

Chrysler All-Wheel-Drive For Minivans, Part I

By Mike Weinberg

with the global competition for increased car sales, manufacturers are adding more options and more technology. In 1991, Chrysler introduced an all-wheel-drive system for the Dodge Caravan and Plymouth Voyager minivans. This system is found on minivans equipped with 3.3 liter V-6 engines, a 604 automatic transaxle and 15-inch wheels. Looking to create a safer vehicle in all weather conditions, many carmakers are offering all-wheel-drive systems. Unfortunately, very few consumers are educated properly in the operation and maintenance of the vehicles and even fewer will read the car owner's manual that resides in the glove box. All-wheel-drive is NOT the same as four-wheel-drive. All-wheeldrive is a fulltime system in which all four wheels are capable of transmitting power to the road. These ve-

hicles are not designed for off-road use as they do not have adequate ground clearance or skid plates to protect undercar components, and they do not have the low-reduction gearing necessary for off-road travel. The all-wheel-drive systems are designed to give better traction and cornering in adverse weather conditions and to give the manufacturer a technological advantage in the battle for sales.

The all-wheel-drive powertrain in the Chrysler minivans is a very sophisticated, complex system and in order to diagnose and repair it successfully, one must understand how the components operate and interact with one another (See Figure 1).

The 604 computer-controlled transaxle is modified to accept a Power Transfer Unit (PTU) that bolts to the

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passenger side of the transaxle (See Figure 2). Two halfshafts supply power from the transaxle to the front wheels. The Power Transfer Unit contains a hypoid ring-and-pinion set that allows power to be transferred 90° to the rear wheels. The only serviceable parts on this unit, manufactured for Chrysler by Steir, Daimler, Puch, are the seals and one ball bearing. If the tapered bearings or the ring and pinion need to be changed, you must purchase a complete new unit from Chrysler (See Figure 3). This unit is lubricated with 80-90W gear oil and shares no lube with the transaxle. Power exits the PTU through a driveshaft equipped with plungetype CV joints and transfers power to a viscous

coupling (See Figure 4). The viscous coupling acts like a differential and allows torque to be transferred between front and rear axles as needed. In normal straight-line driving, 90% of the torque is supplied to the front wheels. Under poor traction conditions where the front wheels slip, the driveshaft to the viscous coupling from the PTU causes the clutch plates in the viscous unit to heat up the silicone fluid that is in the coupling. The fluid expands rapidly to fill the case, and the drag or shear of the opposing clutch plates turning through the high-viscosity fluid causes the power to be transferred through the rear driveshaft.

The viscous coupling is mounted on a torque tube that contains the rear driveshaft and a one-way clutch, which transfers power from the viscous coupling to the rear differential unit. Strapped to the top of the torque tube are a vacuum reservoir, control solenoids and a vacuum shift motor (See Figure 5). The overrun clutch permits the rear driveshaft to overrun in certain conditions to prevent driveline windup and wheel hop. The rear differential is a standard hypoid ring-and-pinion with independent rear axles. The rear unit is lubed with 80-90W gear oil.

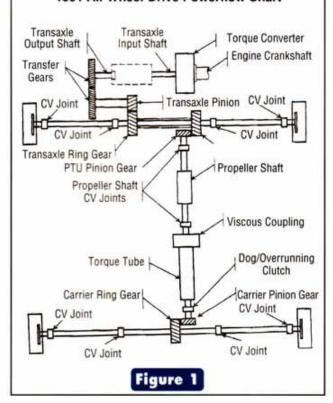
There are a number of vacuum and electrical diagnostics with this all-wheel-drive system that we will look at in depth in the next issue of this magazine. Be advised of the following:

Before you attempt to diagnose and repair one of these vehicles, get your hands on the factory manual – you will need it.

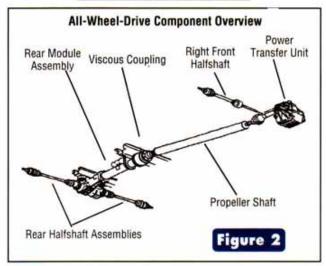
This system is expensive to repair because certain parts of the components are not sold separately. For instance, if the front driveshaft CV boots are torn, Chrysler does not sell the boot separately and you will have to purchase a complete driveshaft. If a pinion or carrier bearing fails in the PTU, you can't get the parts and will have to purchase a whole unit. Personally, I think this approach by the manufacturer is a mistake. I have seen the look on customers' faces when they get the



"AS" Body All-Wheel-Drive (AWD) 1991 All-Wheel-Drive Powerflow Chart



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bad news as to the expense of these repairs, and they become very disenchanted with their choice of vehicles.

Other outside forces can create a nuclear meltdown on the aforementioned expensive components. Example - with the viscous coupling, there are four differentials in this system. A wrong-size tire or tires,

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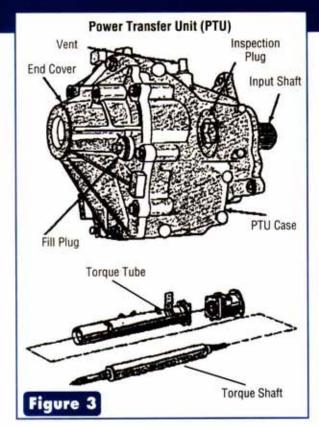
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incorrect tire pressures or badly worn tires can cause big-time damage to the PTU, the viscous coupling or the other differentials.

Next month we are into Chrysler all-wheel-drive diagnostics.

