Transmission Control Systems: Description and Operation
6 Speed Automatic Transaxle
Transaxle Electronic Control System

Electronic System Description
The transmission control module (TCM) and its input/output network controls these operations:
- Shift timing
- Line pressure (shift feel)
- Torque converter clutch (TCC)

The transaxle control is separate from the engine control strategy in the powertrain control module (PCM), although some of the input signals are shared between the TCM and PCM. When determining the best operating strategy for transaxle operation, the TCM uses input information from certain engine-related and driver-demand related sensors and switches supplied by the PCM.

In addition, the TCM receives input signals from certain transaxle-related sensors and switches. The TCM also uses these signals when determining transaxle operating strategy.

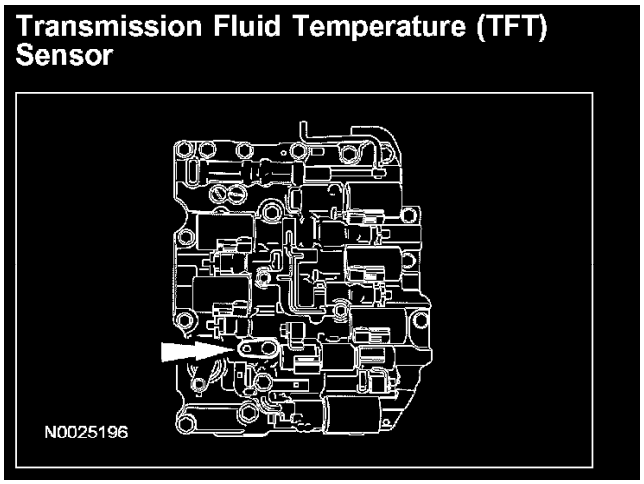
Using all of these input signals, the TCM can determine when the time and conditions are right for a shift, or when to apply or release the torque converter clutch. It will also determine the best line pressure needed to optimize shift feel. To accomplish this the TCM uses output solenoids to control transaxle operation.

Here are brief descriptions of each of the sensors and actuators used to control transaxle operation.

Transmission Control Module (TCM) Control Function
In automatic gear shift control, based on each gear shift pattern, SAA and SBB turn ON or OFF and SSC, SSD, SSE and SSF are operated linearly according to information that includes vehicle speed, the degree to which the accelerator is open and brake signals.

The transmission range (R) sensor is built in the transmission control module (TCM), it detects the automatic transmission range information via the Hall-effect sensor and outputs the information to the TCM. The TCM reads the voltage and adjusts the automatic transmission range.

Brake Pedal Position (BPP) Switch
The brake pedal position (BPP) switch tells the powertrain control module when the brakes are applied. The torque converter clutch disengages when the brakes are applied and the BPP switch closes when the brakes are applied and opens when they are released.



Transmission Fluid Temperature (TFT) Sensor

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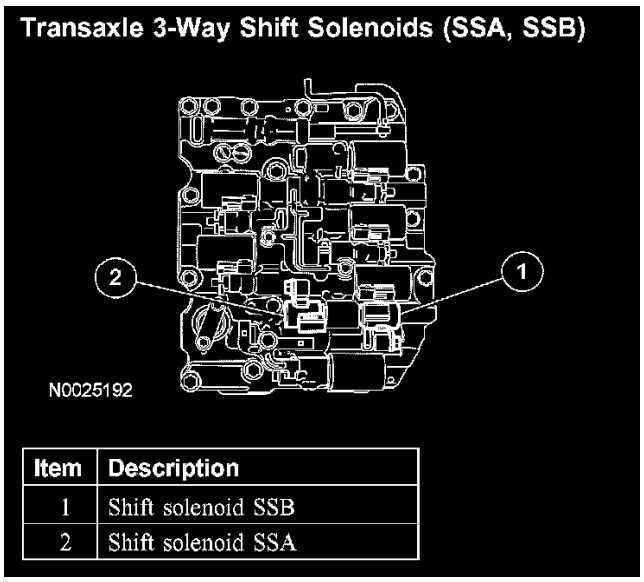
The transmission fluid temperature sensor, which is integrated within the transmission wiring, is installed on the front of the valve body. It directs the fluid temperature within the hydraulic pressure control circuit and transmits a signal based on that temperature to the TCM. Through this it controls gear shift, lockup and slip in response to changes in fluid temperature for smooth shifting across wide fluid temperature zones.



Item	Description
1	Shift solenoid SSB
2	Shift solenoid SSA

Transaxle 3-Way Shift Solenoids (SSA, SSB)

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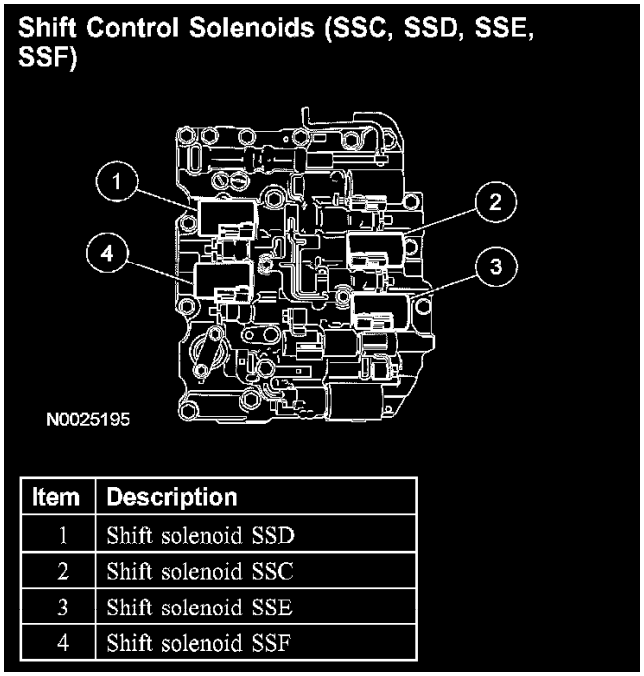
The transaxle 3-way solenoid assembly (SSA) is installed on the middle valve body. The transmission 3-way solenoid assembly (SSB) is installed on the front valve body. The solenoids turn ON and OFF in response to signals output from the TCM. According to the ON or OFF status of SSA or SSB, the 1st gear engine brake operates or the gear shifts into REVERSE. As a fail-safe function, if any transmission 3-way solenoid assembly abnormality occurs, the TCM will disable the current to the solenoids.

