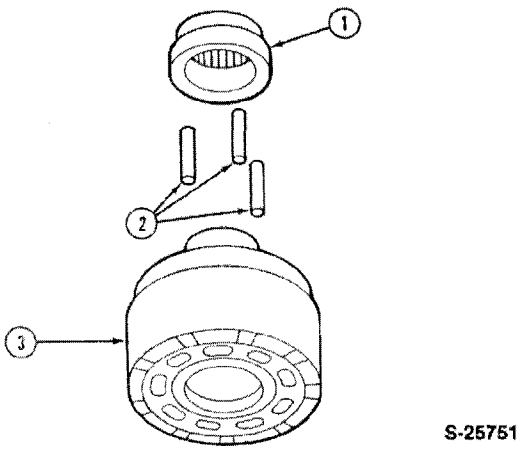


Figure 58
Hydrostatic Pump

1. Retainer
2. Pins
3. Cylinder Block

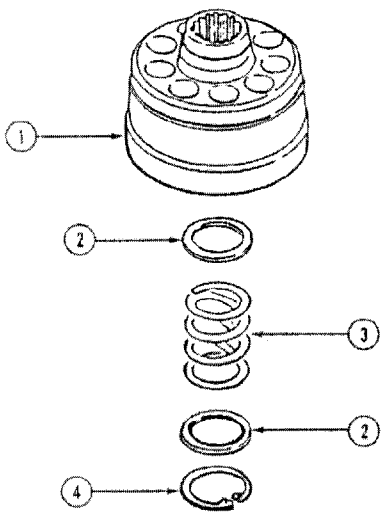


Figure 59
Hydrostatic Pump Assembly

1. Cylinder Block
2. Washers
3. Spring
4. Snap Ring

4. Position the thrust plate in the bottom of the housing in the variable swash plate.

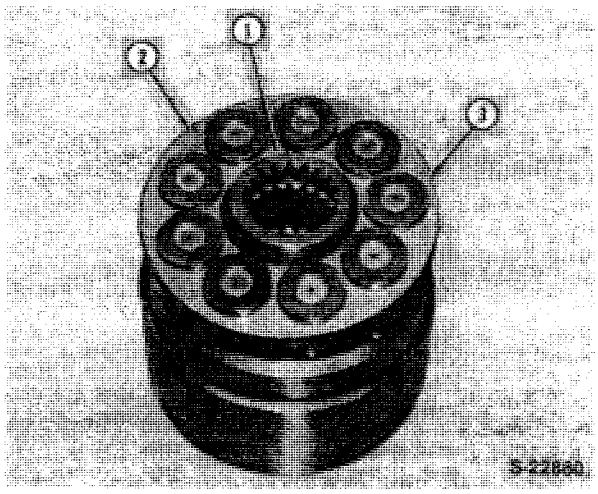


Figure 60
Hydrostatic Pump Installation

1. Retainer Holder
2. Retainer Plate
3. Piston Assy.

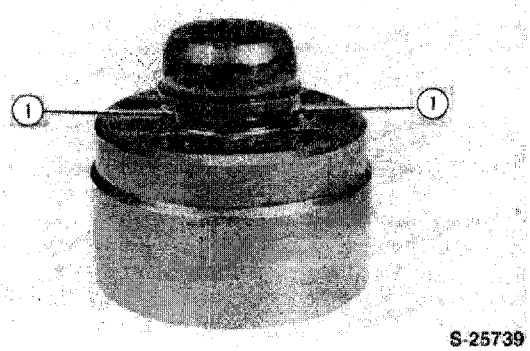


Figure 61
Cylinder Block and Pin Installation

1. Pins

5. Install the assembled pump assembly onto the input shaft, Figure 62.

NOTE: *Recheck to be sure of correct location.*

HST MOTOR CYLINDER BLOCK — ASSEMBLY

1. If removed, press the bearing (2) onto the drive shaft and secure with the snap ring (4), Figure 63.

2. Install the oil seal (5), and O-ring (3) into the case cover (6), Figure 63.

3. Install the output shaft in the motor housing.

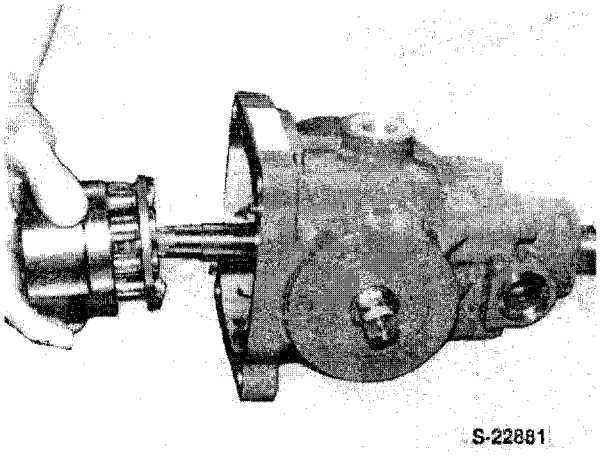


Figure 62
Hydrostatic Pump Installation

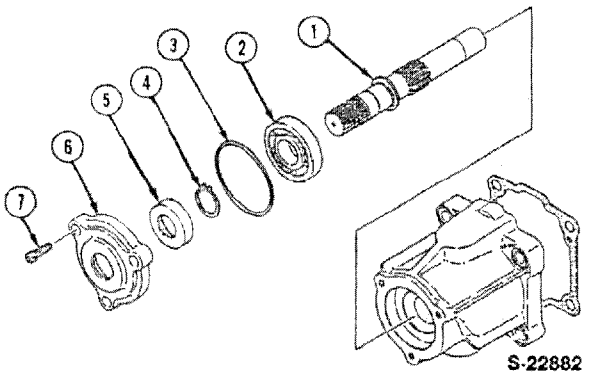


Figure 63
Motor Drive Shaft Installation

1. Motor Drive Shaft
2. Bearing
3. O-Ring
4. Snap Ring
5. Seal
6. Cover
7. Socket Head Bolt

4. Install the cover (6) and tighten the retaining bolts to 3.61 ± 0.36 lbs. ft. (4.9 ± 0.49 Nm) torque.

5. Position the thrust plate (2) in the bottom of the motor housing in the fixed swash plate, Figure 64.

6. Position the assembled motor cylinder block onto the output shaft as shown, Figure 65.

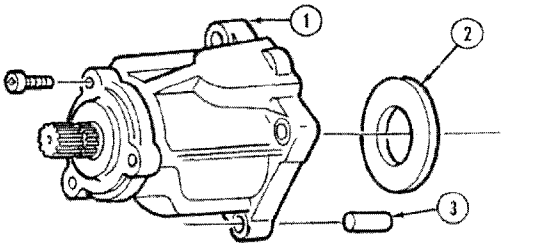


Figure 64
HST Motor Assembly

1. Motor Housing
2. Thrust Plate
3. Dowel Pin

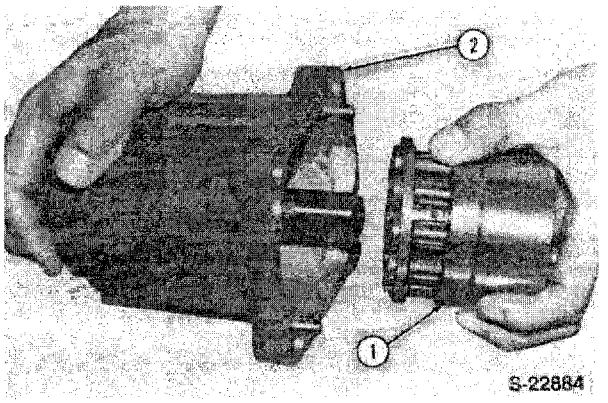


Figure 65
HST Motor Installation

1. Motor Cylinder Block Assy.
2. Motor Housing

PORT BLOCK — ASSEMBLY

NEUTRAL VALVE AND FEED VALVE ASSEMBLY
Reference — Figure 66

Two sets of neutral valves and feed valves are utilized in the hydrostatic transmission unit. One set functions for forward travel and the other for reverse travel.

