
#00-03-10-006D: Information on Tire Radial Force Variation (RFV) - (Nov 26, 2008)



Information on Tire Radial Force Variation (RFV)

Subject:

Models: **2009 and Prior GM Passenger Cars and Light Duty Trucks**
 2009 and Prior HUMMER H2, H3
 2009 and Prior Saab 9-7X
 2000-2005 Saturn L Series
 2003-2007 Saturn ION

This bulletin is being revised to add the 2009 model year. Please discard Corporate Bulletin Number 00-03-10-006C (Section 03 -- Suspension).

Important:

- Before measuring tires on equipment such as the Hunter GSP9700, the vehicle **MUST** be driven a minimum of 16 km (10 mi) to ensure removal of any flatspotting. Refer to Corporate Bulletin Number 03-03-10-007C or newer -- Tire Characteristics of GM Original Equipment Tires (SI Document ID #1414757).
- Equipment such as the Hunter GSP9700 **MUST** be calibrated prior to measuring tire/wheel assemblies for each vehicle.

The purpose of this bulletin is to provide guidance to GM dealers when using tire force variation measurement equipment, such as the Hunter GSP9700. This type of equipment can be a valuable tool in diagnosing vehicle ride concerns. The most common ride concern involving tire radial force variation is highway speed shake on smooth roads.

Tire related smooth road highway speed shake can be caused by three things: imbalance, out of round and tire force variation. These three conditions are not necessarily related. All three conditions must be addressed.

Imbalance is normally addressed first, because it is the simpler of the three to correct. Off-vehicle, two plane dynamic wheel balancers are readily available and can

accurately correct any imbalance. Balancer calibration and maintenance, proper attachment of the wheel to the balancer, and proper balance weights, are all factors required for a quality balance. However, a perfectly balanced tire/wheel assembly can still be "oval shaped" and cause a vibration.

If a vibration or shake still exists after balancing, any out of round conditions, of the wheel, and force variation conditions of the tire, must be addressed. Equipment such as the Hunter GSP9700 can address both (it is also a wheel balancer).

Tire radial force vibration (RFV) can be defined as the amount of stiffness variation the tire will produce in one revolution under a constant load. Radial force variation is what the vehicle feels because the load (weight) of the vehicle is always on the tires. Although free runout of tires (not under load) is not always a good indicator of a smooth ride, it is critical that total tire/wheel assembly runout be within specification.

Equipment such as the Hunter GSP9700 loads the tire, similar to on the vehicle, and measures radial force variation of the tire/wheel assembly. Note that the wheel is affecting the tire's RFV measurement at this point. To isolate the wheel, its runout must be measured. This can be easily done on the Hunter, without the need to set up dial indicators. If the wheel meets the runout specification, the tire's RFV can then be addressed.

After measuring the tire/wheel assembly under load, and the wheel alone, the machine then calculates (predicts) the radial force variation of the tire. However, because this is a prediction that can include mounting inaccuracies, and the load wheel is much smaller in diameter than used in tire production, this type of service equipment should NOT be used to audit new tires. Rather, it should be used as a service diagnostic tool to minimize radial force variation of the tire/wheel assembly.

Equipment such as the Hunter GSP9700 does an excellent job of measuring wheel runout, and of finding the low point of the wheel (for runout) and the high point of the tire (for radial force variation). This allows the tire to be matched mounted to the wheel for lowest tire/wheel assembly force variation.

The machine will simplify this process into easy steps. The following assembly radial force variation numbers should be used as a guide:

P-Metric tires of passenger cars	18 lbs or less
P-Metric tires on light trucks	24 lbs or less
LT-tires on light trucks	35 lbs or less

If match mounting tires to in-spec wheels produces assembly values higher than these, tire replacement may be necessary. Replacing tires at lower values will probably mean good tires are being condemned. Because tires can sometimes become temporarily flat-spotted, which will affect force variation, it is important that the vehicle be driven at least 16 km (10 mi) prior to measuring. Tire pressure must also be adjusted to the usage pressure on the vehicle's tire placard prior to measuring.

Most GM vehicles will tolerate radial force variation up to these levels. However, some vehicles are more sensitive, and may require lower levels. Also, there are other tire parameters that equipment such as the Hunter GSP9700 cannot measure that may be a factor. In such cases, TAC should be contacted for further instructions.

Important:

- When mounting a GM wheel to a wheel balancer/force variation machine, always use the wheel's center pilot hole. This is the primary centering mechanism on all GM wheels; the bolt holes are secondary. Usually a back cone method to the machine should be used. For added accuracy and repeatability, a flange plate should be used to clamp the wheel onto the cone and machine. This system is offered by all balancer manufacturers in GM's dealer program.
- Any type of service equipment that removes tread rubber by grinding, buffing, or truing is NOT recommended, and may void the tire warranty. However, tires may have been ground by the tire company as part of their tire manufacturing process. This is a legitimate procedure.

GM bulletins are intended for use by professional technicians, NOT a "do-it-yourselfer". They are written to inform these technicians of conditions that may occur on some vehicles, or to provide information that could assist in the proper service of a vehicle. Properly trained technicians have the equipment, tools, safety instructions, and know-how to do a job properly and safely. If a condition is described, DO NOT assume that the bulletin applies to your vehicle, or that your vehicle will have that condition. See your GM dealer for information on whether your vehicle may benefit from the information.



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