



Tech Tip

NOISE AND VIBRATION 179

TROUBLESHOOTING NOISE AND VIBRATION

Pinpointing the Source Can Be Elusive

Troubleshooting noises and vibrations can be a challenge, even for the most experienced technician. Our training has taught us to take some basic steps or procedures to identify and resolve these issues, but when these techniques fail, how do you handle the customer's complaint? Repeating the same diagnostics or repairs can only produce the same results, and that guarantees a frustrated customer.

Case in Point: Recently I assisted a friend who was encountering a vibration in his 2007 Ford F150 4X4. He had been assured that the condition was due to the tires. The vibration was so intense that he followed the tire replacement recommendation, even though his existing tires had half of their tread remaining. The tire salesman convinced him of a separation in one or more of the tires. Following two return trips to have the tires re-balanced, the tire store installed a second set of tires, only to encounter the same vibration results. Frustrated, the vehicle owner pleaded for some assistance.

While making our test drive, the vehicle revealed a violent vibration that could be felt throughout the vehicle. It felt as if the drivetrain was secured metal to metal with no dampening devices. Returning to the shop and closely examining the universal joints (u-joints) with a flashlight revealed rust trails from the caps on the u-joints. The needle bearings were history. A complete u-joint replacement had the vehicle operating smoothly, with no vibration symptoms. They were so focused on the tires as the culprit, they failed to explore other possibilities. And to be fair, we had a little more diagnostic experience than the tire salesman and tire tech.

CLICKING OR SNAPPING NOISE

Some 2011–2014 F150 Ford trucks built on 1/1/2011 through 4/1/2014 may exhibit an intermittent clicking or snapping noise from the rear axle on light acceleration from a stop. The noise may also be evident during light acceleration after changing direction from drive to reverse or from reverse to drive.

The noise may be emanating from the rear driveshaft universal joints. To confirm, apply penetrating lubricant to each retaining clip on the universal joints. If the noise is eliminated, the repair is completed. If the noise is still present, it will be necessary to replace the rear pinion oil slinger and seal with revised units from Ford. Follow the proper procedure for setting the pinion preload, or you will have more issues than a noise.

Pinpointing the source of the clicking sounds described would be nearly impossible without the direction of the vehicle manufacturer. Checking for factory TSBs can save a lot of diagnostic time and unnecessary repairs.

STEERING WHEEL AND SEAT VIBRATIONS

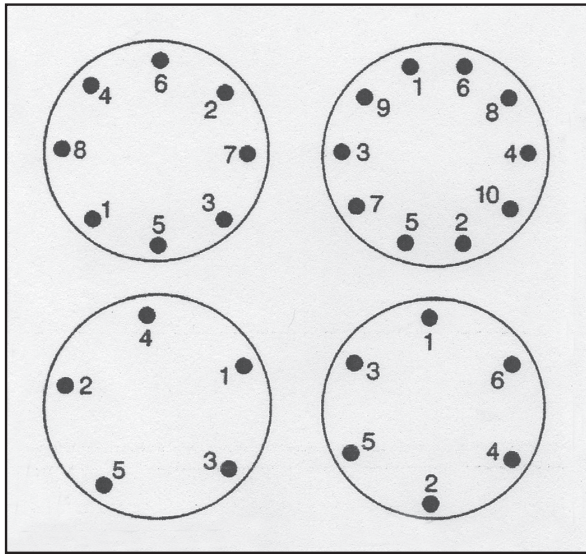
GM has addressed vibrations from the steering wheel and seat between 58-72 mph that are easily misdiagnosed as a tire or wheel imbalance, or excessive tire Radial Force Variation (RFV), which is a condition that cannot be corrected by balancing the tire and wheel assembly.

Tires are constructed using many different compounds and layers of material molded and cured to form the finished product. During this process, variations in the thickness or the elastic properties of the components can affect the RFV of a tire. Thickness variations or elastomeric properties that exceed the allowable limits can produce vibrations that may be difficult to pinpoint. Imperfect wheels can promote the same symptoms.

