

GROUP 2 OPERATIONAL CHECKS AND TROUBLESHOOTING

1. POWER TRAIN OPERATIONAL CHECKS

This procedure is designed so that the mechanic can make a quick check of the system using a minimum amount of diagnostic equipment. If you need additional information, read **structure and function**, 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 the sequence from left to right.

Read each check completely before performing.


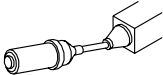
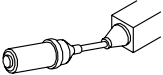
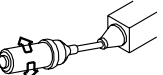
At the end of each check, if no problem is found(OK), that check is complete or an additional check is needed. If problem is indicated(NOT OK), you will be given repair required and group location.

If verification is needed, you will be given next best source of information:

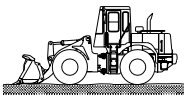
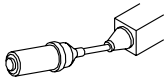
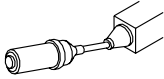

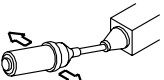
Chapter 2. Troubleshooting

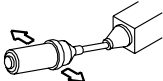
Group 3. Tests and adjustments

※ Transmission oil must be at operating temperature for these checks.

Item	Description	Service action
Transmission oil warm-up procedure	 <p>Start engine. Apply service brakes.</p> <p>Move transmission selector lever to 3rd speed.</p> <p>Move transmission control lever to forward "F" position.</p>  <p>Increase engine speed to high idle for 30 seconds.</p> <p>Move transmission control lever to neutral "N" position and run for 15 seconds.</p> <p>Repeat procedure until transmission temperature gauge arrow points to bar above dial.</p>	OK Check completed.
Transmission selector lever check. Engine OFF.	 <p>Move selector lever to each position.</p> <p>LOOK : Lever must align with gear indicator in each position.</p> <p>NOTE : Indicator position changes slightly as steering column is tilted.</p> <p>FEEL : Lever must move freely through all positions.</p>	OK Check completed. NOT OK Repair or replace switch.
Transmission noise check Engine running.	 <p>Run engine at approximately 1600 rpm.</p> <p>Drive unit with transmission in each forward and reverse speed.</p> <p>LISTEN : Transmission must not make excessive noise in any range.</p> <p>Engine rpm must not "lug down" as unit is shifted between gears.</p>	OK Check completed. NOT OK Go to transmission makes excessive noise chapter 2 in this group.

Item	Description	Service action
<p>Transmission "quick shift" check Engine running.</p>	<div></div> <p>Release park brake and shift to 2nd forward.</p> <p>Drive machine at approximately 1600rpm and press boom control lever switch once.</p> <div></div> <p>LOOK/FEEL : Transmission must shift to and remain in 1st gear.</p> <p>Press boom control lever switch once.</p> <div></div> <p>LOOK/FEEL : Transmission must shift back to 2nd gear.</p> <p>Shift to (4th) gear and press boom control lever switch once.</p> <p>LOOK/FEEL : Transmission must not shift down.</p> <p>NOTE : If boom lever switch is pressed twice, transmission will shift down the immediately back to 2nd.</p>	<p>OK Check completed.</p> <p>NOT OK Check connector at base of control valve.</p>
<p>Forward, reverse and 4th speed clutch pack drag check. ※ Transmission must be warmed up for this check. Engine running.</p>	<div></div> <p>Park unit on level surface.</p> <p>Apply service brakes.</p> <div></div> <p>Move transmission control lever to neutral.</p> <p>Move speed selector lever to 1st.</p> <p>Release park brake and service brakes.</p> <div></div> <p>Run engine at low idle.</p> <p>LOOK : Unit must not move in either direction.</p>	<p>OK Check completed.</p> <p>NOT OK If unit moves, repair transmission.</p>

Item	Description	Service action
1st, 2nd, and 3rd speed clutch pack drag check Engine running.	 <p>Stop unit on a level, hard surfaced area.</p> <p>Run engine at low idle.</p> <p>Release park and service brakes.</p>  <p>Put transmission in 1st forward, 2nd forward, and then 3rd forward.</p> <p>Note machine movement.</p> <p>LOOK : Machine must roll ahead in each gear.</p> <p>NOTE : If machine rolls ahead in one gear but not the other two, drag is indicated in that clutch pack.</p>	<p>OK Check completed.</p> <p>NOT OK Repair transmission.</p>
Transmission pressure, pump flow, and leakage check Engine running.	 <p>Run engine at low idle.</p> <p>Release park brake.</p> <p>Shift transmission to reverse, then forward, and then to 1st, 2nd, and 3rd speeds.</p>  <p>Wait 5 seconds after each shift and observe transmission pressure indicator light.</p> <p>LOOK : Indicator light must not come on.</p> <p>NOTE : If light comes on in one gear only, leakage is indicated on that gear.</p> <p>If light comes on in all gears, low pump flow or pressure is indicated.</p>	<p>OK Check completed.</p> <p>NOT OK Do transmission leakage test, system pressure test, or pump flow test in group 3.</p>
Transmission shift modulation check Engine running.	 <p>Run engine at approximately 1600rpm.</p> <p>Put transmission in 1st forward, shift several times from forward to reverse and reverse to forward. Repeat check in 2nd gear.</p> <p>LOOK : Unit must slow down and change direction smoothly.</p>	<p>OK Check completed.</p> <p>NOT OK Go to unit shifts too fast, chapter 2 in this group.</p>

