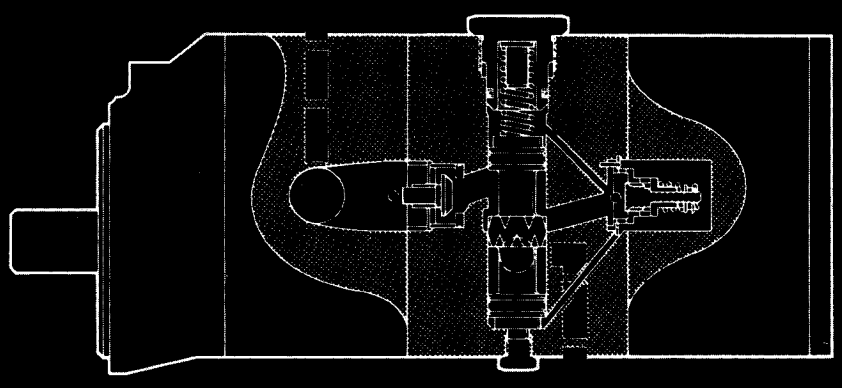
HYDRAULIC SENSING PUMPS 9075



CLARK

Construction Machinery

CLARK

HYDRAULIC SENSING PUMPS

OPERATION, ADJUSTMENT AND TROUBLESHOOTING

Introduction . . .

There are three basic Clark Hydraulic Sensing Systems: a Power Sensor Pump and Valve Assembly, a Power Steering Pump and Valve Assembly, and a Power Steering Diverter Pump and Valve Assembly.

Each assembly consists of two gear pumps mounted in tandem with common suction, and a sensor valve controlling flow from the pumps.

Each of the three systems has either an externally mounted sensor valve (old style), or an internally mounted sensor valve (new style).

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1.5M 849 CGAC 59-940-9075

POWER SENSOR PUMP AND VALVE ASSEMBLIES

Power Sensor Pump and Valve Assemblies consist of two gear pumps mounted in tandem, a common suction, and a sensor valve which controls the flow to the main hydraulic system.

These units are designed to supply a high volume of flow at low pressures for high speed operation of the main hydraulics, and a low volume of flow at high pressure for maximum force to the bucket and boom while providing more available horsepower to the power train.

At system pressures lower than the sensor setting, both pumps supply the main hydraulic system. At system pressures higher than the sensor setting, the sensor valve unloads one of the pumps by directing its flow back to the low pressure inlet side of the pump.

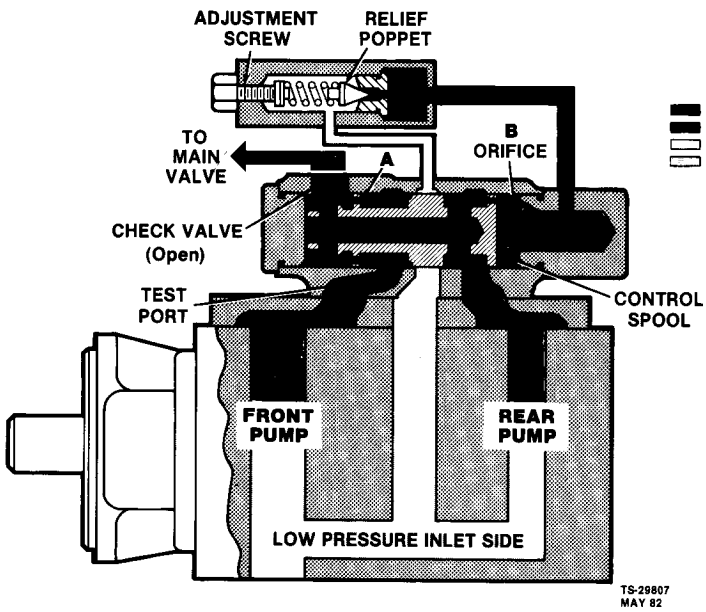
For example: Breaking out of a bank creates high system pressure. Bucket and boom cylinder movement is slight with no need for high-volume flow. By unloading one of the pumps, the horsepower required to drive that pump is greatly reduced . . . more horsepower can be delivered to the power train where it is needed. When hoisting and moving a rated load, system pressure is lower than the sensor setting; both pumps supply oil for fast hydraulics.

EXTERNAL POWER SENSOR VALVE

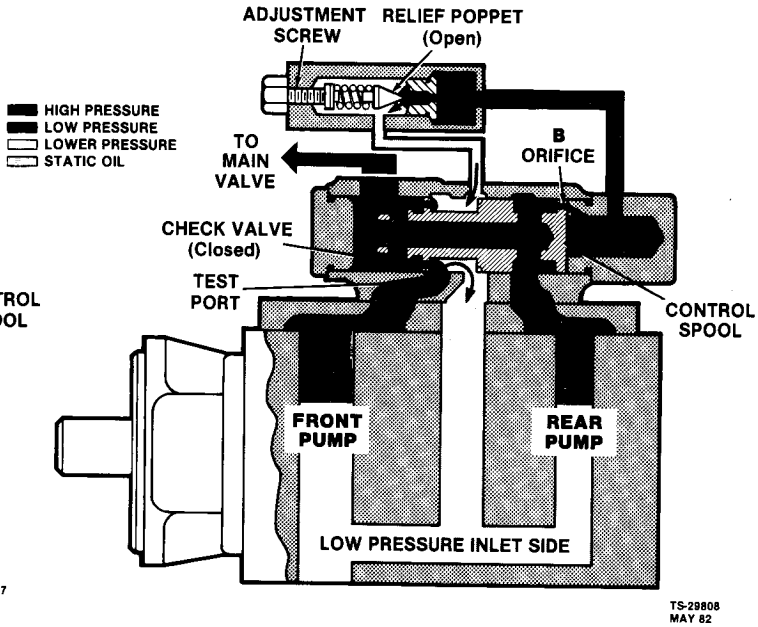
The external Power Sensor Valve (old style) has two main parts: a control spool with check valve, and an adjustable relief poppet. Relief poppet setting determines the pressure at which the control spool shifts from a two- to a one-pump position.

Power Sensor Pump and External Valve Assembly

POSITION 1



POSITION 2



System Pressure Lower Than Sensor Setting (Position 1) The front pump directs oil around the control spool, through a series of holes in a land (A), past a check valve, and out to the main hydraulic system.

Rear pump oil flows *through* the center of the spool to join the front pump oil. Rear pump oil also passes through a small hole in the land at Position 1, (B), through a passage in the end cap to the relief poppet. As long as pressure against the poppet is lower than the relief setting, the poppet will stay closed and the assembly will supply a two-pump high-volume flow to the main hydraulic system.

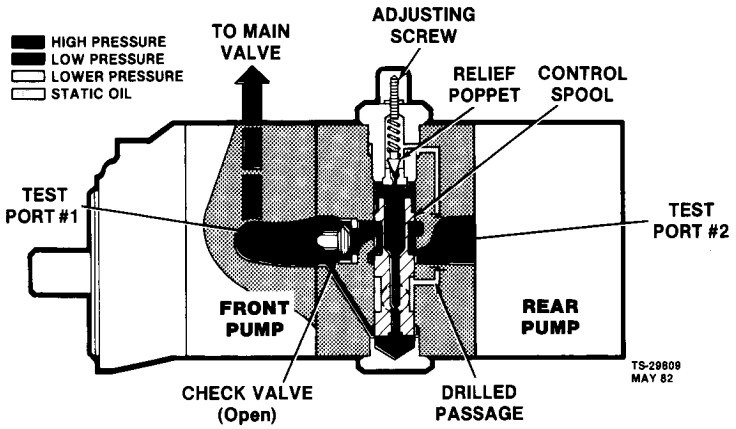
System Pressure Higher Than Sensor Setting (Position 2) When system pressure becomes high enough, the relief poppet opens. Oil flows through the open relief poppet to the low pressure inlet side of the pump. A pressure drop occurs in the spring area to the right of the control spool and the spool shifts to the right, and front pump oil is directed to the low pressure inlet side of the pumps.