DISASSEMBLY

1. Remove the neutral valve assembly from the housing.

2. Remove the feed valve spring and poppet.

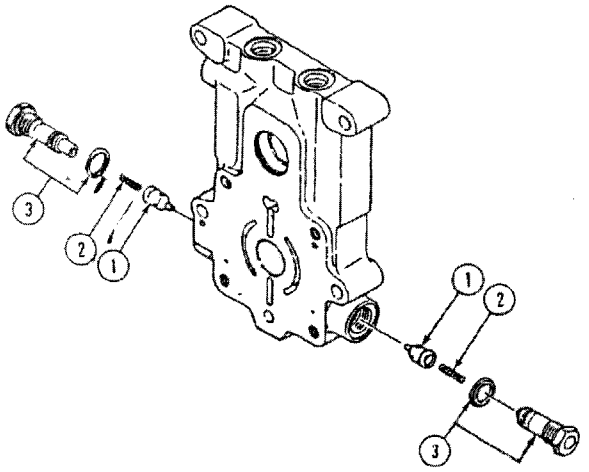


Figure 66
Neutral Valve and Feed Valve Assembly
1. Feed Valve Poppet
2. Feed Valve Spring
3. Neutral Valve Assy.

INSPECTION

1. Inspect the feed valve poppet for excess wear or scoring. Check the poppet in the bore for a sticking or binding condition.

2. Inspect the feed valve spring for wear or damage.

   NOTE: *If the feed valve poppet or spring indicates damage, replace as a kit assembly.*

3. If hydraulic tests indicate faulty neutral valve operation, replace the neutral valve as an assembly.

ASSEMBLY

Install the feed valve spring and poppet onto the end of the neutral valve and install the assembly in the port block. Tighten to the specified torque.

Tightening Torque.....27.12 ± 1.80 lbs. ft.
(36.75 ± 2.45 Nm)

CHARGE PUMP RELIEF VALVE
Reference – Figure 67

The charge pump relief valve functions to maintain approximately 61-81 psi of pressure in the oil supply system to the piston pump at all times. Excess oil not required by the piston pump is returned to sump via the charge pump relief valve.

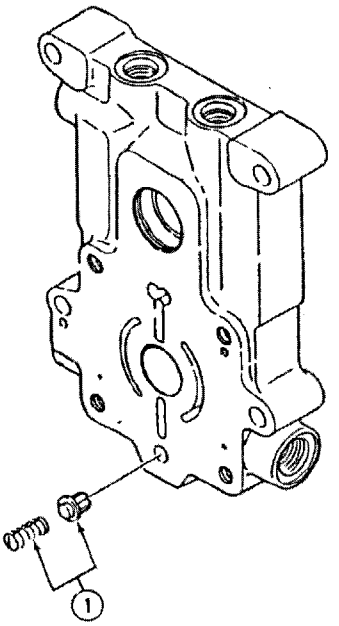


Figure 67
Valve Kit
1. Charge Pump Relief Valve Kit

DISASSEMBLY

1. Remove the spring and valve.

INSPECTION

1. Inspect the valve seat for excess wear or scoring. Check the valve in the bore for a sticking or binding condition.

2. Inspect the valve spring for wear or damage.

   NOTE: *If damage is observed, replace the valve and spring as a kit assembly.*

ASSEMBLY

Assemble the components in the port block.

HIGH PRESSURE RELIEF VALVE
Reference – Figure 68

A single high pressure relief valve assembly is located in the piston pump to motor passages and protects the drive motor from overloads in both forward and reverse directions. See pressure passage circuit, Figure 78.