Item	Description	Service action
Torque converter check	 <p>Start engine. Apply service brakes.</p> <p>Move transmission selector lever to 3rd speed.</p> <p>Move transmission control lever to forward "F" position.</p> <p>Increase engine speed to high idle, observe engine rpm and record lowest rpm reading.</p> <p>LOOK : Torque converter stall rpm must be within the following range. (2300~2440rpm)</p> <p>Move transmission control lever to neutral "N" position and run for 15 seconds.</p>	<p>OK Check completed.</p> <p>NOT OK If stall rpm are too low or too high, problem may be engine power or torque converter. If stall rpm is too high, it could be too powerful engine or clutch slipping.</p>

2. TROUBLESHOOTING

1) TRANSMISSION

※ 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(see group 2.)

Step 3. Troubleshooting(see group 2.)

Step 4. Tests and / or adjustments(see group 3.)

Problem	Cause	Remedy
Transmission slippage	Low oil level Wrong oil grade Low clutch pressure Leak in transmission control valve or gasket Low transmission pump flow due to worn pump Weak or broken pressure regulating valve spring	Fill to proper level. Change oil. Refer to "low clutch pressure". Remove valve and inspect gaskets. Do transmission pump flow test. Refer to "low charging pump flow". Do transmission system pressure test.
Low clutch pressure	Low oil level Clutch pressure regulating valve spool stuck open. Faulty charging pump Broken or worn clutch shaft or piston sealing ring Modulator spool orifice blocked.	Fill to proper level. Clean valve spool and housing. Replace pump. Replace sealing ring. Clean spool orifice.
Low charging pump flow	Low oil level Suction screen plugged Air leaks at pump intake hose and connections or collapsed hose Defective oil pump	Fill to proper level. Clean suction screen. Also, check the filter. If suction screen is clogged pump may be noisy. Tighten all connections or replace hose if necessary. Replace pump.

Problem	Cause	Remedy
Machine will not move	Applied park brake	Check park brake fuse. Check continuity to park brake switch.
	No power to transmission controller.	Check transmission controller fuse.
	Excessive leakage in transmission element	Do transmission element leakage test using system pressure.
	Worn clutch disks	Repair clutch pack.
	Low or no transmission pressure	See clutch pack pressure is low in this group.
	Service brake will not release	Do brake pedal operational check. Do service and park system drag checks.
	Failed torque converter	Do torque converter stall test. If engine pulldown is normal, torque converter is good.
	Broken shafts or gears	Drain transmission to determine if large pieces of metal contamination are present.
	Broken drive shafts	Inspect drive shafts and universal joints for external damage. Repair.
	Broken ring or pinion gear	If drive shaft rotate with transmission in gear but machine does not move, a differential failure is indicated. Repair.
Machine does not engage in low gear	Malfunctioning transmission control solenoid valve	Check solenoid valve.
	Stuck spool in transmission control valve	Remove and inspect transmission control valve spools.
	Stuck modulation valve	Inspect modulation spool. Replace if necessary.
Noisy converter	Worn oil pump	Replace.
	Worn or damaged bearings	A complete disassembly will be necessary to determine what bearing is faulty.

Problem	Cause	Remedy
Transmission shifts too slow	<p>Low oil level(aeration of oil)</p> <p>Low transmission pressure</p> <p>Restricted transmission pump suction screen</p> <p>Low transmission pump flow</p> <p>Excessive transmission element leakage</p> <p>Stuck modulation valve</p> <p>Restricted modulation orifice</p> <p>Restricted oil passages between control valve and transmission elements</p>	<p>Fill to proper level.</p> <p>Do transmission system pressure test.</p> <p>Remove and clean screen.</p> <p>See low charging pump flow in this group.</p> <p>Do transmission element leakage test using system pressure.</p> <p>Inspect modulation spool. Replace if necessary.</p> <p>Remove orifice and inspect for contamination and /or plugging.</p> <p>Remove control valve and inspect oil passage.</p>
Transmission shifts too fast	<p>Wrong transmission controller</p> <p>System pressure too high</p> <p>Stuck modulation valve</p> <p>Stuck or missing check valves</p> <p>Missing O-ring from end of modulation orifice</p> <p>Broken piston return spring</p>	<p>Check if transmission controller has been changed</p> <p>Do transmission system pressure test.</p> <p>Remove and inspect modulation valve. Replace if necessary. Also remove end cover to inspect modulation spool and control valve housing. Replace if necessary.</p> <p>Inspect transmission control valve.</p> <p>Remove orifice and inspect port for O-ring.</p> <p>Disassemble and inspect clutch.</p>
Machine "creeps" in neutral	<p>Warped disks and plates in transmission</p>	<p>Check transmission.</p>
Machine runs only in 2nd gear	<p>Wrong transmission controller</p>	<p>Check if transmission controller has been changed.</p>

