Lesson 4: 906 Wheel Loader Hydrostatic Drive System

Introduction

The 906 Wheel Loader hydrostatic drive system is similar to the hydrostatic drive systems used on other Caterpillar machines. The information learned in this lesson will allow students to understand, test and adjust the hydrostatic drive systems used on other machines.

Objectives

Upon completion of this lesson, the student will be able to:

1. Identify components of the 906 Wheel Loader hydrostatic drive system.
2. State the function of the components in the 906 Wheel Loader hydrostatic drive system.
3. Trace the oil flow through the 906 Wheel Loader hydrostatic system in each operation mode (Neutral, Forward/High, Forward/Low, Reverse/High)
4. Perform the testing and adjusting procedures for the Power Train hydrostatic drive system as stated in the 902 and 906 Compact Wheel Loaders Power Train, Testing and Adjusting Module (Form No. RENR2824).

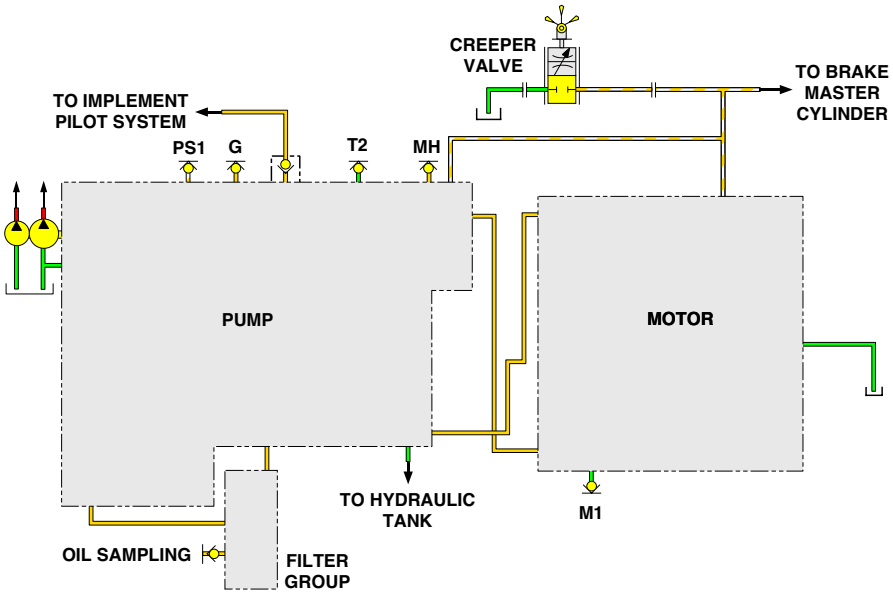

Fig. 3.4.1 Hydrostatic Drive System

HYDROSTATIC DRIVE SYSTEM

The main components of the hydrostatic drive system include a pump group, a motor group and a filter group. The "creeper" valve is optional. The creeper valve enables the operator to infinitely vary the top speed of the machine in either speed position while the engine is at maximum rpm. The system shares the same hydraulic tank with the implement and steering systems.

The motor is mounted to a gear box which mounts to the rear axle. The motor drives an input gear which meshes with the output gear in the gear box. The output gear transmits power directly to the rear axle and to the front axle through a drive shaft.

The hydrostatic drive system also supplies oil to the implement pilot system and the brake master cylinder.

NOTE: The colors codes used to represent the hydrostatic drive system oil pressures are:

Green	-	Return oil to tank
Blue	-	Blocked oil
Red	-	Drive loop high pressure oil
Red and White Stripes	-	Drive loop low pressure oil
Orange	-	Charge pressure oil
Orange and White Stripes	-	Drive signal pressure oil
Orange and White Dots	-	Reduced charge pressure oil

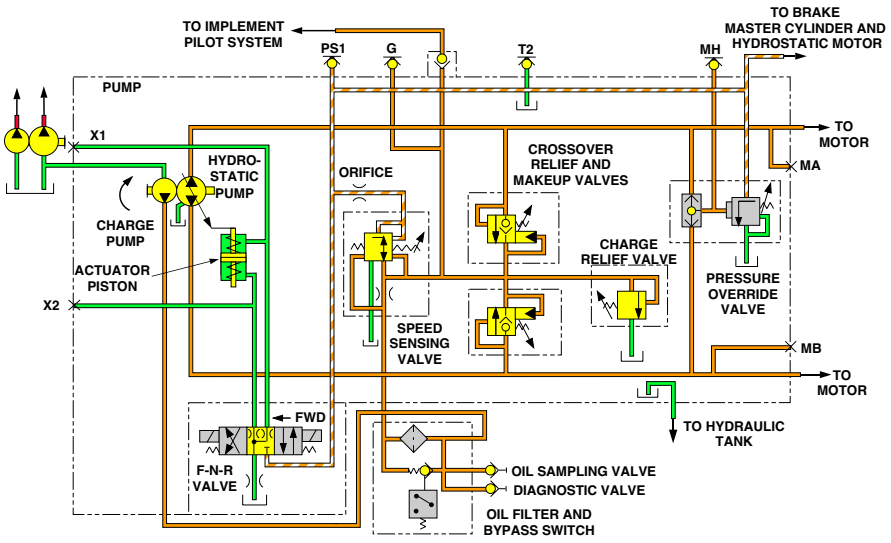

Fig. 3.4.2 Hydrostatic Drive System Pump and Filter Schematic

Hydrostatic Drive System Pump and Filter Groups

The hydrostatic drive pump group consists of the following components:

Hydrostatic drive pump: The variable displacement, over-center piston pump provides flow to drive the bi-directional motor.

Charge pump: Fills the system with oil at start-up, provides makeup oil and provides the source for signal pressure to control the pump and motor.

Speed sensing valve: Controls signal oil and makeup oil.

Orifice: Located in the signal line above the speed sensing valve, it allows the pressure override valve and the brake master cylinder to function as designed.

Combination crossover relief and makeup valves: Maintains a minimum pressure in the drive loop low pressure side and limits maximum pressure in the drive loop high pressure side.

Charge pump relief valve: Controls the maximum charge oil pressure. The maximum hydrostatic system pressure in NEUTRAL and the maximum implement pilot system pressure.