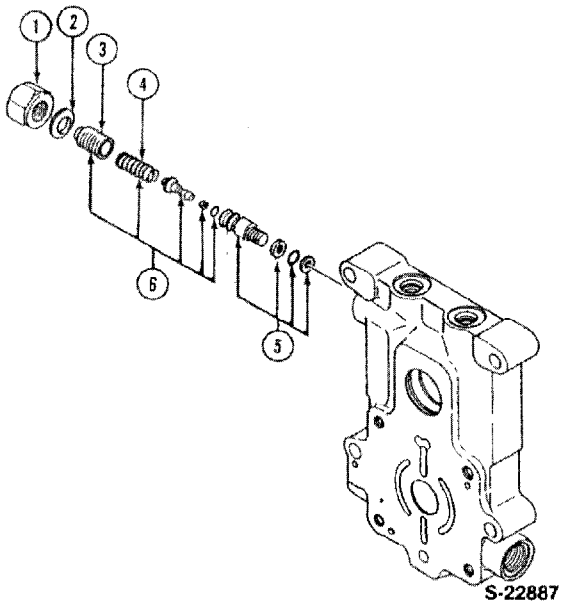


Figure 68
High Pressure Relief Valve

1. Shroud
2. Washer (Seal)
3. Adjusting Screw
4. Spring
5. Valve Assy.
6. Relief Valve Assy.

In forward direction, high pressure oil acts upon the end of the relief valve plunger and in reverse direction, high pressure oil acts upon the shoulder on the relief valve plunger, the high pressure oil passes into the suction side oil passage relieving the pump of overloading.

NOTE: *Assembling relief valve tightening torque.*
47.00 ± 3.6 lbs. ft.
(83.7 ± 4.9 Nm)

HYDROSTATIC PUMP AND PORT BLOCK — ASSEMBLY

Reference — Figure 69

1. Using a straight edge and feeler gauge, measure the depth of the cylinder block surface below the housing end. The clearance should be approximately 0.078 in. (2.0 mm), Figure 69.

   If insufficient clearance is found, disassemble the pump assembly and recheck the thrust plate position and assembling procedures.

2. If removed, install the two dowel pins in the pump housing.

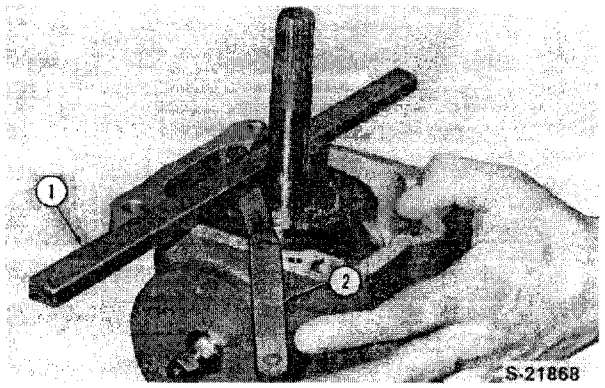


Figure 69
Hydrostatic Pump and Port Block Assembly

1. Straight Edge
2. Feeler Gauge

3. Coat the gasket surface with lithium base grease and position it on the pump housing.

4. Apply lithium base grease to the charge pump relief valve and spring. Install the spring in the pump housing bore and the poppet valve in the port block.

5. Install the port valve with tapered opening onto the port block, Figure 70.

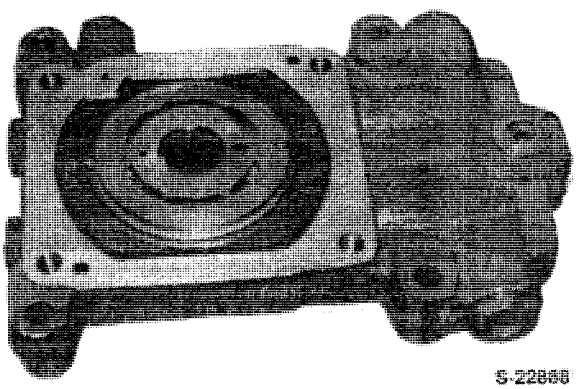


Figure 70
Hydrostatic Pump and Port Block Assembly

6. Install the pump housing assembly to the port block being sure to align the relief valve spring and poppet, Figure 71.

7. Tighten the four socket head type bolts. Be sure that the input shaft rotates freely and then apply final tightening to bolts to specified torque.

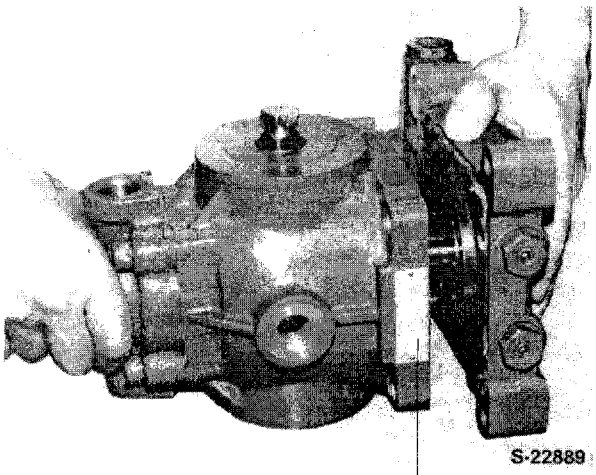


Figure 71
Hydrostatic Pump and Port Block Assembly

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

MOTOR AND PORT BLOCK – ASSEMBLY

1. Using a straight edge and feeler gauge, measure the depth of the cylinder block surface below the housing end. Clearance should be approximately 0.078 in. (2.0 mm), Figure 72.

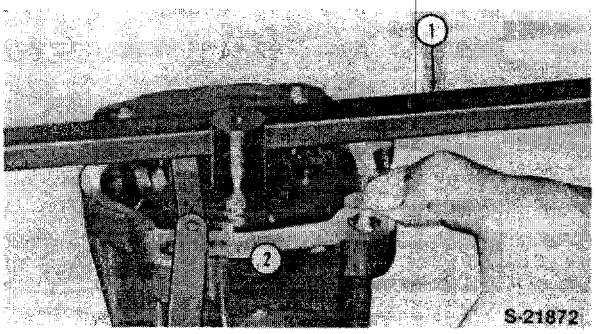


Figure 72
Motor and Port Block Assembly
1. Straight Edge 2. Feeler Gauge

If insufficient clearance is found, disassemble the motor assembly and recheck the position of the thrust plate and assembly procedures.