The rear pump continues to supply oil to the main hydraulic valve. High system pressure keeps the relief poppet open and the spool shifted. *The check valve keeps the rear pump oil from joining the low-pressure front pump oil.*

INTERNAL POWER SENSOR VALVE

The Valve Assembly on the new style power sensor also has a control spool and an adjustable relief poppet. This valve is mounted *between* the two pumps and unloads the *rear* pump when system pressure is higher than the sensor setting. Rear pump oil flows around the control spool and joins the front pump oil (high volume flow), or the control spool directs rear pump oil to the low pressure inlet side of the pumps.

System Pressure Lower Than Sensor Setting

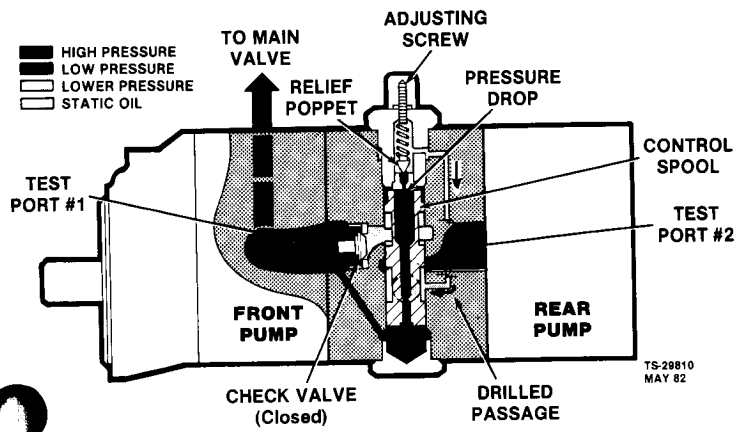


System Pressure Lower Than Sensor Setting — At low system pressures rear pump oil flows around the control spool, through a one-way check valve, and joins the front pump flow to the main hydraulic valve.

A passage directs oil from the front pump side of the check valve to the lower end of the control spool. Then, oil goes through a drilled passage in the center of the spool to the top end of the spool.

When system pressure is lower than the setting of the relief poppet, flow from both pumps provides fast hydraulics.

System Pressure Higher Than Sensor Setting



System Pressure Higher Than Sensor Setting — When operating pressure becomes high enough to force the relief poppet open, pressure drops at the spring end of the control spool, and the spool shifts against the spring.

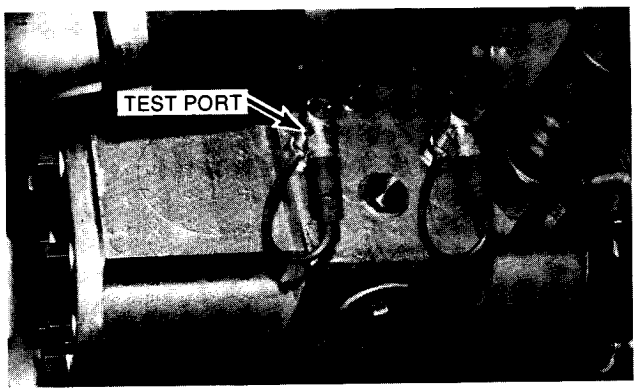
When the spool shifts, rear pump oil flows through a port to the low pressure, inlet side of the pumps. Now, only the front pump supplies the main hydraulics.

When system pressure again falls below sensor setting, the relief poppet closes, pressure on both sides of the spool equalizes, and the spring returns the spool to where both pumps are supplying the main hydraulics.

CHECKING AND ADJUSTING POWER SENSOR RELIEF VALVES

Refer to the service guidebook for recommended specifications.

1. Secure the machine in the SERVICE POSITION:
   - All controls must be in the neutral position.
   - Remove the ignition key.
   - Connect the steering frame lock and engage parking brake.
   - Block the wheels.
   - Tie a red warning flag to the steering wheel.
2. Install a 3000 psi [20700 kPa—210 kg/sq. cm] gauge in the test port . . . front pump passage on external valve units (see page 4), rear pump passage on internal valve units (see below).

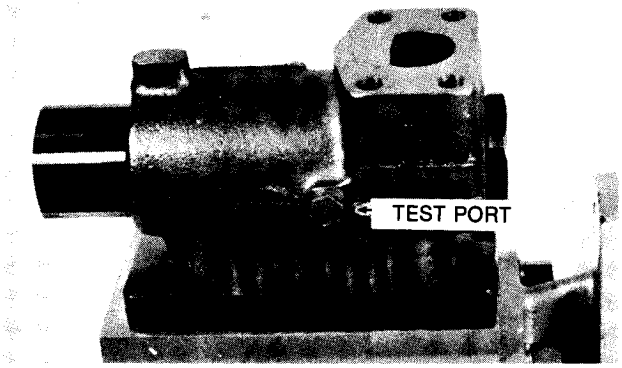


TEST PORT: Internal Valve, Power Sensor Pump and Valve Assembly

3. Start the engine and follow normal warm-up procedure.

⚠ The easiest and safest procedure is to roll the bucket back against the stops.

4. At high free, feather bucket control lever. The pressure reading will increase until it reaches the sensor relief setting.
5. The highest pressure indicated before the gauge drops to around zero will be the sensor relief setting.



TEST PORT: External Valve, Power Sensor Pump and Valve Assembly

6. If the pump does not unload at specified pressure, adjust by turning the adjusting screw clockwise to increase the setting; counter-clockwise to decrease the setting.
7. Tighten locknut, reinstall acorn nut and O-ring. Be careful not to move locknut when tightening acorn nut.

TROUBLESHOOTING THE POWER SENSOR ASSEMBLIES

This section deals only with problems in the Power Sensor Pump and Valve Assemblies. When troubleshooting a problem, do not neglect other components in the hydraulic system. Cylinders, control valves, etc., can cause similar problems.

Before replacing a suspected component, make the following checks in the order listed:

First: Secure the machine in the service position.

Second: Check hydraulic fluid level. Fill, if low. Do not overfill.

Third: Make a visual inspection; look for the obvious:

- Leaks
- Worn or pinched hoses
- Damaged hydraulic connections
- Control valve linkage binding
- Detents not positioned properly

Fourth: With the oil at operating temperature, verify the operator's complaint. Check operating times against specifications.

Fifth: Check:

- Main relief pressure
- Operating pressure
- Sensor relief pressure

Sixth: If hydraulic pressures are normal, check the engine stall speed.

Now proceed with the complaint and the diagnosis.

I. SLOW HYDRAULICS WITHOUT LOAD

A . Check sensor relief pressure setting.

1. If valve is unloading below specifications, try readjusting.
2. If setting can't be adjusted, the control spool is probably stuck in the one-pump position.
   a. Relief poppet or spring could be defective; disassemble and replace defective part(s).
   b. Spool stuck by foreign matter; determine cause and repair.
   c. Spool return spring broken; replace spring.
   d. Small hole through rear land (Position 1, page 2, B, external valve) plugged; clean.
   e. The passage from the front pump side of the check valve to the lower end of the control spool (page 3, internal valve) plugged; clean & reassemble.
3. If setting is correct or can't be reached, replace pump.

