

GROUP 2 OPERATIONAL CHECKS AND TROUBLESHOOTING

1. OPERATIONAL CHECKS

This procedure is designed so the service man can make a quick check of the steering system using a minimum amount of diagnostic equipment. If you need additional information, refer to structure and function in group 1.

A location will be required which is level and has adequate space to complete the checks.

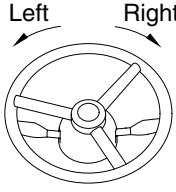
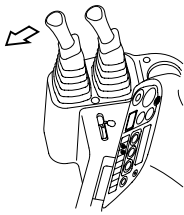
The engine and all other major components must be at operating temperature for some checks.

Locate system check in the left column and read completely, following this sequence from left to right. Read each check completely before performing.

At the end of each check, if no problem is found (OK), that check is complete or an additional check is needed. If problem is indicated (NOT OK), you will be give repair required and group location. If verification is needed, you will be give next best source of information :

- Chapter 2 : Troubleshooting
- Group 3 : Tests and adjustments

※ Hydraulic oil must be at operating temperature for these checks (refer to page 6-75).

Item	Description	Service action
<p>Steering unit check</p>	<p>Run engine at low idle.</p> <p>Turn steering wheel until frames are at maximum right and then left positions.</p> <p>LOOK : Frames must move smoothly in both directions.</p> <p>When steering wheel is stopped, frames must stop.</p> <p>FEEL : Excessive effort must not be required to turn steering wheel.</p> <p>NOTE : It is normal for steering to drift from stops when steering wheel is released.</p>	<p>OK Check completed.</p> <p>NOT OK Go to next check.</p>
<p>Steering system leakage check Heat hydraulic oil to operating temperature. Run engine at high idle.</p>	<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> <p>Left</p>  </div> <div> <p>Turn steering wheel rapidly until frames are against stop.</p> <p>Hold approximately 2kg on steering wheel.</p> <p>Count steering wheel revolutions for 1 minute.</p> <p>Repeat test in opposite direction.</p> <p>LOOK : Steering wheel should rotate less than 7rpm.</p> <p>NOTE : Use good judgment; Excessive steering wheel rpm does not mean steering will be affected.</p> </div> </div>	<p>OK Check completed.</p> <p>NOT OK Do steering system leakage test in group 3 to isolate the leakage.</p>
<p>Priority valve (in main pump) low pressure check</p>	<p>Park machine on a hard surface.</p> <p>Hold brake pedal down.</p> <p>Run engine at high idle.</p> <p>Steer machine to the right and left as far as possible.</p> <p>LOOK : Machine must turn at least half way to the right and left stops.</p>	<p>OK Check completed.</p> <p>NOT OK Do priority valve pressure test in group 3.</p>
<p>Priority valve (in main pump valve) high pressure check Run engine at high idle.</p>	<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;">  </div> <div> <p>Steer to steering stop and release steering wheel.</p> <p>Roll bucket back and hold over relief and observe engine rpm.</p> <p>Turn steering wheel to steering stop and hold, observe engine rpm.</p> <p>LOOK : Steering stall engine rpm must be higher than hydraulic stall rpm.</p> </div> </div>	<p>OK Check completed.</p> <p>NOT OK Priority pressure is set too high. Do priority valve pressure test in group 3.</p>

2. TROUBLESHOOTING

※ Diagnose malfunction charts are arranged from most probable and simplest to verify, to least likely, more difficult to verify. Remember the following steps when troubleshooting a problem :

Step 1. Operational check out procedure (see group 3 in section 1)

Step 2. Operational checks (in this group)

Step 3. Troubleshooting

Step 4. Tests and adjustments (see group 3)

