Tire Size – What's The Diff?

By Mike Weinberg
Contributing Editor

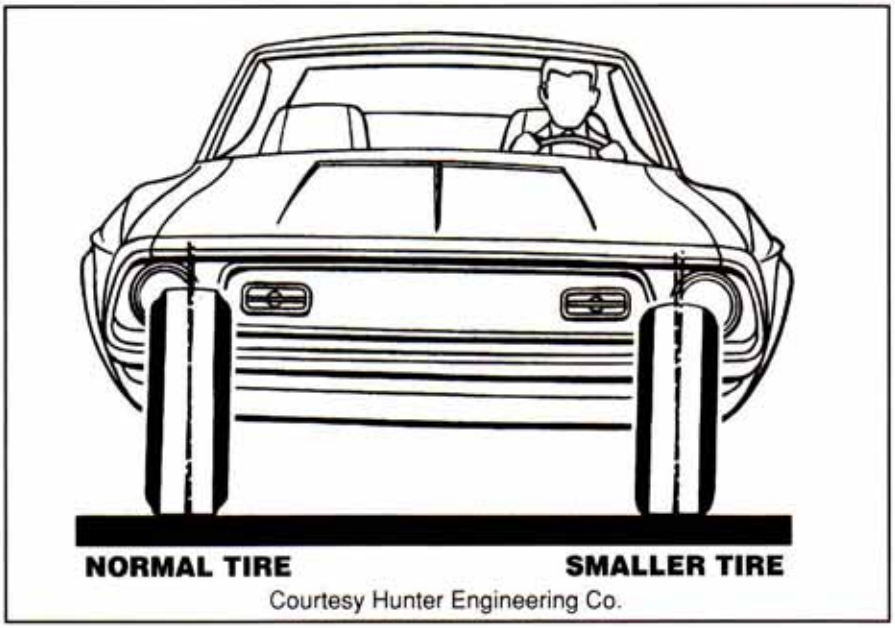
No one will question the fact that transmission repair is on the cutting edge of rapidly changing technology. Automatic and standard transmissions have evolved into very sophisticated units using advanced friction materials and electronic controls.

There are now a great many vehicles on the road with four-wheel-drive, all-wheel-drive and viscous-coupling differentials. Transfer cases are equally complex, using viscous couplings, differentials and electronic controls. We must understand complex theories of operation and be able to troubleshoot involved electrical systems. With so much to know and understand, it becomes very easy to overlook simple, obvious problems that cause unnecessary removal and teardown of transmissions and transfer cases and repeat comebacks.

We handle a large volume of tech calls that involve transfer cases, all-wheel-drive units and front-wheel-drive transaxles with various shift problems and internal failures that have a root cause outside the unit.

Let's look at some common problems.

1. A late-model Jeep is brought into the shop with an NP 242 transfer case that will not shift out of 4WD. The shop spends a lot of time on diagnosis, inspects the transfer case internally only to find nothing wrong. After a frustrating waste of time, it is found that one tire is 5 lbs. low on air pressure. When the tire pressures are corrected, the unit performs properly.



Courtesy Hunter Engineering Co.

2. A Hyundai with a KM 175 transaxle is towed into the shop. The fluid is badly burned and oxidized, the clutches are worn and the differential carrier is wasted. The shop rebuilds the transmission and gives it back to the customer in good working order. Two months later the unit is back in the shop with the differential wasted again and the valve body full of differential dust. The unit is repaired again and returned to the customer at no charge under warranty. Three months later the unit bounces back again with differential failure. While it is being repaired for the third time, one of the installers notices that the passenger-side front tire is an oddball and a full size smaller than the one on the driver's side. The oddball tire is replaced with the spare, and the unit stays out on the road.