II. SLOW HYDRAULICS WITH LOAD

A . Check sensor relief pressure setting.

1. If low, adjust to specifications.
2. If not adjustable, relief poppet or seat may be worn. Replace seat and adjust pressure relief.
3. If settings are correct,
   a. Operator trying to pick up more than rated load.
      1) Check for proper operating pressure.
   b. Bad pump

III. ENGINE LUGS DOWN (Engine Stall Speed Lower Than Specifications)

A . Check sensor relief pressure setting.

1. If too high, adjust to specifications.
2. If not adjustable,

a. Control spool may be stuck in two-pump position. (Position 1, pages 2 and 3)

b. Disassemble, determine cause and correct.

B . Engine malfunctioning.

IV. JERKY HYDRAULICS AND PUMP CHATTER (External Valve Only)

A. Check for cavitation.

1. If pump chatters constantly and the pressure gauge needle vibrates

a. Check all suction hoses and fittings for suction leaks.

b. Check for suction leaks between external sensor housing, mounting plate and pump assembly.

B. Check for bad sensor.

1. If pump chatters when working the hydraulics

a. Check sensor pressure setting. If the pump starts chattering when sensor pressure setting is reached then:

1. The check valve is hanging off its seat, or

2. The check valve retaining ring has come off.

NOTES:

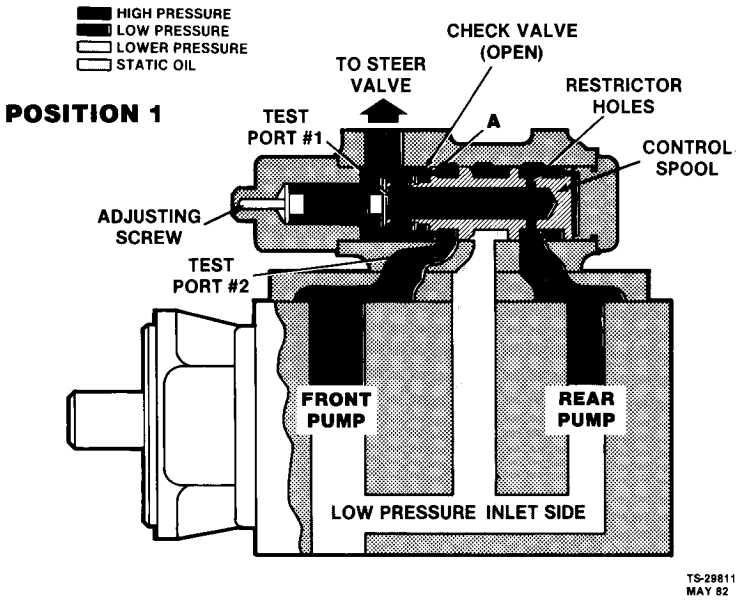
POWER STEERING PUMP AND VALVE ASSEMBLIES

Power Steering Assemblies, like Power Sensor Assemblies, consist of two gear pumps mounted in tandem with common suction and an internal or external sensor valve that controls flow to the power steering valve.

The units are designed to provide uniform steering response, regardless of engine RPM. From low idle to about 1200 RPM, both pumps supply the steering system. Between 1200 and 1600 RPM, the control valve begins by-passing flow from one pump to the low pressure inlet side of the pumps. From 1600 RPM to maximum, flow from one pump is completely redirected to the low pressure inlet side of the pumps. The other pump continues to supply the steering system.

EXTERNAL FLOW SENSOR VALVE

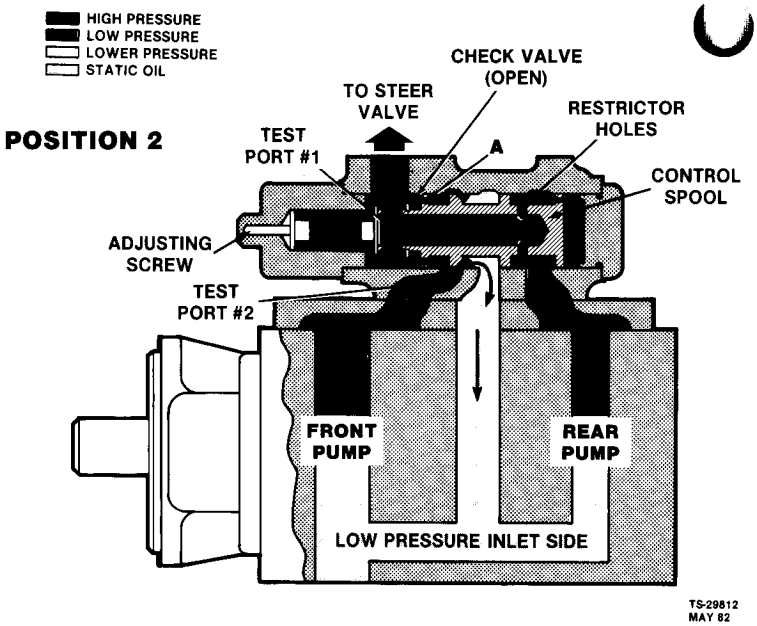
The external flow sensor valve controls flow from both pumps with a hollow control spool, a one-way check valve and restrictor holes in the spool.



At Less Than 1200 RPM (Position 1), both pumps deliver flow to the power steering valve. Oil from the front pump flows around the control spool, through holes in land (A) of the control spool, past a one-way check valve, and out to supply the steer valve.

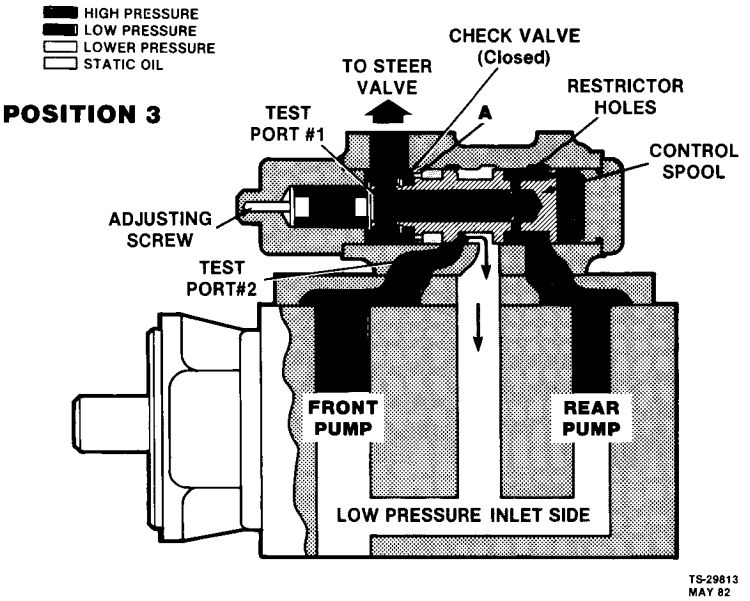
Flow from the rear pump passes through restrictor holes in the spool, through the center of the spool and joins front pump flow to the power steering valve.

From 1200 to 1600 RPM (Position 2) As engine RPM increases, pump flow increases. The increased volume of oil from the rear pump trying to



flow through the restrictor holes causes pressure to increase. This increased pressure is sensed through the small hole and in the area at the right end of the control spool.

When the pump volume is sufficient to create enough pressure at the end of the spool to begin overcoming spring tension, the spool begins to shift. As it shifts, it begins to bypass some oil from the front pump back to the low pressure inlet side of the pumps.



At 1600 RPM and Above (Position 3), the control spool is completely shifted. All the flow from the front pump is directed to the low pressure inlet side. The one-way check valve is now closed and prevents rear pump oil from going to the low pressure inlet side.