GM Promotes Wheel Torque to Correct Vibrations: Lug nut torque is the usual description that we apply to wheel torque. We found a recent GM bulletin concerning lug nut torque to be very interesting, as most associate uneven lug nut torque with rotor warpage and pedal pulsation while braking. The symptoms can involve much more. Improper lug nut torque procedures can result in the wheel and tire assembly being off-set during mounting. The off-set causes the mass of the tire and wheel assembly to orbit the axis of the hub, creating a vibration similar to a tire not properly balanced or one with excessive RFV. The improper torque can cause a distortion of the brake rotor, resulting in a variance in wheel mounting that can cause a condition referred to as smooth road shake vibration.

Wheel Installation Procedure: GM recommends the following installation procedure. For vibration symptoms, remove the tire and wheel assembly and index at least two stud positions from the previous mounted position. Tighten the lug nuts using a 3-step procedure. DO NOT use torque sticks or an air impact wrench to tighten the lug nuts.

- 1) Install lug nuts and hand tighten using only a socket.
- 2) Snug all lug nuts using a star pattern with a hand wrench (see illustration on next page).
- 3) Lower vehicle enough to provide wheel resistance and torque to specification with a torque wrench.



For many years this procedure has been recommended in brake clinics and discussed countless hours on brake hotlines as a means to correct brake pedal pulsation symptoms. The same technique can reduce vibrations. Still, many refuse to give up the torque sticks and impact wrenches.

Following GM's recommendation can resolve many vibration and pedal pulsation symptoms. The procedure applies to any make and model vehicle, foreign or domestic.

FLAT SPOTTING PRODUCES VIBRATION

GM acknowledges customer complaints of a slight tire shake or vibration for the first few miles of operation. The new tires are designed with a nylon overlay configuration engineered to enhance the tire's integrity at high speeds. This allows the tires to be driven at higher speeds without excessive heat buildup. Prior to troubleshooting a shake or vibration condition, the vehicle should be driven a minimum of 15 miles to ensure removal of any flat spotting. The tendency for flat spotting is less as the tires accumulate mileage. They caution the dealers to refrain from attempting repairs for this condition.

Those who were around in the days of nylon tires know the symptoms well. Flat spots would occur, especially when the vehicle was parked overnight. Ten to fifteen miles of driving was necessary to get the tires round again.

WHEEL SLIPPAGE PROMOTES VIBRATIONS

Slippage of a tire on the wheel following a tire replacement results in an imbalance and vibration symptoms.

The slippage condition occurs when the tire slips and rotates during acceleration or braking. The condition is most common on clear coated or chrome wheels with a smooth bead area, but can also occur on alloy or steel wheels. Most slippage conditions occur immediately following a tire/wheel mounting. For those familiar with drag cars, you know the symptoms well. On those applications, screwing the tire to the rim is necessary to prevent wheel/tire slippage.

The condition is usually the result of improper or excessively used non-preferred lubricants that do not dry sufficiently, making the tire and rim excessively slippery. Some lubricants require up to 24 hours to completely dry and the tires achieve maximum adherence to the rims. GM cautions not to use products containing silicone, alcohol, petroleum based products, solvents or corrosives for cleaning or lubrication.

To determine if slippage has occurred, make it a habit to place a chalk mark on the tire directly in line with the valve stem following the tire replacement. Any slippage will be immediately recognizable. Tire movement exceeding one inch can promote a vibration. The tire and wheel illustrated (see illustration) has moved beyond the one inch limit of travel promoting an imbalance condition. This explains why a vehicle may leave your shop with perfectly balanced wheels and tires and then return with an imbalance condition.



ACCESSORIES PROMOTE NOISE AND VIBRATION

Troubleshooting noises and vibrations that the customer claims were not there previously should start with an evaluation of any accessories that may have been added to the vehicle.

Accessory items not properly installed may transfer noises into the vehicle due to the absence of proper insulating material, which prevents metal to metal contact. Components not properly insulated become a sounding board, transferring normal drivetrain noises and wind related vibrations/noises into the passenger compartment. The accessory components could include running boards, windscreens, emergency lighting, custom grilles, bicycle racks, etc.

Summary: Be methodical in your diagnosis. Using your head before your hands can save you a lot of unnecessary work and your customer a lot of unnecessary expense.

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