinder pressure
Engine Cranks Over But Will Not Start	1. Insufficient charging or complete discharging of the battery. 2. Lack of fuel. 3. Air mixed in the fuel system. 4. Clogged fuel filter. 5. Irregular or faulty fuel supply. 6. Glow plug not heating. 7. Improper lubricating oil viscosity. 8. Clogged air cleaner.
Engine Does Not Crank	1. Faulty starter switch. 2. Breaking down of fusible link wire. 3. Faulty starter motor. 4. Main shift lever is not in the neutral position.
Engine Stops While Operating	1. Lack of fuel in the fuel tank. 2. Clogged fuel filter. 3. Air mixed in the fuel system. 4. Faulty component.
Undesirable Exhaust (white or pale)	1. Excess engine oil. 2. Improper lubricating oil viscosity. 3. Faulty injection timing.
Undesirable Exhaust Color (black or light grey)	1. Unsuitable fuel. 2. Excess injection. 3. Faulty engine component. 4. Overloading. 5. Clogged air cleaner.

COOLING SYSTEM

CONDITION	POSSIBLE CAUSES
High Temperature Indication — Overheating	1. Coolant level low. 2. Fan belt loose. 3. Radiator hose(s) collapsed. 4. Radiator blocked to airflow. 5. Faulty radiator cap. 6. Tractor overloaded. 7. Idle speed low. 8. Air trapped in cooling system. 9. Incorrect cooling system component(s) installed. 10. Faulty thermostat. 11. Water pump shaft broken or impeller loose. 12. Radiator tubes clogged. 13. Cooling system clogged. 14. Casting flash in cooling passages. 15. Excessive engine friction.

METRIC BOLT TORQUE SPECIFICATIONS

Bolt Size	Grade No.	Coarse Thread			Fine Thread		
		Pitch (mm)	Pounds-Feet	Newton-Meters	Pitch (mm)	Pounds-Feet	Newton-Meters
M6	4T (4T) (4.6)	1.0	3.6– 5.1	4.9– 6.9	–	–	–
	7T (7T) (8T) (8.8)		6.1– 8.3	8.3– 11.3			
	10T (10T) (11T)		8.7– 11.6	11.8– 15.7			
M8	4T	1.25	9.4– 12.3	12.7– 16.7	1.0	11.2– 14.8	15.2– 20.1
	7T		16.6– 21.0	22.6– 28.4		19.5– 25.3	26.5– 34.3
	10T		21.0– 26.8	28.4– 36.3		22.4– 29.7	30.4– 40.2
M10	4T	1.5	18.8– 24.6	25.5– 33.3	1.25	21.0– 26.8	28.4– 36.3
	7T		32.5– 41.2	44.1– 55.9		36.2– 46.3	49.0– 62.8
	10T		39.8– 51.4	53.9– 69.6		42.7– 54.2	57.9– 73.5
M12	4T	1.75	27.5– 34.7	37.3– 47.1	1.25	31.8– 40.5	43.1– 54.9
	7T		48.5– 61.5	65.7– 83.4		55.0– 69.4	74.5– 94.1
	10T		68.0– 85.4	92.2–116		73.1– 93.3	99.0–127
M14	4T	2.0	46.3– 59.3	62.8– 80.4	1.5	51.4– 64.4	69.6– 87.3
	7T		76.7– 96.9	104 –131		86.1–109	117 –148
	11T		102 –129	139 –175		108 –137	147 –186
M16	4T	2.0	63.6– 81.0	86.3–110	1.5	67.3– 84.6	91.2–115
	7T		110 –136	149 –184		116 –142	157 –192
	11T		152 –188	206 –255		163 –199	221 –270
M18	4T	2.0	83.9–104	114 –141	1.5	96.9–120	131 –163
	7T		145 –174	196 –235		170 –206	230 –279
	11T		203 –246	275 –333		221 –271	299 –368
M20	4T	2.5	106 –132	144 –179	1.5	127 –156	172 –211
	7T		177 –213	240 –289		203 –246	275 –333
	11T		268 –325	363 –441		293 –358	397 –485

C. SPECIAL TOOLS

	Tool No.
Seal Protector — Timing Gear Cover — Crankshaft	1584
Driver — Piston Pin	1585
Valve Guide Seal — Installer	1587
Socket — 27 mm Special Injector Socket	1588
Driver Handle — Use With Tools 1585 & 1587	7778
Engine Oil Pump Installer	11063
Engine Oil Pump Remover	11097
Dial Indicator — (Magnetic Base)	1345
Micrometer	0-1 inch
Micrometer	1-2 inch
Micrometer	2-3 inch
Small Hole Gauge	3/4-1 inch
Cylinder Bore Gauge	2-3 inch
Cylinder Bore Gauge	1-2 inch
Adaptor — Compression Test	FNH 00121
Adaptor — Compression Test 90° Elbow	FNH 00122

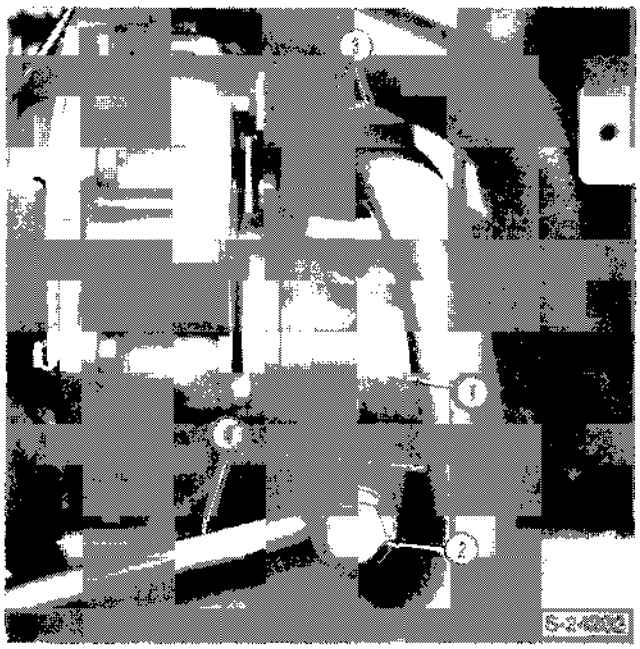

Figure 10
Hydraulic Pump Removal — Model 2120
1. Hydraulic Pump
2. Banjo Bolt
3. Hydraulic Line Attaching Bolts
4. Hydraulic Lines

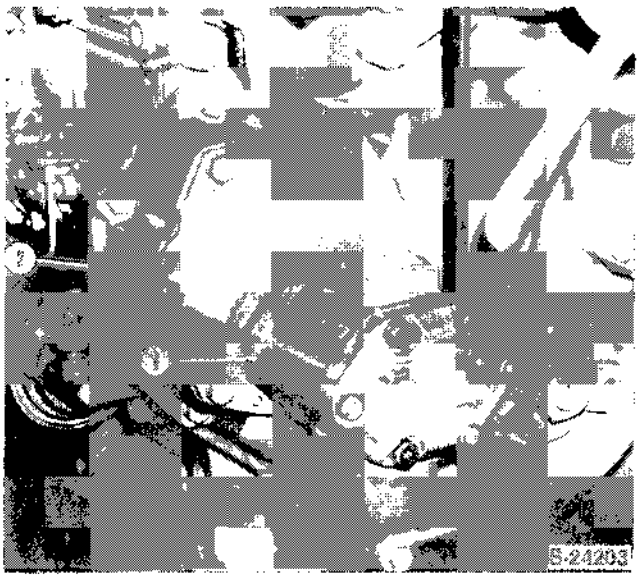

Figure 11
Hydraulic Pump Mounting — Model 2120
1. Hydraulic Pump
2. Injection Pump Gear Cover

Reference — Figure 12

10. Rotate the crankshaft until the timing marks (5) on the idler gear (4) and pump drive gear (1) are aligned.

11. Using a sharp chisel, make an alignment mark (7) on the pump drive gear and coupling.

12. Remove the retaining nut (3) and remove the drive gear and coupling as an assembly. Remove the coupling-to-shaft drive key.

13. Remove the pump mounting bolts and remove the injection pump.

NOTE: *Position a cloth shop towel between the injection pump drive gear and timing gear cover to prevent losing the retaining nut, lock washer or key during removal.*

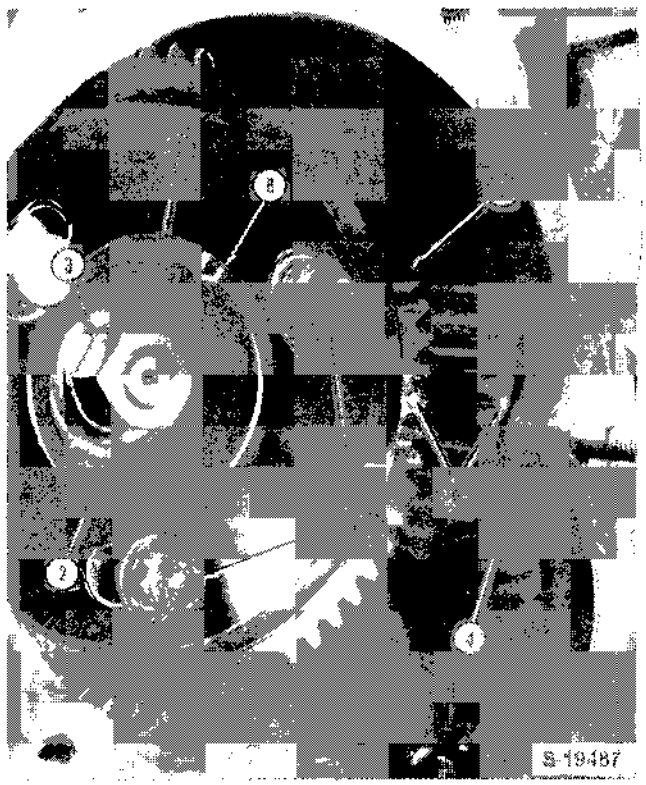

Figure 12
Injection Pump Removal — Model 2120
1. Injection Pump Drive Gear
2. Coupling
3. Retaining Nut
4. Idler Gear
5. Idler Gear-to-Pump Gear Timing Marks
6. Gear Retaining Bolts (3)
7. Gear to Coupling Chisel Mark
8. Coupling Notch

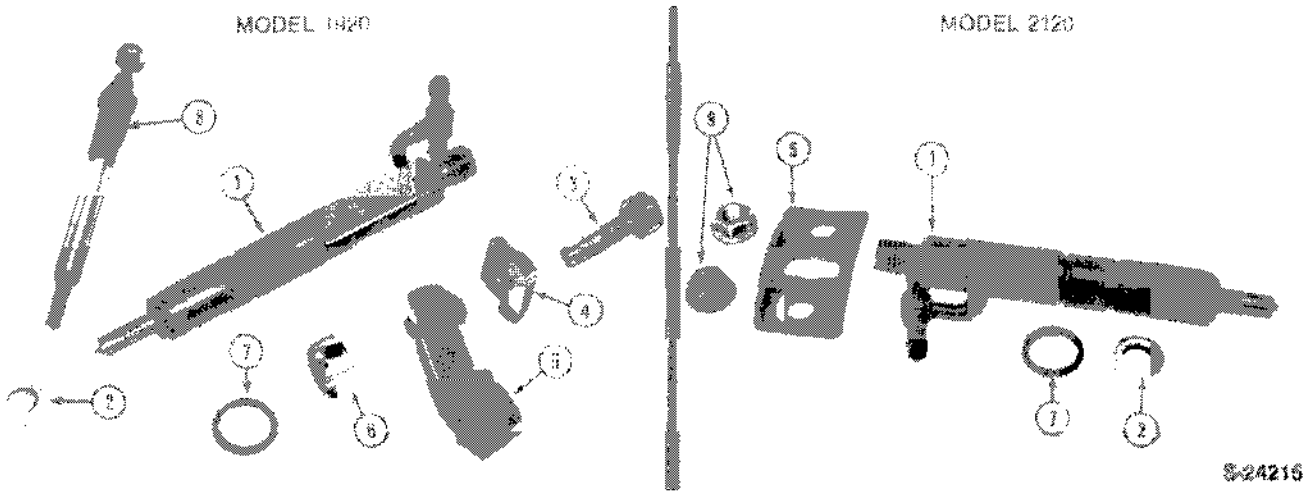

Figure 27
Injector Assembly Removal

1. Injector Assembly
2. Sealing Washer
3. Bolt/Stud
4. Clamp
5. Nozzle Clamp
6. Collar
7. O-Ring
8. Glow Plug
9. Nut

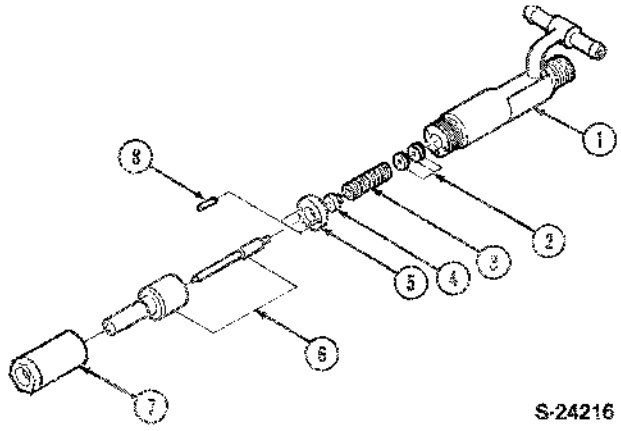

Figure 28
Injector Assembly Components

1. Body
2. Shims
3. Spring
4. Spring Seat
5. Spacer
6. Nozzle
7. Retaining Nut
8. Pin

PART 3
ELECTRICAL SYSTEMS

Chapter 1
WIRING, SWITCHES, GLOW PLUGS AND INSTRUMENTATION

A. DESCRIPTION AND OPERATION

The tractor wiring system consists of a front and rear main wiring harness. All connector plugs are so designed that they connect only to the correct matching connectors for all electrical components.

See wiring diagrams, Figures 1 and 2 for circuit diagnosis and trouble shooting.

KEY START SWITCH

See Chapter 3, Section E.

NEUTRAL START SWITCH

See Chapter 3, Section C.

COMBINATION LIGHTING AND FLASHER SWITCH

The combination light switch (1) Figure 3, is a rotary type switch. The combination switch has two controls, the main control knob controls the lighting system circuits and the flasher lever (2) controls the warning system lights.

The first position of the main lighting control knob is the "Off" position, second position is "High Beam" and the third position is "Low Beam."

The flasher switch has two positions only for "On" and "Off."

NOTE: *The main light switch nust be in one of the "On" positions to operate the flasher system.*

Figure 19
Glow Plug Wiring Check -- Model 1920 Shown
1. Ohmmeter Leads

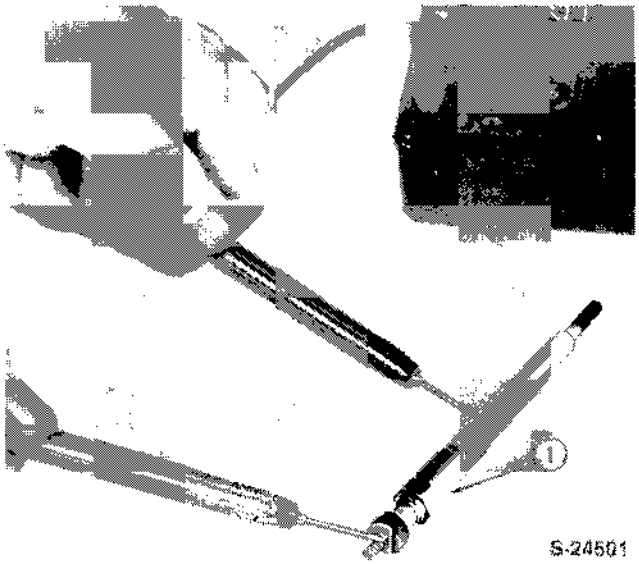

Figure 20
Glow Plug Element Check
1. Glow Plug

Figure 21
Glow Plug Indicator Lamp Removal
1. Circuit Board Panel 2. Glow Plug Lamp

ASSEMBLY

On assembly of the glow plugs, be sure the glow plug and cylinder head threads are clean and all electrical connections are clean and securely tightened.

GLOW PLUG INDICATOR AND RELAY CHECK

1. If the indicator lamp is not functioning, remove the instrument panel mounting screws and raise the instrument panel sufficient to remove the circuit board cover, Figure 21.