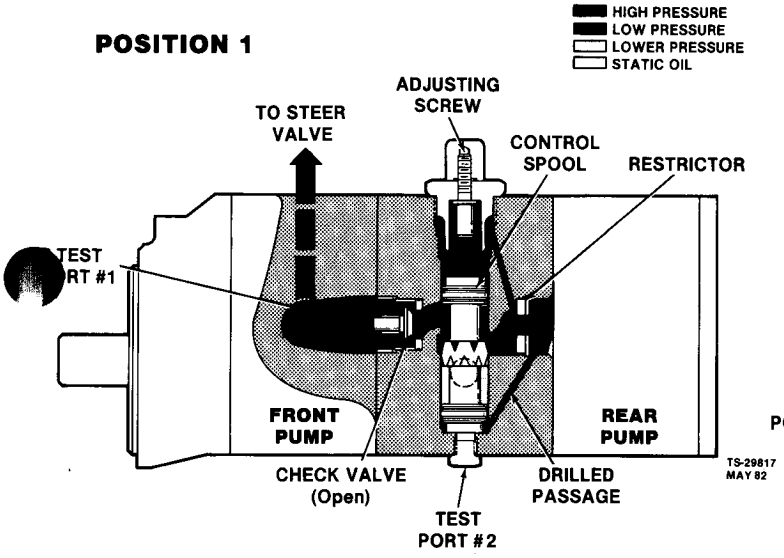
As RPM decreases, flow from the rear pump decreases and the pressure on the end of the control spool decreases. The spring returns the spool to Position 2, and then to Position 1 (page 6), reopening the passage so both pumps supply the steering valve.

INTERNAL FLOW SENSOR VALVE

The internal valve also controls flow to the power steering valve. The sensor valve directs flow from the rear pump to the steering valve or to the low pressure inlet side of the pumps.

Some pumps have a restrictor with a spring-loaded check valve designed to open, when necessary, to keep rear pump pressures before and after the restrictor valve at a differential of no more than 100 psi.

POSITION 1

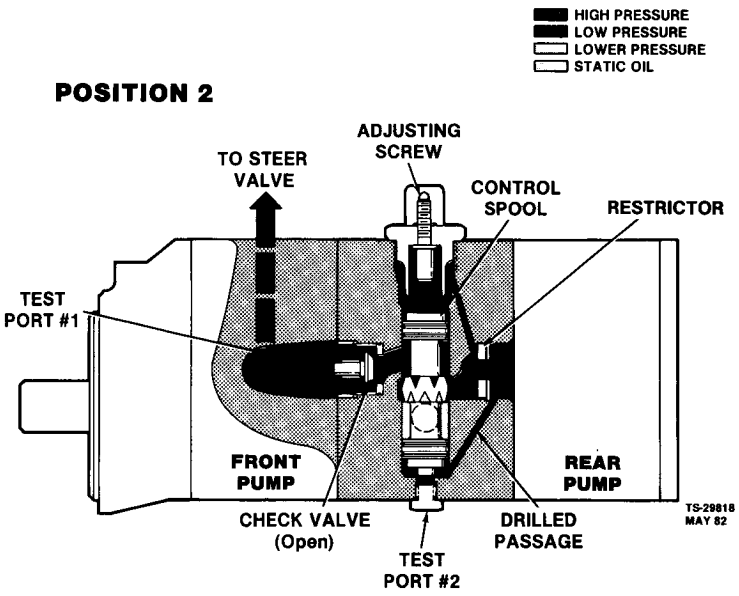


At Less Than 1200 RPM (Position 1), both pumps deliver flow to the power steering valve. Oil from the rear pump flows through a restrictor, around the sensor control spool and past a one-way check valve where it joins the flow from the front pump to the steer valve.

A drilled passage between the rear pump and the restrictor allows rear pump oil to flow against the lower end of the control spool.

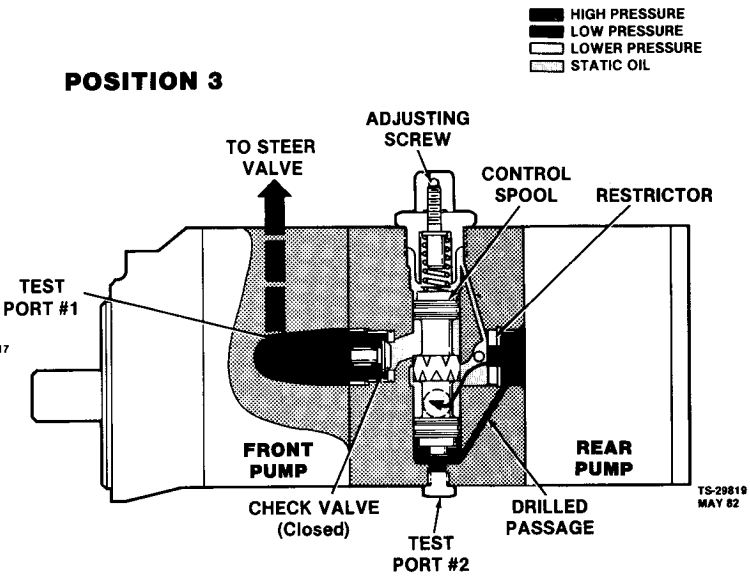
From 1200 to 1600 RPM (Position 2) As pump RPM increases, flow from the rear pump increases. Pressure builds up behind the restrictor, in the drilled passage, and at the lower end of the control spool.

POSITION 2



As pressure increases, the spool begins to shift up against the spring. As it moves, some rear pump oil is directed to the low pressure inlet side of the pumps.

POSITION 3



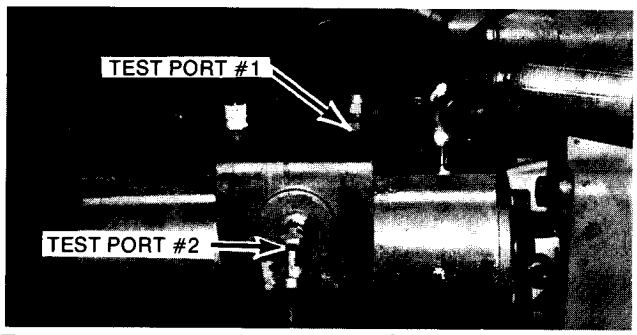
At 1600 RPM and Above (Position 3), the spool is shifted completely. At this point, all flow from the rear pump is directed to the low pressure inlet side of the pumps. The front pump continues to supply the steering valve and the check valve is closed.

As RPM decreases, the pressure decreases, the spring returns the spool to Position 2, and then to Position 1, reopening the passage so both pumps supply the steering valve.

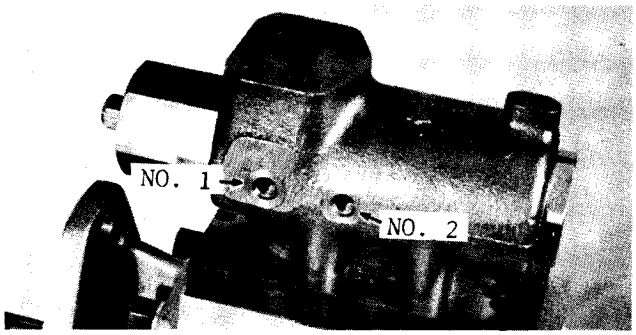
CHECKING AND ADJUSTING POWER STEERING PUMP AND VALVE ASSEMBLIES

Refer to the service guide book for recommended specifications.

