Subject:
Operating principles and diagnosis

Unit:
New Venture 244 Gen II Transfer Case

Essential Reading:
- ☑ Rebuilder
- ☐ Shop Owner
- ☐ Center Manager
- ☑ Diagnostician
- ☑ R & R

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A Look at the New Venture 244 Gen II Transfer Case

We have become used to a never-ending stream of new technology and the introduction of many new models of transmissions and transfer cases. I remember the days when we had only about 20 transmissions to worry about and roughly a half dozen transfer cases; now, you need a computer to keep track of all the different units.

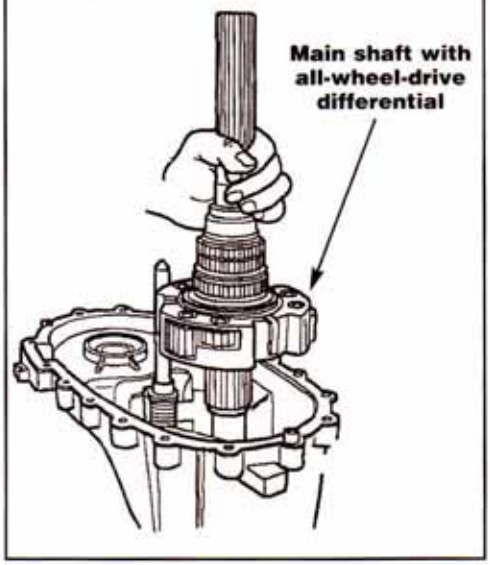
Among this growth is the New Venture 244 Gen II transfer case used in 2004-and-up Dodge Durangos. Gen II stands for Generation 2. This unit also has a little brother, called the 144, which is a one-speed unit, but we will devote this article to understanding the 244.

Understanding is what our business is all about. Too many technicians are concerned with only where the parts go and never take the time to learn the operational theory of these units. This creates a serious gap in customer relations, because it is a rare car owner who understands how his vehicle operates and even rarer is the owner who has actually read the owner's manual. There is no way you can diagnose and repair your customer's vehicle or provide accurate advice if you do not know how the unit is supposed to operate.

The reason I bring this up is that half the warranty calls and tech-line inquiries we handle are generated by a lack of understanding of what the unit is supposed to be doing. For instance, we speak with shops every day that do not understand the significance of measuring tires on four-wheel-drive vehicles. The new-generation transfer cases have so much computer control and interrelated systems that a difference of $^1/_4$ inch in tire diameters will set codes or create clutch chatter, driveline windup and other unpleasant side effects that cause unhappy customers.

Anytime you are working with a four-wheel-drive or all-wheel-drive vehicle, the first step is to MEASURE the tire circumference and make sure all pressures are the same. Not doing this will result in an unbelievable waste of time. The reason I got on my soapbox is that the NV244 Gen II transfer case *does not have a two-wheel-drive mode.* Durangos equipped with this transfer case are always in four-wheel drive. The transfer case is actually a full-time/part-time unit that is electronically controlled. We have already received a number of phone calls from the field asking how to get these units into two-wheel drive, and there isn't any.

Figure 1



Operating Ranges:
AWD (all-wheel drive) – full time
4 Lock (part time) – 4WD High part time
4Low (4WD Low Range) – 2.72 gear reduction, part time.
Neutral

In all-wheel drive a planetary type of differential is used to split torque between the rear and front axles, similar to the way the NV242 transfer case operates. All-wheel drive can be used on any road surface and MUST be used on paved roads. The 4 High and 4 Low ranges can never be used on dry pavement without crow hop and driveline windup. The part-time modes lock the torque split to both axles, and logic tells us that unless you are on snow, ice, dirt, sand or other loose material, the tires cannot slip during turns and will bind the driveline. This makes steering painful and will result in banging noises as the driveline finally releases.

On this unit tire pressures will become critical as the driver tries to shift into all-wheel range from 4 High and the vehicle remains locked in 4 High. Having one tire that is 3 psi low will spline-lock the differential and shaft components, preventing a return to all-wheel drive. Worn tires will create the same problem and, for the uninformed, a lot of wasted labor pulling out perfectly good transfer cases because no one measured the circumference or checked the air pressures.

Shifts are accomplished through a dash-mounted selector switch, which provides input information to the transfer-case control module (TCCM). The TCCM receives inputs from the transfer-case mode sensor, which is part of the encoder/shift motor mounted on the transfer case; the forward control module; and the vehicle bus circuit. If the driver initiates a shift, the TCCM will determine whether all parameters of its program have been met and, if so, will send the signal to the encoder motor to move the internal shift fork to the desired range. The transfer-case mode sensor is a linear analog position sensor that translates the encoder-motor shaft position into a DC signal. While the transfer-case mode sensor can rotate 360°, the range of rotation of the internal shift sector is from 40° negative to 20° positive. The TCCM sends 5 volts DC to the transfer-case mode sensor and constantly monitors the motor-shaft position every 2 milliseconds.

