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.

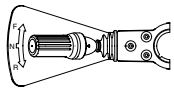
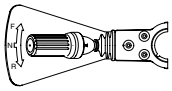
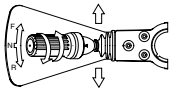
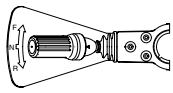
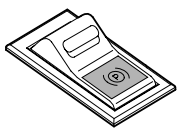
The engine and all other major components must be at operating temperature for some checks.

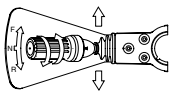
Locate system check in the left column and read completely, following the sequence from left to right. Read each check completely before performing.

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	  Start engine. Apply service brakes and release parking brake. Move gear selector lever to 3rd speed. Move gear selector lever to forward "F" position. Increase engine speed to high idle for 30 seconds. Move gear selector lever to neutral "N" position and run for 15 seconds. Repeat procedure until warm-up operation is completed.	**OK** Check completed.
Gear selector lever Engine OFF.	 Move gear selector lever to each position. **NOTE** : Gear selector lever position changes slightly as steering column is tilted. **FEEL** : Lever must move freely through all positions.	**OK** Check completed. **NOT OK** Repair lock or replace switch.
Transmission noise check Engine running.	 Run engine at approximately 1600 rpm. Drive unit with transmission in each forward and reverse speed. LISTEN : Transmission must not make excessive noise in any range. Engine rpm must not "lug down" as unit is shifted between gears.	**OK** Check completed. **NOT OK** Go to transmission makes excessive noise, chapter 2 in this group.
Forward, reverse and 4th speed clutch pack drag check ※ **Transmission must be warmed up for this check.** Engine running.	  Park machine on level surface. Apply service brakes. Move gear selector lever to neutral. Move gear selector lever to 1st. Release parking brake and service brakes. Run engine at low idle. **LOOK** : Machine must not move in either direction. **NOTE** : If unit moves forward, either the forward pack or the 4th speed pack is dragging.	**OK** Check completed. **NOT OK** If unit moves, repair transmission.

Item	Description	Service action
Torque converter check	 Start engine. Apply service brakes and release parking brake. Move gear selector lever to 4th 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 : 2020±70 rpm 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.
	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.
Machine will not move	Low oil level.	Add oil.
	Applied park brake.	Check parking brake fuse. Check continuity to parking brake switch.
	Malfunctioning parking brake solenoid valve.	Remove and inspect parking brake solenoid valve. Check for power to solenoid valve.
	Excessive leakage in transmission element.	Do transmission element leakage test using system pressure.
	Worn clutch disks.	Repair transmission.
	Low or no transmission pressure.	See transmission 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 pull down in 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.
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.

Problem	Cause	Remedy
Transmission pressure is low (all gears)	Low oil level.	Check transmission oil level and refill if necessary.
	Stuck transmission pressure regulating valve or broken spring.	Remove transmission pressure regulating valve. Inspect for damage (See transmission control valve).
	Failed control valve gasket.	Inspect transmission control valve for external leakage. Remove control valve. Inspect or replace gasket.
Transmission system pressure is low (one or two gears)	Failed transmission pump.	Do pump flow test.
	Failed transmission control valve gasket.	Inspect transmission control valve for external leakage. Remove control valve. Inspect or replace gasket.
	Leakage in clutch piston or seal ring.	Disassemble and repair.
Transmission shifts too late	Low oil level (aeration of oil).	Add oil.
	Low transmission pressure.	Do transmission system pressure test.
	Restricted transmission pump suction screen.	Remove and clean screen.
	Low transmission pump flow.	Do transmission pump flow test.
	Excessive transmission element leakage.	Do transmission element leakage test using system pressure.
	Restricted oil passages between control valve and transmission elements.	Remove control valve and inspect oil passage.
	Incorrect transmission oil.	Change oil (SAE 10W-30/15W-40)
Transmission shifts too fast	System pressure too high.	Do transmission system pressure test.
	Broken piston return spring.	Disassemble and inspect clutch.
	Incorrect transmission oil.	Change oil (SAE 10W-30/15W-40).

Problem	Cause	Remedy
Transmission hydraulic system overheats	High oil level.	Transmission overfilled or hydraulic pump seal leaking.
	Low oil level.	Add oil.
	Wrong oil grade.	Change oil.
	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 sensor.	Install temperature sensor the verify temperature. Do tachometer/temperature reader installation procedure.
	Restricted air flow through oil cooler.	Do oil cooler flow test.
	Internally restricted oil cooler.	Do oil cooler restriction test.
	Leakage in transmission hydraulic system.	Do transmission system pressure, element leakage test.
	Malfunction in converter relief valve.	Do converter out pressure test.
	Low transmission pump output.	Do transmission pump flow test.
Excessive transmission noise (Under load or no load)	Too low engine low idle.	Check engine low idle speed.
	Worn parts or damaged in transmission.	Drain transmission oil via plug. Inspect for metal particles. Repair as necessary.
	Low or no lube.	Do converter-out and lube pressure test. Do transmission pump flow test.
Foaming oil	Incorrect type of oil.	Change oil.
	High oil level.	Transmission overfilled or hydraulic pump seal leaking.
	Low oil level.	Add oil.
	Air leak on suction side of pump.	Check oil pickup tube on side of transmission.
Machine vibrates	Aerated oil.	Add oil.
	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.	Check high idle adjustment.
	Incorrect transmission oil.	Change oil.
	Aerated oil.	Add oil.
	Low transmission pressure.	Do transmission system pressure test.
	Warped transmission clutch.	Do transmission clutch drag checks.
	Torn transmission control valve gasket.	Inspect gasket.
	Brake drag.	Do brake drag check.
	Failed torque converter.	Do torque converter stall speed test.
	Low engine power.	Do engine power test.
Torque converter stall RPM too high	Aerated oil.	Run machine to check for bubbles in oil.
	Stuck open converter relief valve.	Do converter-out pressure test.
	Leakage in torque converter seal.	Do converter-out pressure test.
	Torque converter not transferring power (Bent fins, broken stator).	Replace torque converter.
Torque converter stall RPM too low	Low engine power.	Do engine power test.
	Mechanical malfunction.	Remove and inspect torque converter.

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.
	Incorrect type of oil.	Change oil
	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.
	Mechanical failure in axle planetary.	Remove differential. Inspect, repair.
Oil seeping from outer axle seal	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.
	Overfilled differential.	Check differential oil return system for excessive internal restriction.
Axle overheats	Low differential oil.	Add oil.
	Overfilled differential.	See differential overfills with oil in this group.
	Brake drag.	See brakes drag in this group.

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.