

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.

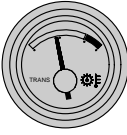
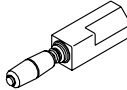
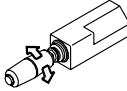
At the end of each check, if no problem is found(OK), that check is complete or an additional check is needed. If problem is indicated(NOT OK), you will be given repair required and group location.

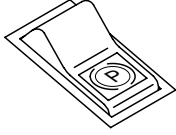
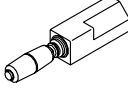
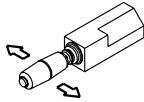
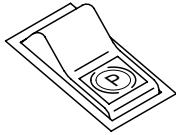
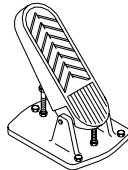
If verification is needed, you will be given next best source of information:

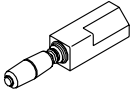

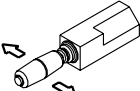
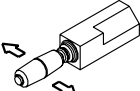
Chapter 2. Troubleshooting

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 and release parking brake.</p> <p>Move gear selector lever to forward "F" position. (Gear selector lever 2nd speed) is selected.</p>  <p>Increase engine speed to high idle for 30 seconds.</p> <p>Move gear selector 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>	<p>OK Check completed.</p>
Transmission noise check Engine running	 <p>Run engine at approximately 1300rpm.</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>	<p>OK Check completed.</p> <p>NOT OK Go to transmission makes excessive noise group 3.</p>

Item	Description	Service action
Transmission "quick shift" check Engine running	 <p>Release parking brake and shift to 2nd forward.</p> <p>Drive machine at approximately 5km/h and press gear selector lever switch once.</p> <p>LOOK/FEEL : Transmission must shift to and remain in 1st gear.</p>  <p>Operate acceleration pedal until high idle.</p> <p>LOOK/FEEL : Transmission must shift back to 2nd gear.</p> <p>Shift to (3rd or 4th) gear and press gear selector lever switch once.</p> <p>LOOK/FEEL : Transmission must not shift down.</p>	<p>OK Check completed.</p> <p>NOT OK Check connector at base of control valve.</p> <p>IF OK Go to transmission controller circuit in group 1.</p>
Forward and reverse clutch pack drag check ※ Transmission must be warmed up for this check Engine running	 <p>Park unit on level surface.</p> <p>Apply service brakes.</p> <p>Move gear selector lever to neutral.</p>  <p>Move gear selector lever to 1st.</p> <p>Release parking brake and service brakes.</p> <p>Run engine at low idle.</p> <p>LOOK : Unit must not move in either direction.</p>  <p>NOTE : If unit moves forward, the forward pack is dragging.</p>	<p>OK Check completed.</p> <p>NOT OK If unit moves, repair transmission.</p>

Item	Description	Service action
Transmission pressure, pump flow, and leakage check Engine running	  Run engine at low idle. Release parking brake. Shift transmission to reverse, then forward, and then to 1st, 2nd, 3rd and 4th speeds. Wait 5 seconds after each shift and observe transmission pressure indicator light. LOOK : Indicator light must not come on. NOTE : If light comes on in one gear only, leakage is indicated on that gear. If light comes on in all gears, low pump flow or pressure is indicated.	OK Check completed. NOT OK Do transmission leakage test, system pressure test, or pump flow test in group 3.
Transmission shift modulation check Engine running	 Run engine at approximately 1300rpm. Put transmission in 1st forward, shift several times from forward to reverse and reverse to forward. Repeat check in 2nd gear. LOOK : Unit must slow down and change direction smoothly.	OK Check completed. NOT OK Go to unit shifts too fast, chapter 2 in this group.
Torque converter check	 Start engine. Apply service brakes and release parking brake. Move gear selector lever to 2nd speed. Move gear selector control lever to forward "F" position. Increase engine speed to high idle. LOOK : Torque converter stall rpm must be within the following range. Stall rpm : 2070 ~ 2210rpm Move gear selector control lever to neutral "N" position and run for 15 seconds.	OK Check completed. NOT OK If stall rpm are too low or too high, problem may be engine power or torque converter. IF OK Replace transmission torque converter.

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 (In this group.)