Encoder-motor sector angles with transfer-case position:
4 LOW=+20°
Neutral=0°
AWD= -20°
4 Lock= -40°

The transfer-case mode sensor has voltage ranges from minimum to maximum for each position of

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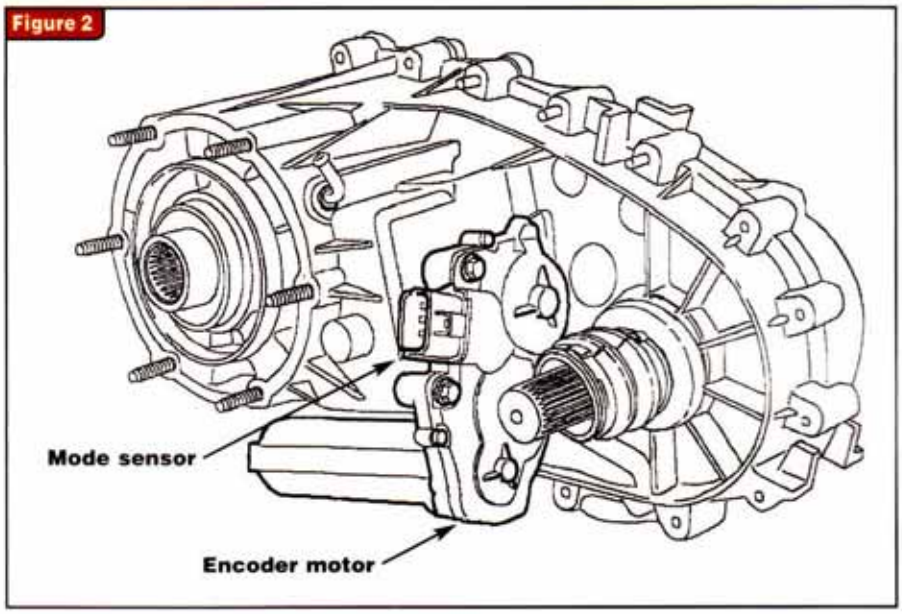
the encoder motor. These are very precise, and any change in wire resistance due to corrosion, shorts, opens or low battery voltage will become a problem.

Encoder 4 Lock Min=4.26 volts
Encoder 4 Lock Max=4.36 volts
Encoder AWD Min=3.36 volts
Encoder AWD Max=3.44 volts
Encoder Neutral Min=2.45 volts
Encoder Neutral Max=2.54 volts
Encoder 4 Low Min=1.48 volts
Encoder 4 Low Max=1.57 volts
Encoder High Range Limit=4.51 volts
Encoder Low Range Limit=0.50 volt

Figure 2



From the preceding chart it is easy to realize that if you are trying to test the encoder motor for the correct sweep through the transfer-case shift positions, you must use a 5-volt or less circuit. Direct application of 12 volts will cause a call to your supplier for a replacement encoder motor. The motor is capable of handling 13.5 volts at 30 amps, but the transfer-case mode sensor is not.

The transfer-case selector switch is a rotary knob type that is mounted on the dash board. As the switch rotates it varies resistance between the transfer-case mode-selector supply voltage and the output. The TCCM interprets the resistance levels to command a shift to the desired range. The following table will give you the proper resistance range for each position. The neutral part of the switch is a shrouded, normally open momentary switch that the driver can access with a ball-point pen or paper clip to make a switch to neutral, without having such a shift occur accidentally.

Encoder Motor/Mode Sensor

By now these are familiar units, but a quick review of the components won't hurt. There is the transfer-case mode sensor, which is mounted on the encoder motor; a small gear-reduction set; and a motor brake. The motor brake releases when a shift is commanded and then rests to hold the motor in the position required by the shift. The motors are shipped in the AWD position. If you are replacing the mode sensor/encoder motor, make sure that the transfer case is in the AWD position. You can manually turn the sector shaft to do this. The motor brake can be released by plugging in the harness and rotating the shift-position selector to the desired gear, or with a 9-volt radio battery.

Remember that your goal as a professional is to understand the operation of every component you work on. Then when a customer comes in with a complaint that his Dodge Durango won't go into two-wheel drive, you can patiently explain how his vehicle operates and show him where the owner's manual is in the glove box. TD

Selector-Switch Resistance Range	
Shorted	<150 ohms
AWD & Neutral	176-200 ohms
4Lock & Neutral	190-216 ohms
4Lo & Neutral	199-226 ohms
AWD (Default)	1159-1287 ohms
4Lock	2259-2503 ohms
4Lo	4820-5334 ohms
Open/Diagnostic	>19,000 ohms