FORWARD-NEUTRAL-REVERSE (F-N-R) valve: Controls the direction of output flow from the hydrostatic drive pump.

Pressure override (POR) valve: Limits the maximum drive loop pressure.

Filter bypass valve and switch: Limits the delta pressure across the filter and signals when the filter bypass is open.

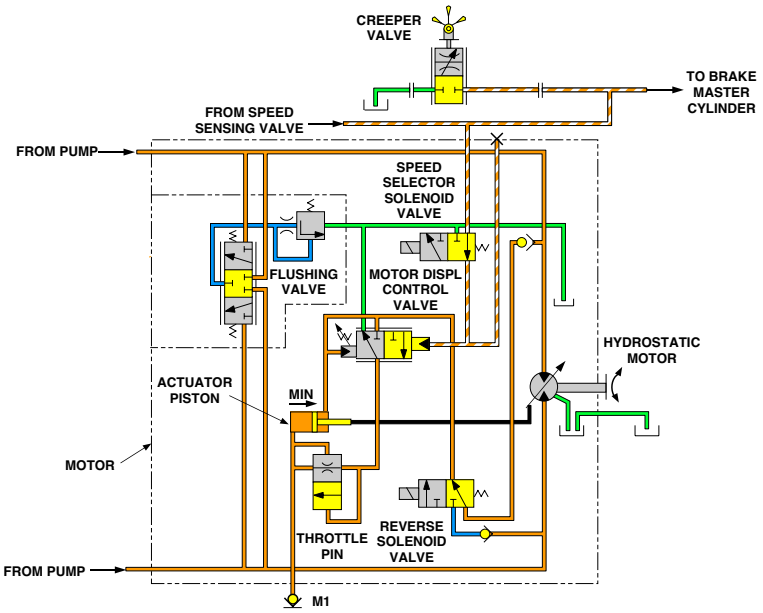

Fig. 3.4.3 Hydrostatic Drive System Motor and Creeper Valve Schematic

Hydrostatic Drive Motor and Creeper Valve Groups

The hydrostatic drive motor group consists of the following components:

Hydrostatic drive motor: A bi-directional, variable displacement, bent axis piston motor and actuator convert hydraulic power into mechanical power.

Throttle pin (Orifice check valve)**:** Controls motor stroking time from minimum stroke to maximum stroke.

Motor displacement control valve: Controls the motor swashplate-angle.

Speed selector valve: Controls the signal oil to the motor displacement control valve.

Reverse solenoid valve: Maintains drive oil pressure to motor displacement control valve in both forward and reverse.

Flushing valve: Continuously drains some oil from the low pressure side of the loop through the motor bearings to case drain and maintains a minimum pressure in the low pressure side of the loop.

Optional "creeper" valve: Drains the signal oil from the speed sensing valve directly to the tank.

NOTE: The 906 has a maximum motor displacement of 80 cc (4.88 cu. in.) per revolution at the rated engine speed of 2600 rpm. The 906 has a minimum motor displacement of 33.5 cc (2.04 cu. in.) per revolution.

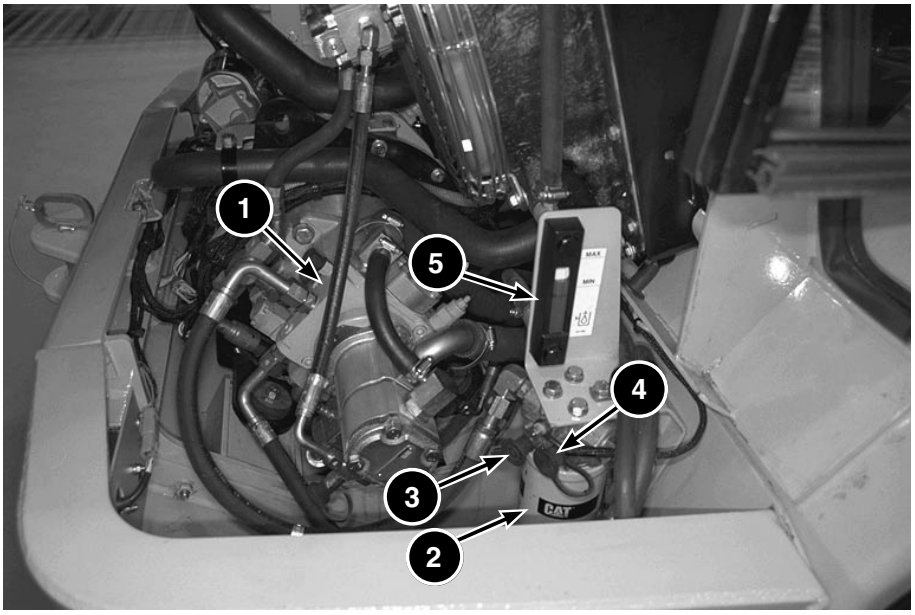

Fig. 3.4.4 Hydrostatic Drive Component Locations

Hydrostatic Drive Component Locations

From the right side of the rear compartment the following components are visible:

- Hydrostatic drive pump (1)
- Hydraulic oil filter (2)
- S•O•S tap (3)
- Charge pressure tap (4)
- Oil tank sight gauge (5)

The hydraulic oil tank (not visible) is located on the right side of the machine below the cab.

Fig. 3.4.5 Additional Component Locations

Hydraulic Oil Cooler and Tank Fill Tube

The hydraulic oil cooler (1) is located just behind the cab on the right side of the machine. The oil cooler is hinged at the inner end to permit cleaning between the cooler and the radiator.

The hydraulic tank fill tube (2) is located in front of the oil cooler.