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

3. Coat the surface of the gasket with lithium base grease and position it on the motor housing,.

4. Install the port valve plate onto the port block, Figure 73.

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

6. Tighten the four socket head type bolts. Be sure the input and output shafts rotate freely and then apply the final tightening to the bolts, Figure 75.

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

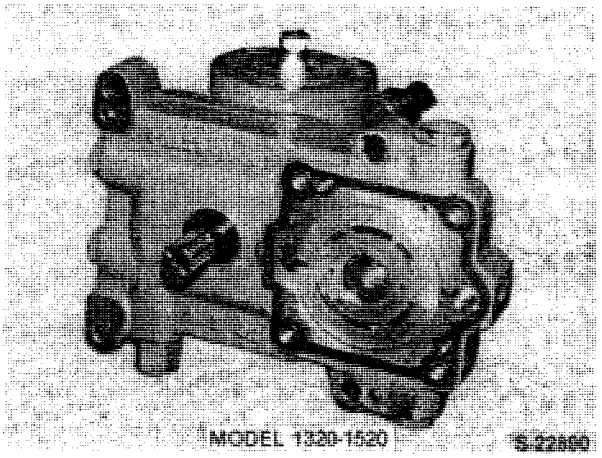


Figure 73
Motor and Port Block Assembly

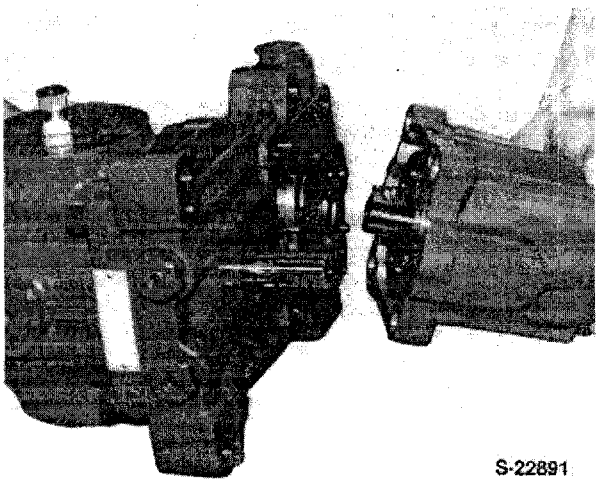


Figure 74
Motor and Port Block Assembly

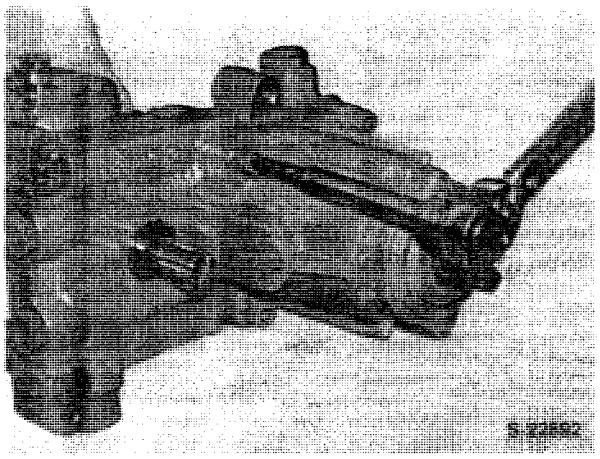


Figure 75
Motor and Port Block Assembly

CHECK VALVE
Reference — Figure 76

A check valve located in the HST filter manifold, Figure 76, protects the cooler from excess pressure due to high oil viscosity or a restriction in the cooler circuit.

DISASSEMBLY

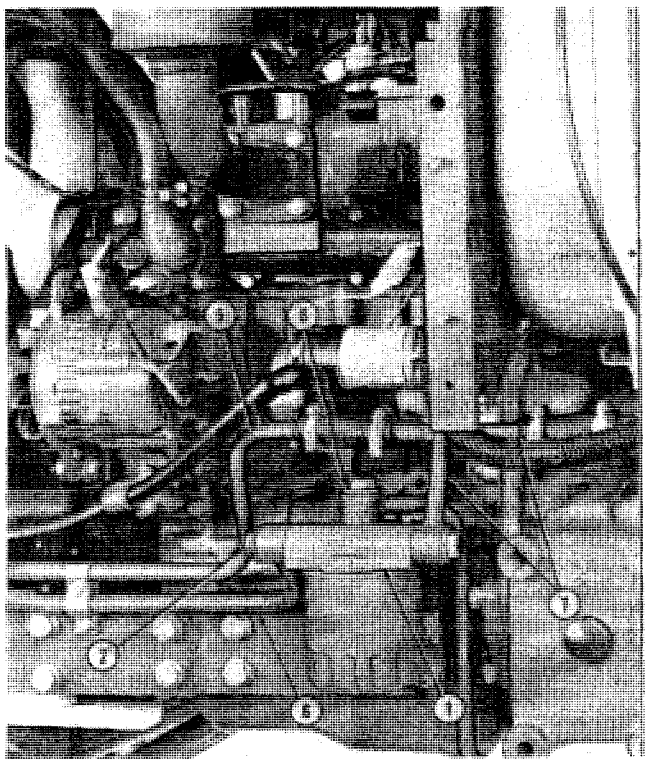
1. Remove the banjo bolt (2), Figure 76, from the cooler return to manifold tube and remove the spring (3) and ball (4) from the manifold.

INSPECTION

1. Inspect the spring and ball for excess wear or damage. Replace faulty components if required.
2. Inspect the ball seat in the pipe. Replace the pipe if required.

ASSEMBLY

Assemble the check valve components as shown in Figure 76.