Step 3. Troubleshooting

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

Problem	Cause	Remedy
Transmission slippage	Low oil level.	Add oil.
	Wrong oil grade.	Change oil.
	Restricted transmission pump suction screen or transmission filters.	Remove and clean screen. Change filters.
	Leak in transmission control valve or gasket.	Remove valve and inspect gaskets.
	Low transmission pump flow due to worn pump.	Do transmission pump flow test.
	Weak or broken pressure regulating valve spring.	Do transmission system pressure test.
	Malfunctioning pressure regulating valve.	Remove and inspect pressure regulating valve.

Problem	Cause	Remedy
Machine will not move	<p>Low oil level.</p> <p>Applied park brake.</p> <p>No power to transmission controller.</p> <p>Malfunctioning parking brake solenoid valve.</p> <p>Restricted modulation orifice.</p> <p>Excessive leakage in transmission element.</p> <p>Worn clutch disks.</p> <p>Low or no transmission pressure.</p> <p>Service brake will not release.</p> <p>Failed torque converter.</p> <p>Broken shafts or gears.</p> <p>Broken drive shafts.</p> <p>Broken ring or pinion gear.</p>	<p>Add oil</p> <p>Check parking brake fuse. Check continuity to parking brake switch.</p> <p>Check transmission controller fuse.</p> <p>Remove and inspect parking brake solenoid valve. Check for power to solenoid valve.</p> <p>Remove orifice and check for contamination and/or plugging. (Do not remove valve housing for this purpose.)</p> <p>Do transmission element leakage test using system pressure.</p> <p>Repair transmission.</p> <p>See transmission pressure is low in this group.</p> <p>Do brake pedal operational check. Do service and park system drag checks.</p> <p>Do torque converter stall test. If engine pulldown in normal, torque converter is good.</p> <p>Drain transmission to determine if large pieces of metal contamination are present.</p> <p>Inspect drive shafts and universal joints for external damage. Repair.</p> <p>If drive shaft rotate with transmission in gear but machine does not move, a differential failure is indicated. Repair.</p>
Machine does not engage in low gear	<p>Malfunctioning transmission control solenoid valve.</p> <p>Stuck spool in transmission control valve.</p> <p>Stuck modulation valve.</p> <p>Malfunctioning transmission speed sensor.</p>	<p>Check solenoid valve.</p> <p>Remove and inspect transmission control valve spools.</p> <p>Remove end cover to inspect modulation spool. Replace if necessary.</p> <p>Check speed sensor.</p>

Problem	Cause	Remedy
Transmission pressure is low (All gears)	<p>Low oil level.</p> <p>Failed transmission pressure switch.</p> <p>Plugged suction strainer.</p> <p>Stuck transmission pressure regulating valve or broken spring.</p> <p>Failed control valve gasket.</p> <p>Stuck modulation valve.</p>	<p>Check transmission oil level and refill if necessary.</p> <p>Verify transmission system pressure. Do transmission system pressure test.</p> <p>Transmission pump may be noisy if transmission suction screen is clogged. Drain oil.</p> <p>Remove and clean suction screen. Also, check condition of transmission filter.</p> <p>Remove transmission pressure regulating valve. Inspect for damage(See transmission control valve).</p> <p>Inspect transmission control valve for external leakage. Remove control valve. Inspect or replace gasket.</p> <p>Remove end cover to inspect modulation spool and check torque on cap screws retaining control valve to transmission.</p>
Transmission system pressure is low (One or two gears)	<p>Failed transmission pump.</p> <p>Failed transmission control valve gasket.</p> <p>Leakage in clutch piston or seal ring.</p>	<p>Do pump flow test.</p> <p>Inspect transmission control valve for external leakage. Remove control valve. Inspect or replace gasket.</p> <p>Disassemble and repair.</p>
Transmission direction shifts too low	<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>Add oil.</p> <p>Do transmission system pressure test.</p> <p>Remove and clean screen.</p> <p>Do transmission pump flow test.</p> <p>Do transmission element leakage test using system pressure.</p> <p>Remove end cover to 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>