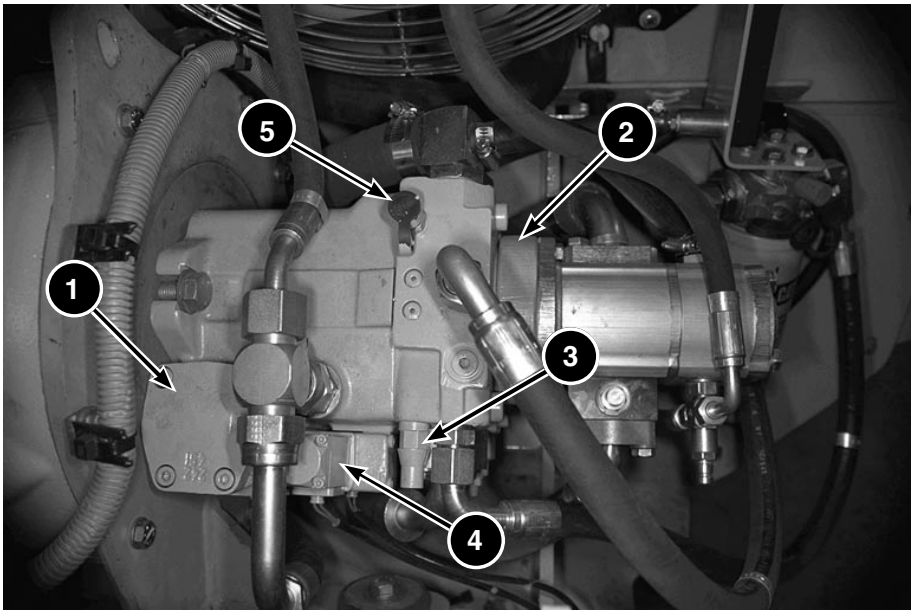

Fig. 3.4.6 Hydrostatic Pump Component Location

Hydrostatic Drive Pump Components

The pump actuator (1) moves the swashplate in the pump. The angle of the swashplate controls the amount and direction of oil flow from the pump to the motors.

The charge pump (2) fills the system at start-up and provides makeup oil. The charge pump also provides the source for signal pressure to control the pump and motor.

The POR valve (3) limits the maximum drive loop pressure.

The Forward-Neutral-Reverse (F-N-R) solenoid valve (4) directs the signal pressure to one end or the other end of the pump actuator to stroke it for Forward or Reverse direction and speed.. The F-N-R solenoid valve is energized by an electric directional control switch mounted in the joystick in the operators compartment.

The pressure tap (5) for drive loop pressure (MH) is located on top of the pump.

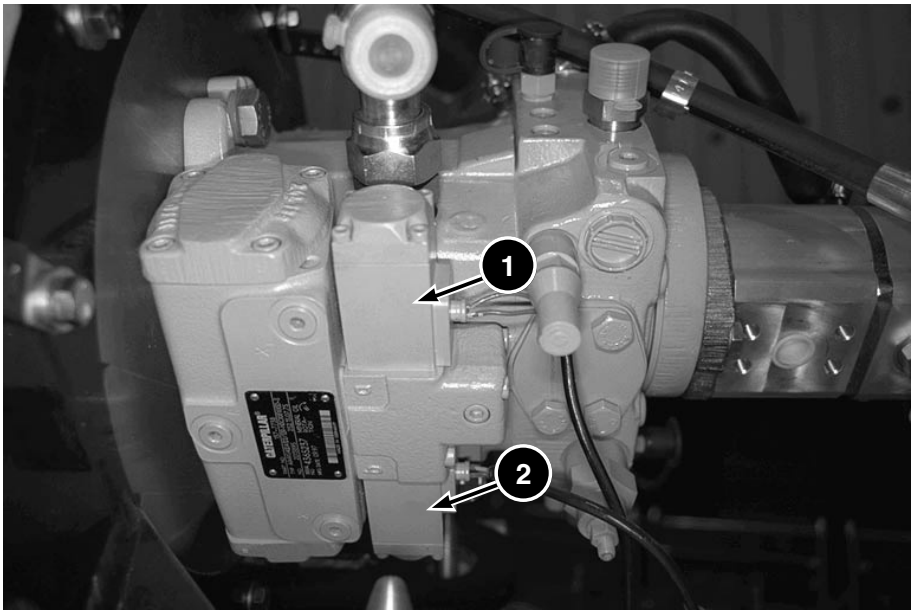

Fig. 3.4.7 Pump Solenoid Valves Location

Pump Solenoid Valves

When the forward (F-N-R) solenoid (1) is energized by the electric directional control switch, the solenoid valve spool is shifted and sends signal oil to actuate the pump to provide flow for the forward direction.

When the reverse (F-N-R) solenoid (2) is energized by the electric directional control switch, the solenoid valve spool is shifted and sends signal oil to actuate the pump to provide flow for the reverse direction.

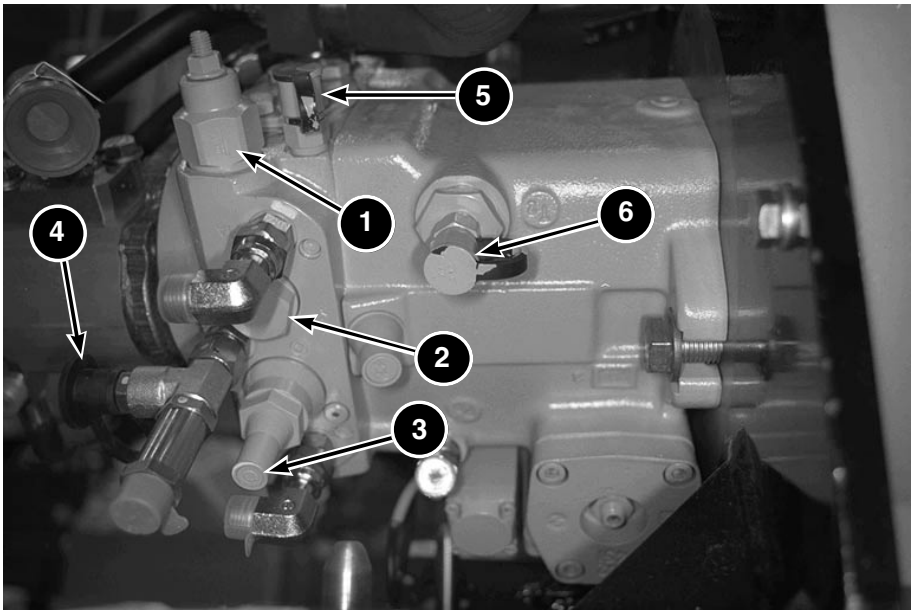

Fig. 3.4.8 Additional Hydrostatic Pump Component Locations

Additional Pump Components

The crossover relief and makeup valves (1) combine two separate functions into one valve as described in Unit 3, Lesson 2. The crossover relief section of the valves limit the maximum pressure in the drive side of the loop. The makeup sections close the connection between the drive side of the loop and the charging system and open the charging system to the low pressure side of the loop to supply makeup oil to the loop. One crossover relief and makeup valve (1) is shown is this view. The other crossover relief and makeup valve is located in the same position on the opposite side of the pump.