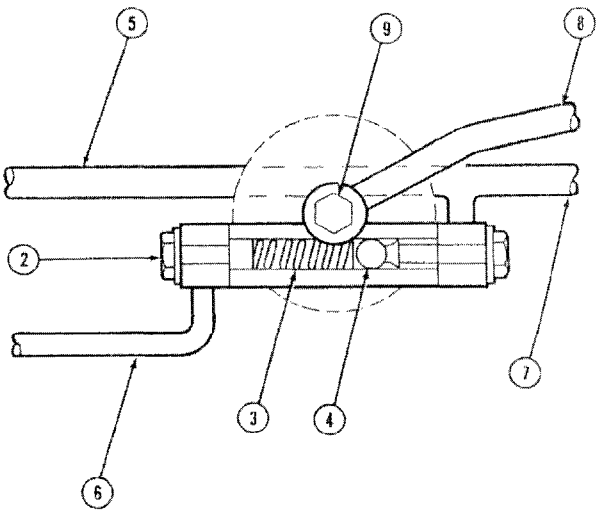


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Figure 76
Check Valve and Manifold Assmbly

1. Check Valve Location
2. Banjo Bolt
3. Spring
4. Ball
5. Oil Tube to Cooler
6. Oil Tube from Cooler
7. Oil Tube from HST Charge Pump
8. Oil Tube to HST Unit
9. Banjo Bolt

TROUBLE SHOOTING

PROBLEM	CHECK	POSSIBLE CAUSE	CORRECTIVE ACTION
Transmission fails to operate.	• Input shaft rotation.	• Clutch or input shaft failure.	• Repair or replace.
Erratic operation.	• Transmission oil level.	• Low oil supply.	• Replenish.
Abnormal noise when operated.	• Charge relief valve pressure.	• Low charge pressure.	
		• Clogged strainer. (suction)	• Clean.
		• Oil viscosity high.	• Replace oil.
		• Charge pump defective.	• Replace pump kit.
		• Defective charge pump relief valve.	• Replace valve kit.
		• Defective cylinder block assembly.	• Replace.
Tractor fails to stop at neutral.	• Pedal neutral position.	• Linkage out of adjustment.	• Adjust neutral position.
		• Neutral cannot be adjusted.	• Replace trunnion shaft joint.
		• Defective neutral valve.	• Replace neutral valve.
Oil leakage.	• Charge pump pressure.	• Pressure too high (above 142 psi [10 kg/cm²]).	• Replace charge pump relief valve.
		• Pressure loss in filter excessive.	• Replace filter.
		• Return oil line restricted.	• Repair as needed.
Low power.	• High pressure relief valve setting.	• Low pressure.	• Reset valve pressure.
			• Replace port block kit.
		• Internal leakage.	• Overhaul.
Oil overheating.	• Cooler.	• Dirty Grid.	• Clean.
	• Check valve pressure setting.	• Low pressure setting.	• Shim pressure spring.
		• Oil.	• Incorrect oil.

C. TROUBLE SHOOTING AND ADJUSTMENTS

PRESSURE TESTING AND ADJUSTMENT
HIGH PRESSURE RELIEF VALVE TEST
Reference — Figure 77

BEFORE TESTING

Remove the steering shroud center panel to gain access to the test port tubes, Figure 77.

1. Operate the tractor to warm the oil to 80°-120°F (25°-50°C) before performing this hydraulic test.
2. Remove the test port plug, left-hand side, accessible through a hole in the top of the clutch housing.
3. Install Nuday test fitting Tool No. 10617 in the test port. Fitting size is PT 1/8"
4. Install a 0-5000 psi gauge to the test fitting.

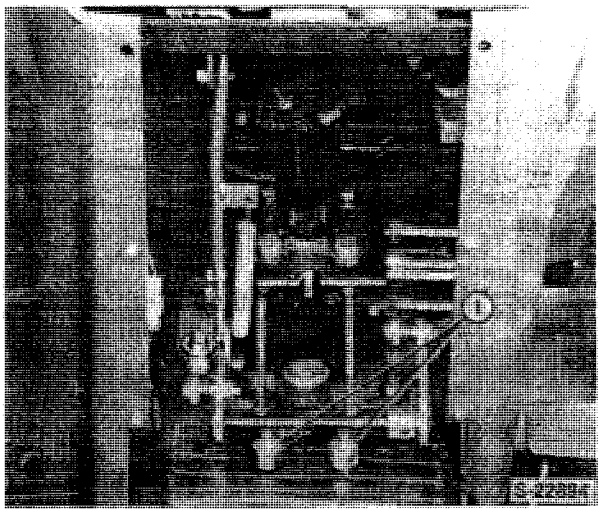

Figure 77
High Pressure Relief Valve Test
1. Test Ports

5. Securely lock the parking brake.

6. Place the range lever in high range.

7. Disengage the clutch and start the engine. Set throttle speed to 2500 rpm.

8. Be sure the transmission foot pedal is in neutral position and then release the clutch pedal.

9. Slowly move the foot pedal in the reverse position to obtain a reading on the pressure gauge. Read the maximum pressure on gauge. Pressure reading should be 3839-4124 psi (270-290 kg/cm²) at 16 litres per minute.

   NOTE: *Read pressure in minimum time to prevent overheating and possible damage to the transmission.*

10. If necessary to adjust the relief valve, separate the tractor and adjust the adjusting screw and then retest the relief valve, Figure 78.

    NOTE: *If the relief valve is faulty, replace the complete port block as an assembly.*

CHARGE PUMP RELIEF VALVE TEST

Operate the tractor to warm the oil to 80°-120°F (25°-50°C) before performing this hydraulic test.

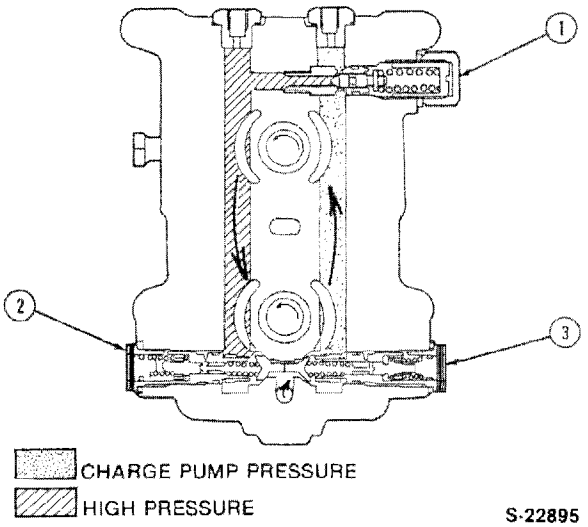

Figure 78
High Pressure Relief Valve Circuit
1. High Pressure Relief Valve
2. Reverse — Neutral Valve
3. Forward — Neutral Valve