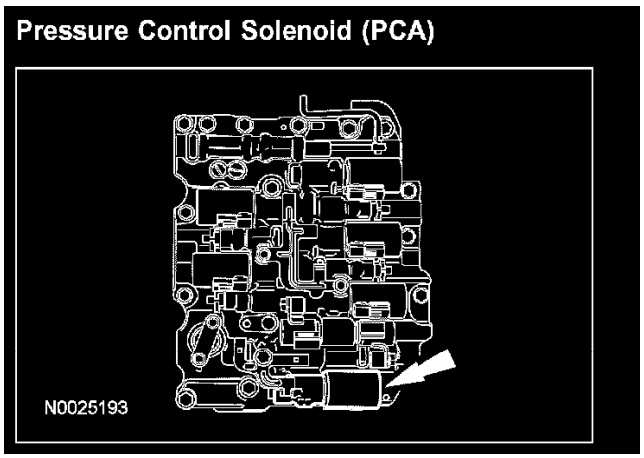


Item	Description
1	Shift solenoid SSD
2	Shift solenoid SSC
3	Shift solenoid SSE
4	Shift solenoid SSF

Shift Control Solenoids (SSC, SSD, SSE, SSF)

Shift Control Solenoids (SSC, SSD, SSE, SSF)

The shift control solenoid assembly (SSC, SSD, SSE, SSF) is installed on the front valve body. The solenoids linearly control hydraulic pressure in response to signals, output from the TCM. Through this, it controls hydraulic pressure to the clutch (C1, C2, C3) and brakes (BB1 for smooth shifting. According to the combination of ON or OFF status of the shift control solenoid assembly, the transmission shifts from 1st gear into 6th gear and vice versa. As a fail-safe function, if any shift control solenoid assembly abnormality occurs, the TCM will disable the current to the shift control solenoids.



Pressure Control Solenoid (PCA)

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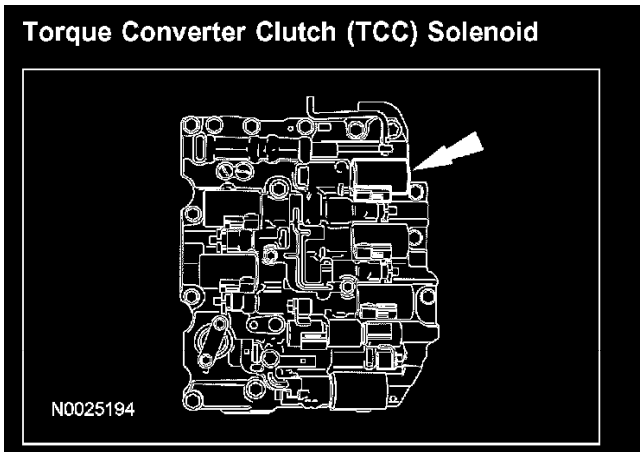
The pressure control solenoid (PCA) is installed on the front valve body. Based on a signal indicating the degree to which the throttle is opened, engine torque, and according to a duty ratio predetermined in the TCM, the solenoids control line hydraulic pressure by linearly changing the comparable throttle hydraulic pressure. Through this, it controls operating hydraulic pressure to the clutch and brakes for smooth shifting. As a fail-safe function, if any shift control solenoid assembly abnormality occurs, the TCM will disable the current to the shift control solenoids. The line pressure is maximized, if the shift control solenoid assembly current is disabled when any abnormality other than locking occurs.

Speed Sensor

The 2 speed sensors are installed in the transaxle case. One speed sensor detects revolutions of the intermediate shaft's C2 drum as input shaft revolutions. The other speed sensor detects the counterdrive gear as output shaft revolutions. These signals are transmitted to the TCM. Based on these signals, the TCM controls engine torque, shift timing and lockup.

Adaptive Shift Control

The TCM has an adaptive learning strategy to electronically control the transaxle which will automatically adjust the shift feel. The first few hundred miles of operation of the transaxle may have abrupt shifting. This is a normal operation. If the battery has been disconnected for any reason it will need to be kept disconnected for **approximately 20 minutes** to reset the adaptive shift pressure strategy or use the diagnostic tool to carry out the keep alive memory (KAM) reset.



Torque Converter Clutch (TCC) Solenoid

Torque Converter Clutch (TCC) Solenoid

The torque converter clutch (TCC) solenoid is used in the transaxle control system to control the application, modulation and release of the torque converter clutch.

The TCC control solenoid is installed on the front valve body. Based on engine rpm, throttle opening degree signals and speed sensor signals, it linearly controls clutch hydraulic pressure. Through this, engagement and slip are controlled. As a fail-safe function, if any control solenoid assembly abnormality occurs, the TCM will disable the current to the TCC solenoid.