The charge pump relief valve (2) limits the charge pressure oil. The valve also limits the maximum hydrostatic system pressure in NEUTRAL and the maximum implement pilot system pressure.

The speed sensing valve (3) senses the charge oil flow and converts some of it to signal oil. The signal oil is used to control the pump and motor.

The following pressure taps are located on the bottom of the pump:

- Charge pressure tap (4)

- Signal pressure tap (5)

- Case drain pressure tap (6)

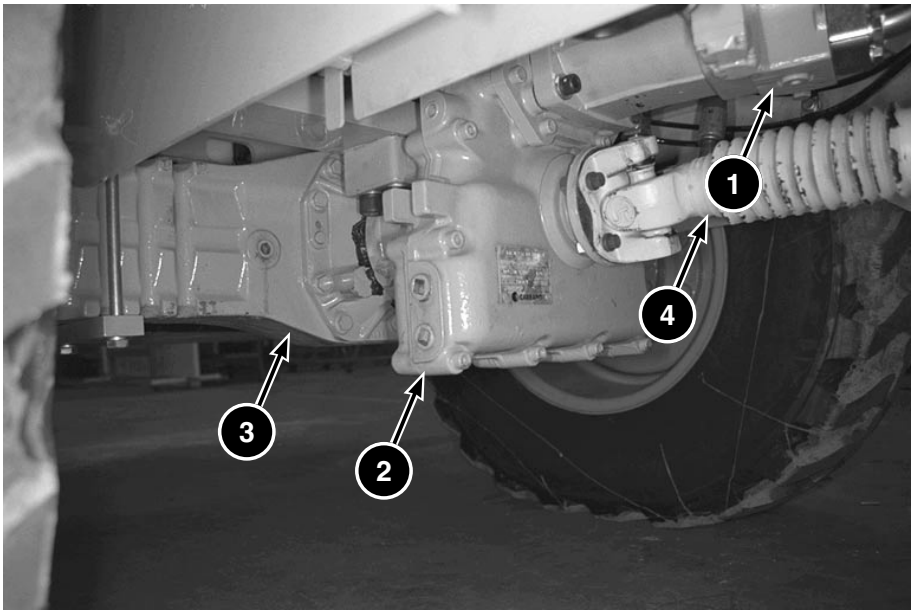

Fig. 3.4.9 Hydrostatic Drive Motor Location

Hydrostatic Drive Motor

The hydrostatic drive motor (1) is mounted to the hydrostatic drive box (2). The hydrostatic drive box is connected to the rear axle (3).

The motor drives an input gear which meshes with the output gear in the hydrostatic drive box. The output gear transmits power directly to the rear axle and to the front axle (not visible) through a drive shaft (4).

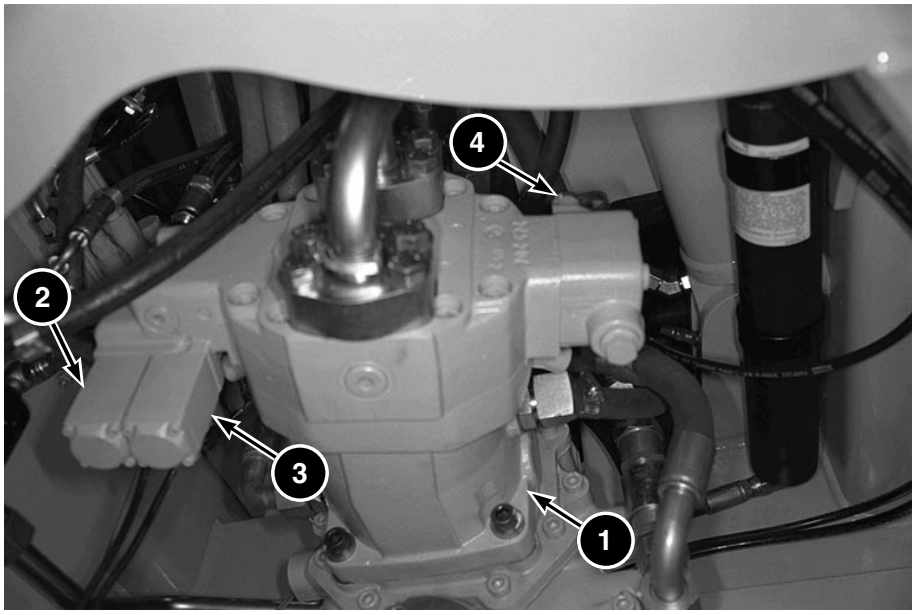

Fig. 3.4.10 Hydrostatic Drive Motor Component Locations

Hydrostatic Drive Motor Components

The bi-directional, variable displacement, bent axis piston motor (1) converts hydraulic power into mechanical power. The motor actuator piston controls the motor displacement by changing the angle of the rotating group relative to its output shaft. The longer the stroke (increased displacement), the higher the torque and lower the speed. The shorter the stroke (decreased displacement), the lower the torque and higher the speed.

The speed selector valve (2) which, when energized, blocks the signal oil from reaching the motor displacement control valve to keep the motor fully upstroked. Machine ground speed is reduced while engine speed and implement pump flow are maintained. The machine is in the SLOW speed mode.

The reverse solenoid valve (3) directs oil form the drive side of the loop, either FORWARD or REVERSE, to the motor displacement control valve and the actuator. This drive side oil pressure is used to upstroke and destroke the motor in both forward and reverse. When the reverse solenoid valve is de-energized, the pressurized oil from the FORWARD drive side of the loop goes to the motor displacement control valve and the actuator. When the reverse solenoid valve is energized, the pressurized oil from the REVERSE drive side of the loop goes to the motor displacement control valve and the actuator.

Hydrostatic motor actuator pressure can be checked at the M1 pressure tap (4).

