Look at the Whole Picture

Sometimes We Can't See the Forest for the Trees

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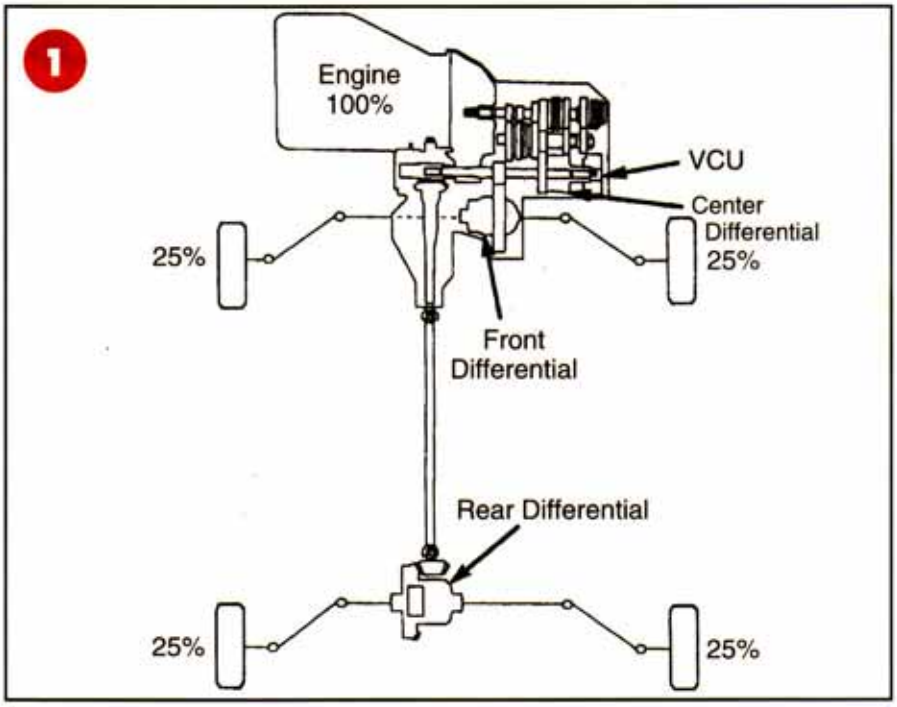


Our industry always has been highly technical and labor intensive. In the salad days of the '70s, when units were simple and relatively cheap, making money was easy, but no one knew how to charge enough. With the advent of front-wheel drive, computer control, and five- and six-speed transmissions, life got more difficult. The cars cost a LOT more, the units eat parts, and diagnosis and troubleshooting are now a career path.

Unfortunately, the mind-set of our industry hasn't changed with the times. We all tend to have some form of tunnel vision and forget to look at the big picture. Step back and stop looking at the transmission as if it were the only part on the car. Look at the whole vehicle, which is basically a platform made up of interlocking components and operating systems. Do not be so quick to fix what is broken without finding out why it broke. We all know that replacing broken parts without understanding and curing the cause of the failure will only lead to an expensive comeback, a black hole where your checkbook used to be and a messy relationship with your customer.

Take a fresh sheet of paper and ask yourself why we accept responsibility for things that are well beyond our control. Look at how the manufacturers handle failures and learn to analyze problems with logic, cost analysis and no emotion. In most cases the factory wants the failed unit back intact so it can do a failure analysis before committing to warranty liability. We as a group are so willing to accept the blame for what we do that we rarely look at all the circumstances. A huge cause for these problems is working at replacing parts without a proper understanding of how they work and how they are affected by the related components in the rest of the vehicle.

The following problems illustrate how much trouble you can get into by just working on the gearbox (your main concern) and forgetting to ask yourself how related systems affect the unit in operation. All of these sad tales were generated either by tech calls that came my way last week or by cores we received back from reman units we sold to our transmission-shop customers.