2. With the battery connected, use a 12-volt test lamp connected to the indicator lamp connector strip to determine that the lamp is receiving current when the key switch is turned to the heat position.

   If there is no current at the test lamp, check the wiring harness for broken wires or loose connections.

   If the test lamp shows that the indicator is receiving current but does not illuminate, connect the test light across the indicator lamp terminals and turn the key switch to the heat position.

   The test light should illuminate for 4-5 seconds and then go out. The indicator lamp is then defective and should be replaced.

   If the test light does not function for the preceding test, replace the timer relay (1) Figure 22.

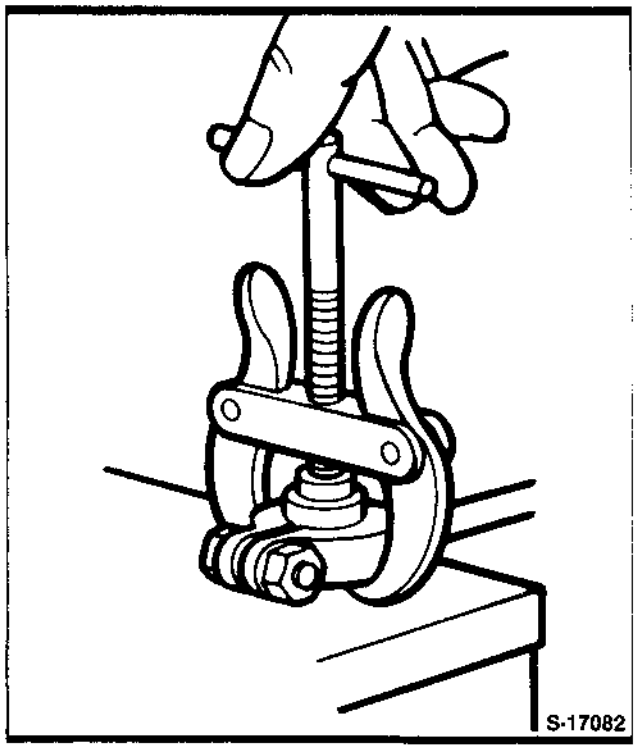

Figure 32
Battery Clamp Removal

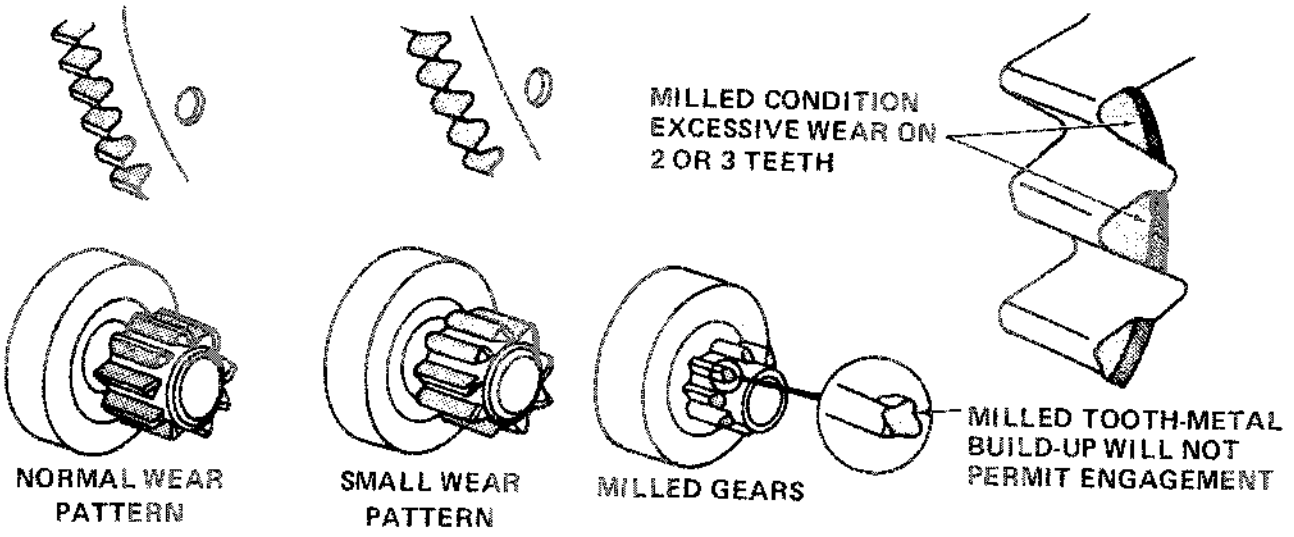

Figure 49
Pinion Gear Wear Check

Repeat this test on the remaining brush holder.

Test Results

High resistance reading = Good.

Low resistance reading = Grounded brush holder — Replace.

Figure 50
Armature Coil Continuity Check

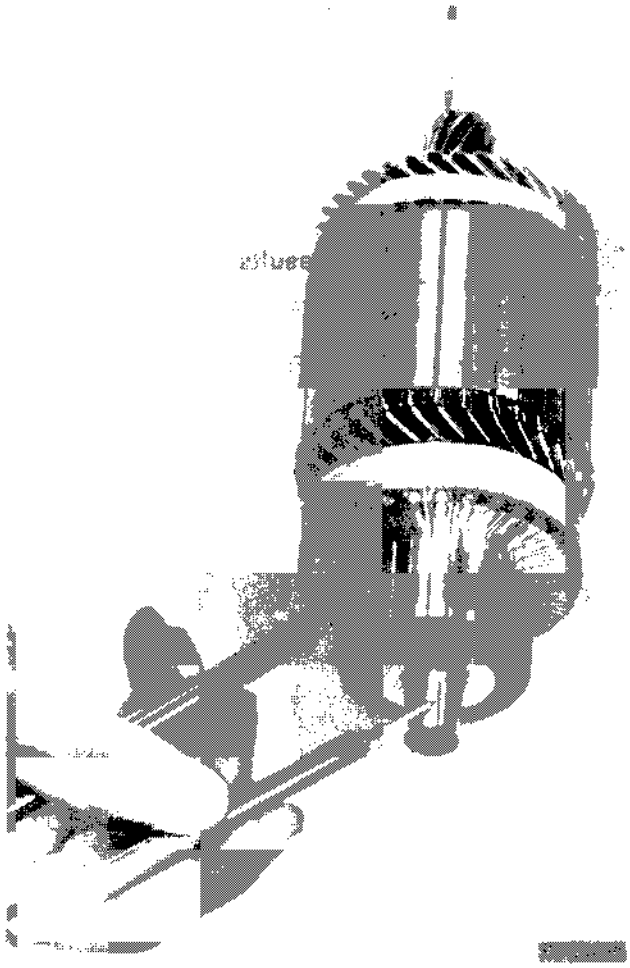

Figure 51
Armature Coil Ground Check

Figure 72
Fuse Box, Flasher, Timer and Neutral Start Switch Relay Location

1. Glow Plug Timer Relay
2. Fuse Box
3. Neutral Switch Relay
4. Flasher Relay

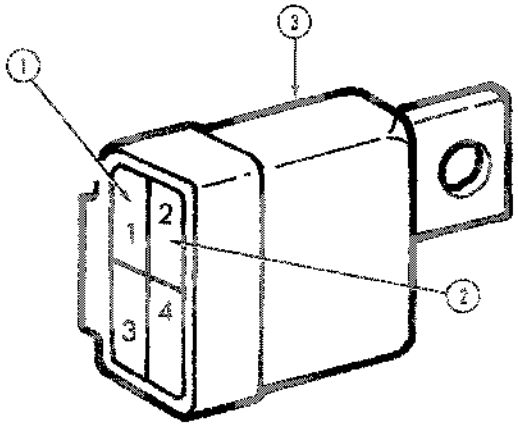

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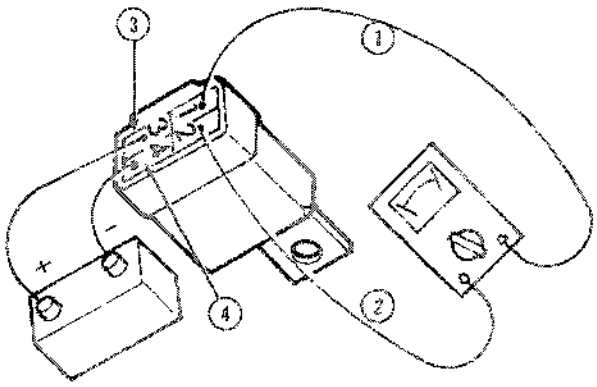
Figure 73
Relay Contact Switch Check

1. To Starter Motor
2. From Key Switch
3. Relay Assy.



S-19007

Figure 74
Relay Contact Switch Check

1. Terminal No. 1, Relay Contact
2. Terminal No. 2, Relay Contact
3. Relay Coil from Key Switch
4. Relay Coil to Reed Switch

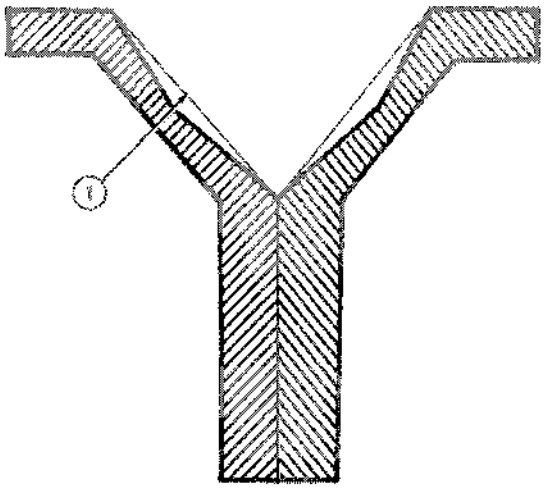


Figure 94
Pulley Inspection
1. Belt Wear Surface

HOUSING
Reference — Figure 95

Inspect the front and rear housings for the following:

1. Scoring in the bearing bores indicating the bearing was spinning in the housing.
2. Cracked or broken mounting bosses.
3. Damaged or cracked housings.

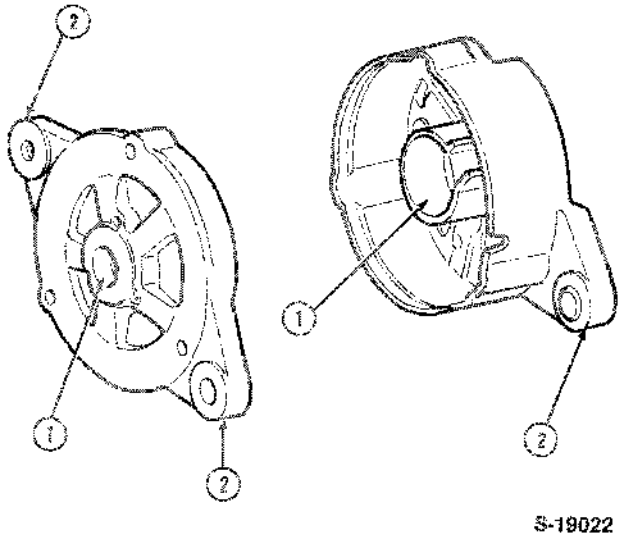


Figure 95
Alternator Housing Inspection
1. Bearing Bore 2. Mounting Bosses

BEARINGS
Reference — Figure 96

Inspect the bearings for the following conditions:

1. To determine the bearing condition, slowly rotate the bearings on the shaft or between the fingers. Replace bearings that are rough and do not rotate smoothly.
2. Inspect the bearings for indications of lubricant leakage past the bearing seals.
3. Inspect the inner and outer race for indications of spinning on the shaft or in the housing.

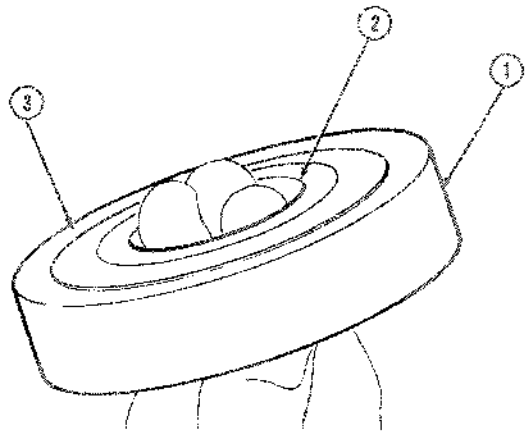


Figure 96
Ball Bearing Inspection
1. Outer Race 3. Seal
2. Inner Race

FAN
Reference — Figure 97

1. Inspect the fan for cracked or damaged hub.
2. Inspect the fins for cracks or other damage.

BRUSHES
Reference — Figure 98

Inspect the brush components for the following conditions:

1. Cracked or damaged brush springs.
2. Chipped or broken brushes.

Test Results

Voltmeter Reading:

Reads more than 10 volts = Good.

Less than 9.9 volts = Open circuit, open fuse, or faulty solenoid — Repair circuit/or Replace solenoid.

SOLENOID CONNECTOR — BLUE/RED WIRE VOLTAGE OUTPUT TEST

- Turn the starter swtich to the "On" position.
- Using a voltmeter, connect the voltmeter red lead to the blue/red wire terminal spade.
- Touch the voltmeter black lead to a good ground and observe the voltmeter reading.

Test Results

Voltmeter Reading:

Reads more than 10 volts = Good.

Reads less than 9.9 volts = Check ground connections, fuse — Repair circuit/or Replace solenoid.

ASSEMBLY

Assembly of the fuel stop solenoid follows the removal procedure in reverse.

INSPECTION

Reference — Figure 4

1. Inspect the pressure plate face for scoring, cracks or overheating. Minor imperfections may be removed by resurfacing the pressure plate face.

2. Inspect the release levers for wear or damage.

3. Inspect the release lever pivot pins and springs for excess wear or damage.

   Replace the pressure plate assembly if damaged.

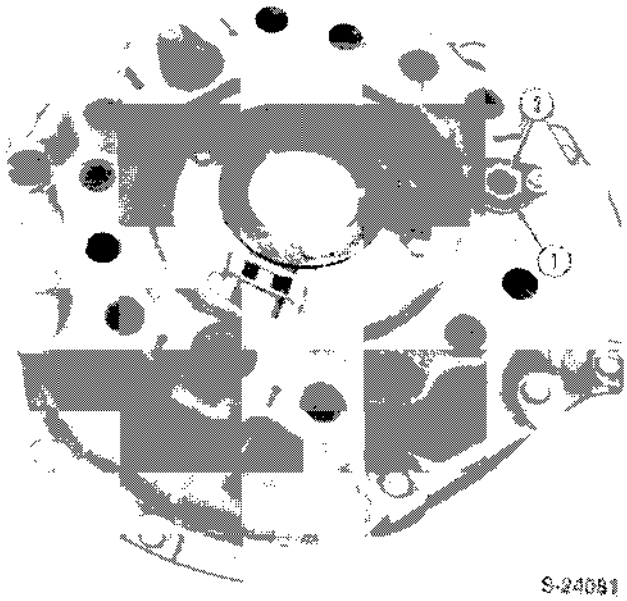


Figure 4
Pressure Plate Assembly

1. Locking Plate
2. Adjusting Nut

Reference — Figure 5

4. Inspect the clutch disc lining for excess wear. Replace the clutch disc if the lining is worn to less than .020 in. (.5 mm) from the top of the rivet head.

5. Inspect the clutch lining for indications of overheating, scoring, or oil impregnation in the lining.

6. Inspect the hub spline for excess wear.

7. Inspect the cushioning springs (3) for signs of wear or damage.

   If any damage to the disc is apparent, replace the clutch disc assembly.

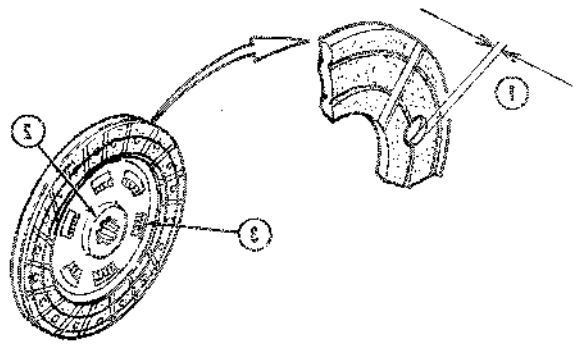


Figure 5
Clutch Disc Assembly

1. Disc Wear Limit .020 in. (.5 mm)
2. Clutch Hub
3. Cushioning Springs (6)

RELEASE LEVER HEIGHT ADJUSTMENT

Reference — Figure 6

NOTE: *Uneven release lever height may cause improper clutch operation and premature wear of the clutch disc. Always check and adjust the clutch release lever height whenever servicing the clutch or installing a new clutch assembly.*

For ease of adjustment, remove the flywheel from the engine as outlined under "Flywheel Removal," Part 1.

