10.General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
• Steering effort is heavy in all ranges. • Steering effort is heavy at stand still. • Steering wheel vibrates when turning.	1. Pulley belt • Unequal length of pulley belts • Contact with oil or grease • Looseness or damage of the pulley belt • Poor uniformity of the pulley belt cross section • Pulley belt touches to pulley bottom • Poor revolution of pulleys (except oil pump pulley) • Poor revolution of oil pump pulley	Adjust or replace.
	2. Tire and wheel • Improper tire out of specifications*1 • Improper wheel out of specifications*1 • Tires not properly inflated	Replace or reinflate.
	3. Fluid • Low fluid level • Air entry in fluid • Entry of dust in the fluid • Fluid deterioration • Inadequate warm–up of fluid *2	Refill, bleed air, replace or instruct customer.
	4. Idle speed • Lower idle speed • Excessive drop of idle speed at start or when turning the steering wheel *3	Adjust or instruct customer.
	5. Measure the hydraulic pressure. <Ref. to PS-45, HYDRAULIC PRESSURE, INSPECTION, Oil Pump.>	Replace the problem parts.
	6. Measure the steering wheel effort. <Ref. to PS-52, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>	Adjust or replace.
• Vehicle leads to one side or the other. • Returning force of steering wheel to center is poor. • Steering wheel vibrates when turning.	1. Fluid line • Folded hose • Flattened pipe	Correct or replace.
	2. Tire and wheel • Flat tire • Mixed use of different tires • Mixed use of different wheels • Abnormal wear of tire • Unequal tread remaining • Unequal pressure of tire	Adjust, fix or replace.
	3. Front alignment • Improper or unequal caster • Improper or unequal toe–in • Loose suspension connections	Adjust or retighten.
	4. Others • Damaged joint assembly • Unbalanced height • Unbalanced weight	Replace, adjust or instruct customer.
	5. Measure the steering wheel effort. <Ref. to PS-52, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If the tires or wheels are wider than standard, the load to the power steering system is increased. Accordingly, in a condition, for example before fluid warms-up, relief valve may work before reaching maximum turning angle. In this case, steering effort may be heavy. When the measured hydraulic pressure is normal, there is no abnormal thing.
*2 In cold weather, flow resistance will increase due to the cold hydraulic fluid, and steering effort will be heavier. After warming-up engine, turn the steering wheel from stop to stop several times to warm-up fluid. If steering effort reduces normally, function is normal.
*3 In cold weather or with insufficient warm–up of the engine, steering effort may be heavy due to excessive drop of idle rpm when turning the steering wheel. In this case, start the vehicle with increasing engine speed than usual. If steering effort reduces normally, function is normal.

1. NOISE & VIBRATION

CAUTION:
Do not keep the relief valve operated over five seconds at any time or inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:
• A screeching noise may be heard immediately after the engine start in extremely cold conditions. In this case, if the noise goes off during warm-up there is no abnormal function in the system. This is due to the fluid characteristics in extremely cold condition.
• The oil pump normally makes a small whining noise due to its mechanism. Even if a noise is heard when steering wheel is turned at stand still, there is no abnormal function in the system provided that the noise eliminates when the vehicle is driving.
• When turning the steering wheel with the brake applied when the vehicle is parked, a screeching noise may be generated by the brake disc and pads. This is not a fault in the steering system.
• There may be a small vibration around the steering devices when turning the steering wheel at standstill, even though the component parts are operating properly.
Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of steering wheel, fluid temperature and braking condition.
These conditions do not indicate a problem in the system.
Confirm vibration for an AT model, by applying the parking brake on a concrete surface, shifting into the “D” range, and turning the steering wheel repeatedly from slow to rapid, step by step.

