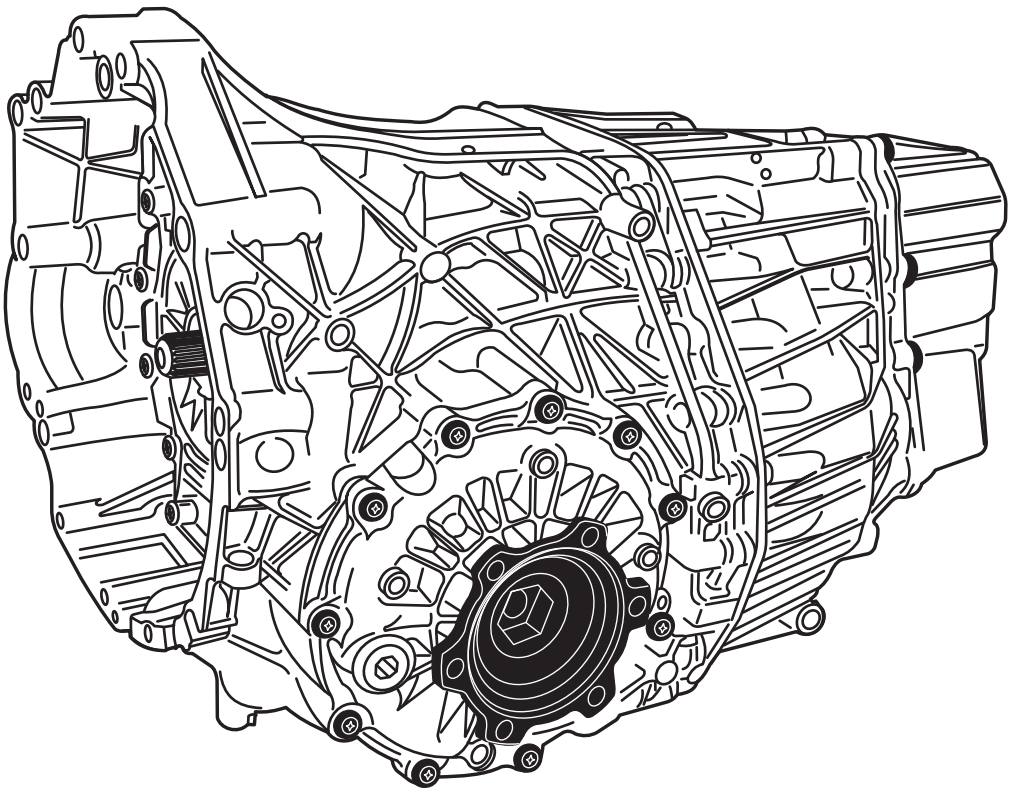
AUDI MULTITRONIC 01J CVT

PRELIMINARY INFORMATION

THE 01J MULTITRONIC®
2004 Audi A4 and A6
1.8L and 3.0L



The 2002 and later Audi A6 and the 2003 and later A4 with 1.8L or 3.0L engines, are equipped with the Multitronic® 01J (VL300) Continuously Variable Transmission. One of the more unique features about this transmission is the fact that the Transmission Control Module (TCM) is located ***INSIDE*** the transmission with the 25 pin TCM connector protruding out the rear of the unit.. This transmission does not use a torque converter, it uses a dual mass flywheel with the 1.8L engine, and a flywheel/damper plate assembly with the 3.0L engine. Another of the unique components of the 01J is the use of a drive chain instead of a belt. This is the first time a drive chain has been used in a CVT application.
The TCM operates several external relays through the same harness as the one that connects to the back of the transmission case. The TCM also communicates with other modules over the CAN Network.
The Tiptronic gear selection feature provides six (6) manually selected speeds.

AUDI MULTITRONIC 01J CVT

PRELIMINARY INFORMATION

Refer to Figure 1 for TCM connector location and terminal functions.

Refer to Figure 2 for Internal Component identification.

Refer to Figure 3 for Speed Sensor description.

Refer to Figure 4 for Transmission Range Sensor and Fluid Temperature Sensor description.

Refer to Figure 5 for Pressure Sender description.

Refer to Figure 6 for Transmission Solenoid description.

Refer to Figure 7 for Valve Body valve identification.