1. Install the clutch disc (1) and pressure plate assembly (2) securely onto the flywheel (3).

2. Remove the lock plates (4) and bolts, and loosen the locknuts (5).

3. Adjust each of the adjusting screws (6) until release lever plate (7) height is 2.14-2.19 in. (54.3-55.7 mm) from flywheel surface. The difference between highest position and lowest position should be less than .02 in. (0.5 mm).

4. After completing the adjustment, tighten the locknuts securely and reinstall the lock plate with bolts.

5. Depress each of the release levers several times and recheck the lever height for proper adjustment.

C. CLUTCH LINKAGE COMPONENTS — OVERHAUL

Separate the tractor between the engine and the clutch housing. See "Separating the Tractor," Part 12.

CLUTCH CROSS SHAFT BUSHINGS

Separate the tractor between the engine and clutch housing. See "Separating the Tractor," Part 12.

1. Remove the cotter pin and clevis pin and remove the adjustment rod from the clutch cross shaft, Figure 19.
2. Remove the snap ring from the right hand end of the cross shaft, Figure 18.
3. Remove the roll pin from the fork and cross shaft and withdraw the cross shaft from the clutch housing, Figure 18.
4. Use a suitable size driver and remove the bushings (2) from the clutch housing (1), Figure 20.
5. Reinstall new bushings using a suitable driver.

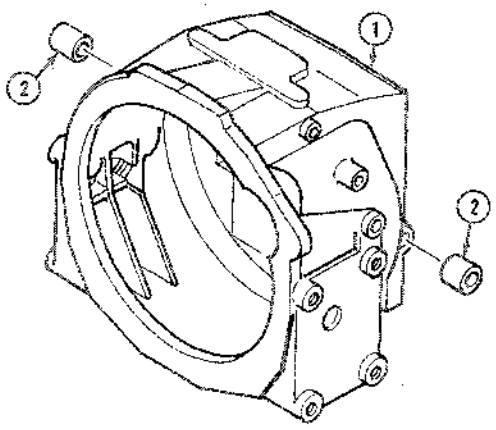


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Figure 20
Cross Shaft Bushing Overhaul
1. Clutch Housing 2. Bushings

ASSEMBLY

Reassembly of the cross shaft generally follows the removal procedure in reverse.

CLUTCH PEDAL BUSHINGS

REMOVAL
Reference — Figure 21

1. Disconnect the brake actuating rods (2) from the brake cross shaft (3) on both sides of the tractor.
2. Remove the two roll pins (8) from the brake cross shaft.
3. On tractors equipped with the 12 x 12 HSS transmission, remove the pins (9) and (10), and washer (12) and disconnect the fork joint (11).
4. Remove the clutch pedal return spring (6).
5. Remove the cotter pin and clutch adjustment rod (5) from the clutch pedal.
6. Withdraw the brake cross shaft from the support and remove the pedal from the shaft.
7. Using a suitable size driver, remove the bushings (7) from the clutch pedal assembly.
8. Reinstall new bushings using a suitable bushing driver.

ASSEMBLY

Assembly generally follows the removal procedure in reverse.

On assembly, if equipped with the hydraulic shuttle shift transmission (Model 2120) check and adjust the lube valve cable as follows:

1. Move the clutch pedal towards the disengaged position until all cable play is removed and the cable is ready to be pulled, Figure 22.
2. Place a wood block (2), Figure 22, between the clutch pedal arm and the bottom side of the running board.

   NOTE: *The pedal, in most cases, will be approximately one inch past center from its total stroke toward the disengaged position, Figure 22.*
3. Measure the distance between the clevis (3) and the cable bracket, Figure 22. This will be measurement "A."

PART 5
TRANSMISSION SYSTEMS

Chapter 1
NON-SYNCHROMESH 12 x 4 GEAR TRANSMISSION — MODEL 1920

A. DESCRIPTION AND OPERATION — MODEL 1920

The non-synchromesh transmission assembly provides twelve forward speeds and four reverse speeds which are manually selected by two levers.

As standard equipment, the transmission is driven by a double clutch and provides a live power take-off system.

The transmission has two compartments, Figure 1. The forward compartment contains the main transmission, which provides three forward and one reverse speed. The rear compartment contains the range gears which provide four range speeds for each of the main transmission speed ratios for a total of twelve forward and reverse speeds.

The main transmission lever (2), Figure 2, controls the three forward and one reverse speed in the main transmission compartment. The range selector lever (1), Figure 2, controls the selection for any of the four range speed gears located in the transmission rear compartment.

The transmission serves as a common oil reservoir which provides the gear lubricant for the differential assembly, transmission and hydraulic system. The oil used is Ford 134C.

The oil level dipstick (4) is located on the transmission top cover, Figure 2.

A transmission cross-section view, gear identification and power flows are shown in Figures 3 through 16.

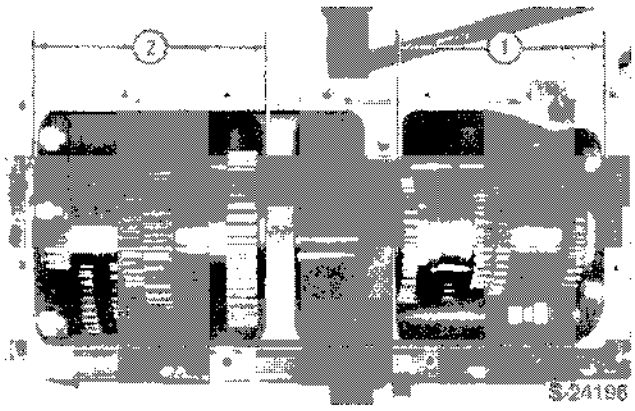

Figure 1
Non-Synchromesh 12 x 4 Gear Transmission Model 1920

1. Main Transmission — Gearbox
2. Range Gear — Gearbox

2. After adjustment, stake the collar nut flange into the groove to lock the assembly together.

   NOTE: *Never use a collar assembly if the staking has been upset.*

Figure 26
Collar Adjustment

1. Collar

COUNTERSHAFT ASSEMBLY
Reference — Figure 17

1. If removed, install the large snap ring in the case web and the smaller snap ring on the countershaft.

2. Position the front bearing (8), fixed gears and collar.

3. Install the countershaft from the rear through the fixed gears, collar and front bearing.

4. Install the rear bearing (3), Figure 17.

5. Lubricate the splines on the PTO countershaft and install it into the transmission.

   NOTE: *Use care when installing the PTO countershaft so as not to damage the seals in the transmission input shaft.*

6. Re-install the transmission into the tractor.

C. SHIFT LEVERS

The non-synchromesh transmission utilizes two shift levers. The main transmission gearshift lever is column mounted, Figure 27. The range gearshift lever is located on the left hand side of the operator's seat, Figure 28. The main shift lever controls the 1st-3rd and 2nd-Rev. gearshifts. The range gear levers control the four range speeds.

Overhaul of the gearshift levers and linkage requires only normal repair procedures. On assembly observe the following requirements.

- With the transmission gears in neutral, assemble the gearshift arm (5) Figure 27, to align the change lever (14) in the neutral position with the guide on the instrument panel.

  Tighten the column shift bracket (6) mounting bolts to 27-31 lb. ft. (36-42 Nm) torque.

- Install the neutral start switch (1) being certain to have the small pin on the switch shaft located in the roll pin groove.

- Center the switch assembly in the slotted holes and tighten the mounting bolts finger tight. Test the switch operation making sure the switch has continuity in the neutral position only. Adjust the switch as required and then tighten the switch mounting screws securely.

  NOTE: *Switch mounting plate is slotted to allow adjusting neutral position.*

MAIN SHIFT FORKS — SHIFTER BOSSES AND SHIFT RAILS REMOVAL

Reference — Figure 49

1. Drive out the roll pins (1) from the main transmission shift rail forks (2) and shifter bosses (3).
2. Remove the detent pins (4), springs (5) and balls (6) from the top of the housing.
3. Slide the shift rail out the front of the housing. Remove the forks and bosses.

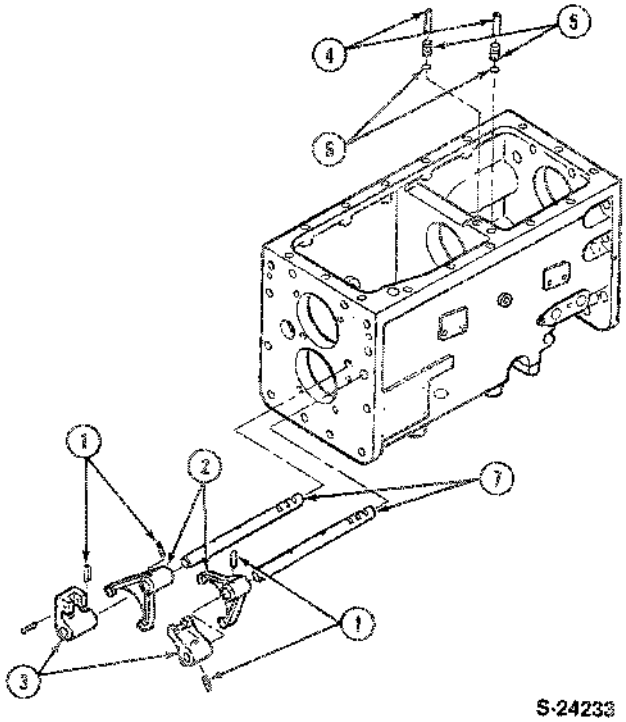

Figure 49
Main Shift Forks, Shifter Bosses and Shift Rails Removal

1. Roll Pins
2. Shift Forks
3. Shifter Bosses
4. Pins
5. Springs
6. Steel Balls
7. Shift Rails

REVERSE IDLER GEAR REMOVAL

Reference — Figure 50

1. Drive out the roll pin (1) from the reverse idler gear shaft (2).
2. Remove the reverse idler gear shaft locking bolt (3) and seal washer (4) from the R.H. side of the housing.
3. Slide out the reverse idler gear shaft from the front of the housing while supporting the idler gear (5) and thrust washer (6).
4. Remove the idler gear (5), needle bearing (7) and thrust washer (6).

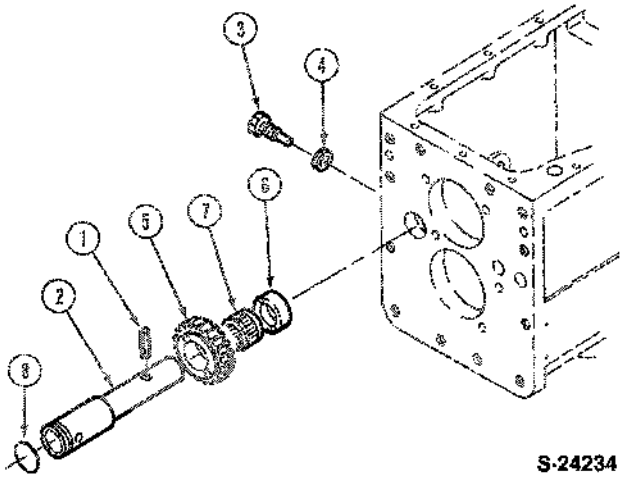

Figure 50
Reverse Idler Gear Removal

1. Roll Pin
2. Shaft
3. Locking Bolt
4. Seal Washer
5. Reverse Idler Gear
6. Thrust Washer
7. Needle Bearing
8. O-Ring

REAR MAIN SHAFT REMOVAL

Reference — Figure 51

1. Remove the coupling (4).
2. Remove the rear bearing retaining ring (1).
3. While supporting the sliding gears (3), remove the main shaft from the rear.

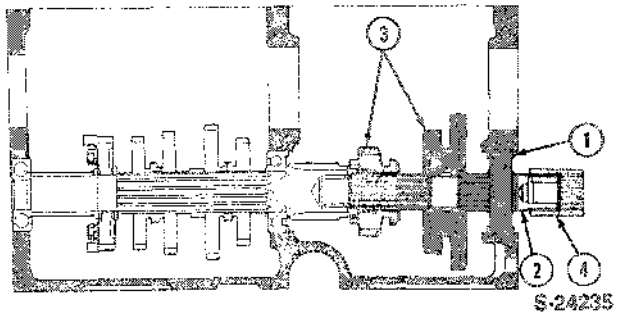

Figure 51
Rear Main Shaft Removal

1. Snap Ring
2. Rear Main Shaft
3. Sliding Gears
4. Coupling

PART 5
TRANSMISSION SYSTEMS

Chapter 3
SYNCHROMESH 12 x 12 SHUTTLE TRANSMISSION — MODEL 1920

A. DESCRIPTION AND OPERATION

The synchromesh shuttle transmission provides 12 forward and 12 reverse speeds which are manually controlled by three levers. The synchromesh shuttle transmission is driven by a double clutch and provides a live power take-off system.

The transmission case contains three compartments. The forward compartment (1), Figure 66, contains the forward and reverse shuttle transmission gears. The gears are designed for synchronized shifting and are controlled by a column mounted shift lever (1), Figure 67.

Figure 66
Synchromesh 12 x 12 Shuttle Gear Transmission
1. Shuttle Transmission Gears
2. Main Transmission Gears
3. Range Transmission Gears

The middle compartment (2), Figure 66, contains the main transmission gears consisting of four gear speeds. These gears are designed for synchronized shifting and are controlled by the column mounted shift lever (2), Figure 67.

Figure 67
Synchromesh Shuttle Shift Transmission — Control Levers
1. Shuttle Shift Lever
2. Main Shift Lever

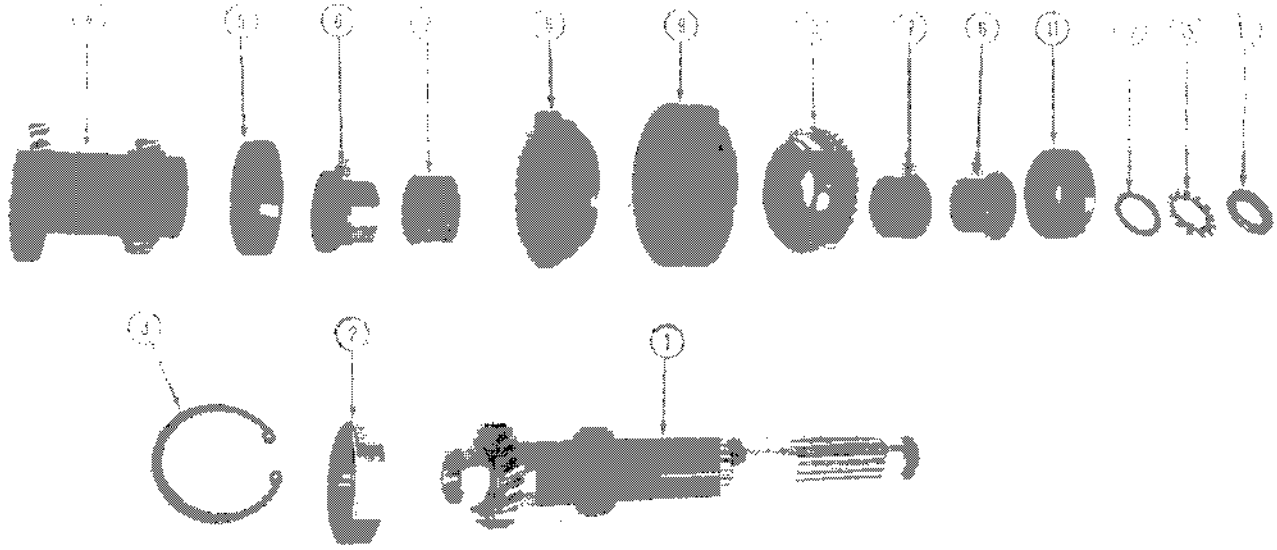

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Figure 88
Main Countershaft Assembly

1. Main Countersheft
2. Bearing (6207)
3. Snap Ring
4. Fixed Counter Gear
5. Bearing (6207)
6. Collar
7. Needle Bearing
8. Counter Gear
9. Gear Assy.
10. Counter Gear
11. Bearing (6303)
12. Thrust Washer
13. Lock Washer
14. Locknut

NOTE: *Install the oil groove side of the thrust washer face toward the idler gear.*

2. Install a new O-ring (7) on the front of the shaft.
3. Insert the idler shaft (3) from the front through the gear (5), needle bearing (4) and thrust washer (6).
4. Install the roll pin (1) in the shaft to secure the thrust washer and gear in place.
5. Align the shaft lock bolt counterbore and install the locking bolt (2), using a new sealing washer.