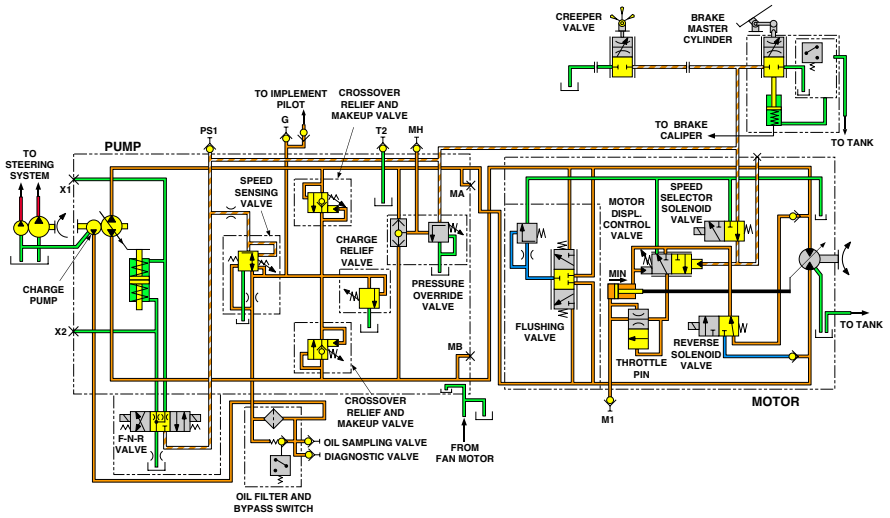

Fig. 3.4.11 Hydrostatic Drive System Schematic in Neutral

Hydrostatic Drive System Operation

At machine start-up with the directional control switch in NEUTRAL, the charge pump sends oil through the oil filter to the speed sensing valve. Oil flows from the speed sensing valve to the charge circuit, the implement pilot circuit, the F-N-R Valve, the brake master cylinder and the creeper valve.

Most of the speed sensing valve oil enters the charge circuit and goes to the crossover relief and makeup valves and the charge pump relief valve.

The charge relief valve in the charging circuit (Fig. 3.4.11) limits the maximum charge pressure in the closed loop. As pressure in the charge circuit increases, the charge relief valve opens to maintain the charge pressure.

The makeup valve (in each crossover relief and makeup valve) opens and allows charge oil to flow through the drive loop to the hydrostatic drive pump, hydrostatic motor, flushing valve, and the reverse solenoid valve. When the system is charged, the charge pump relief valve opens and charge oil flows to the pump case and back to the tank. The charge pressure can be checked at the test port stamped "G" on the pump.

In NEUTRAL, the reverse solenoid valve directs FORWARD drive loop pressure oil to the motor displacement control valve and the motor actuator piston.

Charge oil in the drive loop also flows through the ball resolver in the pressure override valve. Drive loop pressure can be checked at test port "MH." In NEUTRAL, this pressure is the same as charge pressure.

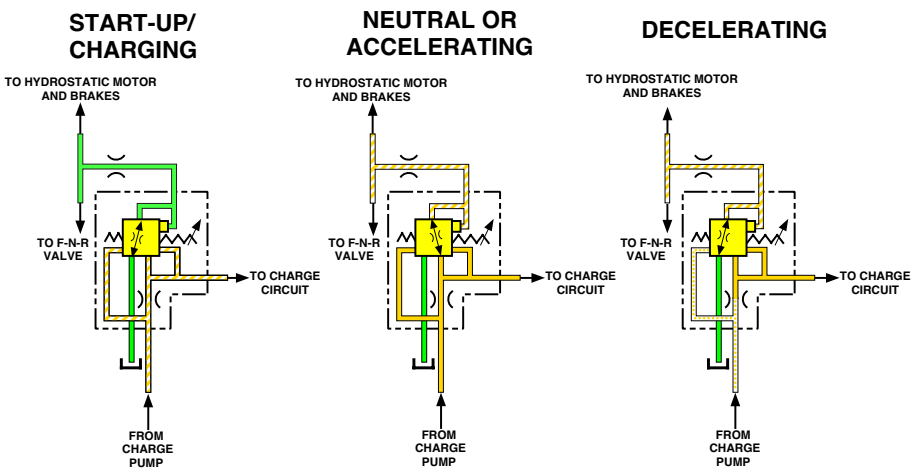

Fig. 3.4.12 Speed Sensing Valve

Speed Sensing Valve Operation

The speed sensing valve regulates signal pressure oil (based on engine speed) to the F-N-R valve, the hydrostatic motor, and the brake.

When the machine is started, the speed sensing valve is in the start-up/charging mode. The charge pump oil flows to the speed sensing valve. From the speed sensing valve, oil flows through the crossover relief and makeup valves to charge the closed drive loop system. Initially, no signal (drive signal) is sent to the F-N-R valve and the hydrostatic motor and brake.

When the drive loop is charged, the charge pressure increases. The higher charge pump oil pressure on the left side of the speed sensing valve assists the spring and causes the speed sensing valve to shift to the right (middle diagram). The signal oil flows to the F-N-R valve and the hydrostatic motor and brake.

An increase in engine speed results in an increase in flow from the fixed displacement charge pump. The flow increase through the orifice at the bottom of the speed sensing valve results in a larger delta pressure across the orifice and shifts the speed sensing valve farther to the right. This increases the flow through the speed sensing valve and increases the signal pressure to the F-N-R valve and the hydrostatic motor. If the F-N-R valve is shifted to either FORWARD or REVERSE position when engine speed is increased, the ground speed will increase.

When the engine speed decreases, the charge pump sends less flow to the speed sensing valve. The charge oil pressure is now lower on the left side of the speed sensing valve than on the right side. This causes the speed sensing valve to shift to the left, directing the signal oil to the tank. With a reduced signal at the hydrostatic motor and the hydrostatic pump, the motor rapidly upstrokes and the pump begins to destroke. This action prevents engine lug.

When the accelerator pedal is depressed, the speed sensing valve creates a signal which flows to the pressure override valve, the F-N-R valve, the brake master cylinder, the speed selector solenoid valve, and the motor displacement control valve. In NEUTRAL, the F-N-R valve blocks the signal oil, which prevents the pump from upstroking.