Problem	Cause	Remedy
Transmission hydraulic system overheats	High oil level	Transmission overfilled or hydraulic pump seal leaking.
	Low oil level	Fill to proper level.
	Wrong oil grade	Change oil.
	Park brake dragging	Check for heat in park brake area.
	Pinched, restricted or leaking lube lines	Check cooler lines.
	Machine operated in too high gear range	Operate machine in correct gear range.
	Malfunction in temperature gauge or sender	Install temperature sensor to verify temperature.
	Restricted air flow through radiator	Check radiator whether restricted or not.
	Failed oil cooler bypass valve(in thermal bypass valve)	Disassemble and inspect.
	Low transmission pump output	Refer to "low charging pump flow".
	Worn oil sealing rings	Remove, disassemble and rebuild converter assembly.
	Worn oil pump	Replace.
	Pump suction line taking air	Check oil line connections and tighten securely.
Excessive transmission noise(under load or no load)	Worn parts or damaged in transmission	Remove transmission suction screen. Inspect for metal particles. Repair as necessary.
	Low or no lube	Check converter out and lube pressure. Also check the pump flow.
Foaming oil	Incorrect type of oil	Change oil.
	Air leak on suction side of pump	Check oil pickup tube on side of transmission.
Oil ejected from dipstick	Plugged breather	Inspect breather on top of transmission. Replace.
Machine vibrates	Low engine speed	Check engine speed.
	Failed universal joints on transmission drive shaft or differential drive shafts	Check universal joints.

Problem	Cause	Remedy
Machine lacks power and acceleration	Engine high idle speed set too low Low engine RPM at converter stall Low transmission pressure Failed torque converter Low engine power	Check high idle adjustment. Tune engine check governor. Refer to "low clutch pressure". Do torque converter stall speed test. Do engine power test.
Torque converter stall RPM too high	Aerated oil Clutch slippage Leakage in torque converter seal Torque converter not transferring power(bent fins, broken stator)	Put clear hose on thermal bypass outlet port. Run machine to check for bubbles in oil. Refer to "transmission slippage". Do converter-out pressure test. Replace torque converter.
Torque converter stall RPM too low	Low engine power Mechanical malfunction	Do engine power test. Remove and inspect torque converter.
Transmission pressure light comes on when shifting from forward to reverse(all other gears OK)	Low oil level Cold oil Leak in reverse pack	Add oil. Warm oil to specification. Do transmission pressure, pump flow, and leakage check.

2) DIFFERENTIAL / AXLE

Problem	Cause	Remedy
Differential low on oil	External leakage	Inspect axle and differential for leaks.
Excessive differential and/or axle noise	Low oil level in differential	Check oil. Remove drain plug and inspect for metal particles in differential case. Disassemble and determine cause.
	Dragging brakes	Do brake check.
	Failed pinion bearing	Remove and inspect pinion. Check to ensure pinion housing was indexed.
	Incorrect gear mesh pattern between ring and pinion gear	Remove pinion gear housing and inspect ring and pinion gear.
	Failed differential pinion gears and / or cross shafts	Remove differential housing drain plug and inspect for metal particles. Disassemble and inspect.
	Failed axle bearing	Do axle bearing adjustment check.
Oil seeping from outer axle seal	Mechanical failure in axle planetary	Remove differential. Inspect, repair.
	Excessive end play in axle	Do axle bearing adjustment check.
	Worn outer bearing and/or cup	Disassemble and inspect outer axle bearing, cup, spacer, and seal. Replace, if necessary.
Axle overheats	Overfilled differential oil	Check differential oil return system for excessive internal restriction.
	Low differential oil	Add oil.
	Overfilled differential oil	Adjust oil level properly.
	Brake drag	Check brake drag.

3) DRIVE LINE

Problem	Cause	Remedy
Excessive drive line vibration or noise	Yokes not in line on drive shafts	Inspect. Align drive shaft yokes.
	Worn front drive line support bearing	Inspect, repair.
	Bent drive shaft	Inspect all drive shafts. Replace.
	Loose yoke retaining nuts(drive shafts wobble at high speed)	Inspect. Replace.
	Lack of lubrication	Lubricate with proper grade of grease.