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Title: Power Steering Diagnostics Flow / Pressure Specs For Power Steering Gears and Power Steering Pumps

Applies To: All vehicles and power steering pumps and gears

WARNING:

You must contact Sheppard's tech line at 1-800-274-7437 for pre-approval prior to making any repairs or doing any diagnostics on any Luk or Sheppard steering components per Warranty G-letter 05-003G

Special Tools :

Part Number	Description
ZTSE2780	Power Steering Analyzer (Note 1)
ZTSE4402	Plug, TRW Steering Gear (Note 1)
3331812K	Plug, Sheppard Steering Gear (Note 2)
Note 1:	Available from Kent Moore/OTC, 1-800-520-2584
Note 2:	Available from International PDC

Service Procedure:

1. To properly diagnose a steering complaint, it is important to understand the complaint, talk to operator and get specific details of what exactly the complaint is, when does it happen, when was the problem first noticed. Does the problem happen when the vehicle is loaded/empty? Also, over loaded front axles and tires may cause intermittent hard steering feel. The better your understanding of the circumstances, the better your ability will be to solve the problem.

2. Inspect the vehicle for maintenance items that would influence problem. Inspect the tractor fifth wheel, front axle king pins and all linkages for excessive wear, seized parts and proper lubrication. Inspect for correct tire pressures, unusual tire wear on all axles. Inspect the steering column and intermediate shaft for binding or sticking in the cowl boot and in the slip joint.

3. Inspect hydraulic system for correct fluid level and condition of the fluid. Discolored fluid with a burnt smell may be caused by extended maintenance intervals or high operating temperature. Inspect the fluid filter element in the reservoir. Use care to avoid introducing dirt into the steering fluid.

4. Carefully inspect power steering hoses, paying close attention to the supply hose from the reservoir to the pump. This hose is critical and is sometimes overlooked in steering diagnosis. The hose should be free of sharp bends, should be pliable, without being spongy. A supply hose that doesn't provide fluid to the pump during all operating conditions could be the cause of a complaint that is thought to be a component issue. Steering that is reported to exhibit periodic binding or hard to steer could be a supply hose that is kinking or closing off during high pump RPM or has a restriction, preventing adequate fluid supply to the pump.

5. Connect power steering analyzer, ZTSE2780, as described in the service manual S05002y, and perform tests according to the steering troubleshooting checklist (Figure 1). Each test must be performed for proper diagnosis. Compare test results with the customer's description of the complaint.

6. Oil temperature affects performance of hydraulic components. When tests are performed, a suitable thermometer should be installed in the power steering reservoir. Test should be performed at system operating temperatures of 180 degrees F. If the complaint indicates an intermittent problem, it may be necessary to perform tests at a higher oil temperature of 220 degrees F. Temperature can be increased by partially closing off the valve on the power steering analyzer to 1500 psi long enough to raise the temperature, then fully open the valve.

7. Perform the following tests and record the data on the Steering Troubleshooting Checklist

WARNING:

To prevent property damage, personal injury or death, watch the power steering analyzer pressure gauge closely when closing the shutoff valve. A bad relief valve may not relieve pump pressure and cause pump damage or a high pressure hose to rupture. If pressure rises rapidly or goes above 2500 PSI, STOP.

A. Measure and record temperature (this can be increased to 180 degrees by partially closing off the valve on the power steering analyzer to 1500 psi long enough to achieve the desired temperature).

B. Measure and record system back pressure. This is done by reading the pressure on the gauge with wheels straight, no steering wheel input.

C. Maximum system pressure test is made by closing and opening the power steering analyzer valve quickly three times and reading maximum (pump relief) pressure. Use caution if pressure goes over 2500 psi. You must not go any further; this means the pump is not relieving and damage or injury could occur. Do not leave the valve closed for more than a few seconds.

D. Measure and record flow at idle, back pressure only; this is read in gallons per minute.

E. Measure and record flow at idle with 1500 psi load applied (closing valve to read 1500 on gauge).

F. Measure and record flow at full governed rpm with 1500 psi load applied.

G. Turn steering wheel at idle and record pressure on left turn and right turn.

H. With an inch pound torque wrench, record inch pound effort to turn steering wheel (engine at idle).

8. To evaluate the results of the tests, it is necessary to understand pump specifications.

A. Each pump is designed for specific applications and has performance specifications. Changing pumps to a different specification is not recommended without Engineering approval.

B. Each steering gear has flow and pressure recommendations . Refer to RH Sheppard or TRW specifications for the steering gear being serviced. If pump flow is lower than the minimum for the specific gear, you could experience a slow or lumpy feel in the steering wheel.

9. If the test results are within specifications and the cause of the steering complaint is not discovered, it may be required to perform a steering gear internal leakage test.

A. Identify if the steering gear is fitted with a pressure relief valve. These will typically be 1000, 2000, 3000, 4000, and 8000 series vehicles.

B. The pressure relief valve is identified by a 1.250 inch nut on the input end cap. To properly test this type of gear, the relief valve must be removed and a special plug installed. The plug part number for a Sheppard gear is 3331812K, the plug for a TRW gear is part number ZTSE4402.

C. As an alternative to using a 1 inch steel block between the axle stop and the axle for this test, it may be more desirable to install a suitable wooden 4x4 block long enough to fit between the tire/wheel and the chassis frame rail. This tests the steering gear leakage at maximum pump delivery.

D. After placing the block of wood in contact with the tire and wheel evenly, so not to push only against the tire, and the other end against the frame rail, turn the steering wheel in the direction of the block. This will be maximum pump pressure.

E. Read the flow meter; if the flow is over one gallon per minute, the gear has excessive internal leakage.

10. Refer to ISIS for the appropriate service manual section for trouble shooting charts. (links below)

11. For current steering gear oil flow and pressure specifications refer to RH Sheppard or TRW depending on the steering gear being serviced.

12. For technical assistance in steering performance diagnostics, call the Technical Service Help Line 1-800-336-4500. You will be asked to fax a completed diagnostic form for evaluation.

Attached Power Steering Diagnostic Form >>> Steering Troubleshooting Checklist

Links to other specific Power Steering Manuals and specifications

For Power Steering Gear: TRW/ROSS-TAS 40,55,65 and 85.
For Power Steering Pumps LUK VT73 and LF93

For Power Steering Pump: Vickers (LUK) V10NF and V20NF.

For VT-365 refer to SFN-0343

The Sheppard M-Series Integral Power Steering Gear

Sheppard Model 292, 392, 492

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