When the speed selector valve switch is in the FAST speed mode, with the F-N-R valve in neutral, the speed selector solenoid is not energized. Signal oil flows to the motor displacement control valve. (The motor will destroke, but since no pump flow is produced, no power is transferred to the hydrostatic gear box.) When the speed selector valve switch is in the SLOW speed mode, the speed selector solenoid is energized. The signal oil is blocked and the motor will not destroke when the transmission selector is moved to either FORWARD or REVERSE. In NEUTRAL, "M1" is equal to charge pressure (at high idle).

Pump case pressure can be checked at test port "T2."

NOTE: Always use at least a 60000 kPa (8500 psi) pressure gauge (such as 8T0861) when checking the drive loop pressure at test ports "MH" and "M1" unless a pressure limiter (such as 1U9161) is used to protect the gauge. Lower range pressure gauges may be used when checking pressures in NEUTRAL as long as care is taken not to shift the directional control switch.

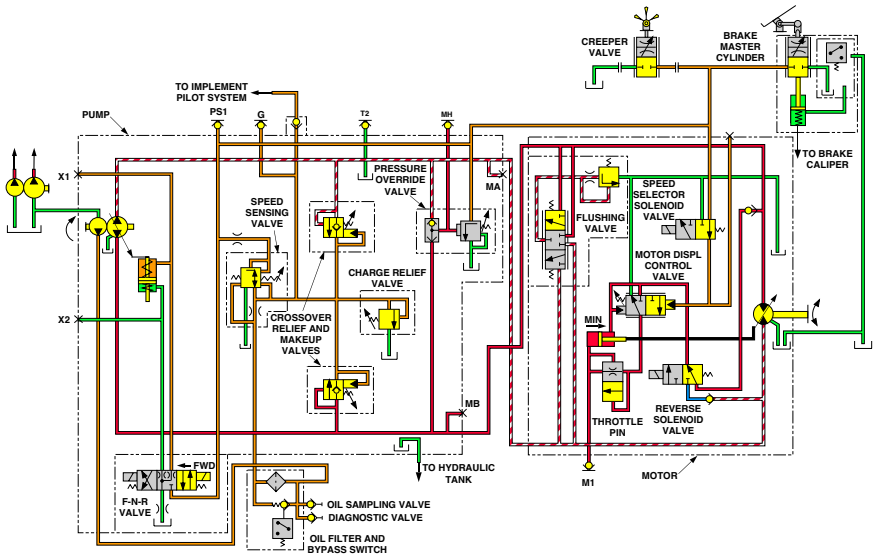

Fig. 3.4.13 Hydrostatic Drive Schematic in Forward/High

Hydrostatic Drive in Forward/High

When the hydrostatic drive control is in the HIGH position and the operator moves the directional control switch to FORWARD, the forward solenoid moves the F-N-R valve to the left. Signal oil from the speed sensing valve flows to the pump actuator. The signal oil pressure acts against the actuator centering springs, but the signal oil pressure is too low at low idle to overcome the spring and move the actuator. The pump will not upstroke and the machine will not move.

As the operator depresses the accelerator pedal, the engine speed increases the charging pump flow which causes the signal pressure to increase. The increase in signal pressure overcomes the actuator centering spring and upstrokes the pump. The pump sends flow to the motor and the machine begins to move. As the engine speed increases, the increasing signal pressure upstrokes the pump. The pump sends more oil to turn the motor and increases the machine speed.

The engine speed and signal pressure continue to increase. The increasing signal pressure is also sensed at the motor displacement control valve. The increased signal pressure moves the motor displacement control valve to the left. High pressure drive loop oil flows past the reverse solenoid valve, the motor displacement control valve and the throttle pin to the motor actuator to destroke the motor. Destroking the motor causes the motor to rotate faster. The machine is at maximum speed when the motor is fully destroked, the pump is fully upstroked and the engine is at maximum rpm.

Any resistance to motor rotation increases the drive pressure, which acts on the left end of the motor displacement control valve. This higher pressure moves the motor displacement control valve to the right and drains oil in the motor actuator to the tank. The motor actuator then moves to the left, causing the motor to upstroke, thus reducing machine speed.

The motor displacement control valve continuously balances the signal and drive loop pressures to prevent excessive engine lug.

NOTE: When FORWARD/HIGH or REVERSE/HIGH is selected, the machine speed ranges from zero to maximum.

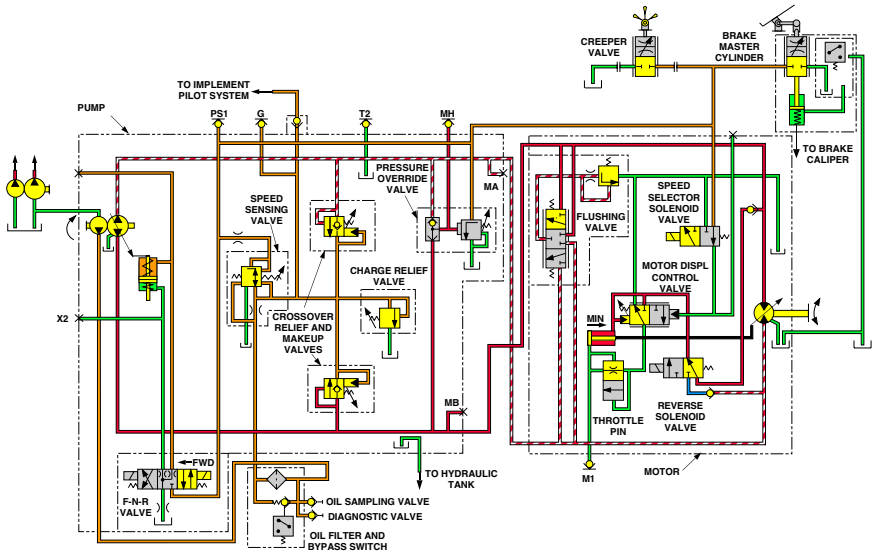

Fig. 3.4.14 Hydrostatic Drive Schematic in Forward/Low

Hydrostatic Drive in Forward/Low

When the hydrostatic drive control is in the LOW position and the operator moves the direction switch to forward, the system operation is similar to FORWARD/HIGH. When in the FORWARD/LOW position the hydrostatic drive control energizes the speed selector valve solenoid. The speed selector solenoid valve blocks signal oil flow to the motor displacement control valve. The motor is held at maximum stroke due to the drive loop pressure acting on the right side of the actuator piston.