Problem	Cause	Remedy
No steering	<p>Low oil level.</p> <p>Failed main pump (P1).</p> <p>Failed main pump drive.</p> <p>Stuck priority valve spool.</p> <p>Broken priority valve spring.</p> <p>Relief valve in steering unit stuck open.</p>	<p>Add recommended oil.</p> <p>Remove and inspect return filter for metal pump particles.</p> <p>Do main pump flow test.</p> <p>Remove and inspect priority valve spool in main pump.</p> <p>Remove and inspect spring.</p> <p>Do relief cartridge leakage test.</p>
No hydraulic functions steering normal	<p>Stuck open system relief valve.</p> <p>Pressed safety switch</p> <p>Plugged pilot line filter.</p> <p>Failed hydraulic pump.</p> <p>Low secondary pressure of RCV.</p>	<p>Replace relief valve.</p> <p>Release safety switch.</p> <p>Inspect and replace.</p> <p>Remove and inspect the pump.</p> <p>Check the pressure and replace if necessary.</p>
Steering wheel difficult to turn.	<p>Tires not inflated to correct pressure.</p> <p>Insufficient hydraulic fluid.</p> <p>Leaks in the relevant hoses or component connections.</p> <p>Air in the hydraulic system.</p> <p>Low pump flow.</p> <p>Steer relief valve set incorrectly.</p> <p>Worn or damaged parts in the steer control valve.</p> <p>Priority valve not operating correctly.</p> <p>Mechanical failure.</p>	<p>Inflate tire to correct pressure.</p> <p>Check for leaks and fill up the hydraulic tank as required.</p> <p>Check hoses and connections for leaks.</p> <p>Bleed system - bleed the load sense line.</p> <p>Check pump flow, if required service or replace pump.</p> <p>Check pressure setting of steer unit relief valve, adjust as required.</p> <p>Remove and inspect.</p> <p>Check if priority valve is sticking, repair as required.</p> <p>Check the load sense line from the steering unit to the priority valve in main pump for signs of leaking or poor connection.</p> <p>Check for damaged axle components, such as rams, trackrods, linkages etc.</p>

Problem	Cause	Remedy
Machine will not turn when the steering wheel turned	<p>Insufficient hydraulic fluid.</p> <p>Leaks in the relevant hoses or component connections.</p> <p>Air in the hydraulic system.</p> <p>Low pump flow.</p> <p>Steer relief valve set incorrectly.</p> <p>Worn or damaged parts in the steering unit</p> <p>Priority valve in main pump not operating correctly.</p> <p>Mechanical failure.</p> <p>Steer column splined shaft not fully engaged in steering unit.</p> <p>Power track rod failure.</p>	<p>Check for leaks and fill up the hydraulic tank as required.</p> <p>Check hoses and connections for leaks.</p> <p>Bleed system - bleed the load sense line.</p> <p>Check pump flow, if required service or replace pump.</p> <p>Check pressure setting of steer unit relief valve, adjust as required.</p> <p>Remove and inspect.</p> <p>Check if the priority valve is sticking, repair as required. Check the load sense line from the steering unit to the priority valve for signs of leaking or poor connection.</p> <p>Check for damaged axle components, such as rams, trackrods, linkages etc.</p> <p>Check shaft engagement.</p> <p>Check power track rod for signs of damage, leaks etc.</p>
Slow or hard steering	<p>Too much friction in the mechanical parts of the machine.</p> <p>Cold oil.</p> <p>Low priority valve pressure setting.</p> <p>Worn hydraulic pump.</p> <p>Sticking priority valve spool.</p> <p>Broken priority valve spring.</p>	<p>Lubricate bearings and joints of steering column or repair if necessary. Check steering column installation.</p> <p>Warm the hydraulic oil.</p> <p>Do priority valve pressure test. Clean or replace cartridge in steering unit.</p> <p>Do hydraulic pump performance check .</p> <p>Remove and inspect.</p> <p>Remove and inspect.</p>
Constant steering to maintain straight travel	<p>Air in system.</p> <p>Leakage in steering system.</p> <p>Worn steering unit.</p> <p>Leaf spring without spring force or broken.</p> <p>Spring in double shock valve broken.</p> <p>Gear wheel set worn.</p> <p>Cylinder seized or piston seals worn.</p>	<p>Check for foamy oil.</p> <p>Do steering system leakage check.</p> <p>Do steering system leakage check. Do steering unit neutral leakage test in group 3.</p> <p>Replace leaf springs.</p> <p>Replace shock valve.</p> <p>Replace gear wheel set.</p> <p>Replace defects parts.</p>

Problem	Cause	Remedy
Slow steering wheel movement will not cause any frame movement	Leakage in steering unit gerotor. Worn steering unit gerotor.	Do steering system leakage check. Do steering leakage check.
Steering wheel can be turned against steering stop	Leakage in steering system.	Do steering system leakage check.
Steering wheel turns with no resistance	Broken steering column or splined coupling. Lack of oil in steering unit. Leakage in steering system.	Remove and inspect. Start engine and check steering operation. Do steering system leakage test in group 3.
Erratic steering	Air in oil. Low oil level. Sticking priority valve spool. Loose cylinder piston. Damaged steering unit.	Check for foamy oil. Add recommended oil. Remove and inspect spool. Remove rod to inspect piston. Remove and inspect.
Spongy or soft steering	Air in oil. Low oil level.	Check for foamy oil. Add recommended oil.
Free play at steering wheel	Loose steering wheel nut. Worn or damaged splines on steering column or unit.	Tighten. Inspect.
Steering unit binding or steering wheel does not immediately return to neutral when released	Binding in steering column or misalignment of column. High return pressure. Contamination in steering unit. Large particles of contamination in steering unit.	Inspect. Check for a pinched or damaged return line. Inspect hydraulic filter for contamination. Repair cause of contamination. Flush hydraulic system. Inspect hydraulic filter for contamination. Repair cause of contamination. Flush hydraulic system.