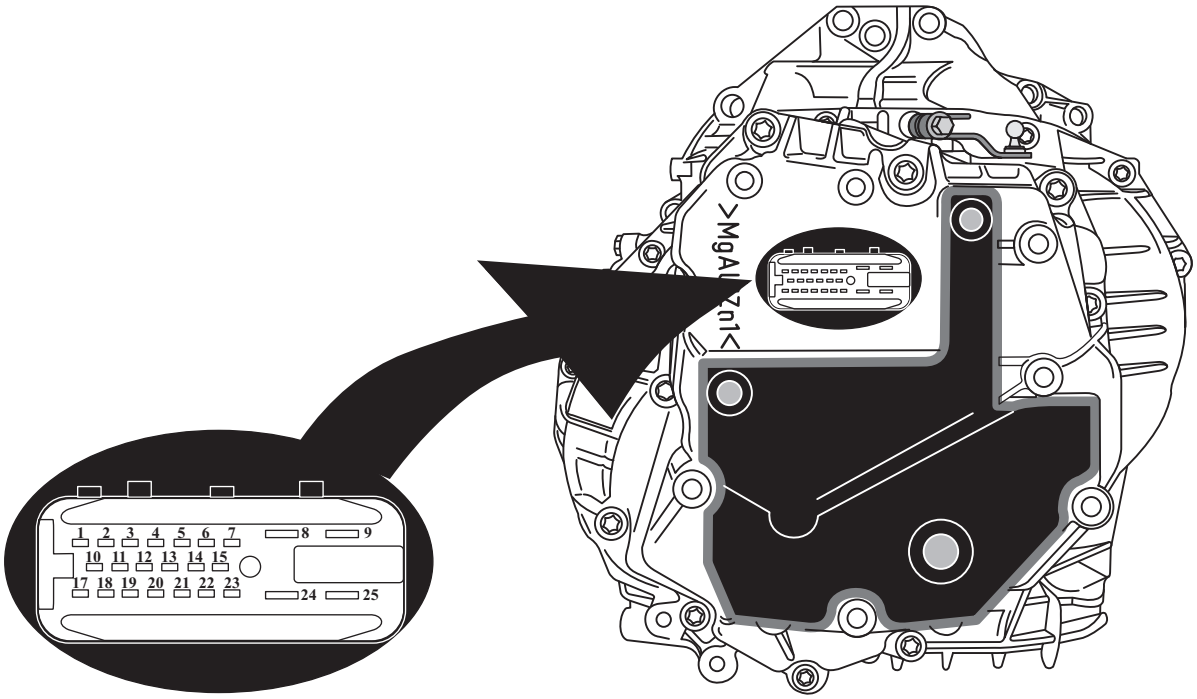
Refer to Figure 8 for TCM Controlled External Component identification.

Refer to Figure 9 for CAN BUS Communication information.

Refer to Figure 10 for Fault Indication information.

Refer to Figure 11 for 01J Transmission Specifications.

TCM CONNECTOR LOCATION & TERMINAL FUNCTIONS



The Transmission Control Module J217
25 pin compact connector

Two terminals are used in the TCM's 25 pin compact connector to connect to the CAN bus network system known as the Drivetrain CAN Bus Low and Drivetrain CAN Bus High. Hard wired directly into the 25 pin connector is an Engine Speed Signal on terminal 15. The hard input is the priority line for engine RPM data. It is a key parameter for the slip control feature of the forward and reverse clutch. The Engine RPM data that the TCM receives over the CAN bus is a redundancy (back-up) signal.

Terminals 12 (upshift), 13(recognition) and 14 (downshift) are inputs to the TCM from the Tiptronic Console Shifter.