High engine speed can be maintained, while machine speed is relatively low with high torque. With high engine speed, the implement pump is able to provide more flow to improve productivity during applications such as truck loading.

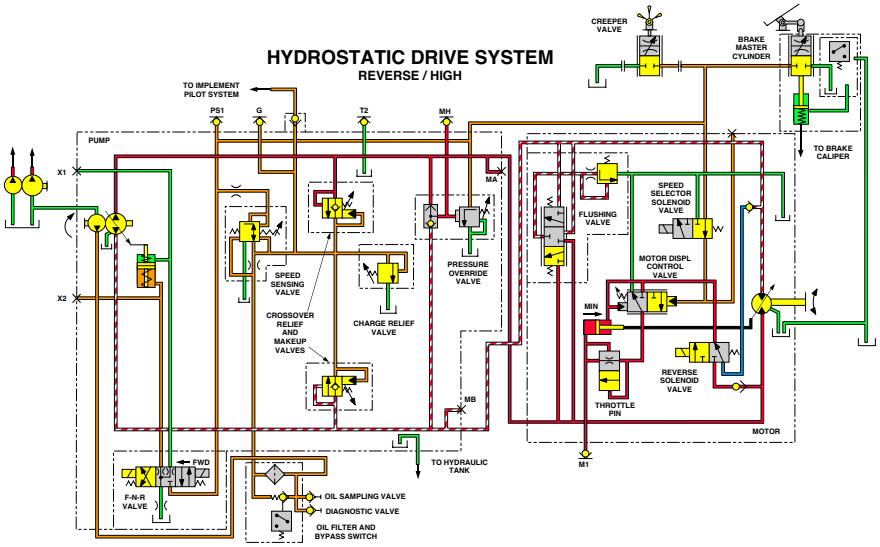

Fig. 3.4.15 Hydrostatic Drive Schematic in Reverse/High

Hydrostatic Drive in Reverse/High

Operation in REVERSE/HIGH (as shown here) and REVERSE/LOW is similar to operation in FORWARD/HIGH and FORWARD/LOW except that the F-N-R valve moves to the right. The reverse solenoid valve for the motor is energized and also moves to the the right. High pressure oil is then sent from the opposite side of the drive loop to the motor displacement control valve and the motor actuator.

If the brake is applied in either FORWARD or REVERSE, signal pressure (PS1) will be reduced, upstroking the motor (if it is destroked) and destroking the pump.

Lab 3.4.1: Hydrostatic Drive System Component Identification and Machine Orientation

Purpose

This lab measures your ability to identify and locate the hydrostatic drive components.

Procedure No. 1:

Identity the Hydrostatic Drive System components by matching the lettered or numbered tags on the components with the names on the worksheets.

Procedure No. 2

Using the 902 and 906 Compact Wheel Loaders Operation and Maintenance Manual perform the following operations:

1. Perform a walk-around inspection of the machine.
2. Identify the machine controls.
3. Perform machine start-up and shutdown procedures.
4. Operate the machine noting steering and brake characteristics, power train operation and implement control function.
5. Operate the implements (optional) and note the operation of the different functions.

Materials Needed

902 and 906 Compact Wheel Loaders Operation and Maintenance Manual (Form No. SEBU7137)

902 and 906 Compact Wheel Loaders Hydraulic System Schematic (Form No. SENR1294)

Lab 3.4.1 Worksheets

Pen or pencil

902 or 906 Compact Wheel Loader

Mechanic's tool box with hand tools

Lab 3.4.1: Hydrostatic Drive System Component Identification Worksheet

Directions: Use this worksheet during the slide presentation to take notes on the function and location of each component. During the lab exercise, write the letter or number attached to the component next to the correct name.

_____ **Hydrostatic Drive System Pump**

Location: _____

Function: _____

Item Number: _____

_____ **Charge Pump**

Location: _____

Function: _____

Item Number: _____

_____ **Hydrostatic Drive Motor**

Location: _____

Function: _____

Item Number: _____

_____ **Hydrostatic Drive Box**

Location: _____

Function: _____

Item Number: _____

_____ **Hydraulic System Filter**

Location: _____

Function: _____

Item Number: _____

Lab 3.4.1: Hydrostatic Drive System Component Identification Worksheet (continued)

_____ **Hydraulic Oil Cooler**

Location: _____

Function: _____

Item Number: _____

_____ **Hydraulic Tank**

Location: _____

Function: _____

Item Number: _____

_____ **Hydrostatic Drive Pump Pressure Tap (MH)**

Location: _____

Function: _____

Item Number: _____

_____ **Charge Pressure Tap (G)**

Location: _____

Function: _____

Item Number: _____

_____ **Pump Signal Pressure Tap (PS1)**

Location: _____

_____

Function: _____

Item Number: _____

Lab 3.4.1: Hydrostatic Drive System Component Identification Worksheet (continued)

_____ **Pump Case Pressure Tap (T2)**

Location: _____

Function: _____

Item Number: _____

_____ **Motor Actuator Pressure Tap (M1)**

Location: _____

Function: _____

Item Number: _____

_____ **Flushing Valve**

Location: _____

Function: _____

Item Number: _____

_____ **FORWARD-NEUTRAL-REVERSE (F-N-R) Valve**

Location: _____

Function: _____

Item Number: _____

_____ **Crossover Relief and Makeup Valves (2)**

Location: _____

Function: _____

Item Number: _____

_____ **Charge Relief Valve**

Location: _____

Function: _____

Item Number: _____

Lab 3.4.1: Hydrostatic Drive System Component Identification Worksheet (continued)

_____ **Speed Sensing Valve**

Location: _____

Function: _____

Item Number: _____

_____ **Pressure Override (POR) Valve**

Location: _____

Function: _____

Item Number: _____

_____ **Motor Displacement Control Valve**

Location: _____

Function: _____

Item Number: _____

_____ **Speed Selector Solenoid Valve**

Location: _____

Function: _____

Item Number: _____

_____ **Reverse Solenoid Valve**

Location: _____

Function: _____

Item Number: _____

Lab 3.4.2: Hydrostatic Drive System Testing and Adjusting

Shop Lab Exercise

This lab measures your ability to perform testing and adjusting procedures on the 906 Wheel Loader Hydrostatic Drive System.