INPUT SHAFT ASSEMBLY
Reference — Figure 91

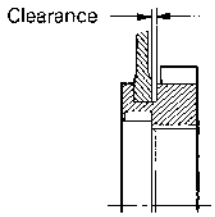
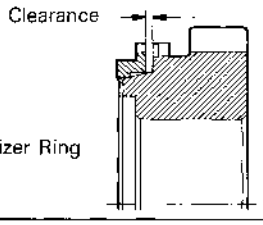
1. Using a suitable size installer, install a new oil seal (12), in the input shaft.
2. If removed install the snap ring (9) in the case web.
3. Insert the input shaft into the front of the case and position the gear (4) and the two snap rings (10) on the shaft.
4. Position the gear (3) and bearing (2) on the shaft and install the two snap rings (10) in their shaft grooves.

D. TROUBLE SHOOTING AND SPECIFICATIONS

TROUBLE SHOOTING

CONDITION	POSSIBLE CAUSE	REMEDY
Gear oil leakage	1. Excessive gear oil	1. Adjust the oil amount to the specified level on the oil dipstick.
	2. Loosened bolts	2. Retighten.
	3. Worn oil seal or O-ring	3. Replace the oil seal or O-ring.
	4. Defective gasket	4. Replace gasket.
	5. Cracked transmission housing	5. Replace the transmission housing.
Abnormal sound	1. Worn bearing	1. Inspect and replace.
	2. Excessive gear backlash	2. Adjust or replace.
	3. Worn gears	3. Replace.
	4. Gears improperly engaged	4. Adjust or replace.
	5. Oil level low	5. Fill as required.
Gear not engaged	1. Damaged shift lever	1. Replace
	2. Bent or damaged shifter fork or shifter rod	2. Correct or replace.
	3. Clutch is not disengaged	3. Refer to Chapter 4, Part 4.
Gears disengaged	1. Damaged spring	1. Replace.
	2. Worn detent groove ball on the shifter rod	2. Replace the shifter rod.
	3. Uneven gear wear	3. Replace.
	4. Shifter rod detent ball worn	4. Replace.
Gears not disengaged	1. Bent shifter rod	1. Correct or replace.
	2. Foreign matter locked in gears	2. Remove the foreign matter.
	3. Dragging clutch	3. Replace the clutch.

SPECIFICATIONS

Gear Backlash	.0016-.0063 in. (.04-.16 mm)
Allowable Backlash	.0236 in. (0.6 mm)
 Clearance Between Slide Gear and Shifter Fork Allowable Clearance Limit	.008-.016 in. (0.2-0.4 mm) .039 in. (1.0 mm)
 Clearance Between Synchronizer Ring and Gear Allowable Clearance Limit	.059 in. (1.5 mm) .031 in. (0.8 mm)

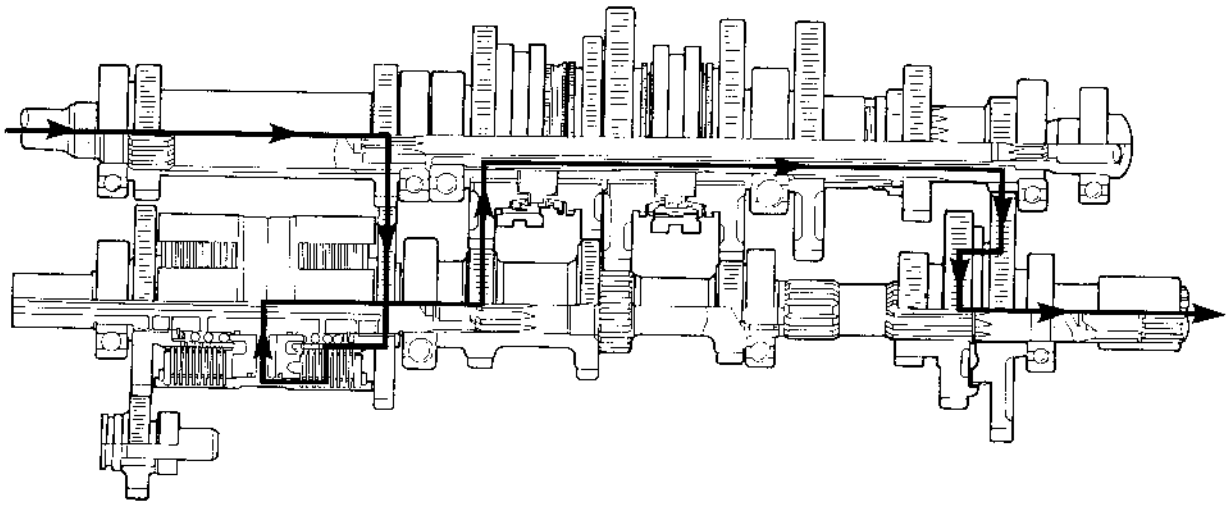


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Figure 123
Power Flow — Speed 3 (R3) —
3rd Main — Low Range

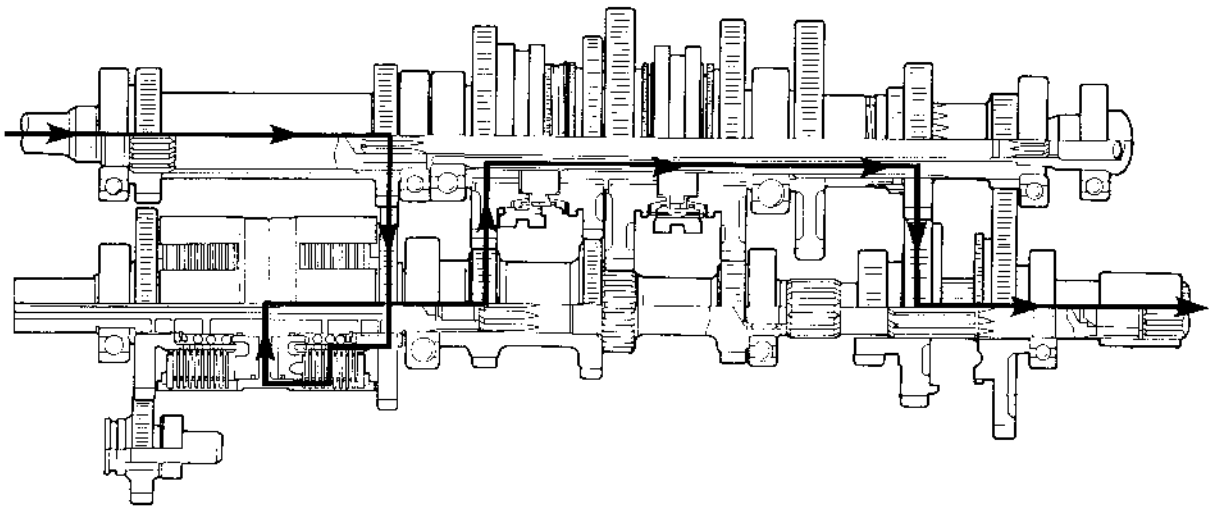

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Figure 124
Power Flow — Speed 7 (R7) —
3rd Main — Middle Range

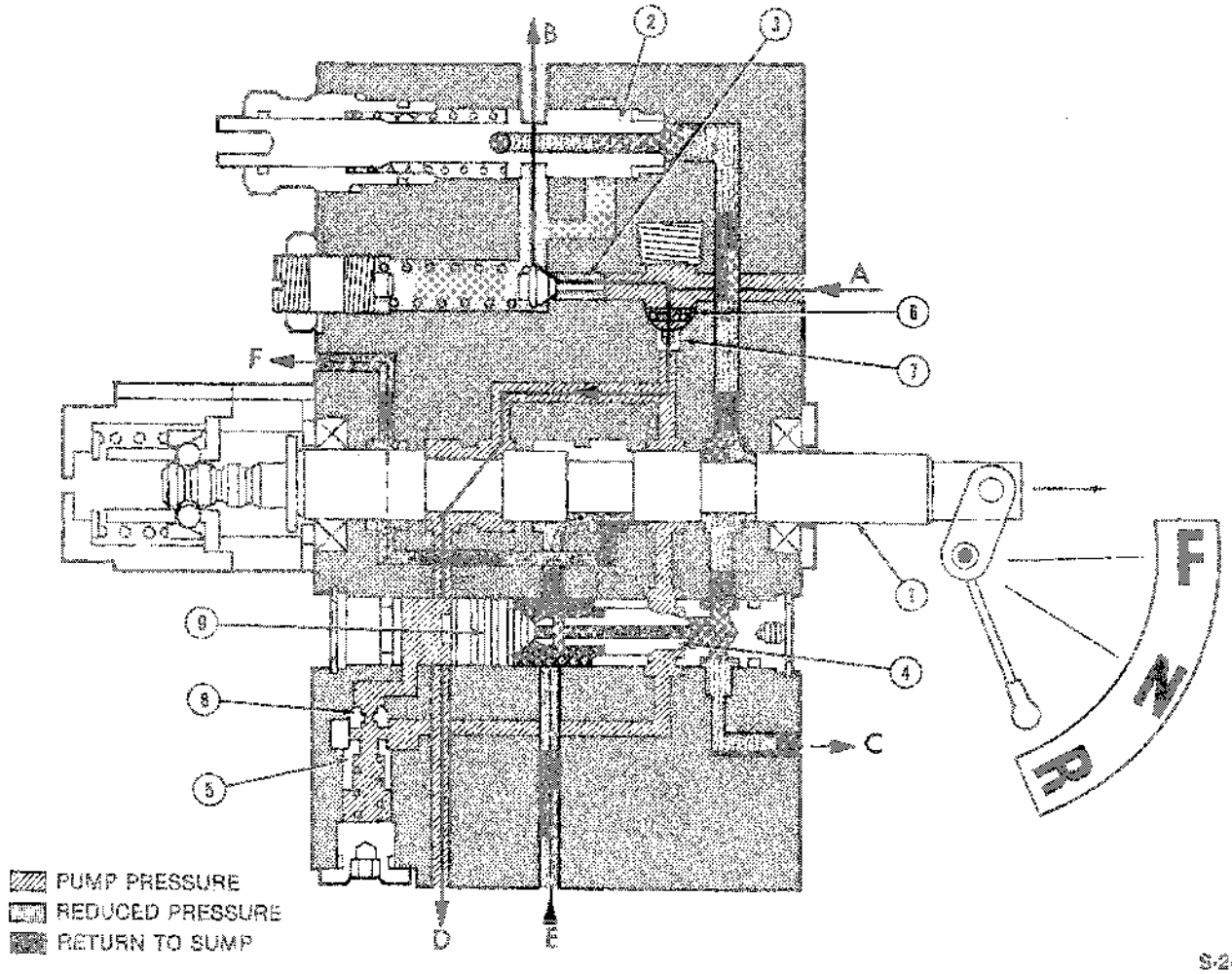


Figure 136
Oil Flow — Reverse Position

A. Pump Pressure
B. Lube — Reduced Pressure
C. To Sump
D. Reverse Clutch Passage
E. Forward Clutch Passage
F. Shuttle Clutch to Sump

1. Control Valve Spool
2. Lube Cut-Off Valve Spool
3. Relief Valve
4. Pressure Regulating Valve
5. Check Valve
6. Filter (Screen)
7. Orifice
8. Orifice
9. Piston
10. Forward Clutch
11. Reverse Clutch
12. Forward Drive Gear

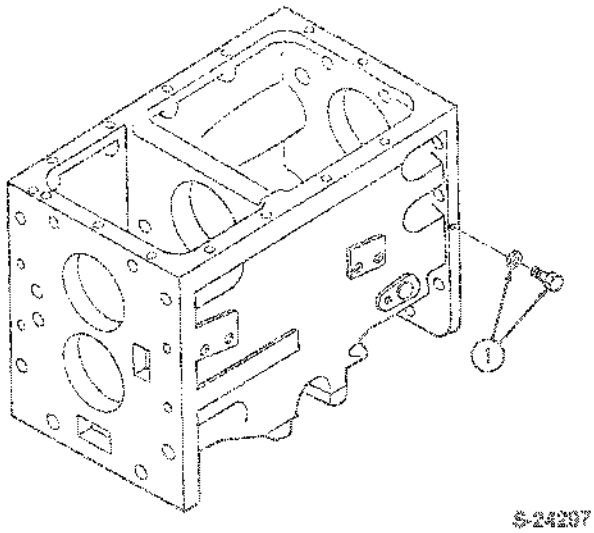


Figure 155
Range Gearshift Fork and Rail Removal
1. Lock Bolt and Seal

2. Rotate the shift rail 1/4 turn and slide the rail (1) out the rear of the housing, Figure 156.

NOTE: *Use care on removing the shift rail as the detent spring and ball will be expelled with considerable force when released by the rail. Cover the shift fork detent bore with a shop towel when removing the rail.*

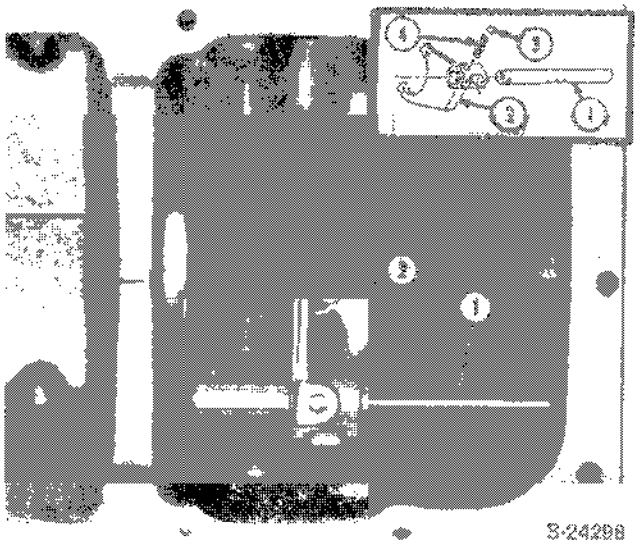


Figure 156
Range Gearshift and Rail Removal
1. Shift Rail
2. Shift Fork
3. Detent Ball
4. Detent Spring

3. Remove the shift fork (2), detent ball (3) and spring (4), Figure 156.

HSS TRANSMISSION INSPECTION AND REPAIR

1. Wash all components using a suitable cleaning solvent and air dry.

2. Inspect all bearings for excess wear, score marks, discoloration from overheating or other damage. Rotate the bearings by hand and check for roughness while turning the inner and outer races.

3. Lubricate all bearings with a clean lubricant before assembly.

4. Inspect the transmission case for cracks, worn bearing bores or other damage.

5. Check the detent springs for wear, chipped or weak spring tension.

6. Inspect the detent balls for excess wear or other damage.

7. Inspect the shift rail detent grooves for excess wear.

8. Inspect the gears for excess wear, chipped gear teeth or other damage.

9. Inspect the shift forks for excess wear, bent forks or other damage. See "Specifications," this Chapter.

10. Establish matching marks between the coupler and gear and inspect the synchronizer components for excess wear or other damage, Figure 157 and 158. Measure the cone wear between the synchronizer ring and gear, Figure 159. See "Wear Limit Specifications.".

11. Using a feeler gauge, measure the side clearance between the shift fork and the sliding collar, Figure 160. See "Side Clearance Wear Limit Specifications," this Chapter.