1. Secure the machine in the SERVICE POSITION:
   - All controls must be in neutral position.
   - Remove the ignition key.
   - Connect the steering frame lock and engage parking brake.
   - Block the wheels.
   - Tie a red warning flag to the steering wheel.
2. Install two 3000 psi [20700 kPa—210 kg/sq. cm] gauges (one in each test port). *Note: Some machines have remote quick-disconnect test ports.*
3. Install remote tachometer on engine.



Test Ports: Internal Valve Power Steering Pump and Valve Assembly



Test Ports: External Valve Power Steering Pump and Valve Assembly

4. Remove steering frame lock if attached between frames. (Do not remove steering frame lock on 175C and 275C machines.)

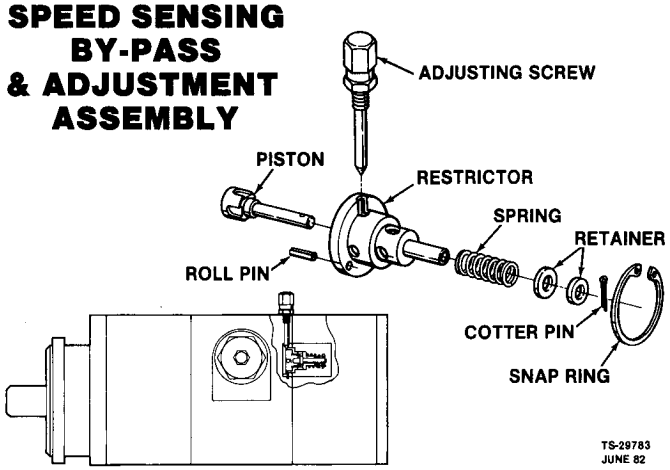
Do not stand or work in hinge area when engine is running. There is no room for a man in this area when the machine is turned.

5. Start the engine, warm oil to operating temperature.
6. With engine at low idle, *turn steering against stops and hold.* Both gauges should read steering relief pressure. If they do not, adjust steering relief pressure to specifications.
7. Watch the gauges and tachometer while increasing engine RPM. The gauge attached to Test Port #1 should continue to read steering relief pressure. The gauge attached to Test Port #2 should drop, at the specified RPM, to 300 psi [2070 kPa—21 kg/sq. cm] or less.
8. Make a note of the RPM at the time of the pressure drop.
9. If the RPM at the pressure drop does not meet specifications, turn the adjusting screw clockwise to increase RPM at pressure drop off; turn it counter-clockwise to decrease RPM.
10. Tighten locknut and acorn nut being careful not to disturb setting.

NOTE: Some power steering pump and valve assemblies with the ***internal*** *valve have an additional fine-tuning adjustment. This adjustment provides more accurate control of the shifting point than the original adjustment. To use this setting.*

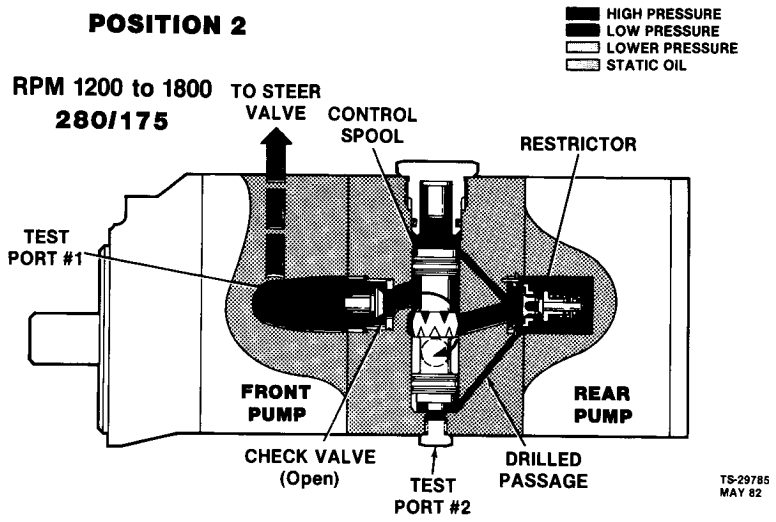
1. Attach gauges as described above, turn the fine-tuning adjustment screw clockwise to decrease shifting RPM; turn it counter-clockwise to increase shifting RPM. (The fine-tuning adjusting screw is on the same side of the pump as Test Port #1.)
2. Tighten locknut and acorn nut without disturbing setting.
3. If proper setting cannot be reached, the control spool spring-tension setting should be checked (page 7):
   a. Turn the original adjusting screw counter-clockwise until spring tension is released.
   b. Turn adjusting screw clockwise until it contacts the spring; then turn screw two (2) 360° turns. Then try adjusting fine-tuning adjustment again.

SPEED SENSING BY-PASS & ADJUSTMENT ASSEMBLY

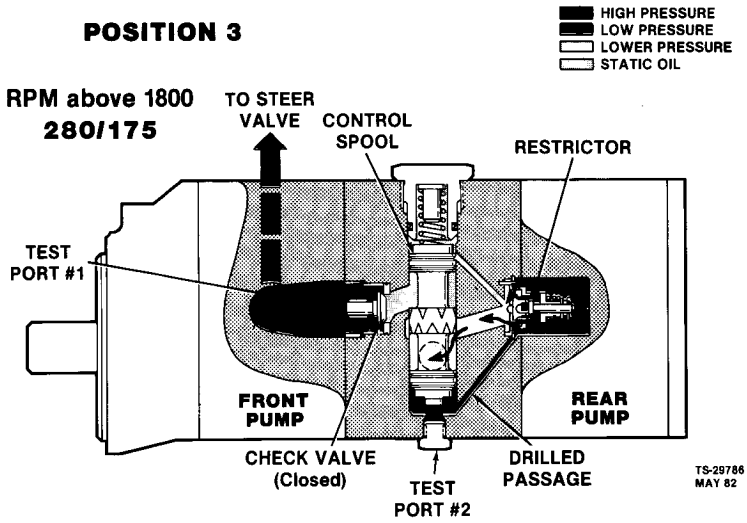


The speed sensing by-pass and fine-tuning adjustment has two major functions. First the by-pass spring is pre-set to give way whenever there is approximately a 120 psi [828 kPa—8.4 kg/sq. cm] differential from the rear pump side of the restrictor and the control spool side of the restrictor. This prevents excessively high pressures and heat from being created by the restrictor at high RPM. Second, the speed sensing adjustment is referred to as the fine-tuning adjustment. Its function is to provide a more sensitive adjustment. When the adjusting screw is turned counter-clockwise the restrictor hole is made larger; therefore, it requires higher RPM to produce enough flow through the restrictor to create enough back pressure to shift the control spool. When the adjusting screw is turned clockwise the restrictor hole is made smaller; therefore, it requires lower RPM to produce enough flow through the restrictor to create enough back pressure to shift the control spool.