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	Relief valve emits operating sound when steering wheel is completely turned in either direction. (Do not keep this condition over five seconds.)	Normal
	Relief valve emits operating sound when steering wheel is not turned. This means that the relief valve is defective.	Replace the oil pump.
Rattling noise (intermittent) While engine is running.	Interference with adjacent parts	Check the clearance. Correct if necessary. <Ref. to PS-39, INSPECTION, Pipe Assembly.>
	Loosened installation of oil pump, oil tank, pump bracket, gearbox or crossmember	Retighten.
	Loose oil pump pulley or other pulley(s)	Retighten.
	Looseness of linkage, play of steering, improper tightening (looseness) of suspension joint or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace faulty parts in the gearbox or oil pump.
Knocking When turning steering wheel in both directions with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for adjusting backlash	Adjust and retighten.
	Insufficient tightening or play in the tie–rod or tie–rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Air in vane pump	Inspect and retighten the fluid line connection. Refill the fluid and vent air.
	Vane pump seizing	Replace the oil pump.
	Oil pump pulley bearing seized	Replace the oil pump.
	Folded hose, flattened pipe	Replace.
Squeal, squeak (intermittent or continuous) While engine is running.	Improper adjustment of pulley belt Damaged or over tensioned pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Runout or dirty V–groove surface of oil pump pulley	Clean or replace.

Trouble	Possible cause	Corrective action
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix the faulty part causing aeration. Replace the fluid and vent air.
	Damaged pipe of gearbox	Replace the pipe.
	Faulty inside of hose or pipe Flattened hose or pipe	Repair or replace.
	Abnormal inside of oil tank	Replace.
	Removed oil tank cap	Install cap.
Whistle (continuous) While engine is running.	Faulty pipe of gearbox or faulty hose	Replace the faulty parts of the gearbox or the hose.
Whine or growl (intermittent or continuous) While engine is running with/ without steering turned.	Looseness of oil pump, oil pump bracket attachment	Retighten.
	Fault inside of oil pump or hose	Replace the oil pump or hose, if the noise can be heard when vehicle is running as well as being stopped.
	Torque converter growl, air conditioner compression growl	Remove the power steering pulley belt and check.
Grinding noise (continuous) While engine is running with the steering turned.	Fault inside of gearbox	Replace the faulty parts of gearbox.
	Faulty steering shaft bearing	Apply grease or replace.
	Occurs when turning the steering wheel with brakes (service or parking) applied.	If the noise goes off when brake is released, it is normal.
Vibration While engine is running with/ without steering turned.	Engine speed is too low.	Adjust, and notify customer.
	Air in vane pump	Repair faulty part Vent air.
	Damaged valve in oil pump or gearbox	Replace the faulty parts in gearbox and oil pump.
	Excessive play in steering, looseness of suspension parts	Retighten.