HSS TRANSMISSION ASSEMBLY

1. Lubricate all components with clean transmission oil prior to assembly into the case.

2. Install new gaskets and seals during assembly.

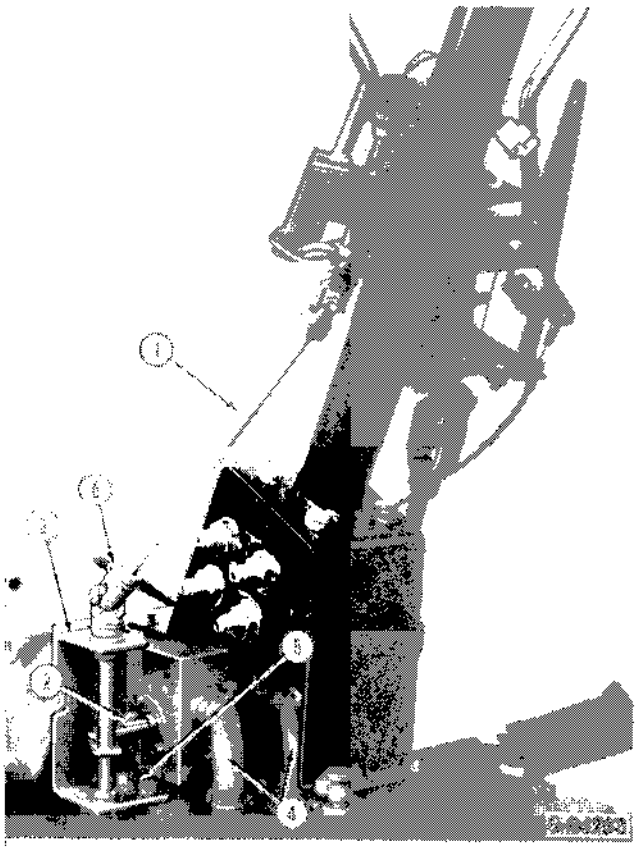


Figure 181
HSS Control Valve Removal

1. Shuttle Shift Control Rod
2. Shift Link
3. Shift Rod Bracket
4. Hose (2)
5. Mounting Bolts (2)
6. Universal Joint

10. Remove the two mounting bolts (5) and remove the control valve.

    NOTE: *Use care and observe the O-rings seals used between the valve body and the clutch housing.*

DISASSEMBLY

CONTROL VALVE SPOOL
Reference — Figure 182

1. Remove the two bolts and remove the spool cap (1), Figure 182.

2. Remove the shim (2), spring (3), bushing (4), steel balls (5), guide (6), spacer (7) and plate (8).

3. Remove the seals (9).

4. Remove the two screws and remove the plate (12), from the opposite end.

5. Push the spool out of the valve body and remove the seal (11).

LUBE CUT-OFF VALVE
Reference — Figure 182

1. Remove the bushing (13), spring (15) and lube cut-off valve spool (16) from the valve body.

CHECK VALVE
Reference — Figure 182

1. Remove the plug (17), spring (18) and valve poppet (19), from the valve body.

PRESSURE REGULATING VALVE
Reference — Figure 183

1. Remove the snap ring (1).

2. Install a 5 mm bolt in the end of the valve seat (2) and pull the seat out of the valve body.

3. Remove the valve (3), springs (4 and 5) from the valve body bore.

4. Remove the snap ring (9), and push the piston (7) and plug (8) out of the bore.

RELIEF VALVE
Reference — Figure 182

1. If required, loosen the locknut and unscrew the adjusting screw (20) from the valve body.

    NOTE: *Do not loosen or remove the adjusting screw unless required as this affects the pressure setting and will require resetting pressure after completing assembly.*

FILTER AND ORIFICE
Reference — Figure 183

1. Remove the plug (10).

2. Remove the snap ring (11).

3. Remove the filter screen (12).

4. Using a 2 mm allen wrench, remove the orifice (13).

E. TROUBLE SHOOTING AND SPECIFICATIONS

TROUBLE SHOOTING

HSS TRANSMISSION — MAIN AND RANGE GEARS

CONDITION	POSSIBLE CAUSE	REMEDY
Oil leakage	1. Over fill	1. Adjust oil level.
	2. Loose bolts	2. Retorque.
	3. Worn oil seal or O-ring	3. Replace.
	4. Defective gasket	4. Replace.
	5. Cracked case	5. Replace.
Abnormal sound	1. Worn bearing	1. Inspect and replace.
	2. Excessive gear lash	2. Adjust or replace.
	3. Worn gears	3. Replace.
	4. Gears improperly engaged	4. Adjust or replace.
	5. Low oil level	5. Adjust oil level.
Gears will not engage	1. Clutch does not disengage	1. Refer to Chapter 4 Part 4.
	2. Bent or damaged shifter fork or rod	2. Correct or replace.
	3. Damaged Shift lever	3. Replace.
Gears disengage	1. Damaged detent spring	1. Replace.
	2. Worn detent grooves	2. Replace.
	3. Excessive gear wear	3. Replace.
	4. Worn detent ball	4. Replace.
Gears difficult to disengage	1. Bent shift rod	1. Replace.
	2. Foreign material in synchronizer gear	2. Disassemble and clean
	3. Main clutch drags	3. Adjust free play or adjust.

PART 5
TRANSMISSION SYSTEMS

Chapter 6
CREEPER GEAR OPTION — MODEL 2120

A. DESCRIPTION AND OPERATION

The creeper gear reduction is available as a factory installed option on the Model 2120 tractor equipped with either the 12 x 4 non-synchromesh or the synchromesh 12 x 12 hydraulic shuttle transmission.

On the 12 x 4 non-synchronized transmission, the creeper gear option provides an additional 12 forward a 4 reverse speeds for a total of 24 reverse and 8 reverse speed gears.

On the synchromesh 12 x 12 hydraulic shuttle shift tranmission, the creeper gear option provides an additional 12 forward and 12 reverse speeds for a totol of 24 forward and 24 reverse speed gears.

See Figures 203 and 204 for ground speed charts for each type of transmission.

The creeper gear control lever is located on the top left hand side of the rear axle center housing.

To engage the creeper gear, push the lever to the fully forward (down) position. To restore the standard gear speeds, pull the lever to the full (up) position.

The creeper gear consists of a sliding gear (2), Figure 205, on the drive pinion shaft (5) and a fixed gear (1) and main shaft (12). When the creeper control lever is moved to the standard gear position (up), the shifter fork (8) is moved forward and couples the sliding gear (2) directly to the transmission output shaft (4). This couples the output shaft to the drive pinion to provide standard drive.

When the creeper control lever is moved to the creeper engaged position (down), the sliding gear is moved rearward engaging the gear of main shaft (12).

Power then flows from the transmission output shaft (4) to the fixed gear (1) and main shaft (12), to the sliding gear (2), which is splined to the drive pinion shaft, thus reducing speed at the final drive.

2. While supporting the sliding gear, gently drive the output shaft rearward and remove them from the housing.

3. If required, remove the bearing (2) from the housing.

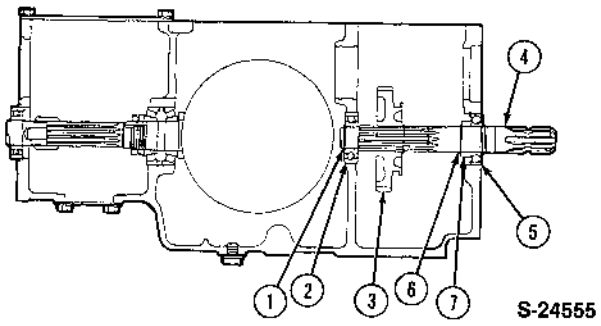


Figure 6
Live Power Take-Off
(One-Speed PTO Shown)

1. Snap Ring
2. Bearing
3. Sliding Gear
4. PTO Output Shaft
5. Bearing
6. Snap Ring
7. Collar

POWER TAKE-OFF LEVER AND SHIFTER REMOVAL
Reference — Figure 7

1. Drive the roll pin out of the change lever (1) and separate it from the shift arm.

2. If not previously removed, remove the cover (10) from the top of the rear axle center housing.

3. Drive the roll pins out of the shifter fork (4), boss (5) and protrusion (6) and remove the fork and protrusion.

4. While supporting the shifter boss, slide the shift rail (3) and sealing plug (11) rearward, and remove them from the housing.

5. Remove the shift arm inward of the housing.

NOTE: *Use care to not lose the detent ball (8) and spring (7), Figure 7.*

INSPECTION

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

2. Inspect the gears for excess wear or damage.

3. Check the bearing for excess wear or damage by slowly rotating by hand.

4. Inspect the shift rail for worn grooves.

5. Inspect the detent spring and ball for excess wear or damage.

POWER TAKE-OFF LEVER AND SHIFTER ASSEMBLY
Reference — Figure 7

1. Install the shift arm from inside of the housing.

2. Position the shift fork, boss and protrusion in place.

3. Insert the shift rail from the rear through the shifter fork, boss and protrusion and drive the roll pin in to secure them.

4. Install the top cover, if removed and install the neutral switch (9) on the top cover.

5. Install the change lever into the shift arm and drive the roll pin in to secure the change lever.

OUTPUT SHAFT ASSEMBLY
Reference — Figure 8

1. If removed, install the bearing (2) in the housing.

2. Position the bearing (5), snap ring (8), collar (7), two snap rings (6) on the shaft and insert the output shaft assembly from the rear through the sliding gear and front bearing.

3. Install the front snap ring (1) onto the front of the output shaft.

COUNTERSHAFT ASSEMBLY
Reference — Figure 9

1. If removed, install the bearing (9) and snap ring (8) in the center housing.

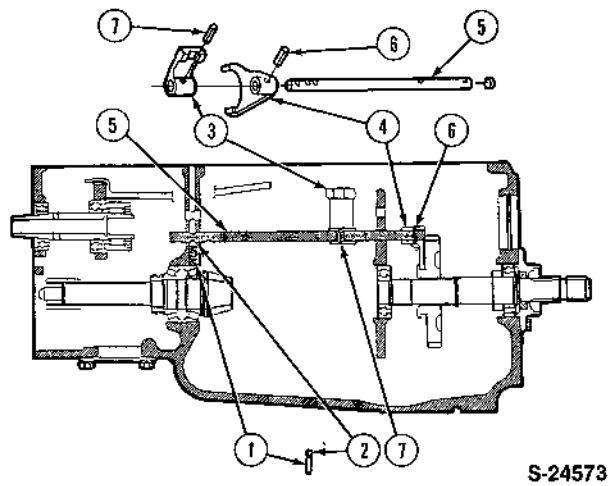


Figure 24
PTO Shift Rail and Fork Removal

1. Spring
2. Ball
3. Shift Boss
4. Shift Fork
5. Shift Rail
6. Roll Pin
7. Roll Pin

NOTE: *Use care when removing the shift rail to not lose the detent spring (1) and ball (2), Figure 24. Cover the detent bore with a shop towel to contain the components while removing the rail as they will be expelled with considerable force when released.*

7. Remove the detent spring, ball, shifter boss, shift fork and rail from the housing.

INSPECTION

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

2. Inspect the gear for excess wear or damage.

3. Check the bearings for excess wear or damage by slowly rotating the bearings by hand.

4. Inspect the shift rail for worn grooves.

5. Inspect the detent spring and ball for excess wear or damage.

6. Replace all O-ring seals and gaskets on assembly.

ONE-WAY CLUTCH ASSEMBLY
HSS Model Only

ASSEMBLY
Reference — Figure 22

1. Assemble the one-way bearing (3) into the outer race.

2. Assemble the inner race (2), bearing (4) and snap ring (5), Figure 22.

NOTE: *On assembly, be sure the one-way bearing locks up when the outer race is rotated counterclockwise (as viewed from the rear) against the inner race and will rotate freely when turned clockwise.*

ASSEMBLY (WITHOUT CREEPER GEAR)
Reference — Figure 25

1. Position the bearing (2) on the shaft and secure with the snap ring (4), Figure 25.

2. Install the assembled one-way clutch assembly in the housing.

3. Install the snap ring (5).

4. Install the front bearing (3) and secure with the snap ring (7).

5. Install the oil trough (6).

ASSEMBLY (WITH CREEPER GEAR)
Reference — Figure 26

1. Position the fixed gear (1) in the housing and insert the main shaft (2) from the rear through the fixed gear.

2. Install the rear bearing (7) and snap ring (3), Figure 26.

3. Install the front bearing (4) and snap ring (5), Figure 26.

4. Install the needle bearing (6) in the rear of the main shaft.

5. Install the assembled one-way clutch and countershaft into the main shaft assembly.

6. Install the oil trough.

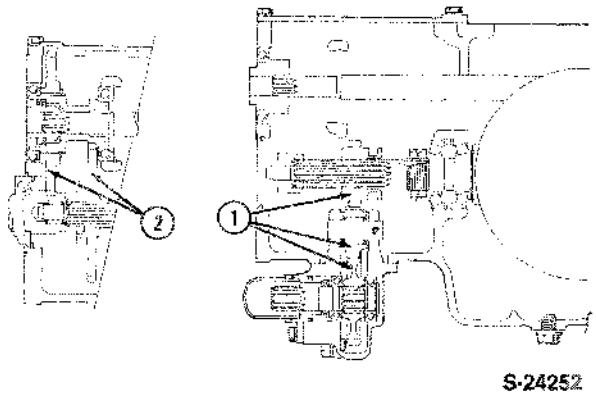


Figure 2
FWD and Creeper Gear (Option)
1. FWD Gears 2. Creeper Gears

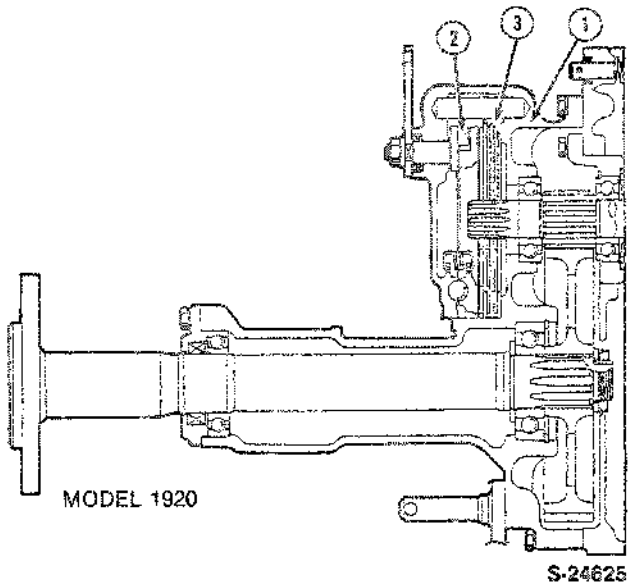


Figure 4
Rear Axle and Brakes — Model 1920
1. Axle Housing
2. Actuator
3. Brake Discs and Stators

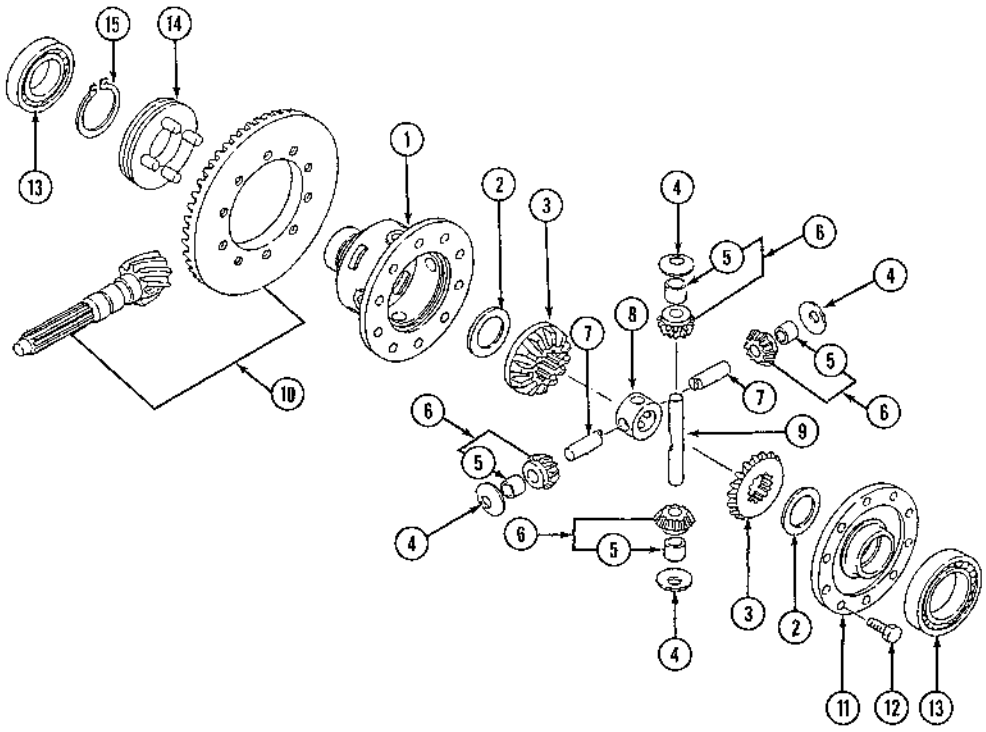
REAR AXLE AND BRAKES

The rear axle is a double reduction type, using the conventional ring gear and pinion for the primary reduction and a final drive pinion and gear for the secondary reduction.