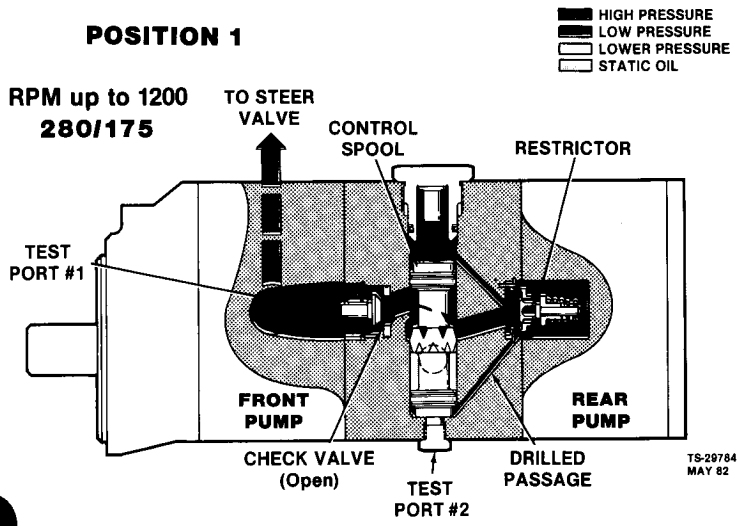
POSITION 2



POSITION 3



POSITION 1



CURRENT PRODUCTION POWER STEERING PUMP INTERNAL SENSING VALVE

280B's and 175C power steering pumps with the internal sensing valve now have only the fine-tuning adjustment. The original adjusting screw located on the end of the sensor spool has been removed. (Refer to Positions 1, 2 and 3). The operation, oil flows and troubleshooting are the same as the original internal sensor pumps shown on pages 7 and 8.

TROUBLESHOOTING POWER STEERING PUMP AND VALVE ASSEMBLIES

This section deals only with problems in Power Steering Pump and Valve Assemblies. When troubleshooting a problem, do not neglect other components in the steering hydraulic system.

Refer to the general checks on page 4 of this manual . . . with special attention to verifying operator complaints. On a hard, flat surface, check operating times against the machine's specifications. Having verified the complaint, isolate the problem.

I. SLOW STEERING — LOW IDLE ONLY

A. Check steering relief valve and adjust, if necessary, to specifications according to service guidebook.
   1. If not adjustable:
      a. Relief valve bad; replace
      b. Bad power steering pump; replace
   2. If it is or can be set to specifications, proceed.

B. Connect tachometer; connect pressure gauges to Test Ports #1 and #2 (page 8)
   1. At low idle, turn machine against stops and hold; both gauges should read steering relief pressure.
   2. If gauge #2 does not,
      a. Sensor setting much too low; adjust
      b. Spool stuck is position 3 (pages 7 and 9); determine cause and correct
         1) Spool return spring broken
         2) Foreign material blocking spool movement

II. FAST JERKY STEERING AT HIGH RPM

A. Spool shift-setting at too high an RPM
   1. Attach gauges and tachometer
   2. Try to adjust setting
      a. With setting readjusted, verify solution
      b. If setting not adjustable,
         1) Sensor Spool stuck in two-pump position (Position 1, pages 7 and 9)
         2) Disassemble, determine cause, correct

III. SLOW STEERING AT ALL RPM

A. Check steering relief valve and adjust, if necessary, to specifications according to service guidebook.
   1. If not adjustable:
      a. Relief valve bad
      b. Bad power steering pump; replace

NOTES:

POWER STEERING DIVERTER PUMP AND VALVE ASSEMBLIES

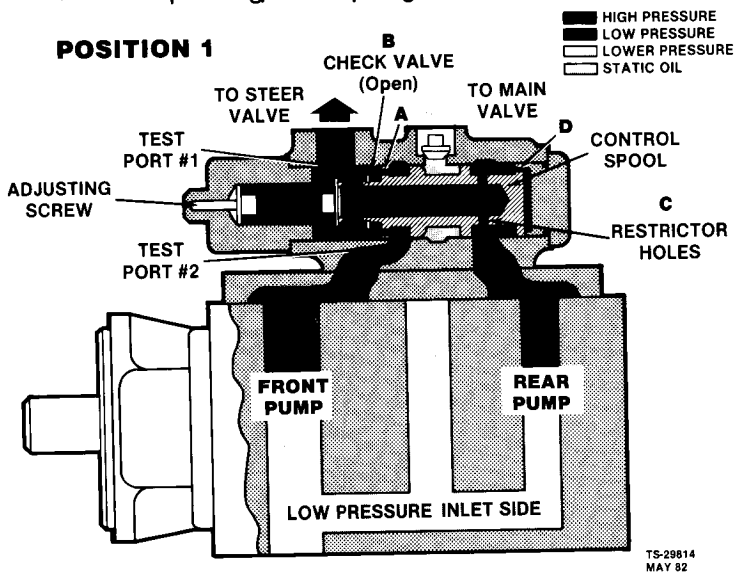
Power Steering Diverter Assemblies, like Power Steering Assemblies, consist of two gear pumps mounted in tandem with common suction and an internal or external sensor valve that controls flow to the power steering valve.

The units are designed to provide uniform steering response, regardless of engine RPM and provide greater oil volume to the main hydraulics during high RPM for faster hydraulic speeds. From low idle to about 1200 RPM, both pumps supply the steering system. Between 1200 and 1600 RPM, the control valve begins diverting flow from one pump to the main valve. From 1600 RPM to maximum RPM, flow from one pump is completely diverted to the main valve. The other pump continues to supply the steering system.

EXTERNAL FLOW SENSOR VALVE

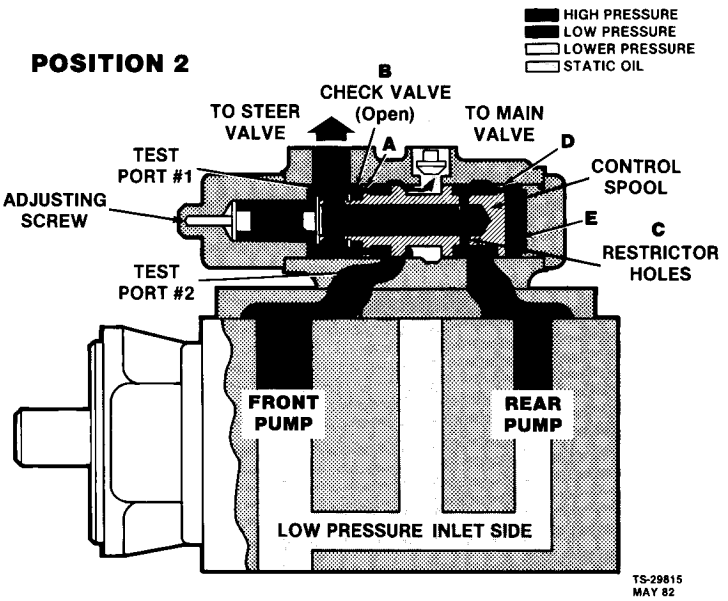
The external flow sensor valve controls flow from both pumps with a hollow control spool, a one-way check valve and restrictor holes in the spool.

The valve does not depend on system pressure to trigger movement of the spool. It uses restrictor holes to create the pressure needed to shift the control spool against spring tension.



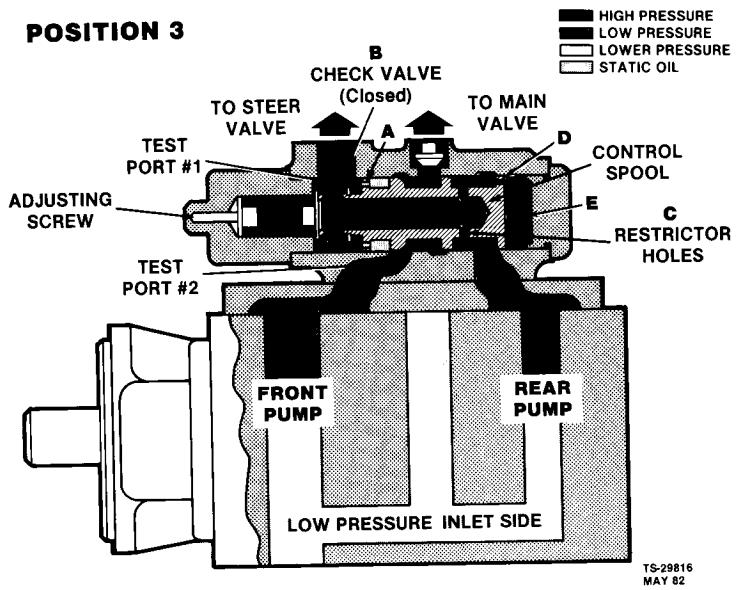
At Less Than 1200 RPM (Position 1), both pumps deliver flow to the power steering valve. Oil from the front pump flows around the sensor spool, through holes in land (A) of the spool, past a one-way check valve (B), and out to supply the steer valve.