Problem	Cause	Remedy
Steering unit locks up	<p>Large particles of contamination in steering unit.</p> <p>★ Thermal shock</p> <p>Worn or damaged steering unit.</p>	<p>Inspect hydraulic filter for contamination. Repair cause of contamination. Flush hydraulic system.</p> <p>Do priority valve LS port flow test in group 3. This oil flow provides a warm-up flow to steering unit when not using the steering.</p> <p>Repair or replace steering unit.</p>
Abrupt steering wheel oscillation	Improperly timed gerotor gear in steering unit.	Time gerotor gear.
Steering wheel turns by itself	Lines connected to wrong port.	Reconnect lines.
Vibration in steering system or hoses jump	High priority valve setting.	Do priority valve pressure test.
Neutral position of steering wheel cannot be obtained, i.e. there is a tendency towards "motoring"	<p>Steering column and steering unit out of line.</p> <p>Too little or no play between steering column and steering unit input shaft.</p> <p>Pinching between inner and outer spools.</p>	<p>Align the steering column with steering unit.</p> <p>Adjust the play and, if necessary, shorten the splines journal.</p> <p>Contact the nearest service shop.</p>
"Motoring" effect. The steering wheel can turn on its own.	<p>Leaf springs are stuck or broken and have therefore reduced spring force.</p> <p>Inner and outer spools pinch, possibly due to dirt.</p> <p>Return pressure in connection with the reaction between differential cylinder and steering unit too high.</p> <p>Oil is needed in the tank.</p> <p>Steering cylinder worn.</p> <p>Gear wheel set worn.</p> <p>Spacer across cardan shaft forgotten.</p>	<p>Replace leaf springs.</p> <p>Clean steering unit or contact the nearest service shop.</p> <p>Reduce return pressure.</p> <p>Fill with clean oil and bleed the system.</p> <p>Replace or repair cylinder.</p> <p>Replace gear wheel set.</p> <p>Install spacer.</p>

★ Thermal shock is caused by a large temperature differential (Approx 30°C, 50°F) between the steering unit and hydraulic oil. If the steering is not operated for a long period of time and the orifice in the bottom of the priority valve spool is plugged, the steering unit may bind up when the steering is operated if the hydraulic oil is hot enough.

Problem	Cause	Remedy
Backlash	Cardan shaft fork worn or broken. Leaf springs without spring force or broken. Worn splines on the steering column.	Replace cardan shaft. Replace leaf springs. Replace steering column.
"Shimmy" effect. The steered wheels vibrate. (Rough tread on tires gives vibrations)	Air in the steering cylinder. Mechanical connections or wheel bearings worn. High priority valve setting pressure.	Bleed cylinder. Find and remove the reason for air collection. Replace worn parts. Set pressure as regular value.
Steering wheel can be turned slowly in one or both directions without the steered wheels turning.	One or both shock valves are leaky or are missing in steering valve.	Clean or replace defective or missing valves.
Steering is too slow and heavy when trying to turn quickly.	Insufficient oil supply to steering unit, pump defective or number of revolutions too low. Relief valve setting too low. Relief valve sticking owing to dirt. Spool in priority valve sticking owing to dirt. Too weak spring in priority valve.	Replace pump or increase number of revolutions. Adjust valve to correct setting. Clean the valve. Clean the valve, check that spool moves easily without spring. Replace spring by a stronger.
"Kick back" in steering wheel from system. Kicks from wheels.	Fault in the system.	Contact authorized man or shop.
Heavy kick-back in steering wheel in both directions.	Wrong setting of cardan shaft and gear-wheel set.	Correct setting as shown in service manual.
Turning the steering wheel activates the steered wheels opposite.	Hydraulic hoses for the steering cylinders have been switched around.	Connect lines to correct ports.
Hard point when starting to turn the steering wheel	Spring force in priority valve too weak. Oil is too thick (cold).	Replace spring by a stronger. Let motor run until oil is warm.
Too little steering force (possibly to one side only).	Pump pressure too low. Too little steering cylinder. Piston rod area of the differential cylinder too large compared with piston diameter.	Correct pump pressure. Fit a larger cylinder. Fit cylinder with thinner piston rod or 2 differential cylinders.
Leakage at either input shaft, end cover, gear-wheel set, housing or top part.	Shaft defective. Screws loose. Washers or O-rings defective.	Replace shaft seal. Tighten screws. Replace.