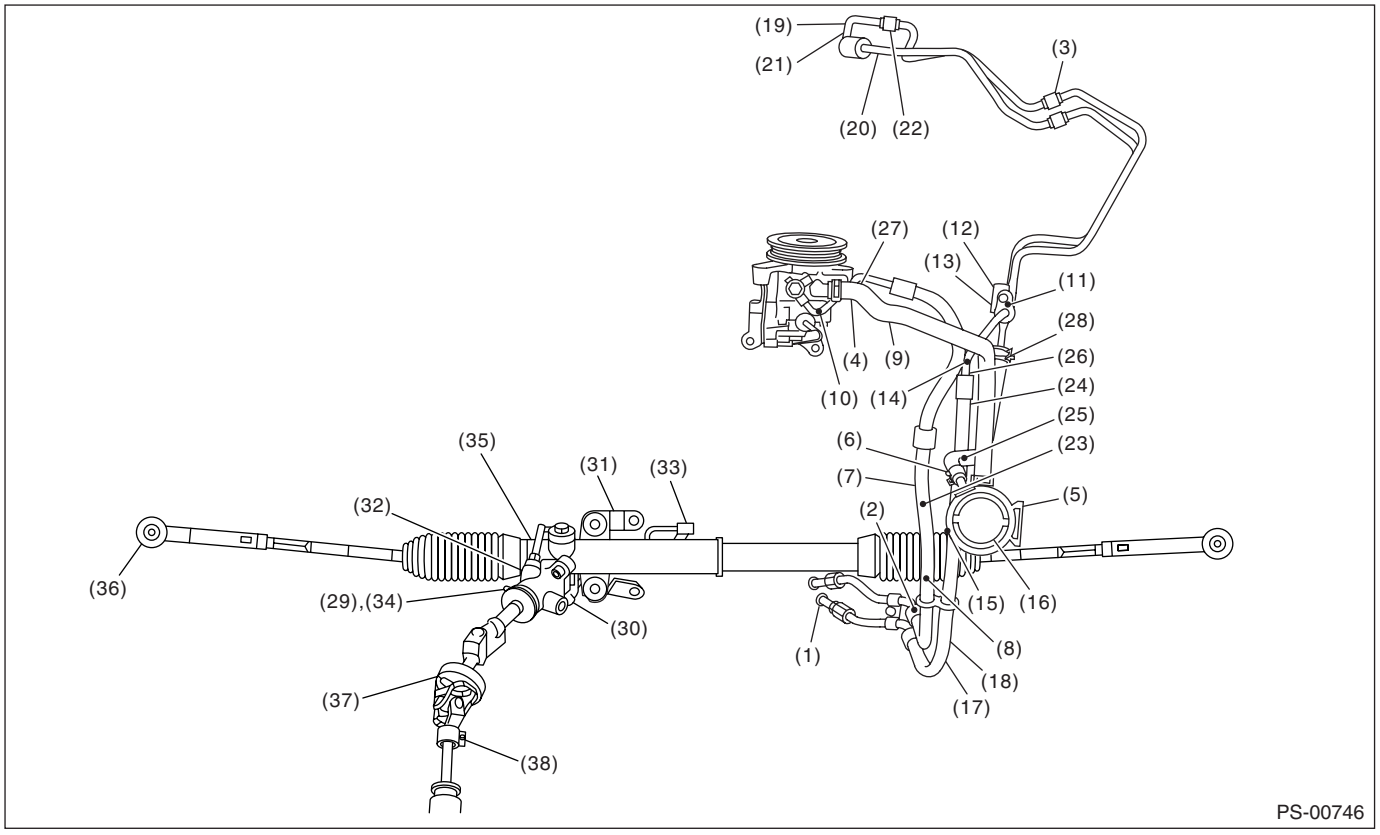
2. MEASUREMENT OF STEERING EFFORT

	Step	Check	Yes	No
1	**CHECK STEERING EFFORT.** 1) Stop the vehicle on paved road. 2) Start the engine. 3) Run the engine at idle. 4) Install a spring scale on the steering wheel. 5) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts. NOTE: When turning the steering more quickly than necessary from a direction to the other direction at an engine speed over 2,000 rpm, steering effort may be heavy. This is caused by flow characteristic of the fluid in the oil pump and is not a defect.	Is the steering effort less than 29.4 N (3.0 kgf, 6.6 lb)?	Go to step **2**.	Adjust the backlash.
2	**CHECK STEERING EFFORT.** 1) Stop the engine. 2) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts.	Is the steering effort less than 294.2 N (30 kgf, 66.2 lb)?	Go to step **3**.	Perform the adjustment.
3	**CHECK STEERING WHEEL EFFORT.** 1) Remove the universal joint. 2) Measure the steering wheel effort.	Is steering effort less than 2.26 N (0.23 kgf, 0.51 lb)?	Go to step **4**.	Check, adjust and replace if necessary.
4	**CHECK STEERING WHEEL EFFORT.** Measure the steering wheel effort.	Is the difference of steering effort between right and left less than 20%?	Go to step **5**.	Check, adjust and replace if necessary.
5	**CHECK UNIVERSAL JOINT.** Measure the swing torque of the joint (yoke of steering column side). <Ref. to PS-13, INSPECTION, Universal Joint.>	Is the swing torque of the universal joint less than 7.3 N (0.74 kgf, 1.64 lb)?	Go to step **6**.	Replace with a new part.
6	**CHECK UNIVERSAL JOINT.** Measure the swing torque of the joint (yoke of gearbox side). <Ref. to PS-13, INSPECTION, Universal Joint.>	Is the swing torque of the universal joint less than 3.8 N (0.39 kgf, 0.86 lb)?	Go to step **7**.	Replace with a new part.
7	**CHECK FRONT WHEEL.** Check the front wheels.	Does the front wheels have unsteady revolution or rattling, or does the brake drag?	Inspect, readjust and replace if necessary.	Go to step **8**.
8	**CHECK TIE–ROD ENDS.** Remove the tie–rod ends.	If the tie-rod ends of suspension have unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step **9**.
9	**BALL JOINT CHECK.** Remove the ball joint.	If the ball joints of suspension have unsteady revolution or rattling?	Inspect and replace if necessary.	Go to step **10**.
10	**CHECK GEARBOX.** Measure the rotating of gearbox. <Ref. to PS-35, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>	Is the rotating resistance of steering gearbox less than 10.5 N (1.1 kgf, 2.4 lb)? Is the difference between right and left sides less than 20%?	Go to step **11**.	Readjust the backlash, and if ineffective, replace the faulty parts.
11	**CHECK GEARBOX.** Measure the sliding of gearbox. <Ref. to PS-34, LIMIT, INSPECTION, Steering Gearbox.>	Is the sliding resistance of steering gearbox less than 400 N (41 kgf, 90 lb)? Is the difference between the right and left sliding resistance less than 20%?	Steering effort is normal.	Readjust the backlash, and if ineffective, replace the faulty parts.