Flow from the rear pump passes through restrictor holes in the control spool (C), through the center of the spool and joins front pump flow to the power steering valve.



From 1200 to 1600 RPM (Position 2) As engine RPM increases, pump flow increases. The increased volume of oil from the rear pump trying to flow through the restrictor holes causes pressure to increase. This increased pressure is sensed through the small hole at "D" and in the area (E) at the end of the control spool.

When the pump volume is sufficient to create enough pressure at "E" to begin overcoming spring tension, the spool begins to shift. As it shifts, it begins to bypass some oil from the front pump past a check valve to the main valve.



At 1600 RPM and Above (Position 3), the spool is completely shifted. All the flow from the front pump is directed to the main valve. The one-way check valve is now closed and prevents rear pump oil from going to the main valve.

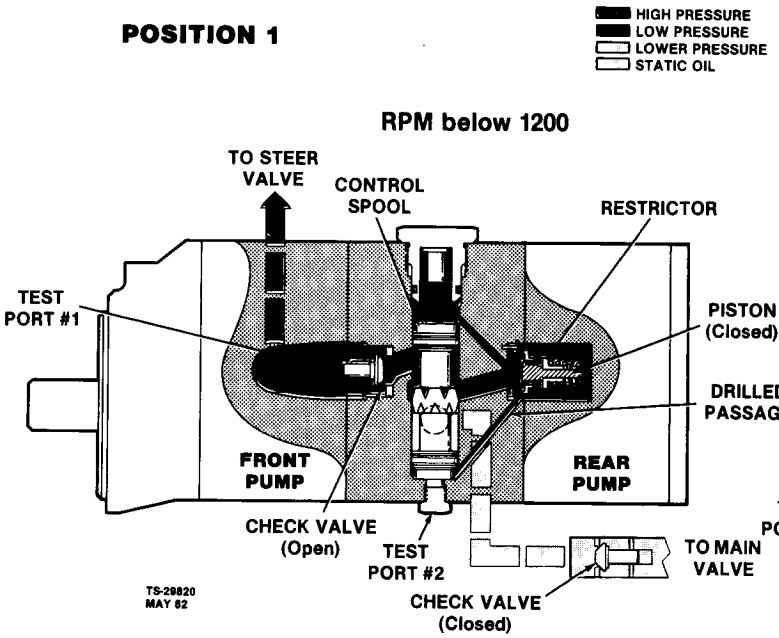
As RPM decreases, flow from the rear pump decreases and the pressure on the control spool at (E) decreases. The spring returns the spool to Position 2, and then to Position 1, reopening the passage so both pumps supply the steering valve.

INTERNAL FLOW SENSOR VALVE

The internal valve also controls flow to the power steering valve. The sensor valve directs flow from the rear pump to the steering valve or to the main valve.

Some pumps have a restrictor valve with a spring-loaded check valve designed to open, when necessary, to keep rear pump pressures before and after the restrictor valve at a differential of no more than 100 psi.

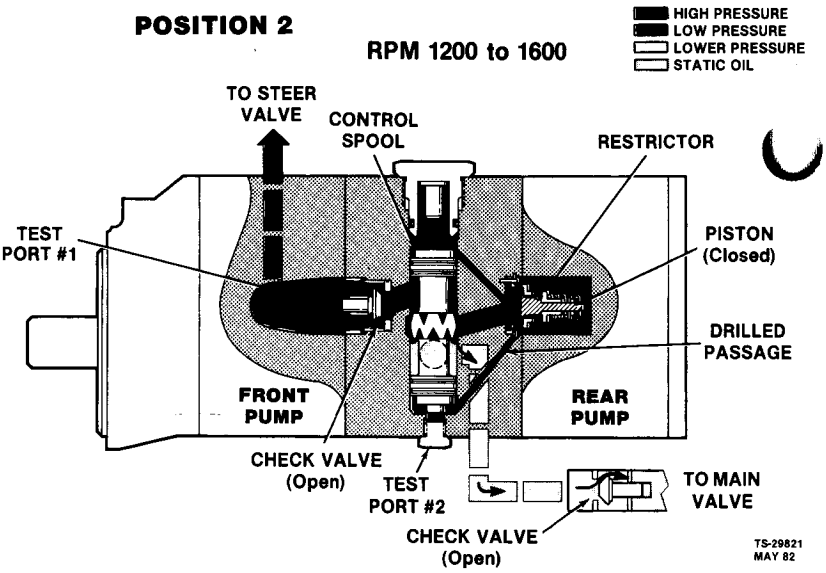
POSITION 1



At Less Than 1200 RPM (Position 1), both pumps deliver flow to the power steering valve. Oil from the rear pump flows through a restrictor around the sensor control spool and past a one-way check valve where it joins the flow from the front pump.

A drilled passage between the rear pump and the restrictor allows rear pump oil to flow against the lower end of the control spool.

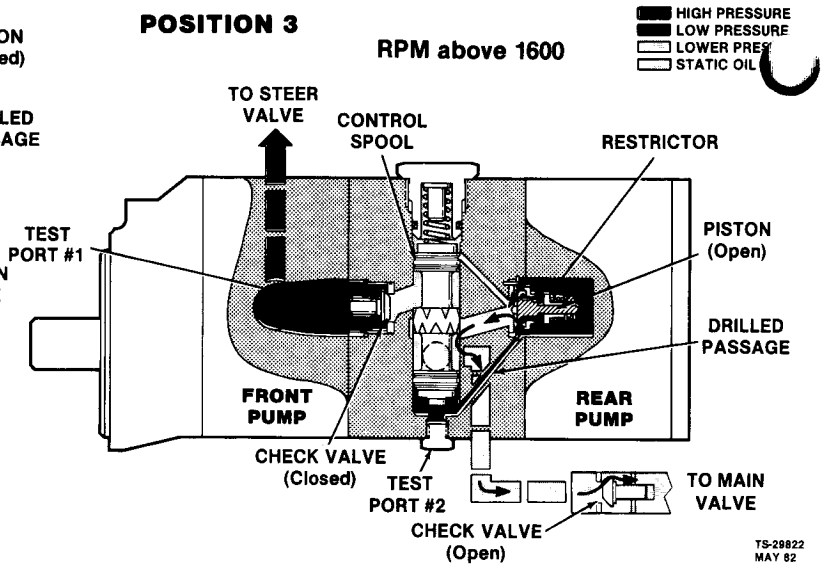
POSITION 2



From 1200 to 1600 RPM (Position 2) As pump RPM increases, flow from the rear pump increases. Pressure builds up behind the restrictor, in the drilled passage, and in area at the lower end of the sensor spool.

As this pressure increases, the spool begins to shift against the spring at the upper end of the control spool. As it moves, some rear pump oil is directed past a check valve to the main valve.

