

163707

### Installation Procedure

**Notice:** Refer to *Fastener Notice* in Cautions and Notices.

1. Install the front speed sensor into the transfer case.

#### **Tighten**

Tighten the front speed sensor to 31N·m (23 lb ft).

2. Install the electrical connector to the speed sensor.
3. If removed, install the transfer case shields. Refer to *Shield Replacement*.

## Description and Operation

### Transfer Case Circuit Description

#### 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.

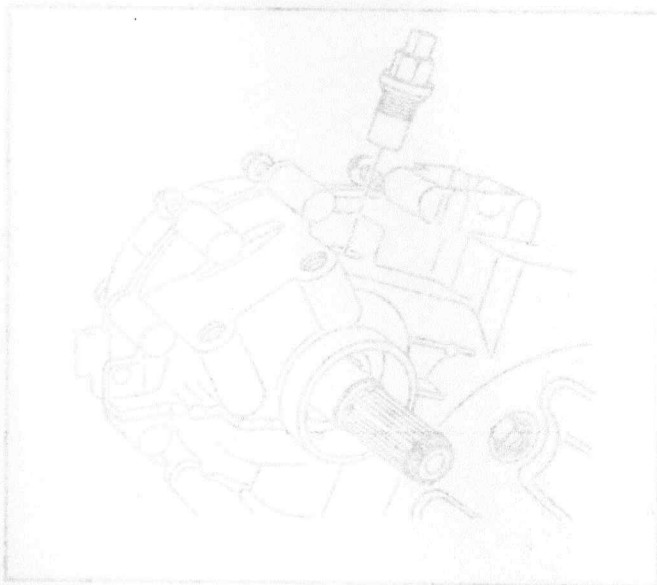
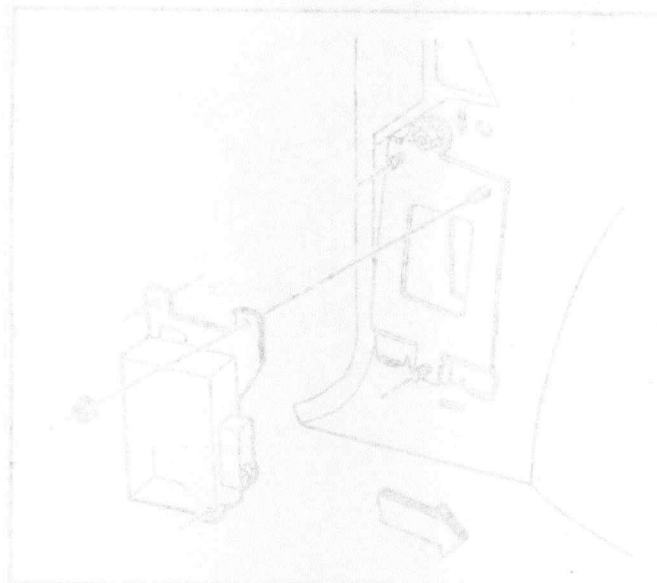
The direct battery supply line (CKT 1640) provides the power to the module and motor circuitry.

#### 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 (drivers side) of the transfer case. When activated it turns the sector shaft of the transfer case (clockwise or counter clockwise) to shift the transfer case. The encoder motor is controlled with a pulse width modulated (PWM) circuit within the transfer case shift control module. This circuit consists of a driver on both the Motor A and Motor 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.

#### Transfer Case Encoder

The encoder is mounted to the transfer case encoder motor assembly and is replaced as an assembly. The encoder converts the sector shaft position (representing a mode or range) into electrical signals inputs to the automatic transfer case control module. The module can detect what position the transfer case is in by monitoring the 4 encoder channels (P, A, B, and C). These inputs translates into AUTO, 2H, 4H, NEUTRAL, and 4L or in transition between gears.



**Transfer Case Motor Lock**

The transfer case motor lock is used to provide a 2H, 4H, and 4L lock-up feature. When the lock circuit is energized, the transfer case encoder motor is allowed to turn. When the transfer case is placed 2H, 4H, or 4L the motor lock circuit has no power provided to it and the lock is applied. This assures that the transfer case remains in the current gear position. When AUTO is selected the motor lock remains applied until an adaptive mode (torque is applied to the front propshaft) is required. During an adaptive mode the motor lock circuit is energized and the motor lock is released, enabling the encoder motor to turn and apply torque to the front propshaft.

**Transfer Case Speed Sensors**

There are three speed sensors on the automatic transfer case (ATC), 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 pulsing AC voltage. The AC voltage level and number of pulses increases as speed increases.

**Vehicle Speed Sensor**

One of the two 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 automatic transfer case 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.

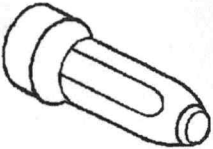
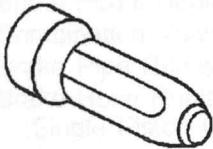
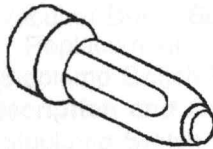
**Front Propshaft Speed Sensor**

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 (Adapt) mode of operation 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 indicator (4WD/AWD) Lamp**

The SERVICE indicator (4WD/AWD) lamp is an integral part of the cluster and cannot be serviced separately. This lamp is used to inform the driver of the vehicle of malfunctions within the automatic transfer case (ATC) system. The SERVICE indicator (4WD/AWD) lamp is controlled by the transfer case shift control module via CKT 1567.

**Special Tools and Equipment**

Illustration	Tool Number/Description
 <p style="text-align: right;">404850</p>	<p style="text-align: center;">J 35870 Rear Output Shaft Seal Installer (For start of production front output shaft seal.)</p>
 <p style="text-align: right;">404818</p>	<p style="text-align: center;">J 43484 Front Output Shaft Seal Installer (For midyear 1999 and after front output shaft seal.)</p>
 <p style="text-align: right;">404841</p>	<p style="text-align: center;">J 29162 Rear Output Shaft Seal Installer</p>