1. Remove the banjo bolt (2), Figure 79.

2. Drill and tap a banjo bolt for pressure testing as shown, Figure 80.

3. Install a 0-300 psi gauge to the special banjo bolt.

4. Set the range selector lever in neutral.

5. Set the engine throttle at 2500 rpm and read the pressure gauge.

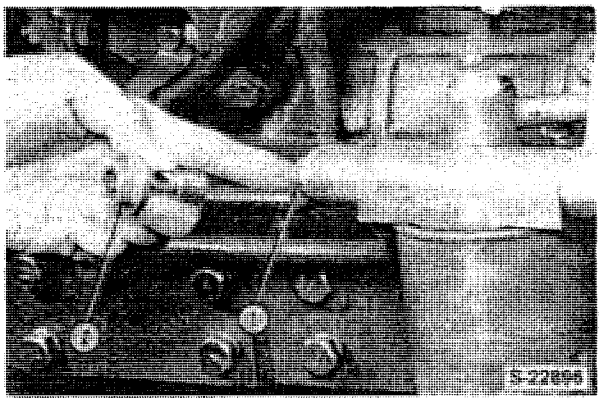

Figure 79
Charge Pump Relief Valve Test
1. Test Port (1/8")
2. Banjo Bolt

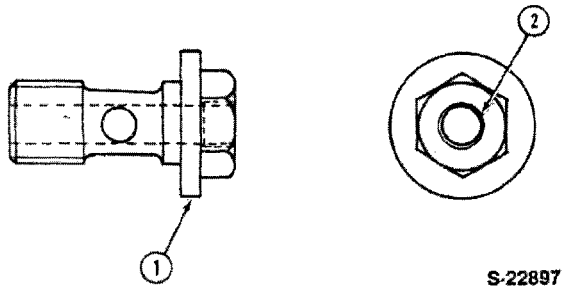

Figure 80
Charge Pump Relief Valve Test

1. Banjo Bolt (for Pressure Test)
2. Drill and Tap — 1/8 in NPT

Pressure Reading . .61-81 psi (5 ± 0.7 kg/cm²)

NOTE: *If the charge pressure reading is low, check the following:*

- Restricted suction filter.
- Check or replace the charge pump relief valve.
- Check and repair the charge pump.

PART 5
TRANSMISSION SYSTEMS

Chapter 3
HYDROSTATIC TRANSMISSION GEARBOX — MODEL 1320-1520

A. DESCRIPTION AND OPERATION

The hydrostatic transmission gearbox, Figure 81, provides the power flow from the hydrostatic unit for the following functions:

- Three speed gear ratios to the rear axle drive pinion.
- Power take-off drive through a gear reduction to the rear PTO and mid-power take-off output shafts.
- Front wheel drive when equipped.

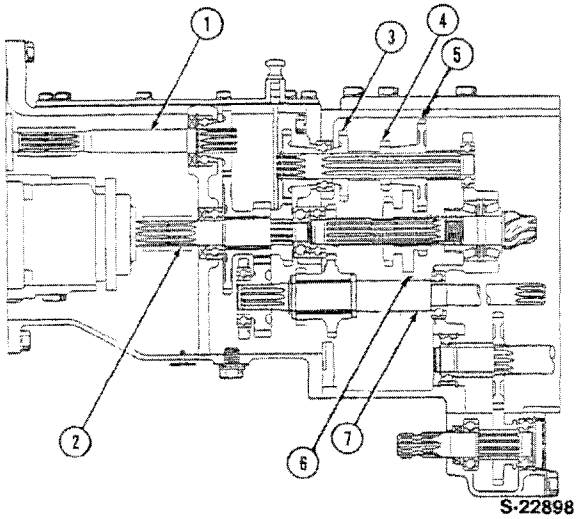

Figure 81
Hydrostatic Transmission Gearbox

1. Input Shaft (PTO)
2. Input Shaft (Trans.)
3. Middle Range Gear
4. Low Range Gear
5. High Range Gear
6. High, Middle, Low Sliding Gear
7. PTO Countershaft

The upper hydrostatic shaft (2), Figure 82, provides a direct drive from the engine to the PTO front countershaft (7), Figure 81.

The lower shaft (3), Figure 82, provides hydrostatic motor to drive the rear axle assembly.

Power flows through the gearbox for high, low and mid-range gear speed as shown in Figures 83 through 85.

Power flow to the rear power take-off output shaft is shown in Figure 86.

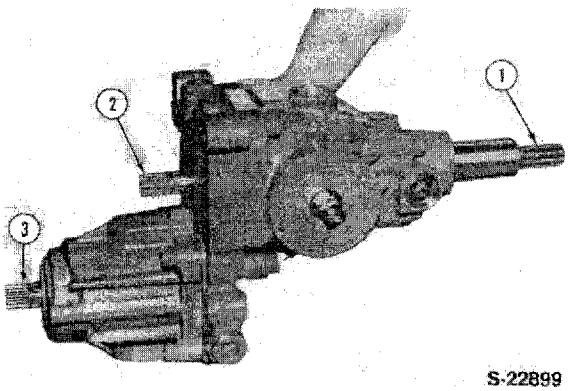

Figure 82

1. Input Shaft
2. PTO Drive
3. Transmission Drive

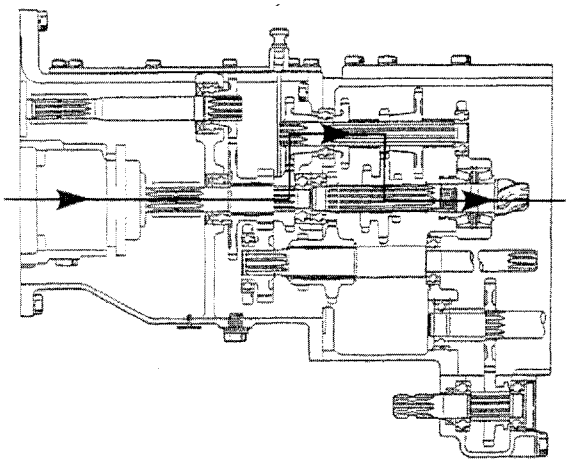
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Figure 83
Power Flow — Low Range