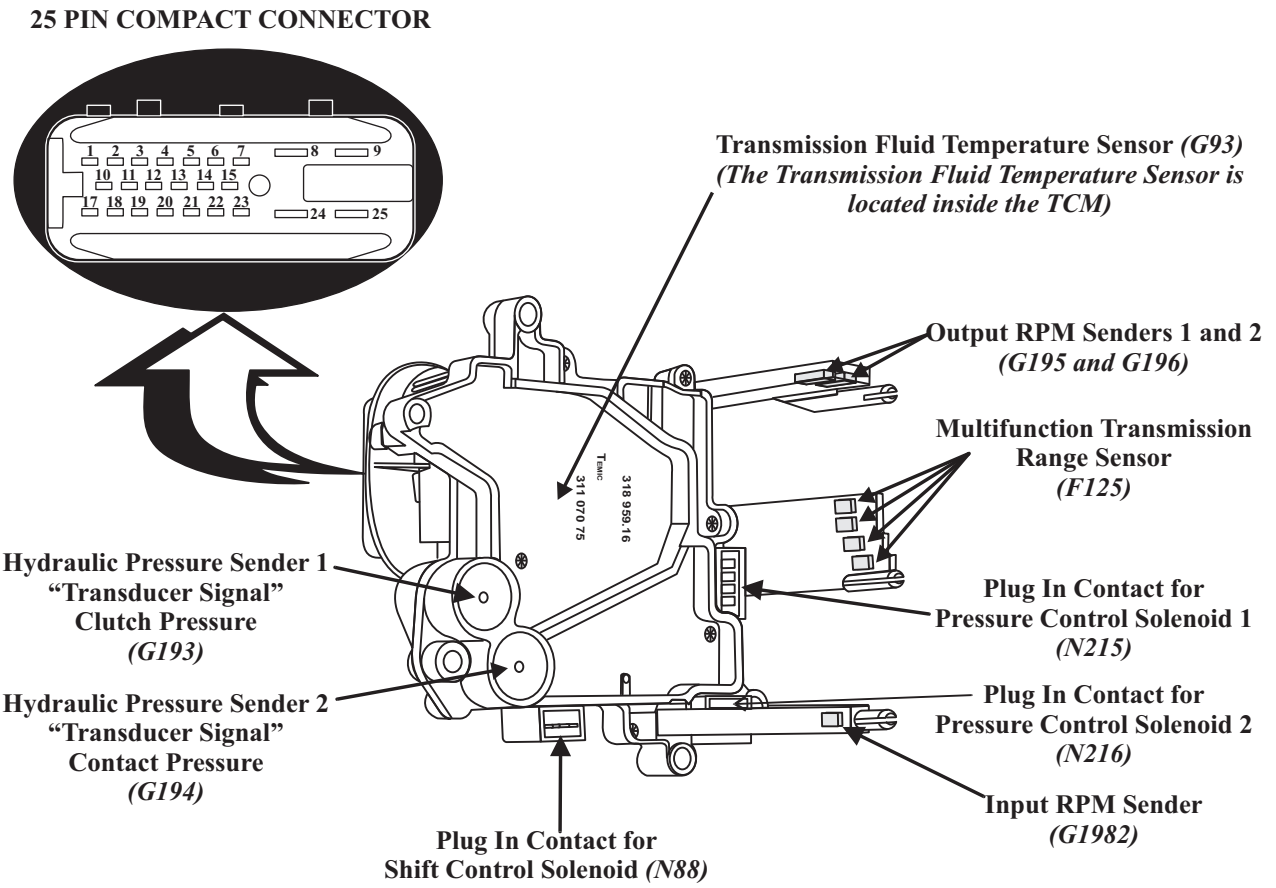
Pin 6 is a shift indicator signal sent out by the TCM
Pin 5 is a vehicle speed signal sent out by the TCM
Pin 2 is the diagnosis and programing interface wire

These specific data signals are also sent into the CAN bus network system from the TCM.

Other connections to the TCM's 25 pin compact connector are power and grounds, the Park/Neutral Position Relay, the Shift Lock Solenoid