3. An all-wheel-drive Ford Aerostar with a Dana 28 transfer case is brought into a shop with a complaint of bind-up and trailer-hitching on turns and in straight-line driving. The shop diagnoses the computer and electronic system and finds no trouble codes. Speed sensors are replaced just to be sure, with no fix for the problem. The unit is removed and inspected internally. No damage is found, but the shop then finds that the rear tires are bald and the front ones are new. They are the same size and brand, but the tire stagger (difference in diameter at the center of the tread; see illustration on page 38) is at least 1 inch. The rear tires are replaced, and the complaint is gone.

4. An Eagle Talon with an all-wheel-drive 5-speed Mitsubishi

transaxle comes into the shop with a failed center differential and viscous coupling. The driver-side front tire is brand new. Upon being questioned by the shop service writer, the customer explains that while he was returning from vacation the tire went flat on the freeway and was replaced with the "space-saver" spare. The car then was driven at 70 mph for 750 miles to the owner's home and used for normal commuting for three days, until the owner bought a new tire on his lunch hour. Although the space-saver spare had a warning on it that it should not be used at more than 50 mph for 50 miles, the owner through his ignorance paid for an expensive transmission repair.

5. A Chrysler Town & Country minivan with a 3.8-liter engine, 604 transmission and all-wheel-drive is towed into a transmission shop, unable to move and making a variety of expensive noises. Undercar inspection reveals that both the all-wheel-drive unit and the rear differential are empty of lube oil. The plastic fill plugs in both units have melted from intense heat, and the two cases have gotten so hot that the axle seals have moved out of their bores. Both the all-wheel-drive unit and the rear differential have suffered catastrophic failure of the ring-and-pinion set and all bearings because of the loss of lubrication. The 604 transaxle clutches are burned, and the vacuum regulator for the all-wheel-drive unit has melted. The boot on the CV joint for the rear driveshaft is destroyed, and – since Chrysler does not sell this boot separately – a new driveshaft must be bought at a list price of $610. Both the all-wheel-drive unit and the rear differential assembly are manufactured for Chrysler by Styer, Daimler, Puch. The ring-and-pinion sets are not available as replacement parts, so both units have to be bought as complete as-

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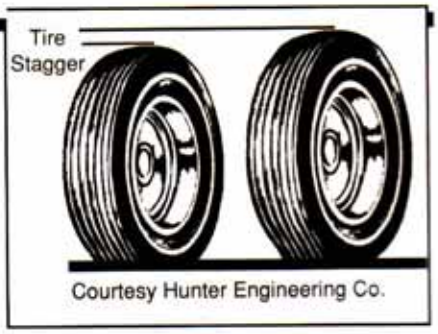
semblies.

Before the vehicle was returned to the customer, a careful evaluation of the entire vehicle was made to ensure that this very costly repair would not fail again. The driver-side front tire had severe wear on the sidewall, so much so that the tire size and brand name were worn off. The customer remembered that his daughter had taken the minivan to her college for several weeks and brought it home with 10 lbs. of air pressure in the left front tire.

As you can see from these sad tales, any transaxle, transfer case, all-wheel-drive unit that is capable of differentiating torque can suffer from mismatched, underinflated or overinflated tires, or different-sized tires. The difference in the rolling radius of the tire puts great stress on differentials and viscous couplings. The greater the difference, the greater the potential for damage. The length of time the vehicle is operated under these conditions increases the chance for severe damage.



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Assume nothing, and take no chances. You cannot predict or defend against stupidity. The average vehicle owner will never read the operating manual and does not own a tire gauge, and many of them, unfortunately, will not even walk around the car once to examine the rubber. As part of any initial inspection of front-, four- or all-wheel-drive vehicles, the few minutes you spend checking tire pressures, tread wear, brand names, tire sizes and tire stagger may provide answers for some curious problems and prevent recurring failures.

Note: Do not accept tires of the same brand and size as being equal. Measuring stagger will show that four new tires of the same brand and size will have differences in diameter. This is why race teams measure stagger on every tire and mark them accordingly, because the differences will have an effect on vehicle handling and stability at high speeds. Just because tires come out of the same mold does not mean they will reach the same size when inflated. Small differences will not cause problems in passenger vehicles, but large variations will cause expensive problems. TD

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