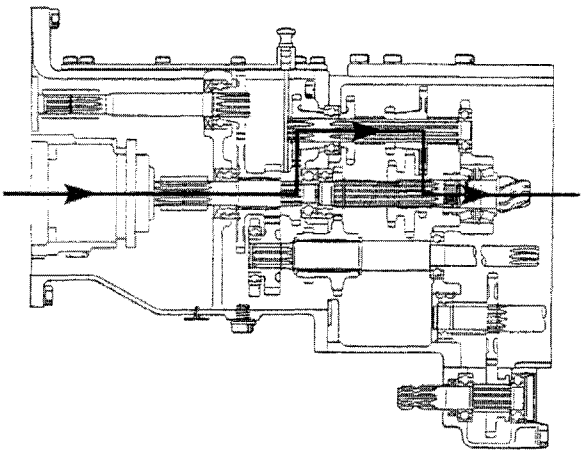
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Figure 85
Power Flow — High Range

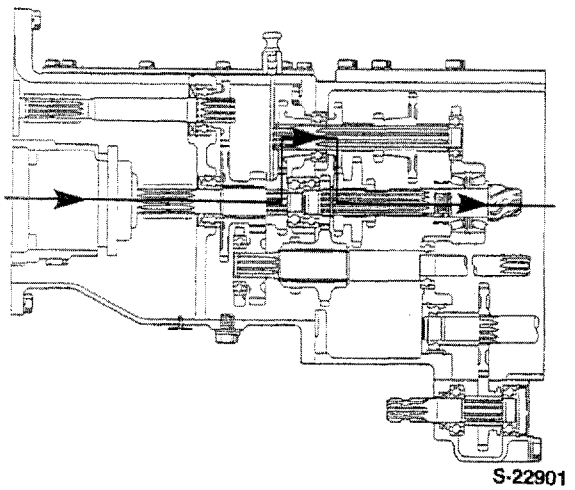
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Figure 84
Power Flow — Mid-Range

B. OVERHAUL

REMOVAL

1. Drain the oil from the transmission case.
2. Separate the transmission case from the engine and rear transmission See "Separating the Tractor," Part 12.

DISASSEMBLY

1. Remove the two test port adaptors (1), Figure 87.
2. Disconnect the HST control rod (1), Figure 88.
3. Remove the clutch housing attaching bolts and remove the clutch housing, Figure 87.
4. Remove the hydrostatic unit retaining bolts and nuts and remove the hydrostatic unit from the transmission case, Figure 89.

TRANSMISSION CASE — REMOVAL

Reference — Figure 90

1. Remove snap ring (1) and fixed gears (2) from the main shaft, Figure 90.
2. Remove the transmission to rear axle buckle-up bolts. Note that one buckle-up bolt (4), Figure 90, is located inside the case. Remove the transmission case from the rear axle center housing.