Figure 1

MULTITRONIC ® TCM COMPONENT IDENTIFICATION



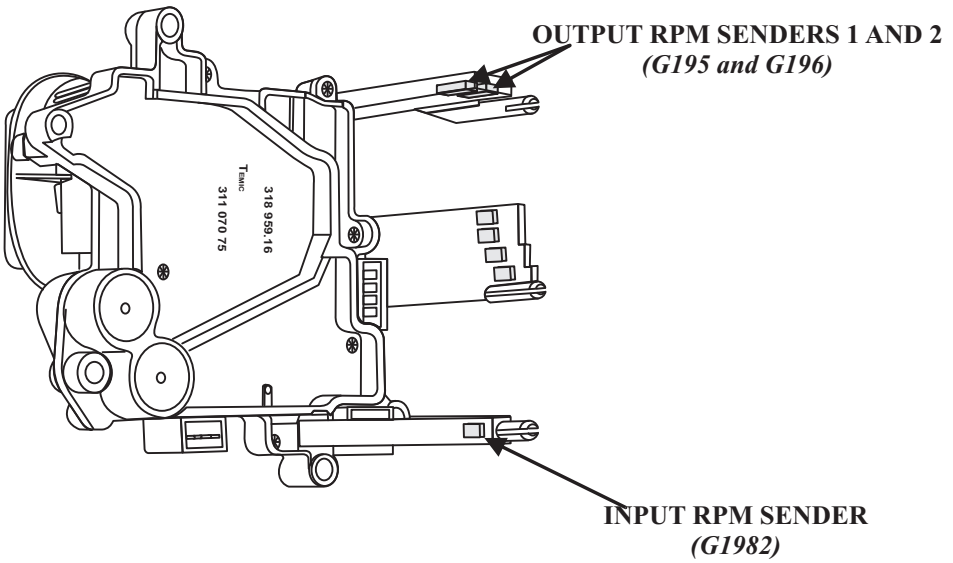
Located inside the Multitronic® unit is the ***Transmission Control Module (TCM)***. Incorporated into the TCM are two hydraulic pressure transducers. Also incorporated into the unit are Hall Effect Sensors used for RPM readings and manual valve selection. The TCM uses robust plug-in gooseneck connectors to snap into the three solenoids that are fitted into the valve body housing. This special electrical feature of the TCM being integrated into the transmission eliminates the need for wiring. This allows the unit to be impervious to electromagnetic interference and with the Hall Effect sensors being free of mechanical wear, the durability and reliability of the TCM's system increases significantly.

As a result of this integrated system, testing of the solenoids and RPM signals can not be accomplished with the use of a scope or DVOM. A scan tool will need to be used to observe its data stream.

The TCM is connected to a CAN bus system through its 25 pin compact connector where information is exchanged over the network between the ECM and ABS control module. The TCM receives data rom the ECM such as, but not limited to; the Engine speed signal, cruise control, coolant temperature, accelerator pedal position, kickdown information, brake switch information, intake air temp, altitude information and AC compressor status. The TCM also receives data from the ABS control module such as but not limited to; individual wheel speed signals and ABS activity.

Figure 2

THE TRANSMISSION CONTROL MODULE J217
HALL EFFECT SENSORS



The ***RPM Hall Effect Sensors*** are mounted in the TCM and reach past the valve body. The Input RPM sensor reads a signal off of a sender wheel containing 40 equally spaced magnets. This registers the rotation speed of pulley set 1 (the drive pulley) which represents actual transmission input speed. It is used together with engine speed data for clutch control.

Output RPM Sender 1 and Sender 2 read a signal off of a sender wheel containing 32 equally spaced magnets. Output RPM Sender 1 registers the rotation speed of pulley set 2 (the driven pulley) to be used as output speed. Transmission output speed is used for transmission control, slip control and for a hill-hold function.

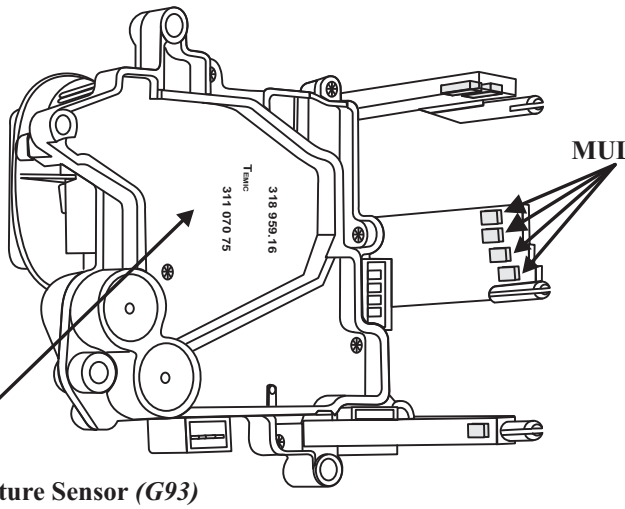
The positions of Sender 1 and 2 is offset so that the phase angles of the senders are 25% out of phase with one another. This allows Sender 2 to be used to recognize forward or reverse rotation. If the signal from the Output Sender 1 is lost, the output speed will be determined by sender 2.