The axle housings enclose the brake discs and stators assemblies, Figure 4. The rear axle and differential components are lubricated by the common oil reservoir.

Power is transmitted by the transmission to the differential drive pinion and ring gear. The ring gear is bolted to the differential case which contains the differential pinions and axle side gears, Figure 5.

Figure 3
FWD, Creeper Gear and Differential Lock Control Lever — Model 1920
1. FWD Control Lever
2. Creeper Gear Control lever
3. Differential Lock Control lever



Differential Lock Disassembly

1. Differential Housing
2. Thrust Washer
3. Differential Gear (Side Gear)
4. Thrust Washer
5. Bushing
6. Gear Assembly
7. Pinion Shaft
8. Joint
9. Pinion Shaft
10. Ring Gear Assembly
11. Differential Housing End Plate
12. Bolt
13. Ball Bearing
14. Differential Lock Clutch
15. Snap Ring

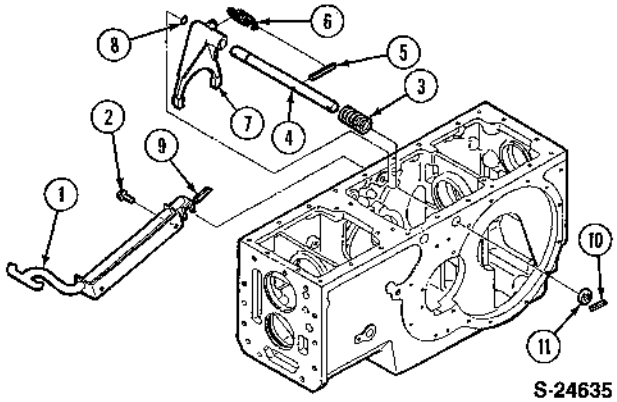


Figure 27
Differential Lock Linkage Removal

1. Differential Lock Pedal
2. Bolt
3. Spring
4. Differential Lock Shaft
5. Roll Pin
6. Spring
7. Differential Lock Fork
8. O-Ring
9. Roll Pin
10. Roll Pin
11. Oil Seal

1. Assemble the differential pinion shafts, pinion gears, thrust washers and side gears as shown, Figure 43.

2. Install the ring gear (16) on the gear case and tighten the bolts (10) with locking tabs (2) to the specified torque.

3. Bend the locking tabs (2) to the retaining bolts.

4. Install the side gear (8) with thrust washer (7), gear case end plate (6) and tighten the bolts (1) to the specified torque.

5. Install the clutch (5), snap ring (4) and bearing (3) onto the end plate (6).

6. If removed, install the bearing (18) onto the housing.

7. If removed, install the two drive pinion bearing snap rings (1), Figure 45, in the housing.

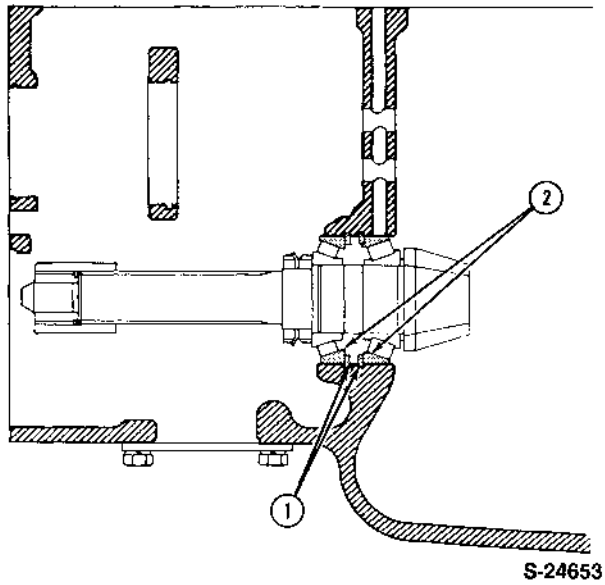


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Figure 45

1. Snap Rings
2. Pinion Bearings

8. Assemble the thrust washer, shims and pinion shaft rear bearing on the shaft, Figure 46. Insert the pinion shaft into the housing from the rear while installing the front bearing, locknuts and lock washer, Figure 46.

   NOTE: *If equipped with four wheel drive, also assemble the front wheel drive gear (4). If equipped with creeper gear, also assemble the creeper sliding gear (1). Units without creeper gear assemble coupler (2) with snap ring (3) onto pinion gear shaft (12), Figure 46.*

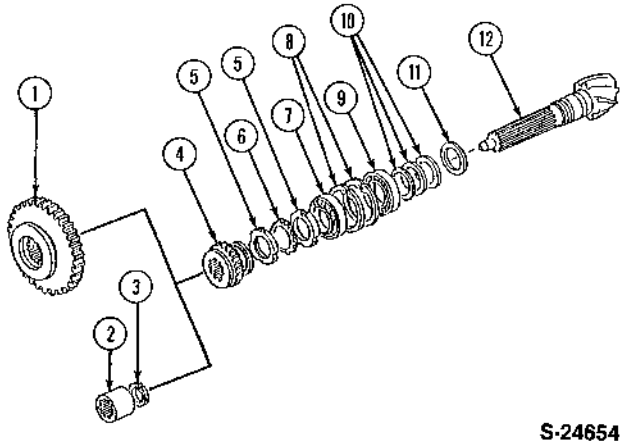

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Figure 46

1. Sliding Gear (With Creeper Gear Model)
2. Coupler (Without Creeper Gear Model)
3. Snap Ring (Without Creeper Gear Model)
4. Sliding Gear (With Front Wheel Drive Model)
5. Locknut
6. Lock Washer
7. Bearing
8. Snap Ring
9. Bearing
10. Shims
11. Thrust Washer
12. Pinion Gear

9. Adjust the pinion bearing pre-load using a strong cord wrapped around the pinion shaft and a pull scale, Figure 47. Tighten the pinion nut to obtain the specified pounds of constant pull to rotate the pinion assembly.

   Tighten the locknut and lock with the locking washer tabs.

Pinion Bearing Pre-Load	Constant Pull
	37.8-48.9 lbs. (17-22 kg)

   NOTE: *Turn drive pinion several times by hand before performing pull scale test.*

10. Position the differential assembly in the housing and install the right and left hand bearing carriers, Figure 48.

PART 8
HYDRAULIC SYSTEM

Chapter 1
HYDRAULIC SYSTEM CIRCUITS

Chapter 2
HYDRAULIC PUMP AND FILTER

Chapter 3
REMOTE VALVE

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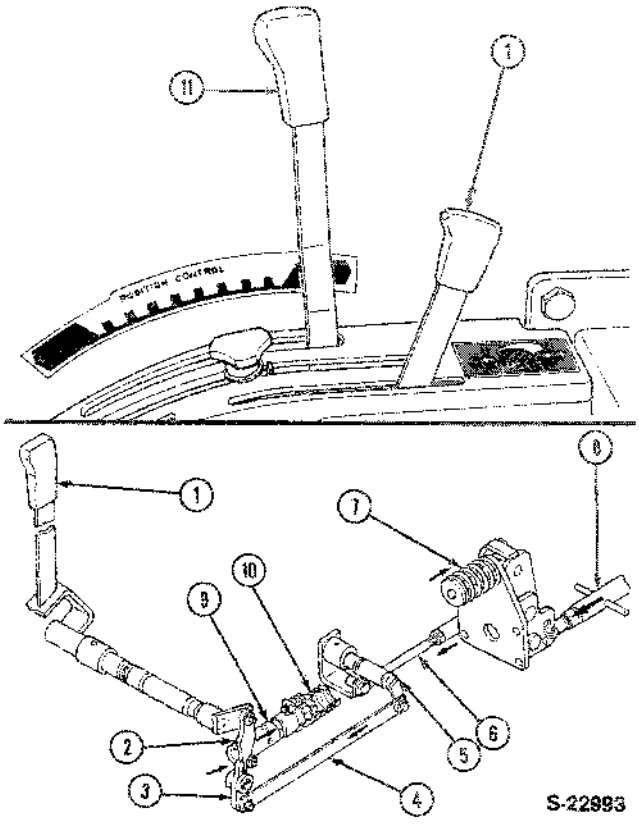

Figure 15
Draft Control Linkage Operation — Top Link Sensing to Raise

1. Draft Control Lever
2. Control Lever Cam
3. Feedback Link Cam
4. Feedback Link (Internal)
5. Feedback Arm
6. Adjustment Rod
7. Main Spring
8. Top Link
9. Control Valve Spool
10. Valve Spring
11. Position Control Lever

TOP LINK SENSING — LOWERING
Reference — Figure 16

As the soil conditions vary to decrease the draft load of the implement, the force on the top link (8) is reduced and causes the main spring (7) to extend. This action causes the feedback linkage (3, 4, 5 and 6), to move in the direction of the arrows reducing the force on the control valve spool (9). The control valve spring (10) then moves the spool forward into the lowering position. This action causes the implement to lower and as the implement lowers, the force on the top link and main spring increases the force of the linkage (3, 4, 5 and 6), against the control valve spool. The control valve spool then moves inward to the neutral position when the force on the top link and main spring is increased to the original amount to maintain the original draft load on the tractor.

The raising and lowering actions are repeated with changing forces on the top link as created by variations in soil conditions.

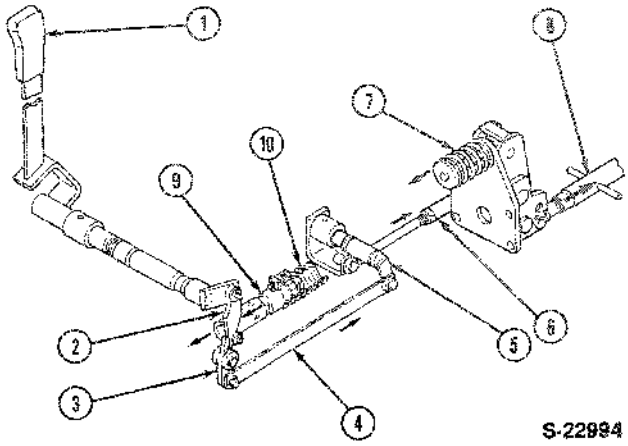

Figure 16
Draft Control Linkage Operation — Top Link Sensing to Lower

1. Draft Control Lever
2. Control Lever Cam
3. Feedback Link Cam
4. Feedback Link (Internal)
5. Feedback Arm
6. Adjustment Rod
7. Main Spring
8. Top Link
9. Control Valve Spool
10. Valve Spring

TOP LINK SENSING — VARYING DRAFT CONTROL SETTINGS
Reference — Figure 17

As described above, varying forces on the top link (8) move the feedback linkage (3, 4 and 5), back and forth to apply appropriate pressure on the control valve spool and spring to maintain a constant draft load on the tractor.

The draft load is manually selected by the operator by positioning of the draft control lever. As the draft control lever is moved forward (down), the lever cam (2) is moved up causing greater top link force to move the feedback linkage and control valve spool into the raise position.

As the draft control lever is moved up on the quadrant, the lever cam (2) is moved downward and the control valve spool is moved closer to the raise position and lifting takes places with a small increase in top link pressure and movement of the feedback linkage.

Adjusting the draft control lever up or down on the quadrant repositions the lever cam (2) to provide the appropriate resistance to the top links to suit operating conditions.

2. Using clean hydraulic oil, lubricate all valve components including O-rings on assembly.

3. Replace all O-rings and gaskets using new parts.

4. Assemble and install the control valve spool assembly in reverse of the disassembly procedure, see Figure 42. Tighten the plug (1) to 72 lbs. ft. (98 Nm) torque.

5. Install the lowering valve spool components, Figure 43. Tighten the plug (5) to 18 lbs. ft. (24 Nm) torque.

6. Install the check valve components, Figure 44. Tighten the cap (1) to 43 lbs. ft. (58 Nm) torque.

INSTALLATION

1. Using new O-rings, install the control valve to the cover.

2. Install the handles to the cover.

3. Position the control valve and cover assembly with a new gasket on the lift cover assembly and install the attaching bolts. Tighten the attaching bolts to the specified torque. See "Specifications," Chapter 4.

4. Install the quadrant guide and handle grips.

5. Install the position control link and adjust as described in section C, this Chapter.

6. Install the high pressure line and banjo bolt using new O-rings, see Figure 39.

7. On draft control models, install the draft control feedback rod and adjust as described in section C, this chapter.

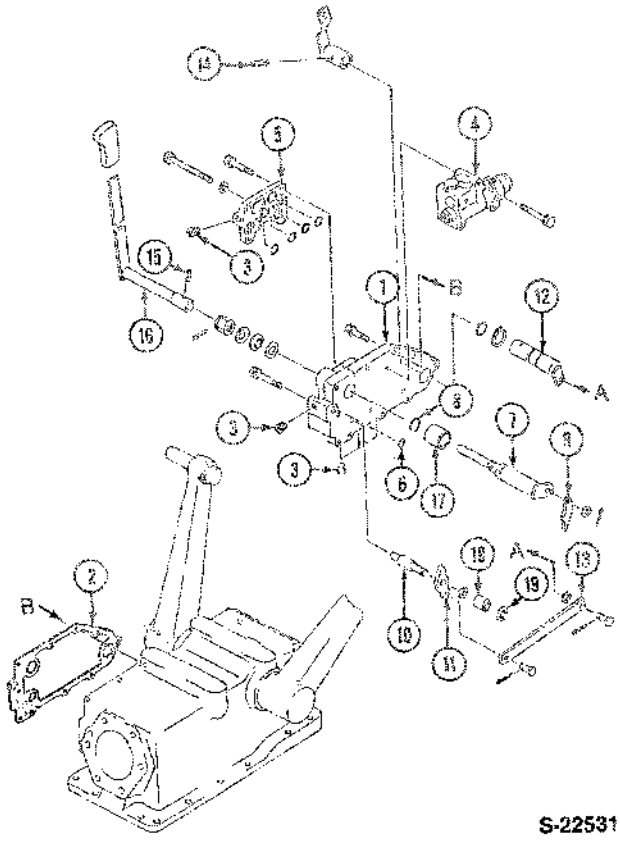

Figure 45
Single Lever Position Control Valve Components

1. Cover
2. Gasket
3. Plug
4. Valve Assembly
5. Cover
6. O-Ring — P12
7. Position Control Shaft
8. O-Ring — P21
9. Position Control Cam
10. Shaft
11. Position Control Cam
12. Position Control Shaft
13. Position Control Link
14. Roll Pin
15. Roll Pin
16. Lever
17. Collar
18. Collar
19. Snap Ring

COMBINATION SYSTEM RELIEF AND DIVERTER VALVE ASSEMBLY

REMOVAL
Reference — Figures 47 and 48

1. Disconnect the relief valve to sump return line (2) at the valve body fitting.

2. Remove the pump pressure line (4) and pressure line to control valve (5) at the valve body fitting.

3. Remove the valve retaining bolt and remove the valve assembly.

DISASSEMBLY
Reference — Figure 49

1. Remove the relief valve plug (1).

PART 8
HYDRAULIC SYSTEM

Chapter 3
REMOTE VALVE

A. DESCRIPTION AND OPERATION

Single spool and double spool remote control valves are available as dealer installed accessories on the 1920 and 2120 tractors.

The single spool remote control valve is mounted on the outside of the main control valve cover plate on the right hand side of the hydraulic lift cover, Figure 63.

The two spool valve is mounted on the right hand side of the hood, Figure 64.

Both control valves utilize the double acting control spool as shown in Figures 65 and 66.