Sad Tale #1

The tech call began with a sad and desperate voice on the line: "I just rebuilt a 1992 Eagle Talon with a five-speed trans and all-wheel-drive, and it slips just like it had a bad clutch. If you put on the emergency brake and let the clutch out in gear, it groans and then tries to pull through the brakes (See Figure 1). With the E brake off it just slips. I don't think that the clutch is bad."

After I ascertained that he was working on a Mitsubishi-built W5M33 transaxle with all-wheel drive, the plot thickened. I asked whether he had replaced the viscous coupling, which is attached to the center differential. He had bought a new viscous coupling. I explained that the symptoms he was seeing seemed to be related to the viscous coupling. At this point it became clear that the tech did not understand how the unit functioned. I explained that most all-wheel-drive systems have to have some method to differentiate torque between the front and rear axles. In the W5M33 there is a regular transfer gear (pinion) and ring gear that are the differential for the front drive axles, and there is a

continues page 20

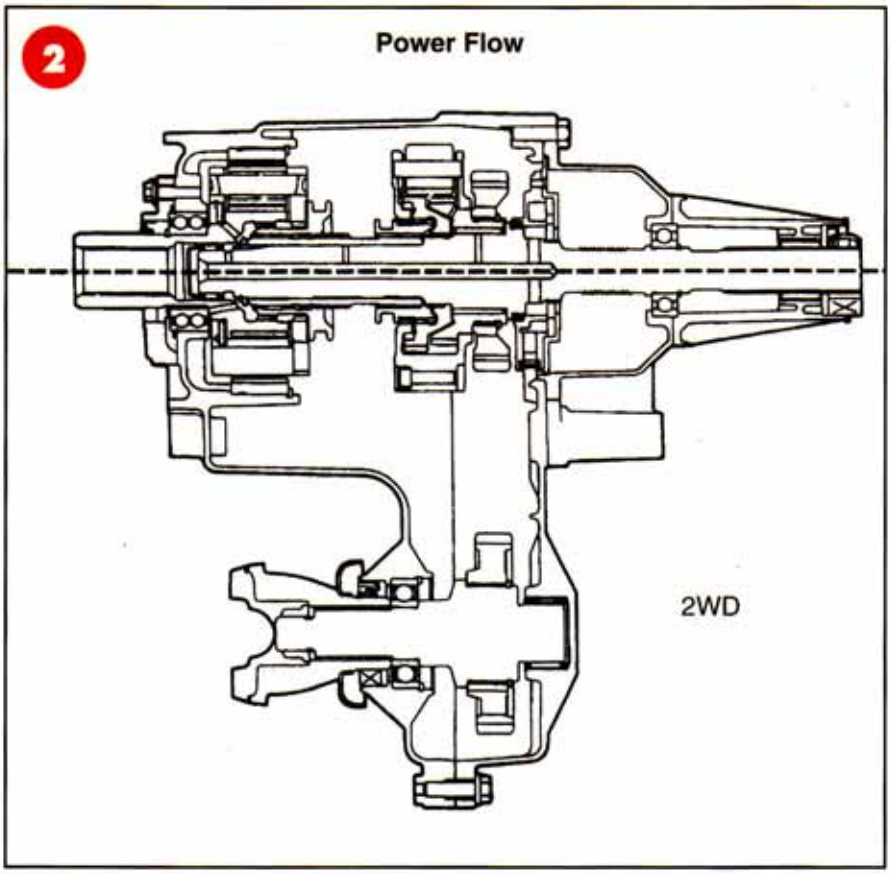
center differential hooked to a viscous coupling to allow torque difference to the rear axle. The viscous coupling permits the two axles to turn at different speeds during turns to eliminate wheel hop and tire scrub. Under braking, with the front discs providing 80% of the stopping power, the coupling allows the rear wheels to overrun, preventing wheel hop. Most of the torque split is concentrated at the front wheels, and if the rear wheels begin to slip, the viscous coupling will lock up and send more torque to the rear wheels.

Armed with a new understanding of how this system worked, the tech re-examined the vehicle as a whole and found that one of the rear axles was missing. The axle had been damaged and had been removed by another shop. This in turn caused the viscous coupling to overheat and go to the big junkyard in the sky. The shop that now was trying to repair this car had concentrated only on fixing the transaxle without realizing that a rear axle was non-existent. A brand-new viscous coupling was down for the count, and the shop was forced to pay for another one.

