

ATTENTION:
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CLAIMS PERSONNEL ☐
SERVICE MANAGER ☐

IMPORTANT - All
Service Personnel
Should Read and
Initial in the boxes
provided, right.

QUALITY DRIVEN® SERVICE



SUBARU

SERVICE BULLETIN

APPLICABILITY: All Subaru Vehicles
SUBJECT: Noise, Vibration and Harshness (NVH)
at Highway Speeds Caused by a Tire
Imbalance or Excessive Radial Force

NUMBER: 05-50-10

DATE: 07/23/10

INTRODUCTION

This bulletin is to serve as information only and is intended to help minimize steering wheel vibrations at highway speed.

DESCRIPTION

Some customers may describe a concern of a steering wheel vibration, oscillation or a “shimmy” condition at highway speeds that may be caused by improper tire and wheel balance or excessive radial force variation (RFV).

Subaru of America Inc. (SOA) recommends the use of the Hunter GSP 9700 Wheel Balance and Road Force Measurement System to properly balance the wheel and tire assemblies “dynamically” and to measure the radial force variation of the wheel and tire assembly.

While the majority of these conditions can be greatly reduced with proper wheel balancing, some road feel may be considered characteristic and can be compared to like model vehicles with similar mileage.

Wheel Imbalance

The two most common types of wheel imbalances are static (single weight plane) and dynamic (dual weight plane). A static imbalance is best described as a vertical imbalance when the assembly is mounted on the vehicle. A dynamic imbalance is defined as a vertical and inner/outer imbalance while the assembly is mounted on the vehicle.

Wheel and tire assembly imbalance should be addressed first as this is the most common source of tire and wheel vibrations. A well maintained dual weight plane balancer (commonly known as a Dynamic Balancer) such as a Hunter GSP9700 should be used to achieve the best possible results. Balancer settings and proper maintenance are critical to obtaining the best results. Refer to the operating instructions as provided by the balancer manufacturer for setup and maintenance instructions.

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**CAUTION: VEHICLE SERVICING PERFORMED BY UNTRAINED PERSONS
COULD RESULT IN SERIOUS INJURY TO THOSE PERSONS OR TO OTHERS.**

Subaru Service Bulletins are intended for use by professional technicians ONLY. They are written to inform those technicians of conditions that may occur in some vehicles, or to provide information that could assist in the proper servicing of the vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do the job correctly and safely. If a condition is described, DO NOT assume that this Service Bulletin applies to your vehicle, or that your vehicle will have that condition.

**SUBARU OF AMERICA, INC. IS “ISO
14001 COMPLIANT”**

The international standard for excellence in Environmental Management Systems. Please recycle or dispose of automotive products in a manner that is friendly to our environment and in accordance with all local, state and federal laws and regulations.

Radial Force Variation (RFV)

Radial force variation is an industrial measurement describing the tire uniformity under load. These variations, or harmonics, are measured in kilograms, pounds or newtons. SOA asks that all weight measurements be reported using the metric system (grams, kilograms, etc.)

The Hunter GSP 9700 Road Force Measurement System is capable of measuring these harmonics and displaying them as R1H (radial first harmonic), R2H (radial second harmonic) and R3H (radial third harmonic.) These different harmonic levels indicate the number of bad occurrences per revolution.

Most commonly, radial first (R1H) through radial third (R3H) harmonics are the cause of steering wheel or body related vibrations that can be felt at highway speeds. Radial force variation can be greatly affected if the vehicle has been parked for an extended period of time causing flat spots or by improper tire inflation. Before performing any diagnosis, be sure to drive the vehicle at least 10 miles and adjust tire pressures as indicated on the door label.

Machine Setup

SOA recommends the use of the Hunter GSP 9700 Road Force Measurement System to properly balance and measure radial force on tire and wheel assemblies. To ensure the most accurate results, the following guidelines should be used:

- Refer to the operating instructions to set the machine to measure in grams (for balancing) and kilograms (for radial force measurements)
- Refer to the operating instructions to enable the dynamic balancing mode
- Refer to the operating instructions to disable the Quickmatch™ function, if available.
- Select the “Mixed Weights Balance” mode and measure the weight location carefully.
- Calibration should be checked at least once per week
- Ensure the arbor threads and base plate are clean and in good condition
- Measure the wheel center bore and select the proper cone for mounting the wheel to the balancer
- Inspect the cone for any debris or damage and clean or replace as necessary
- Perform the Centering Check® Procedure (software version 2.1 and higher) before each wheel is balanced

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PROCEDURE

Always verify the concern with a test drive before beginning diagnosis and performing repairs. Drive the vehicle a minimum of 10 miles to eliminate any flat spots on the tires. Immediately after the road test, lift the vehicle into the air to minimize flat spotting. Adjust tire pressures according to the door label and inspect for any visible damage. If any damage is found, resolve these concerns before continuing with diagnosis.

Tire dynamic imbalance should be measured first and adjusted to within 5 grams. Leave any remaining factory weights in place and remove weights that have been added after production; be careful not to damage the wheel. If the assembly cannot be adjusted to within 5 grams, inspect for the following:

- Improperly mounted tire or unseated tire bead
- Improperly mounted assembly to the balancer
- Damage to the wheel or tire
- Damage to the tire balancer
- Debris located inside the tire

If a vibration can still be felt after the wheels have been properly balanced, there is a possibility of excessive radial force variation (RFV) in the tire and wheel assembly. To address RFV concerns, a wheel balancer capable of measuring RFV must be used; Subaru Of America Inc. recommends the use of the Hunter GSP 9700 Road Force Measurement System. If a GSP 9700 is not available, locate the nearest machine through the Hunter Engineering website (www.gsp9700.com).

Measure and record the RFV readings of the wheel and tire assembly for R1H, R2H and R3H. Then perform the wheel runout measurements by following the on-screen instructions or by referring to the operating instructions; this will determine the individual tire and wheel RFV measurements.

The following assembly RFV measurements can be used as a **guide**:

- R1H on passenger tires – 5.5kg or less
- R2H on passenger tires – 4.5kg or less

If higher than normal RFV measurements are found for the assembly, refer to the on-screen instructions or the operating instructions to match the tire and wheel to minimize the assembly RFV. By matching the low spot of the tire to the high spot of the wheel, radial force can be reduced without replacing any components.

After all RFV measurements are adjusted to the lowest possible level, install the wheels with the lowest RFV measurements on the front of the vehicle and road test to verify the concern has been reduced.

Replacement of tires due to excessive assembly measurements may be unnecessary.

If the concern still exists at an unacceptable level, contact the Subaru Technical HelpLine at 1-800-SOATECH (1-800-762-8324) with the following information readily available:

- Thorough description of customer's concern
- VIN
- Mileage
- Tire manufacturer, size and condition

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- Completed “Dealer Vibration Analysis Worksheet” and “Tire Analysis Worksheet” available under TechLine Pre-Call Worksheets on Subarunet. (All measurements should be in grams or kilograms)
- Service history of vehicle

WARRANTY/CLAIM INFORMATION

For vehicles within the Basic New Car Limited Warranty period, this repair may be claimed using the following:

LABOR DESCRIPTION	LABOR OPERATION #	FAIL CODE	LABOR TIME
4 Wheel Balance with RFV Adjustment	B613-118	XBQ88	1.2
Sublet Repair, Administrator Expenses	C101-108		0.3