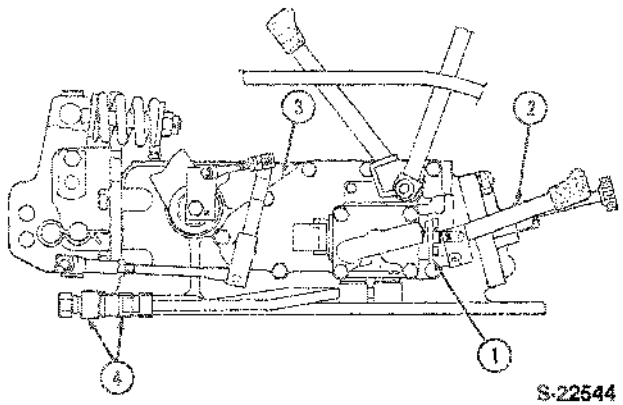

Figure 63
Single Spool Remote Control Valve

1. Single Spool Control Valve
2. Control Lever
3. Hydraulic Lift Cover
4. High Pressure Tube

The valves are equipped with self-centering springs so that the spools automatically return to neutral when the control handle is released following a raise or lowering operation.

The two spool control valve also contains a spring loaded detent mechanism to provide a float position for loader operation. In float position oil is free to flow between the piston and rod sides of the loader lift cylinder allowing the lift arms to float over uneven terrain.

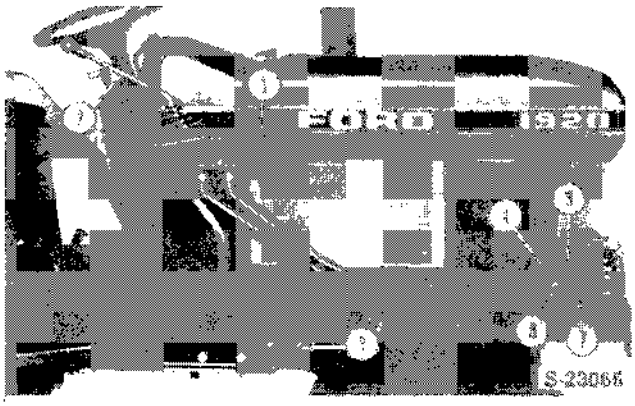

Figure 64
Two Spool Remote Control Valve

1. Two Spool Control Valve
2. Control Lever
3. System Relief Diverter Manifold
4. High Pressure Tube — Bucket Control — Scooping (Curling)
5. High Pressure Tube — Bucket Control — Dumping
6. High Pressure Tube — Lift Control — Raising
7. High Pressure Tube — Lift Control — Lowering

2. Install all new O-rings and seals on assembly.

INSTALLATION

Installation of the valve on the tractor generally follows the removal procedure in reverse.

During installation observe the following:

1. Be sure the mounting surfaces are free of dirt and foreign material.
2. Install new O-rings on assembly.
3. Tighten the mounting bolts gradually to the specified torque.

PART 9
STEERING SYSTEM

Chapter 1
POWER STEERING SYSTEM

A. DESCRIPTION AND OPERATION

The power system used on the Model 1920 and 2120 tractors is a full hydraulic power steering system, hydrostatic type.

The power steering system consists of the power steering control valve, hydraulic pump, oil reservoir tank, steering cylinder and tubing, Figure 1.

On the Model 1920 tractor, the power steering pump and reservoir are mounted on the right hand side of the engine, Figure 2.

On the Model 2120 tractor, the power steering pump and reservoir are located on the left hand side of the tractor, Figure 3.

The steering cylinder is located on the rear side of the front axle. On the front wheel drive models, the cylinder rod end is connected to the steering arm, Figure 4.

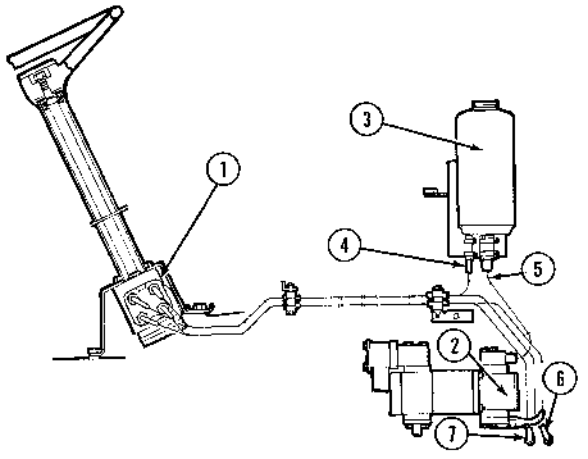

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Figure 1
Power Steering System — Model 1920 Shown

1. Power Steering Control Valve
2. Hydraulic Pump
3. Oil Tank
4. Return Line
5. Suction Line
6. Delivery Line (Left Turning)
7. Delivery Line (Right Turning)

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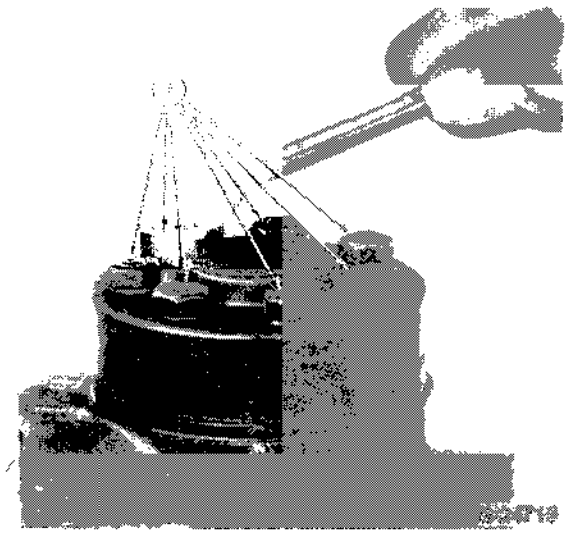

Figure 17
Control Valve Disassembly
1. Bolts

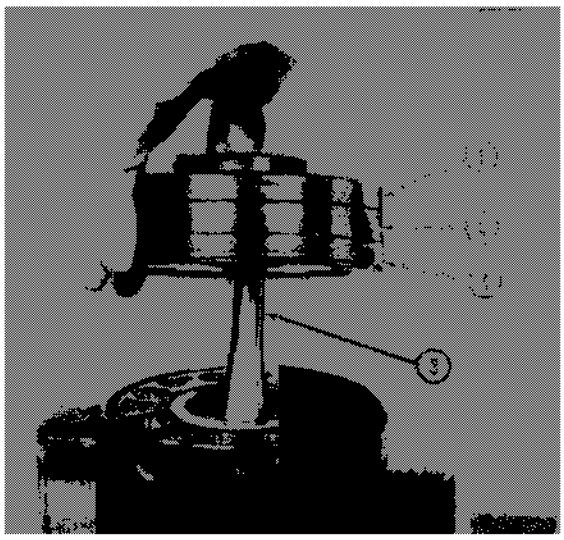

Figure 18
Control Valve Disassembly
1. End Cover
2. Gerotor
3. Drive Shaft
4. Plate

5. Reposition the control valve in the vise, with the mounting flange facing up.

NOTE: *Place a clean wood board under the valve body to protect the valve body face from damage by contacting the metal vise.*

Do not over-tighten the vise as the valve body is easily damaged.

6. Remove the bolts and mounting plate (1) while lightly pushing downward on the valve spool, Figure 19.

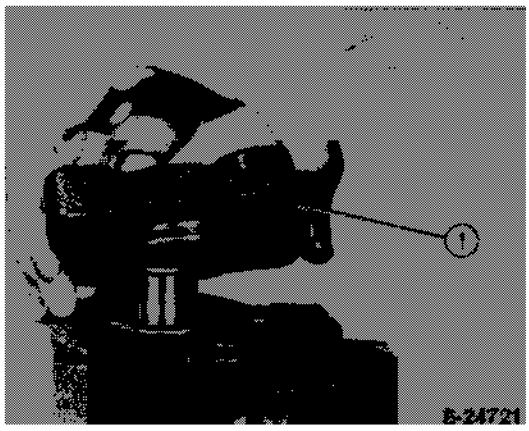

Figure 19
Control Valve Disassembly
1. Mounting Plate

7. If required, remove the sleeve and spool together, Figure 20.

NOTE: *Use care in removing the sleeve and spool and be sure the pin is centered in the spool and sleeve assembly so as not to cause binding with the valve body. Do not use force when removing these components.*

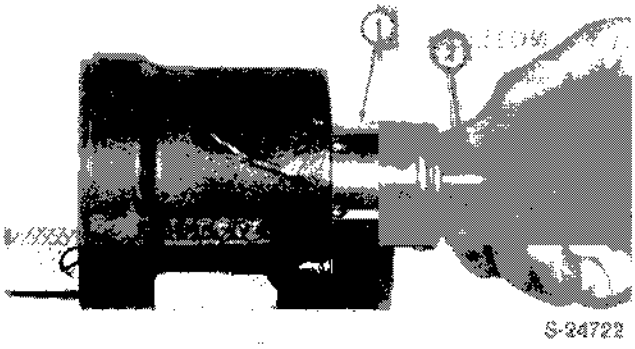

Figure 20
Control Valve Sleeve and Rotor Removal
1. Sleeve
2. Spool

Use sealing tape on the hose connections and tighten the hoses to 15-17 lbs. ft. (20-24 Nm) torque.

POWER STEERING PUMP AND RESERVOIR

PUMP REMOVAL

Reference — Figures 50 and 51

1. Drain the power steering reservoir, Figure 50.
2. Remove the suction tube from the pump.
3. Disconnect the high pressure tube.
4. Loosen the tube clamp to allow moving the high pressure tube clear of the pump.
5. Remove the pump mounting stud nuts and remove the pump from the tractor.

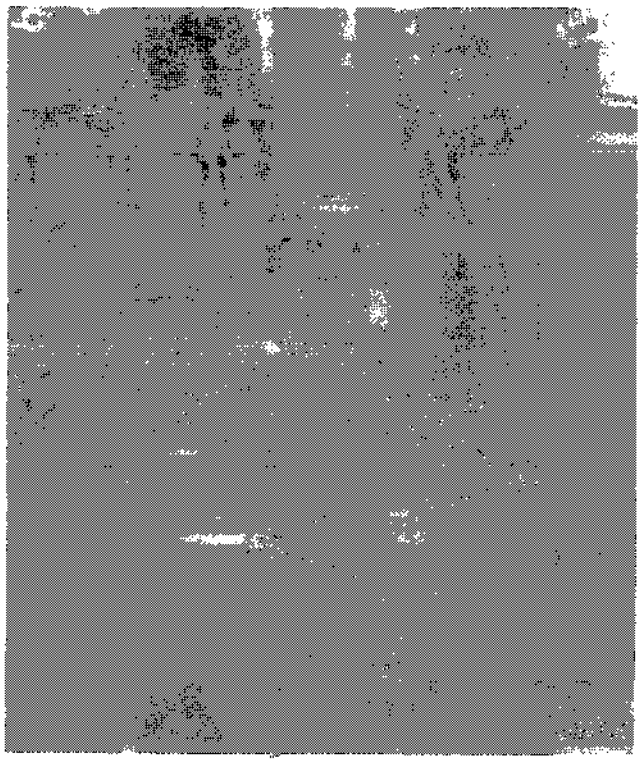

Figure 50
Power Steering Pump Removal — Model 1920

1. Power Reservoir
2. Suction Tube
3. High Pressure Tube
4. Tube Clamp
5. Mounting Stud Nuts
6. Power Steering Pump

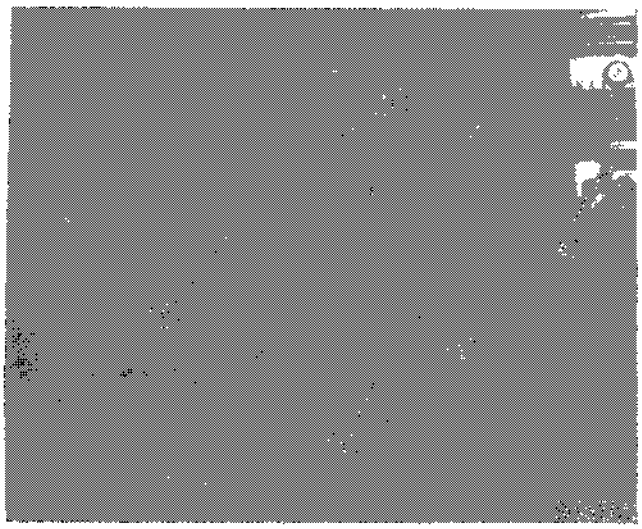

Figure 51
Power Steering Pump Removal — Model 2120

1. Suction Tube
2. High Pressure Tube
3. Tube Clamp
4. Pump Mounting Stud Nuts
5. Power Steering Pump

INSPECTION AND REPAIR

Reference — Figure 7

A seal repair kit is available for repair of oil leaks on the power steering pumps. If further damage is evident, replace the pump with a complete assembly.

INSTALLATION

Installation of the power steering pump generally follows the removal procedure in reverse order.

On assembly observe the following.

Tighten the high pressure tube fitting to 22-29 lbs. ft. (29-39 Nm) torque.

Bleed the air from the system by turning the steering wheel fully to the left and right several times with the engine running at idle speed.

After bleeding the system, adjust the fluid level in the reservoir tank as needed.

Check the tubing to assure that tubes are not in contact with other parts on the tractor.

Tighten the tube clamps securely.

PART 10
FRONT AXLE AND RELATED PARTS

Chapter 1
TWO-WHEEL DRIVE

A. DESCRIPTION AND OPERATION

Model 1920

The adjustable front axle, Figure 1, is standard equipment on the Model 1920 tractor.

The front axle consists of a center axle member and two outer axle sections. The center section is mounted centrally to the engine support by a pivot shaft. The axle rotates on the pivot shaft thereby maintaining the tractor chassis in a level position and ensuring stable operation even on irregular ground.

Each outer axle section is attached to the center axle by three bolts and nuts.

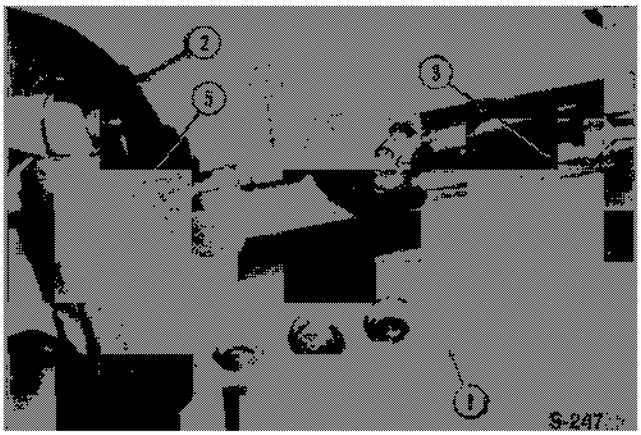

Figure 1
Adjustable Front Axle — Model 1920

1. Axle Center Section
2. Spindle Arm
3. Power Steering Cylinder
4. Tie Rod Assembly
5. Axle Outer Section

Model 2120

The adjustable front axle on the Model 2120, Figure 3, is adjustable from 48-72 in. (122-183 cm).

The front axle consists of a center axle member (1) and two outer axle sections (4). The center member is mounted centrally to the engine support (6), Figure 2, by a pivot shaft. The axle rotates on the pivot shaft, thereby maintaining the tractor chassis in a level position and ensuring stable operation even on irregular ground.

Each outer axle section is attached to the center axle by two bolts on the Model 2120.