Sad Tale #2

We sold a rebuilt NP 242 transfer case to a transmission shop and received the core exchange a few days later. The core was put into production and torn down (See Figure 2). On disassembly we found the differential to be melted from extreme overheating. The pinion pins had become so hot that they melted the carrier, and although other related parts also were damaged, there was no appearance of lack of lube.

Curious about this extreme damage, and fearing that something was wrong in other parts of the driveline that could cause a repeat failure, the chief of production called the purchasing shop. They had no clue as to what happened to create this mess but were kind enough to call their customer to find out.



It seems that the customer who owned the '89 Jeep Cherokee had been in the process of moving. Being careful with his money, he rented a truck on a one-way basis with a trailer to tow the Jeep behind. The trailer was a drive-on type with wheel pads onto which the front wheels of the Jeep were driven and secured, leaving the rear wheels free to roll on the pavement. The owner placed the Jeep's transmission in neutral and started out. Not far into the trip, the Jeep's transfer case locked up, causing the rear wheels to lock, and the 24-foot rental truck with the Jeep in tow did a 360 on the freeway. Miraculously, nothing turned over and the out-of-control rig did not hit the guard rail or another vehicle. The only casualty was that the driver had to change his shorts.

This is how seemingly innocent behavior turns into three years of courtrooms, multiple insurance carriers and a boatload of personal-injury lawyers. The owner of the vehicle lost only a transfer case in what easily could have become a deadly tragedy on the 6 o'clock news.

If the owner had disconnected the rear driveshaft or towed the vehicle with all four wheels free to turn on the ground, there would have been no drama. If you examine the powerflow of the 242 transfer case in two-wheel drive, you will see that the input, intermediate-clutch shaft and output turn as an assembly. With the front wheels free to turn, the chain can move freely and the drive sprocket does not remain stationary. Thus the differential pinions are not turning as the whole carrier turns.

If the front wheels are held stationary, the driven sprocket cannot turn. This causes the chain to hold the drive sprocket in place, and the planetary-type differential now must walk around the stationary driven sprocket as the

continues page 22

carrier turns. While the carrier is free to spin, the pinions are traveling at light speed because of ratio difference and achieve nuclear meltdown.

The moral of the story is that there is no way to flat-tow modern vehicles safely with the driveshafts connected. This also presents a dilemma for many states like New York that have gone to dynamic emission testing using a chassis dyno. These dynos turn only the drive wheels with the other set stationary. This should in time dramatically increase business on all-wheel-drive vehicles for shops in those states.

Sad Tale #3

A tech call comes in from a shop working on a Mitsubishi Eclipse five-speed with all-wheel drive. The conversation begins with: "How do you tell if a viscous coupling is bad? The one in my hand is all discolored, and black gunky stuff is coming out of it." I reply that the coupling is definitely shot and then explain how it functions as I did in sad tale #1. My next question gets to the big picture: "How are the tires on the car? Are they all the same size and equal pressure all around? Get a tape measure and measure the diameter of each tire at the center." The technician now goes to look and comes back to report, "They are all the same except for the doughnut spare on the right-front corner."

We will never know how long the driver used the compact spare, but it was long enough to trash the viscous coupling and cause the transmission to fail. Had this shop simply repaired the trans and sent the driver on his way, it would have cost them an expensive comeback. They notified the car owner and explained that if he wanted them to guarantee their work they would have to install a new set of tires. The owner agreed, and the shop delivered the vehicle.

Be careful not to narrow your focus to only the component you are working on so that you exclude looking carefully at the whole vehicle. A broader perspective will create a complete fix and a more-profitable end result. When you deliver the vehicle, make sure it is going to stay on the road and give your customers the added value they paid for. TD

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Circle the corresponding number on the free information card.

87 Useful information.
88 Not useful information.
89 We need more information.