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Document ID# 667576
2001 Chevrolet/Geo Blazer - 4WD

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Transfer Case Description and Operation

The NVG 236/246 transfer case features a 4 button shift control switch located on the instrument panel. When the vehicle has the ignition key in the RUN position, the transfer case shift control module starts monitoring the transfer case shift control switch to determine if the driver desires a new mode/gear position. At a single press of the transfer case shift control switch, the lamp of the new desired position will begin flashing to inform the driver that the transfer case shift control module has received the request for a new mode/gear position. The lamp will continue to flash until all shifting criteria has been met and the new mode/gear position has been reached, or has been engaged. Once the new mode/gear position is fully active, the switch indicator lamp for the new position will remain ON constantly.

During normal driving situations the transfer case can operate in the Auto 4WD mode. In the Auto 4WD mode the transfer case shift control module monitors rear wheel slip speed, based on the inputs from both the front and rear propshaft speed sensors. When the vehicle experiences a rear wheel slip condition, the transfer case shift control module sends a pulse width modulated (PWM) signal to an electronic motor, which is the transfer case encoder motor. This motor rotates the transfer case sector shaft, applying a clutch pack. This clutch pack is designed to deliver a variable amount of torque, normally delivered to the rear wheels, and transfers it to the front wheels. Torque is then ramped up to the front wheels until the front propshaft speed sensor matches that of the rear propshaft speed sensor. Torque is then ramped down until torque is completely removed from the front wheels or until rear wheel slip is once again detected. The process would then repeat.

The NVG 236/246 transfer case has the added feature of also providing the driver with 3 manual mode/gear positions:

- 4HI - 4 Wheel Drive high range
- 2HI - 2 Wheel Drive high range
- 4LO - 4 Wheel Drive low range

The driver may choose to select any of these mode/gear positions while driving the vehicle. However, the transfer case will not allow a shift into or out of 4LO unless the following criteria has been met:

- The engine is running.
- The automatic transmission is in Neutral, clutch depressed on manual transmissions.
- The vehicle speed is below 5 km/h (3 mph).

This transfer case also has a Neutral position. A shift to the Neutral position allows the vehicle to be towed without the rear axle rotating the transfer case main shaft and the transmission output shaft. Neutral position may be obtained only if the following criteria has been met:

- The key is ON.
- The automatic transmission is in Neutral, clutch depressed on manual transmissions.
- The vehicle speed is below 5 km/h (3 mph).
- The transfer case is in 2HI mode.

Once these conditions have been met, press and hold both the 2HI and 4LO buttons for 10 seconds. When the system completes the shift to neutral, the red neutral lamp will illuminate.

View the list of major components that make up the automatic transfer case (ATC) system below.

Transfer Case Shift Control Module

The transfer case shift control module uses the VIN information for calculations that are required for the different calibrations used based on axle ratio, transmission, tire size, and engine. The system does not know which calibration to use without this information. This information is provided to the transfer case shift control module via Class 2 data bus from the powertrain control module (PCM).

The transfer case shift control module monitors front and rear propshaft speed as well as controlling the operation of the transfer case encoder motor assembly and the engaging and disengaging of the front axle.

Transfer Case Encoder Motor

The transfer case encoder motor consists of a permanent magnet (PM) DC motor and gear reduction assembly. It is located on the left hand side of the transfer case. When activated it turns the sector shaft of the transfer case, clockwise or counterclockwise to shift the transfer case and to apply the clutch that applies the front propshaft. The encoder motor is controlled with a pulse width modulated (PWM) circuit provided by the transfer case shift control module. This circuit consists of a driver on both the Motor Control A and Motor Control B circuits. The encoder motor is bi-directional to allow the motor to shift the transfer case from 2HI or 4HI to NEUTRAL and 4LO positions.

The transfer case encoder motor can be turned ON and OFF using a scan tool. You may also monitor Motor Control A and B circuits using a scan tool.

Transfer Case Encoder

The encoder is mounted to the transfer case encoder motor assembly and is replaced only as an assembly. The encoder converts the sector shaft position, representing a mode or range, into electrical signal inputs to the transfer case shift control module. The module detects what position the transfer case is in by monitoring the 4 encoder channels (P, A, B, and C). These inputs translate into AUTO 4WD, 2HI, 4HI, NEUTRAL, and 4LO or whether the motor is still in transition between gears.

The transfer case encoder channel circuits may be monitored using a scan tool.

Transfer Case Motor Lock

The transfer case motor lock is used to prevent the transfer case from changing mode/gear positions or popping out of position when the vehicle is in 2HI, 4HI, and 4LO. When the lock circuit is energized, the transfer case encoder motor is allowed to rotate. When the transfer case is placed 2HI, 4HI, or 4LO the motor lock circuit has no voltage provided to it, applying the lock which assures that the transfer case remains in the current mode/gear position. When AUTO 4WD is selected the motor lock remains applied until an adaptive mode, torque being applied to the front propshaft is required. During an adaptive mode the motor lock circuit is energized, the locking mechanism is released, enabling the encoder motor to turn and apply torque to the front propshaft.

The transfer case motor lock circuit can be turned ON and OFF using a scan tool. You may also monitor

the lock circuit using a scan tool.

Transfer Case Speed Sensors

There are three speed sensors mounted on the transfer case, two on the rear output shaft and one on the front output shaft. Each speed sensor is a permanent magnet (PM) generator. The PM generator produces a AC voltage. The AC voltage level and number of pulses increases as speed increases.

Vehicle Speed Sensor

One of the two speed sensors on the rear output shaft is the vehicle speed sensor (VSS) input to the powertrain control module (PCM). The PCM sends this information to the transfer case shift control module via the Class 2 serial data bus.

Rear Propshaft Speed Sensor

The transfer case shift control module converts the pulsating AC voltage from the rear transfer case speed sensor to a rear propshaft speed in RPM to be used for calculations. The rear propshaft speed can be displayed with a scan tool.

Front Propshaft Speed Sensor

The transfer case shift control module converts the pulsating AC voltage from the front transfer case speed sensor to front propshaft speed in RPM to be used for calculations, and to monitor the difference between the front and rear sensor speed. It is also used in the AUTO 4WD mode to determine the amount of slip and the percent of torque to apply to the front axle. The front propshaft speed can be displayed with a scan tool.

SERVICE 4WD Indicator

The SERVICE 4WD message is displayed on the driver information center and is an integral part of the cluster and cannot be serviced separately. This message is used to inform the driver of the vehicle of malfunctions within the automatic transfer case (ATC) system. The SERVICE 4WD message is controlled by the transfer case shift control module via a Class 2 message.

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