

# General Diagnostic Table

## POWER ASSISTED SYSTEM (POWER STEERING)

### 1. NOISE & VIBRATION

#### CAUTION:

**Do not keep the relief valve operated for five seconds or more 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)<br>While engine is running.                                                         | Relief valve emits operating sound when steering wheel is completely turned in either direction. (Do not keep this condition for five seconds or more.) | Normal operation                                                                             |
|                                                                                                             | 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)<br>While engine is running.                                                   | Interference with adjacent parts                                                                                                                        | Check the clearance.<br>Correct if necessary.<br><Ref. to PS-41, 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<br>When turning steering wheel in both directions with small angle repeatedly at engine ON or OFF. | Excessive backlash<br>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)<br>While engine is running.                                                     | Air in vane pump                                                                                                                                        | Inspect and retighten the fluid line connection.<br>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)<br>While engine is running.                                     | Improper adjustment of pulley belt<br>Damaged or over tensioned pulley belt<br>Unequal length of pulley belts                                           | Adjust or replace.<br>(Replace two belts as a set.)                                          |
|                                                                                                             | Runout or dirty V-groove surface of oil pump pulley                                                                                                     | Clean or replace.                                                                            |

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| Trouble                                                                                                  | Possible cause                                                                   | Corrective action                                                                                         |
|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Sizzling noise (continuous)<br>While engine is running.                                                  | Fluid aeration                                                                   | Fix the faulty part causing aeration.<br>Replace the fluid and vent air.                                  |
|                                                                                                          | Damaged pipe of gearbox                                                          | Replace the pipe.                                                                                         |
|                                                                                                          | Faulty inside of hose or pipe<br>Flattened hose or pipe                          | Repair or replace.                                                                                        |
|                                                                                                          | Abnormal inside of oil tank                                                      | Replace.                                                                                                  |
|                                                                                                          | Removed oil tank cap                                                             | Install cap.                                                                                              |
| Whistle (continuous)<br>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)<br>While engine is running with/<br>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)<br>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<br>While engine is running with/<br>without steering turned.                                   | Engine speed is too low.                                                         | Adjust, and notify customer.                                                                              |
|                                                                                                          | Air in vane pump                                                                 | Repair faulty part<br>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.                                                                                                |

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## POWER ASSISTED SYSTEM (POWER STEERING)

### 2. MEASUREMENT OF STEERING EFFORT

| Step                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Check                                                                                                                                                                       | Yes                                         | No                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-----------------------------------------------------------------------|
| <b>1 CHECK STEERING EFFORT.</b><br>1) Stop the vehicle on paved road.<br>2) Start the engine.<br>3) Run the engine at idle.<br>4) Install a spring scale on the steering wheel.<br>5) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts.<br><br><b>NOTE:</b><br>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 back-lash.                                                 |
| <b>2 CHECK STEERING EFFORT.</b><br>1) Stop the engine.<br>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.                                               |
| <b>3 CHECK STEERING WHEEL EFFORT.</b><br>1) Remove the universal joint.<br>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.                               |
| <b>4 CHECK STEERING WHEEL EFFORT.</b><br>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.                               |
| <b>5 CHECK UNIVERSAL JOINT.</b><br>Measure the swing torque of the joint (yoke of steering column side). <Ref. to PS-14, 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.                                              |
| <b>6 CHECK UNIVERSAL JOINT.</b><br>Measure the swing torque of the joint (yoke of gearbox side). <Ref. to PS-14, 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.                                              |
| <b>7 CHECK FRONT WHEEL.</b><br>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.                                                         |
| <b>8 CHECK TIE-ROD ENDS.</b><br>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.                                                         |
| <b>9 BALL JOINT CHECK.</b><br>Remove the ball joint.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | If the ball joints of suspension have unsteady revolution or rattling?                                                                                                      | Inspect and replace if necessary.           | Go to step 10.                                                        |
| <b>10 CHECK GEARBOX.</b><br>Measure the rotating of gearbox.<br><Ref. to PS-36, 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 of the rotating resistance between right and left sides less than 20%? | Go to step 11.                              | Readjust the back-lash, and if ineffective, replace the faulty parts. |
| <b>11 CHECK GEARBOX.</b><br>Measure the sliding of gearbox.<br><Ref. to PS-35, LIMIT, INSPECTION, Steering Gearbox.>                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Is the sliding resistance of steering gearbox less than 400 N (41 kgf, 90 lb)? Is the difference of sliding resistance between right and left sides less than 20%?          | Steering effort is normal.                  | Readjust the back-lash, and if ineffective, replace the faulty parts. |

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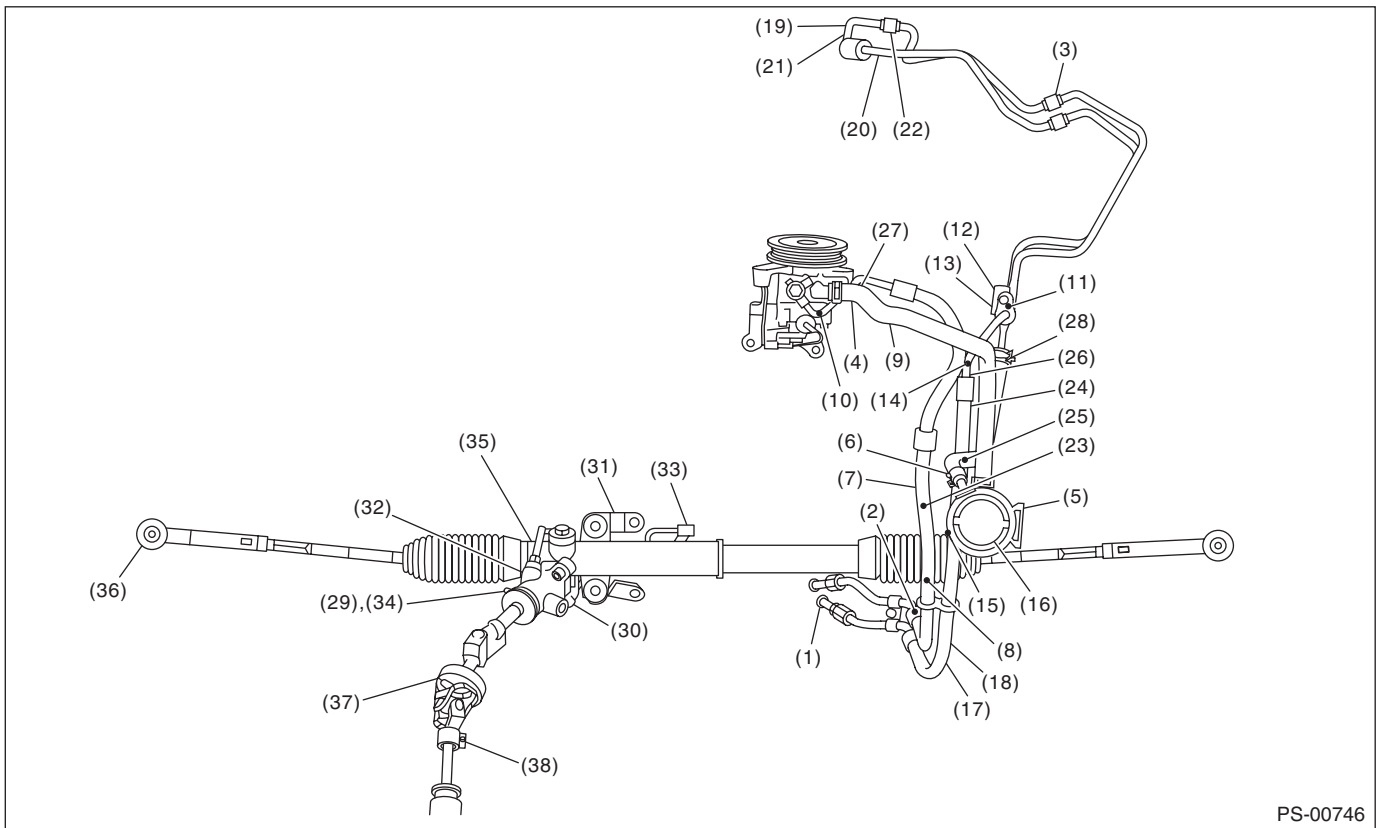
## 3. INSPECTION OF CLEARANCE

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) Airbag sensor to Cooler pipe assembly        | 10 (0.39)                 |
| (4) Engine cover-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 (0.78)                 |
| (13) Oil pipe to Cooler pipe joint block         | 20 (0.78)                 |
| (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 gauge           | 10 (0.39)                 |
| (38) Yoke to Brake booster                       | 5 (0.20)                  |

# General Diagnostic Table

## POWER ASSISTED SYSTEM (POWER STEERING)



## BODY SECTION

This service manual has been prepared to provide SUBARU service personnel with the necessary information and data for the correct maintenance and repair of SUBARU vehicles.

This manual includes the procedures for maintenance, disassembling, reassembling, inspection and adjustment of components and diagnostics for guidance of experienced mechanics.

Please peruse and utilize this manual fully to ensure complete repair work for satisfying our customers by keeping their vehicle in optimum condition. When replacement of parts during repair work is needed, be sure to use SUBARU genuine parts.

All information, illustration and specifications contained in this manual are based on the latest product information available at the time of publication approval.

**HVAC SYSTEM  
(HEATER, VENTILATOR AND A/C)** AC

**HVAC SYSTEM (AUTO A/C)  
(DIAGNOSTICS)** AC(diag)

**AIRBAG SYSTEM** AB

**AIRBAG SYSTEM (DIAGNOSTICS)** AB(diag)

**OCCUPANT DETECTION SYSTEM  
(DIAGNOSTICS)** OD(diag)

**SEAT BELT SYSTEM** SB

**LIGHTING SYSTEM** LI

**WIPER AND WASHER SYSTEMS** WW

**ENTERTAINMENT** ET

**COMMUNICATION SYSTEM** COM

**GLASS/WINDOWS/MIRRORS** GW

**BODY STRUCTURE** BS

**INSTRUMENTATION/DRIVER INFO** IDI

**SEATS** SE

**SECURITY AND LOCKS** SL

**SUNROOF/T-TOP/CONVERTIBLE TOP  
(SUNROOF)** SR

**EXTERIOR/INTERIOR TRIM** EI



**BODY SECTION****EXTERIOR BODY PANELS****EB****CRUISE CONTROL SYSTEM****CC****CRUISE CONTROL SYSTEM  
(DIAGNOSTICS)****CC(diag)****IMMOBILIZER (DIAGNOSTICS)****IM(diag)****LAN SYSTEM (DIAGNOSTICS)****LAN(diag)**



# HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

# AC

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