POSITION 3



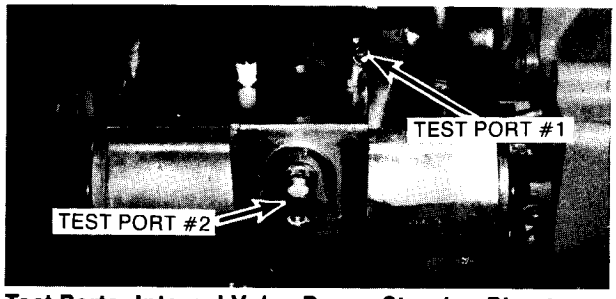
At 1600 RPM and Above (Position 3), the spool is shifted completely. At this point, all flow from the rear pump is directed to the main valve. The front pump continues to supply the steering valve.

As RPM decreases, the pressure decreases, the spring returns the spool to Position 2 and then to Position 1, reopening the passage so both pumps supply the steering valve.

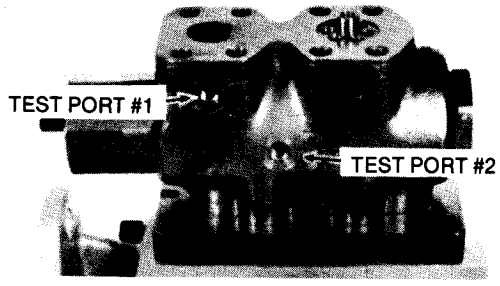
CHECKING AND ADJUSTING POWER STEERING DIVERTER PUMP AND VALVE ASSEMBLIES

Refer to the service guide book for recommended specifications.

1. Secure the machine in the SERVICE POSITION:
   - All controls must be in neutral position.
   - Remove the ignition key.
   - Connect the steering frame lock and engage parking brake.
   - Block the wheels.
   - Tie a red warning flag to the steering wheel.
2. Install two 3000 psi [20700 kPa—210 kg/sq. cm] gauges (one in each test port). *Note: Some machines have remove quick-disconnect test ports.*
3. Install remote tachometer on engine.



Test Ports: Internal Valve Power Steering Diverter Pump and Valve Assembly



Test Ports: External Valve Power Steering Diverter Pump and Valve Assembly

4. Remove steering frame lock if attached between frames. (Do not remove safety link on 175C and 275C machines.)

   Do not stand or work in hinge area when engine is running. There is no room for a man in this area when the machine is turned.

5. Start the engine, warm oil to operating temperature.
6. With engine at low idle, *turn steering against stops and hold.* Both gauges should read steering relief pressure. If they do not, adjust steering relief pressure to specifications.
7. Watch the gauges and tachometer while increasing engine RPM. The gauge attached to Test Port #1 should continue to read steering relief pressure. The gauge attached to Test Port #2 should drop, at the specified RPM, to 300 psi or less.
8. Make a note of the RPM at the time of the pressure drop.
9. If the RPM at the pressure drop does not meet specifications, turn the adjusting screw clockwise to increase RPM at pressure drop off; turn it counter-clockwise to decrease RPM.
10. Tighten locknut and acorn nut being careful not to disturb setting.

NOTE: Some earlier power steering diverter pump and valve assemblies with the internal valve have an additional fine-tuning adjustment. This adjustment provides more accurate control of the shifting point than the original adjustment. The fine-tuning adjusting screw is on the same side of the pump as Test Port #1. To use this setting:

1. Attach gauges as described above, turn the fine-tuning adjustment screw clockwise to decrease shifting RPM; turn it counter-clockwise to increase shifting RPM.
2. Tighten locknut and acorn nut without disturbing setting.
3. If proper setting cannot be reached, the flow sensor spool spring-tension setting should be checked:
   a. Turn the original adjusting screw counter-clockwise until spring tension is released.
   b. Turn adjusting screw clockwise until it contacts the spring; then turn screw two (2) 360° turns. Then try adjusting the fine-tuning adjustment again.
4. The diverter pump and valve assembly now has only the fine-tuning adjustment.

TROUBLESHOOTING POWER STEERING DIVERTER PUMP AND VALVE ASSEMBLIES

This section deals only with problems in Power Steering Diverter Pump and Valve Assemblies. When troubleshooting a problem, do not neglect other components in the steering or hydraulic system.

Refer to the general checks on page 4 of this manual . . . with special attention to verifying operator complaints. On a hard, flat surface, check operating times against the machine's specifications. Having verified the complaint, isolate the problem.

I. SLOW STEERING AT LOW IDLE ONLY

A. Check steering relief valve and adjust, if necessary, to specifications according to service guidebook.

1. If not adjustable:

a. Relief valve bad

b. Bad power steering pump; replace

2. If it is or can be set to specifications, proceed

B. Connect tachometer; connect 3000 psi [20700 kPa—210 kg/sq. cm] pressure gauges to Test Ports #1 and #2 (page 13)

1. At low idle, turn machine against stops and hold; both gauges should read steering relief pressure.

2. If gauge #2 does not,

a. Sensor setting much too low; adjust

b. Spool stuck in position 3 (pages 12 and) determine cause and correct

1) Spool return spring broken

2) Foreign material blocking passages or spool movement

II. FAST JERKY STEERING AT HIGH RPM

A. Spool shift-setting at too high an RPM

1. Attach gauges and tachometer

2. Try to adjust setting

a. With setting readjusted, verify solution

b. If setting not adjustable,

1) Sensor Spool stuck in Position 1 (pages 11 and 12)

2) Disassemble, determine cause, correct

III. SLOW STEERING AT ALL RPM

A. Check steering relief valve and adjust, if necessary, to specifications according to service guidebook.

1. If not adjustable:

a. Relief valve bad

b. Bad power steering pump section; replace

IV. SLOW HYDRAULICS

A. Isolate the problem to power sensor and power steering diverter pumps by following procedures outlined in the Basic Hydraulic Troubleshooting section of the service guidebook.

B. Determine which assembly is malfunctioning.

1. Power steering operation times.

a. Park machine on a hard flat surface.

b. Check lock-to-lock time at low idle against specifications.

c. Check lock-to-lock time at maximum RPM.

2. If idle time-test is slow, and high RPM time is normal, rear steering power pump is not supplying specified volume.

3. If idle time is normal, and high RPM time is too fast, power steering pump is not diverting.

a. Spool stuck in two-pump position.

b. Setting at too high RPM.

4. Both test-times are slow. Front power steering pump is bad.

5. Times are normal. Perform next text.

C. Further isolate the problem.

1. Test: Boom operating times.

a. Check boom-raising time at 1000 RPM; it should be 17 to 20 seconds.

b. Check boom-raising time at high free idle; it should be 8 seconds.

2. Boom too slow at low RPM.

a. Something in the main pumps is causing the problem. Before condemning the pump, the complete main hydraulic system must be considered.

b. Problem in power sensor pump see Troubleshooting the Power Sensor Assemblies (page 4).

3. Boom normal at low RPM, too slow at high RPM.

a. Problem is in diverted steer pump.

275B AND 275C SENSOR PUMP FUNCTIONS

A. High RPM — Low Pressure

1. High RPM — One power steering pump diverts to main valve.
2. Low Pressure — both power sensor pumps supply main valve.
3. Three pumps supply main valve; one supplies steer valve.

B. Low RPM — Low Pressure

1. Low RPM — Both power steering pumps supply steer valve.
2. Low Pressure — Both power sensor pumps supply main valve.
3. Two pumps supply main valve; two supply steer valve.

C. High RPM — High Pressure

1. High RPM — One power steering pump diverts to main valve.
2. High Pressure — One power sensor pump unloads to low pressure inlet side.
3. Two pumps supply main valve; one supplies steer valve.

D. Low RPM — High Pressure

1. Low RPM — Two power steering pumps supply steer valve.
2. High Pressure — One power sensor pump supplies main valve.
3. One pump supplies main valve; two supply steer valve.

NOTES: