

Tires, Product Liability, and Dynamic Emissions Testing

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Contributing Editor

The massive problem that has beset Bridgestone/Firestone Tire Co. and Ford Motor Co. over high failure rates on certain SUV tires should serve as a wake-up call to everyone in our industry. Concerned as we are about doing quality repairs on transmissions and transfer cases, it is extremely important to realize that all the parts of the vehicle affect the operation of the components we work on.

Tires cause a multitude of problems that seriously affect the transmission, transfer case and differential. Mismatched tires (different sizes), incorrect tire inflation and badly worn tires can cause repeated failures of transmission and transfer-case parts.

An easy example is the familiar space-saver spare tire that is factory equipment on many vehicles. If you examine one of these mini-spare (doughnuts), the first thing you notice is the obvious difference in diameter between the spare and the full-size tire. If you look further you will see that various warning labels caution the driver not to exceed 50 mph and

not to drive farther than 50 miles on the mini-tire.

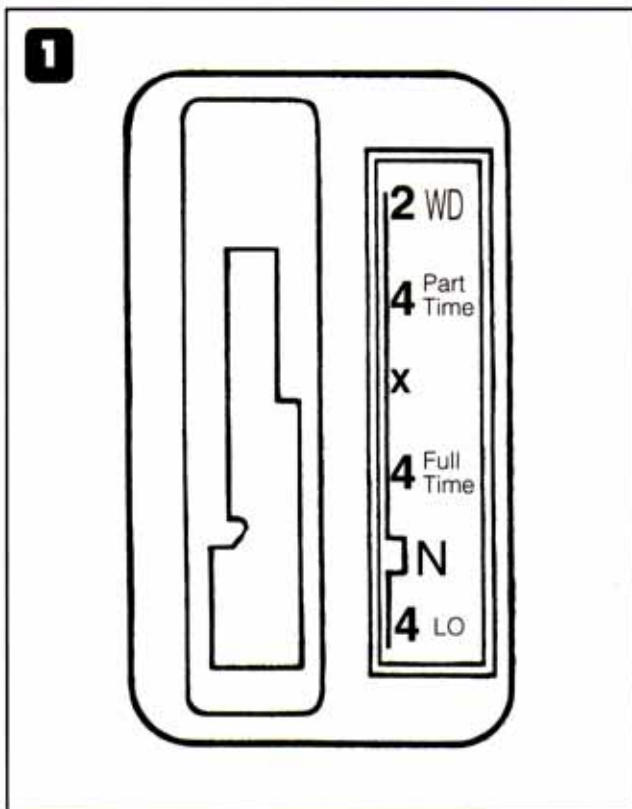
The intent of this space-saving design is to permit a driver to reach a service facility to have a replacement tire of the correct size mounted. We all know that many vehicle owners either don't read or ignore these warnings. Some drivers will choose to continue their trip to its final destination before replacing the tire, even if it means driving 800 miles on the mini-spares. Other drivers don't have the money until payday to buy another tire. A person who is paid monthly or bi-weekly may ride that spare for two to four weeks.

Think about how a differential operates and the problem becomes clear. The side and pinion gears in the differential are turning as a unit with the differential carrier as long as the vehicle is moving in a straight line. In a turn the differential permits the outside wheel, which has to cover more distance, to turn faster than the inside wheel. If the tires have different diameters, the smaller tire has to turn faster to travel the same distance as the larger tire.

This means the side gears in the differential are working even when the car is moving in a straight line. Since the differential was not designed to have the side gears working constantly, this situation will cause overheating of the final drive and shorten the life of the differential parts. This can happen in both front-drive and rear-drive vehicles. If it happens on a vehicle equipped with all-wheel drive or four-wheel drive and a viscous coupling or torque-sensing differential, the problems move to the transfer case and transmission and become extremely expensive.