3. INSPECTION OF CLEARANCE

This table lists various clearances that must be correctly adjusted to ensure the normal vehicle driving without interfering noise, or any other faults.

Install locations	Minimum allowance mm (in)
(1) Crossmember-to-Hose assembly	10 (0.39)
(2) Front frame side-to-Hose assembly	15 (0.59)
(3) Air bag sensor to cooler pipe assembly	10 (0.39)
(4) Air cleaner case-to-Suction hose	10 (0.39)
(5) VDCH/U to Reservoir tank bracket	10 (0.39)
(6) Air boots to Hose clip	15 (0.59)
(7) Air boot-to-Hose assembly	15 (0.59)
(8) Protector to Hose assembly	10 (0.39)
(9) Intake manifold to Suction hose	10 (0.39)
(10) Intake manifold to hose assembly	10 (0.39)
(11) Air cleaner case to Cooler pipe joint block	5 (0.20)
(12) Chain cover to Cooler pipe joint block	20 (0.79)
(13) Oil pipe to Cooler pipe joint block	20 (0.79)
(14) Suction hose to Hose assembly	10 (0.39)
(15) Air boot to Reservoir tank	10 (0.39)
(16) Brake pipe to Reservoir tank	10 (0.39)
(17) Harness to Hose assembly	10 (0.39)
(18) Relay box to Hose assembly	15 (0.59)
(19) Bumper beam to Cooler pipe assembly	10 (0.39)
(20) Radiator bracket to Cooler pipe assembly	10 (0.39)
(21) ATF cooler to Cooler pipe assembly	10 (0.39)
(22) Undercover to cooler pipe assembly	10 (0.39)
(23) Protector to Hose assembly	10 (0.39)
(24) Protector to Hose assembly	15 (0.59)
(25) Return hose to Hose assembly	10 (0.39)
(26) Air cleaner case to Hose assembly	10 (0.39)
(27) Suction hose to Hose assembly	10 (0.39)
(28) Air cleaner case to Return hose	3 (0.12)
(29) Valve housing to DOJ	12 (0.47)
(30) Valve housing to Crossmember	1 (0.04)
(31) Mount to Crossmember	There must be no contact.
(32) Feed tube to Crossmember	3 (0.12)
(33) Elbow to Crossmember	3 (0.12)
(34) Cylinder pipe to Crossmember	3 (0.12)
(35) Feed tube to Exhaust pipe	18 (0.71)
(36) Tie-rod end to Brake dust cover	2.5 (0.10)
(37) Coupling rubber to AT level gage	10 (0.39)
(38) Yoke to Brake booster	5 (0.20)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