Problem	Cause	Remedy
Transmission direction shifts too fast	Wrong transmission controller.	Check if transmission controller has been changed.
	System pressure too high.	Do transmission system pressure test.
	Stuck modulation valve.	Remove and inspect modulation valve. Replace if necessary. Also remove end cover to inspect modulation spool and control valve housing. Replace if necessary.
	Stuck or missing check valves.	Inspect transmission control valve.
	Missing O-ring from end of modulation orifice.	Remove orifice and inspect port for O-ring.
	Broken piston return spring.	Disassemble and inspect clutch.
Machine "creeps" in neutral	Warped disks and plates in transmission.	Check transmission.
Transmission hydraulic system overheats	High oil level.	Transmission overfilled or hydraulic pump seal leaking.
	Low oil level.	Add oil.
	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 the verify temperature. Do tachometer/temperature reader installation procedure.
	Restricted air flow through oil cooler or radiator.	Do radiator air flow test.
	Failed oil cooler bypass valve(In thermal bypass valve).	Disassemble and inspect.
	Failed thermal bypass valve.	Remove thermal bypass valve and check to see if machine still overheats. Do transmission oil cooler thermal bypass valve test.
	Internally restricted oil cooler.	Do oil cooler restriction test.
	Leakage in transmission hydraulic system.	Do transmission system pressure, element leakage, and shift modulation test.
	Malfunction in converter relief valve.	Do converter out pressure test.
	Low transmission pump output.	Do transmission pump flow test.

Problem	Cause	Remedy
Excessive transmission noise (under load or no load)	Too low engine low idle. Worn parts or damaged in transmission. Warped drive line between engine and torque converter. Low or no lube.	Check engine low idle speed. Remove transmission suction screen. Inspect for metal particles. Repair as necessary. Inspect drive line. Do converter-out and lube pressure test. Do transmission pump flow test.
Foaming oil	Incorrect type of oil. High oil level. Low oil level. Air leak on suction side of pump.	Change oil. Transmission overfilled or hydraulic pump seal leaking. Add oil. Check oil pickup tube on side of transmission.
Oil ejected from dipstick	Plugged breather.	Inspect breather on top of transmission. Replace.
Machine vibrates	Aerated oil. Low engine speed. Failed universal joints on transmission drive shaft or differential drive shafts.	Add oil. Check engine speed. Check universal joints.
Machine lacks power and acceleration	Engine high idle speed set too low. Incorrect transmission oil. Aerated oil. Low transmission pressure. Warped transmission clutch. Torn transmission control valve gasket. Brake drag. Failed torque converter. Low engine power.	Check high idle adjustment. Change oil. Add oil. Do transmission system pressure test. Do transmission clutch drag checks. Inspect gasket. Do brake drag check. Do torque converter stall speed test. Do engine power test.
Torque converter stall RPM too high	Aerated oil. Stuck open converter relief valve. Leakage in torque converter seal. Torque converter not transferring power(Bent fins, broken starter).	Put clear hose on thermal bypass outlet port. Run machine to check for bubbles in oil. Do converter-out pressure test. Do converter-out pressure test. Replace torque converter.

Problem	Cause	Remedy
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.
Transmission pressure light comes on for each shift	Cold oil. No time delay in monitor. Restriction in modulation orifice. Stuck modulation valve. Low transmission pressure circuit. Leak in transmission pressure circuit. Failed transmission pump. Clogged filter.	Warm oil to specification. Do monitor check. Remove orifice and inspect for restriction and/or plugging. Remove and inspect. Do transmission system pressure test. Do converter out pressure test. Do transmission pump flow test. Inspect filter. Replace.
Low converter charging pump output	Low oil level. Sump screen plugged. Air leaks at pump intake hose and connections or collapsed hose. Defective oil pump.	Fill to proper level. Clean screen and sump. Tighten all connections or replace hose if necessary. Replace pump.
Low flow through cooler with low converter in pressure	Defective safety by-pass valve spring. Converter by-pass valve partially open. Excessive converter internal leakage, check converter lube flow. Broken or worn sealing rings in transmission clutches.	Replace spring. Check for worn by-pass ball seat. Remove, disassemble, and rebuild converter assembly, replacing all worn or damaged parts. See Group 3.

Problem	Cause	Remedy
Low flow through cooler with high converter out pressure	<p>Plugged oil cooler. Indicated if transmission lube pressure is low.</p> <p>Restricted cooler return line.</p> <p>Lube oil ports in transmission plugged. Indicated if transmission lube pressure is high.</p>	<p>Back flush and clean oil cooler.</p> <p>Clean out lines.</p> <p>Check lube lines for restrictions.</p>
Noisy converter	<p>Worn coupling gears.</p> <p>Worn oil pump.</p> <p>Worn or damaged bearings.</p>	<p>Replace.</p> <p>Replace.</p> <p>A complete disassembly will be necessary to determine what bearing is faulty.</p>

2) DIFFERENTIAL / AXLE

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

3) DRIVE LINE

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