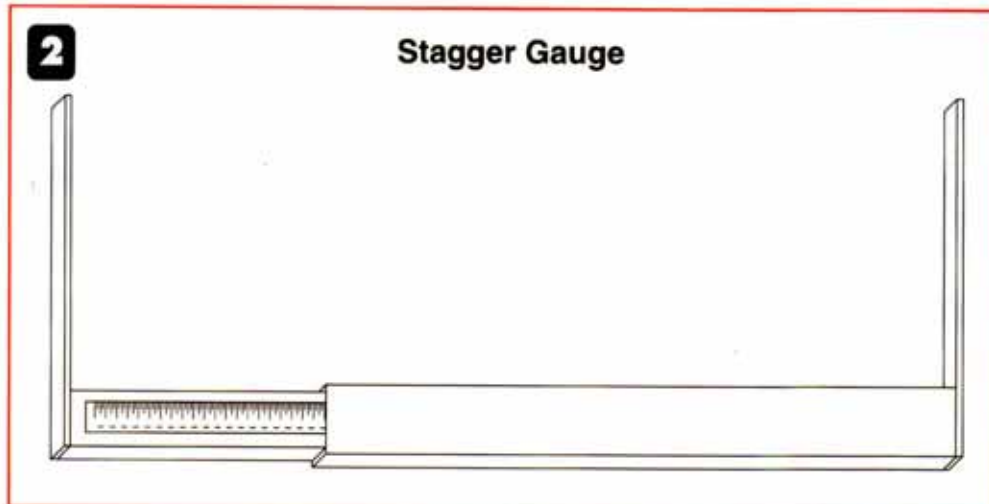
When the average shop begins to work on a transmission or transfer case, most of the concern is with the unit, the cost of the repair, selling the work to the customer, and the repair and installation of the unit. In most instances there is little or no attention to the condition of the tires, their sizes and their air pressure. Making these items part of your diagnostic routine will help you determine why certain transmissions or transfer cases have failed and can prevent a failure under your warranty.

A case in point is the NP242 transfer case, which uses a planetary-type differential to distribute torque to the front and rear output shafts of the transfer case.



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The 242 has a five-position shifter with 2WD, 4WD part time, 4WD full time, neutral and 4WD low range (See Figure 1). Because of the differential, a difference of 3 to 5 psi in tire pressure will cause the transfer case to remain in 4WD even when the driver selects 2WD. Placing the vehicle on a lift with the wheels off the floor will release the transfer case and allow 2WD operation, because the difference in tire diameters does not matter with the wheels free.



Part of your normal road test and vehicle inspection before getting into the gearboxes should be to check tire diameters and tire pressures. The fact that all the tires have the same labels does not matter. Measure the diameters and you will find differences. The proper way to measure tire diameters is with a "stagger gauge," which is a large caliper that will allow you to measure the diameter quickly with the wheels on the ground (See Figure 2). The whole process should take about 10 minutes and will be well worth the effort. If you don't know where to get a stagger gauge, call me and I will help you obtain this necessary and inexpensive tool.

A different problem with the same complications is cropping up all over the country since the federal government began requiring many states to do dynamic emissions testing during the periodic state motor-vehicle inspection. This means that the shop must test exhaust emissions while the vehicle is running at various road speeds on a chassis dynamometer. The test involves placing the drive wheels on a set of rollers that are loaded through a braking system to duplicate the horsepower and torque loads at various road speeds.

Trust me; this type of testing will be good for your business. All-wheel-drive or 4WD vehicles with viscous couplings or torque-sensing differentials in the transfer case can sustain damage during the emissions-testing process. None of these vehicles with the

capability to differentiate torque between the front and rear axles fares well when one set of wheels is held stationary while the other wheels are under power.

We go back to the NP242 transfer case. In 2WD the input shaft, output shaft and torque-sensing differential are turning as an assembly, provided that all wheels are free to turn. If the front wheels are held stationary the same process takes place, but the

differential now begins to operate and through the gear ratio has the carrier turning much faster than the sun gear. In short order the differential overheats and self-destructs.

Even in states that do not use dynos to test emissions, you will find this damage when customers tow an all-wheel-drive vehicle on a wheel lift with one set of wheels locked and the others turning at road speed.

Understanding the design and function of all-wheel-drive, torque-sensing 4WD units and viscous couplings will help you prevent premature failures on units you repair and understand why the unit failed on vehicles you are about to work on. Nothing is more frustrating and expensive than to have a failure occur because of worn, mismatched or underinflated tires or as a result of dynamic testing when preventing it could be so easy. Get in the habit of checking "where the rubber meets the road" as part of your regular vehicle checklist, and this routine will add cash to your bottom line. **TD**

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