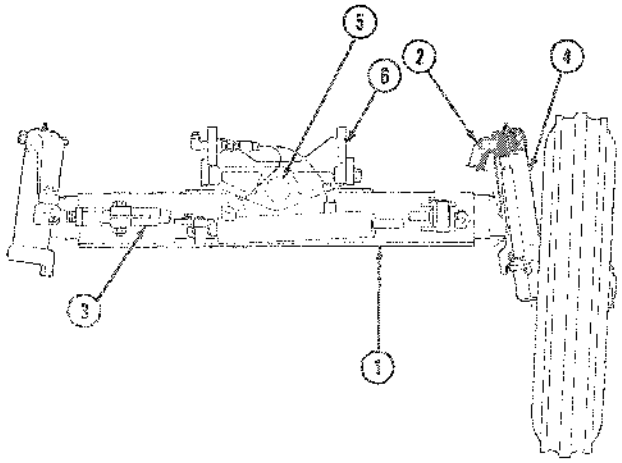

Figure 2
Adjustable Front Axle — Model 2120

1. Axle Center Section
2. Spindle Arm
3. Tie Rod
4. Outer Axle Section
5. Pivot Shaft
6. Engine Support

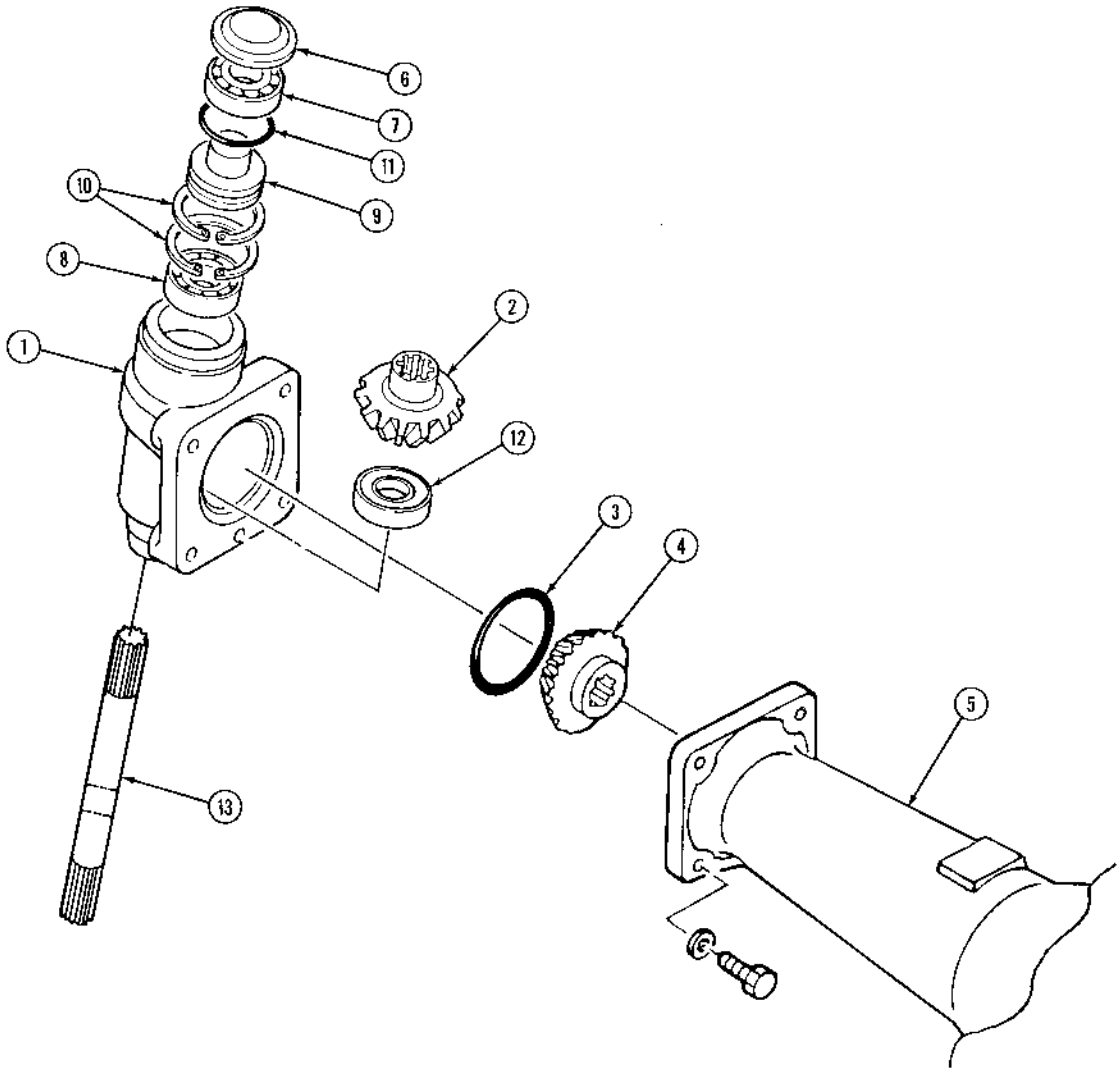

Figure 24
Idler Gear Case Disassembly

1. Idler Gear Case
2. Idler Pinion
3. O-Ring
4. Axle Drive Pinion
5. Front Axle Housing
6. Spacer
7. Bearing
8. Bearing
9. King Pin
10. Snap Ring (2)
11. O-Ring
12. Bearing
13. Shaft

2. Remove the outer pinion drive gear (8) and bearing (7), from the axle housing, each side, Figure 26.

3. Remove the axle housing retaining bolts and remove the axle housing (10) and shaft (6) as an assembly, Figure 26. Remove the axle shaft from the housing.

NOTE: *Observe the quantity and size shims (1) used between the differential left side support bearing and the axle housing, Figure 26.*

4. Remove the differential assembly from the housing.

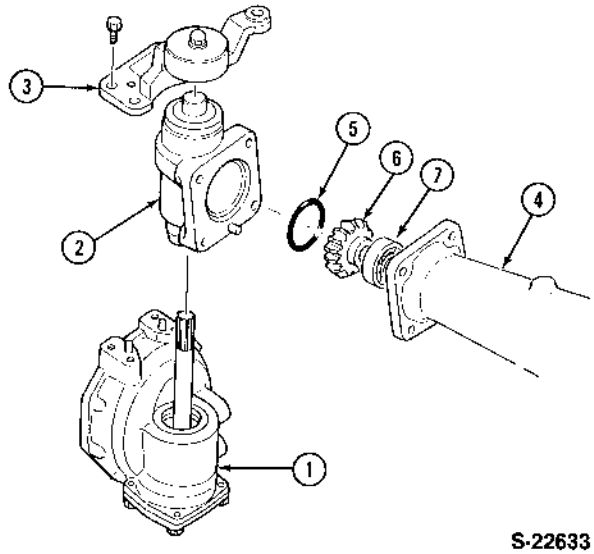

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Figure 39
Reduction Gearbox

1. Bevel Gear Case Assembly
2. Idler Gear Case Assembly
3. Steering Arm and Cover Assembly
4. Axle Housing
5. O-Ring
6. Gear
7. Bearing

16. Install the pinion gear (6) and bearing (7) on the axle shaft in the end of the axle housing, Figure 39.

17. Install the O-ring (5) on the axle housing, Figure 39.

18. Apply liquid gasket sealer to axle housing mating surface and install the assembled drop box to the axle housing. Tighten the attaching bolts to the specified torque.

19. Apply liquid gasket sealer to the bevel gear housing cover mating surface and install the cover and hub assembly to the gearbox, Figure 40. Install the cover bolts and tighten to the specified torque.

BEVEL GEAR-TO-PINION BACKLASH CHECK

Reference — Figure 41

With the front wheels removed and the front end of the tractor supported, check the drop box bevel gear-to-pinion backlash as follows:

1. Remove the oil drain plug from the bevel gear case and drain the oil into a clean container.

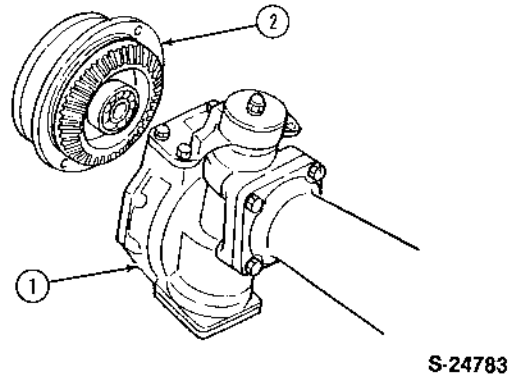

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Figure 40
Bevel Gear and Hub Assembly

1. Bevel Gear Housing
2. Bevel Gear and Shaft Assembly

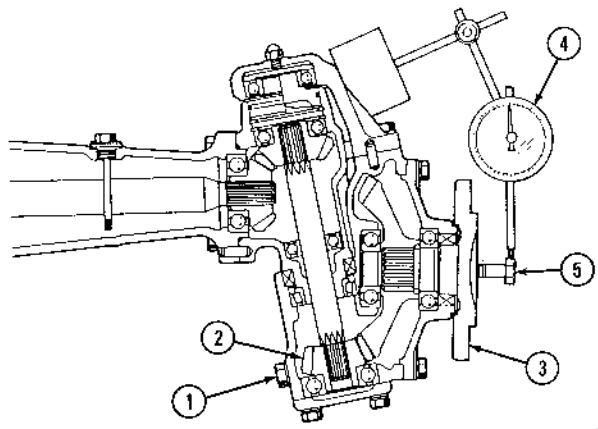

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Figure 41
Bevel Gear to Pinion Backlash Check

1. Drain Plug
2. Pinion Gear
3. Wheel Hub
4. Dial Indicator
5. Hub Bolt

2. Install a long bolt (1) in the drain plug hole so that it contacts the pinion gear and keeps it from rotating.

3. Install a bolt (5) in the wheel hub flange and attach a dial indicator as shown, Figure 41.

4. Rotate the hub (3) back and forth and observe the dial indicator reading.

   Replace the bearings and/or gears if the backlash exceeds 0.020 in. (0.5 mm).

PART 11
WHEELS AND TIRES

Chapter 1
WHEELS AND TIRES

A. TREAD SETTING

TWO WHEEL DRIVE MODELS:

The front wheel tread setting is adjustable by a combination of repositioning the front axle and by reversing the front wheels.

The rear wheel tread setting is adjustable by repositioning the wheel rims and discs and by changing the wheels from side to side.

On the Model 1920 tractor the tread setting is adjusted from 43 in. (109.5 cm) to 57.1 in. (145.0 cm).

Turf tire tread width settings are adjustable from 45.1 in. (114.5 cm) to 55.1 in. (140.0 cm).

On the Model 2120 tractor the tread setting is adjusted from 48.0 in. (122 cm) to 76 in. (193 cm).

Turf tire tread width settings are adjusted from 50.0 in. (127 cm) to 69.6 in. (177 cm).

The holes in the front axle allow location of the axle in four different positions on the Model 1920, Figure 1 and six positions on the Model 2120, Figure 3.

The front wheels are reversible and provide additional increments of tread settings as shown in Figures1 and 3.

NOTE: *Turf tires cannot be reversed.*

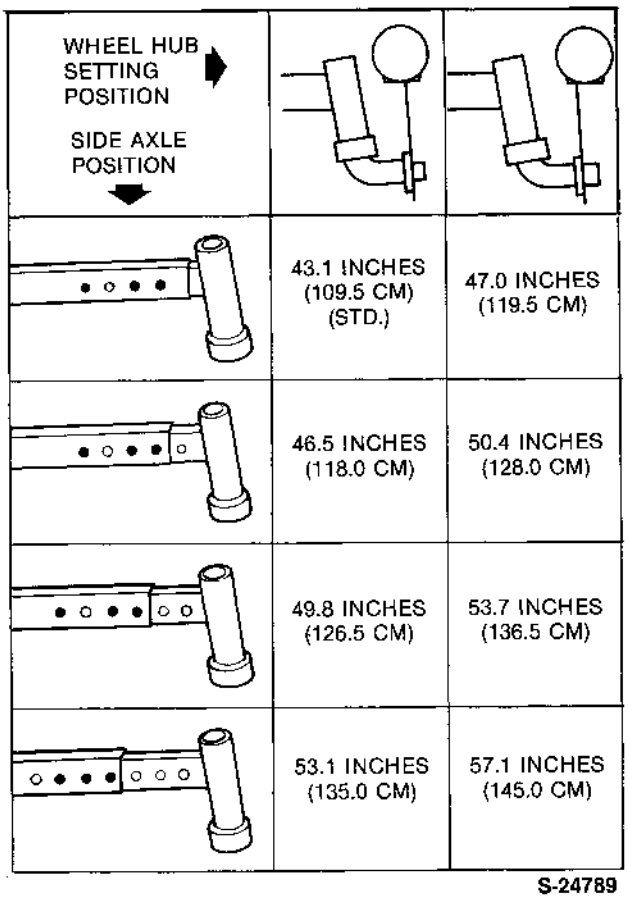

Figure 1
2WD Front Axle Tread Setting — Model 1920

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PART 12
SEPARATING THE TRACTOR

Chapter 1
SEPARATING THE TRACTOR

A. FRONT AXLE REMOVAL

TWO WHEEL DRIVE

1. Disconnect the power steering cylinder hoses (1) and cap all openings, Figure 1.
2. Place a floor jack under the transmission housing.
3. Place wood blocking in front and rear of both rear wheels and lock the parking brake.
4. Gently raise the front end of the tractor to take the weight off the front axle.
5. Place safety stands under the engine side frames.
6. Remove the axle pivot front bearing holder (1), Figure 2.
7. Remove the axle pivot rear bearing support (3), Figure 1.

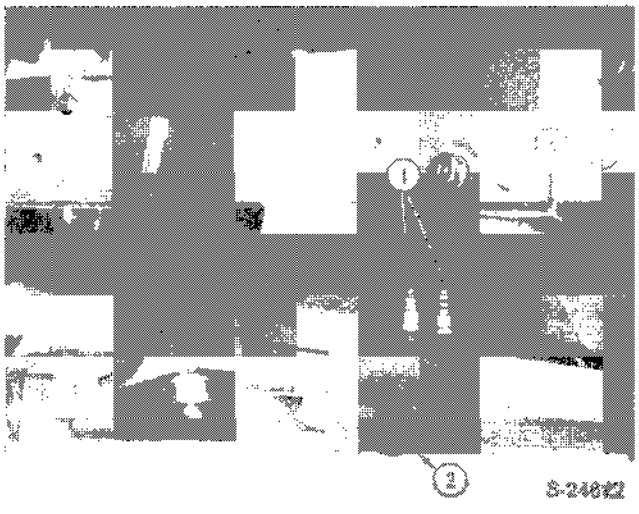

Figure 1
Power Steering Hoses Removal — 2WD
1. Power Steering Hoses
2. Power Steering Cylinder
3. Rear Pivot Support

Figure 2
Front Axle Removal — 2WD
1. Pivot Bearing Casing — Front

Figure 27
Steering Column and Shift Linkage Removal
1. Snap Ring
2. Pin
3. Shift Arm
4. Universal Joint
5. Mounting Bolts (4)
6. Steering Column

17. Remove the sheet metal panels, Figure 29.

18. Remove the brake pedal rods, Figure 30.

19. On the HSS model, disconnect the lube cut-off valve cable from the clutch pedal, Figure 31.

20. Disconnect the clutch pedal rod from the bellcrank, Figure 31.

21. Remove the brake cross shaft support bolts and remove the cross shaft, support and pedals as an assembly, Figure 31.

22. Remove the parking brake mounting bolt and remove the parking brake linkage and switch as an assembly, Figure 32.

23. Remove the rubber mat from the transmission housing.

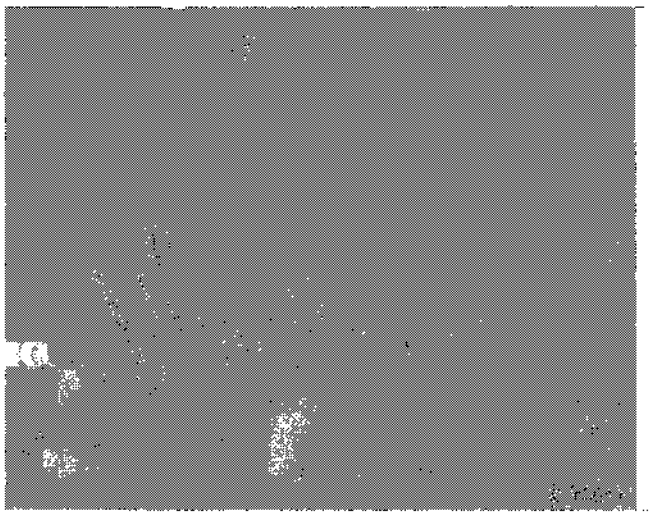

Figure 28
Foot Throttle Cable Removal
1. Foot Throttle Cable
2. Foot Throttle Pedal

24. Remove the rear wiring harness from the transmission case.

25. Remove the transmission case cover and center housing cover, Figure 33.

26. Disconnect the range gearshift lever(s), Figure 31.

27. Remove the internal buckle-up bolts, Figure 34.

28. Attach an overhead hoist to the transmission housing.

29. Remove the external buckle-up bolts (5), Figure 33.

30. Using a heavy rubbet mallet, loosen the transmission to center housing mating joint and carefully slide the transmission forward off the dowel pins.

INSTALLATION

Reassembly of the transmission to the rear axle center housing generally follow the removal procedure in reverse order.