PTO INPUT SHAFT — REMOVAL

1. Remove the oil seal (6) from the front of the case, Figure 90.
2. Remove the snap ring (11) and gear (10), Figure 90.

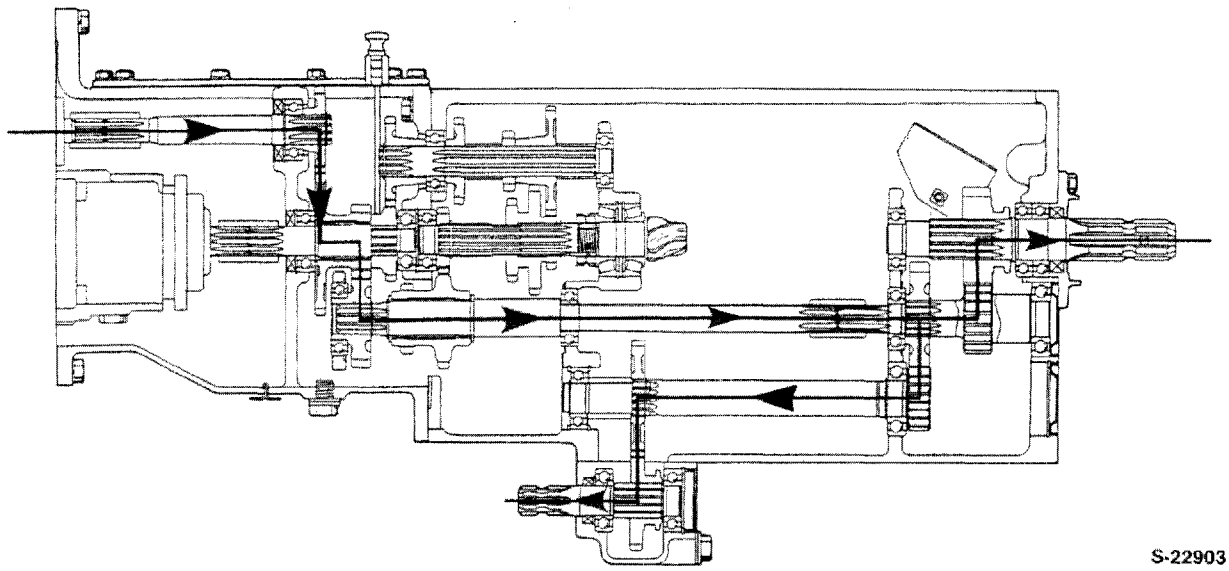

Figure 86
Power Flow — Hydrostatic Transmission — Power Take-Off

3. Remove the bearing retaining ring (8).

4. Gently drive the PTO input shaft (5) forward and remove the shaft and bearing assembly from the case.

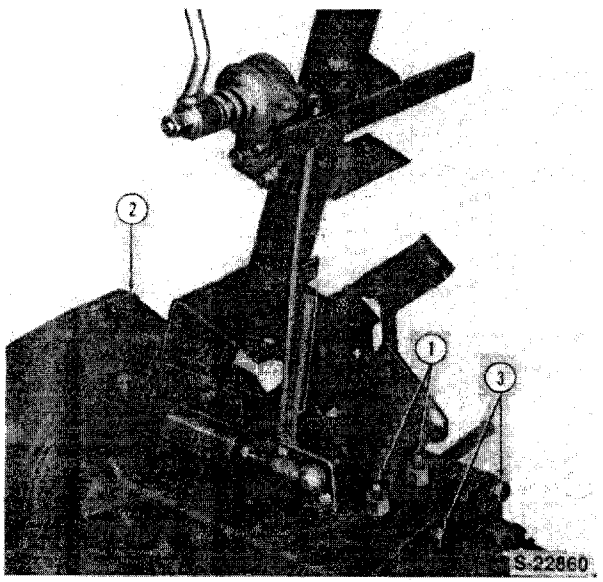

Figure 87
Clutch Housing Removal

1. Adaptors — Pressure Test Ports
2. Clutch Housing
3. Clutch Housing Attaching Bolts

TRANSMISSION INPUT SHAFT — REMOVAL

Reference — Figure 91

1. Remove the input shaft oil seal (1), Figure 91.

2. Remove the bearing retaining snap ring (2).

3. While supporting the gears, slide the input shaft and front bearing out the front of the case.

4. Remove the counter gear (7), needle bearings (6), spacer (8), and fixed gear (9), out through the top of the case.

5. If necessary, use a suitable puller and remove the bearing from the shaft.

4WD SHIFT ROD — REMOVAL

Reference — Figure 92

1. Drive the roll pin (11), Figure 92, out of the lever (7) and remove the lever.

2. Remove the shift rod (5) from the rear.

   NOTE: *Use care to not lose the detent ball and spring when separating the rod from the fork.*

3. Remove the shift fork (1) and arm (2), from the case.

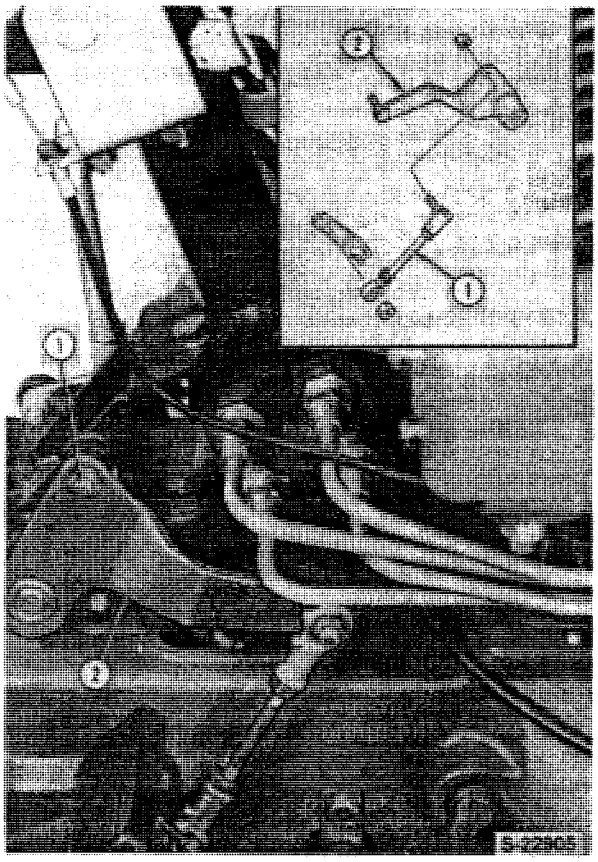

Figure 88
HST Control Rod Removal
1. Rod
2. Shift Link

4WD DRIVE SHAFT — REMOVAL
Reference — Figure 93

1. Remove the seal (4) from the transmission case.
2. Remove the bearing retaining snap ring (5).
3. While supporting the sliding gear (7) pull the 4WD shaft out the front of the case.
4. Remove the sliding gear and rear bearing.

REAR MAIN SHAFT — REMOVAL

1. Gently drive the main shaft forward while removing the rear bearing (7), Figure 94, from the shaft.
2. While supporting the gears and spacers remove the shaft from the front.

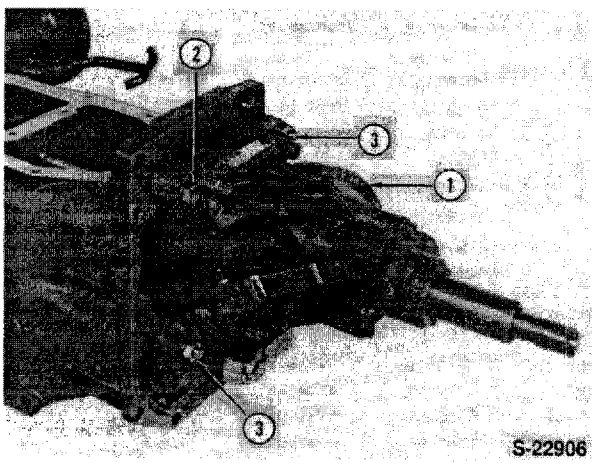

Figure 89
Hydrostatic Unit Removal
1. HST Unit
2. Bolts (2)
3. Stud Nuts 2)

RANGE GEAR SHIFTER ROD — REMOVAL

1. Drive out the roll pin (10) and remove the lever (11) from shift arm, Figure 95.
2. Pull out the shift rod (7) from the front.

   NOTE: *Use care to not loose the dentent spring and ball when the shaft is being separated from the fork.*
3. Remove the fork.
4. Remove the retaining plate (8) and remove the shift arm.

DRIVE PINION SHAFT — REMOVAL
Reference — Figure 96

The rear axle and differential assembly must be removed from the center housing prior to removal of the drive pinion shaft or range gear sliding gears.

See "Differential — Rear Axle and Brakes," Part 7.

1. Pry up the lock washer tabs (7), Figure 96 and loosen the two locknuts (6).
2. Gently drive the pinion rearward while removing the front bearings (1).