Procedure

Perform the hydrostatic drive system tests in Lab 3.4.2 worksheets using the 902 and 906 Compact Wheel Loader Power Train Testing and Adjusting Module (Form No. RENR2824). Record all test results on the "Lab 3.4.2 Hydrostatic Drive System Testing and Adjusting Worksheet."

Materials Needed

Lab 3.4.2 Worksheets

902 or 906 Compact Wheel Loader

Service Manual module "902 and 906 Compact Wheel Loader Power Train Testing and Adjusting" (Form No. RENR2824)

1 - 8T0853 Pressure Gauge

4 - 8T0855 Pressure Gauge

1 - 8T0860 Pressure Gauge

1 - 8T0861 Pressure Gauge

7 - 6V3014 Hose

1 - 9U7400 Multitach Group

2 - 6V9509 Plug

3 - 3J1907 O-ring

2 - 6V8398 O-ring

1 - 6V9830 Cap

14 - 6V4143 Coupler Assembly

5 - 6V3989 Unvalved Nipple

4 - 6V3966 Valved Nipple Assembly

1 - 6V3965 Valved Nipple Assembly

1 - 1S8937 Needle Valve

1 - 2D7325 Pipe Tee

2 - 1106349 Valved Nipple Assembly

4 - 1U9760 Stand

2 - 1U5482 Hose

Mechanic's tool box with hand tools

Lab 3.4.2: Hydrostatic Drive System Testing and Adjusting Worksheet

Directions: Perform the tests, record the actual readings, and compare the actual machine readings to the specifications.

Machine Model_____ Date_____

Serial Number_____ Service Meter Hours_____

Test A: BASELINE (902 Wheel Loader)				
Test	**Low Idle**		**High Idle**	
	Specification	**Actual**	**Specification**	**Actual**
Engine Speed				
Charge Pressure				
Pump Signal Pressure				
Pump Case Pressure				

Test A: BASELINE (906 Wheel Loader)				
Test	**Low Idle**		**High Idle**	
	Specification	**Actual**	**Specification**	**Actual**
Engine Speed				
Charge Pressure				
Pump Signal Pressure				
Pump Case Pressure				

Lab 3.4.2: Hydrostatic Drive System Testing and Adjusting Worksheet (continued)

TEST B: PUMP AND MOTOR DISPLACEMENT (Forward Direction)		
Test	**Specification**	**Actual**
Signal Pressure		
MH (drive loop) Pressure		
Engine rpm		
Charge Pressure		

TEST B: PUMP AND MOTOR DISPLACEMENT (Reverse Direction)		
Test	**Specification**	**Actual**
Signal Pressure		
MH (drive loop) Pressure		
Engine rpm		
Charge Pressure		

Lab 3.4.2: Hydrostatic Drive System Testing and Adjusting Worksheet (continued)

TEST C: HYDROSTATIC SYSTEM STALL (902 Wheel Loader)		
Test	**Specification**	**Actual**
Engine Speed from Test A		
Engine Speed from Test C		
Difference in Engine Speed from Test A and C		
MH (drive loop) pressure		

TEST C: HYDROSTATIC SYSTEM STALL (906 Wheel Loader)		
Test	**Specification**	**Actual**
Engine Speed from Test A		
Engine Speed from Test C		
Difference in Engine Speed from Test A and C		
MH (drive loop) pressure		

Lab 3.4.2: Hydrostatic Drive System Testing and Adjusting Worksheet (continued)

TEST C: IMPLEMENT SYSTEM STALL (902 Wheel Loader)		
Test	**Specification**	**Actual**
Implement Pressure		
Engine rpm below Test A rpm		

TEST C: IMPLEMENT SYSTEM STALL (906 Wheel Loader)		
Test	**Specification**	**Actual**
Implement Pressure		
Engine rpm below Test A rpm		

Lab 3.4.2: Hydrostatic Drive System Testing and Adjusting Worksheet (continued)

TEST D: HYDROSTATIC AND IMPLEMENT SYSTEMS STALL (902 Wheel Loader)		
Test	**Specification**	**Actual**
MH (drive loop) pressure		
Implement pressure		
Engine rpm below Test A rpm		

TEST D: HYDROSTATIC AND IMPLEMENT SYSTEMS STALL (906 Wheel Loader)		
Test	**Specification**	**Actual**
MH (drive loop) pressure		
Implement pressure		
Engine rpm below Test A rpm		

TEST E: PUMP NEUTRAL SETTING		
Test	**Specification**	**Actual**
MA Drive loop pressure	NA	
MB Drive Loop Pressure		
Difference in MA and MB Pressures		

Lab 3.4.2: Hydrostatic Drive System Testing and Adjusting Worksheet (continued)

TEST F: MAXIMUM RUNOUT--FORWARD DIRECTION (902 Wheel Loader)				
Test	**Slow**		**Fast**	
	Specification	**Actual**	**Specification**	**Actual**
Signal Pressure				
MH (drive loop) Pressure				
Engine rpm				
Drive Shaft rpm				

TEST F: MAXIMUM RUNOUT--FORWARD DIRECTION (906 Wheel Loader)				
Test	**Slow**		**Fast**	
	Specification	**Actual**	**Specification**	**Actual**
Signal Pressure				
MH (drive loop) Pressure				
Engine rpm				
Drive Shaft rpm				

Lab 3.4.2: Hydrostatic Drive System Testing and Adjusting Worksheet (continued)

TEST F: MAXIMUM RUNOUT--REVERSE DIRECTION (902 Wheel Loader)		
Test	**Slow**	
	Specification	**Actual**
Signal Pressure		
MH (drive loop) pressure		
Engine rpm		
Drive Shaft rpm		

TEST F: MAXIMUM RUNOUT--REVERSE DIRECTION (906 Wheel Loader)		
Test	**Slow**	
	Specification	**Actual**
Signal Pressure		
MH (drive loop) pressure		
Engine rpm		
Drive Shaft rpm		

Lab 3.4.2: Hydrostatic Drive System Testing and Adjusting Worksheet (continued)

TEST G: MOTOR DESTROKING			
Test	**Charge Pressure Set with Needle Valve**		
	2000 kPa (290 psi)	**2500 kPa (360 psi)**	**2800 kPa (400 psi)**
Charge pressure at Motor			
M1 (motor actuator) Pressure