If both fail, a substitute value is generated from the information available from the wheel speeds across the CAN bus.

With any combination of output speed data failure, the hill-hold feature is eliminated.

Figure 3

THE TRANSMISSION CONTROL MODULE J217
RANGE SENSOR/HALL EFFECT SENSORS &
TRANSMISSION FLUID TEMPERATURE SENSOR



MULTIFUNCTION TRANSMISSION RANGE SENSOR (F125)

Transmission Fluid Temperature Sensor ***(G93)***
(The Transmission Fluid Temperature Sensor is located inside the TCM)

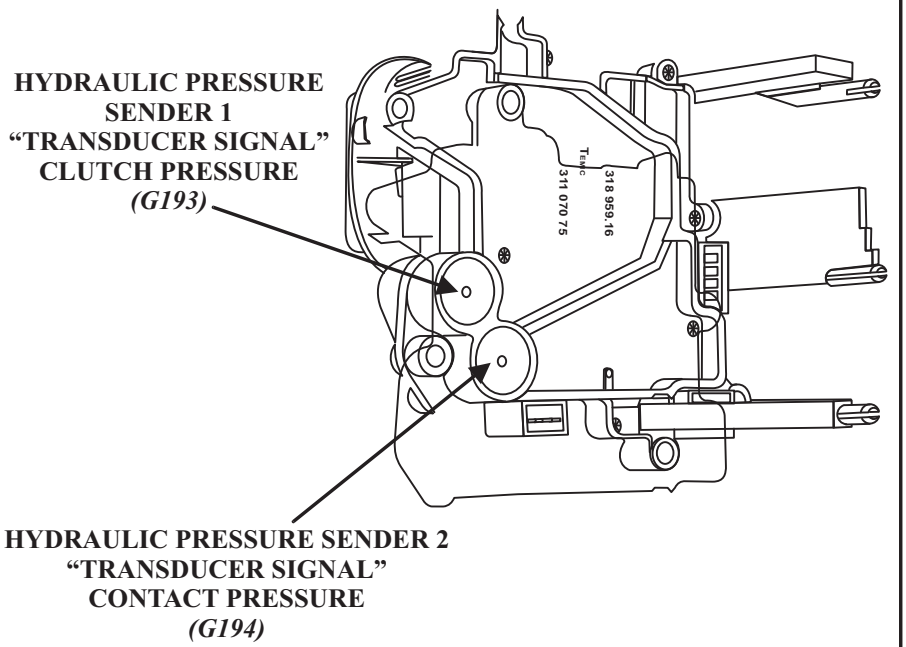
The ***Multifunction Transmission Range Sensor*** has four Hall Effect Sensors which are controlled by a magnetic gate located in the rooster comb area of the selector shaft. The signals from the sensors are interpreted in the same way as the positions of mechanical switches either open or closed. With 4 sensors, 16 total open and closed combinations can be obtained. 6 combinations are used to inform the TCM of a Park, Reverse, Neutral and Drive manual valve selection as well as intermediate movement positions from Park to Reverse and a Reverse to Neutral to Drive movement. The other 10 possible combinations are reserved as being faulty.

The ***Transmission Fluid Temperature Sensor*** is integrated into the circuit board ***inside*** the TCM. It records the temperature of the TCM aluminum mounting frame which is in close proximity to the actual fluid temperature.
Transmission oil temperature influences clutch control and transmission input speed control and adaptation functions. If the fluid temperature sensor fails, engine temperature is used to calculate a substitute value.To protect the transmission, engine performance will be reduced gradually until the engine is at idle.

Figure 4

THE TRANSMISSION CONTROL MODULE J217
PRESSURE SENDERS

Pressure Sender 1 registers clutch pressure of the forward and reverse clutches and is used to monitor clutch function. This clutch pressure monitoring has a high priority so malfunction of this sender usually causes the failsafe valve to be activated. The safety valve is activated by Shift Control Solenoid N88.



Pressure Sender 2 registers contact pressure which is regulated by a torque sensor. It is used to control clutch slip based on torque input. Therefore, contact pressure will be proportional to input torque. If this sender fails, the slip control adaptation is deactivated. Slip torque is then controlled by means of stored values.

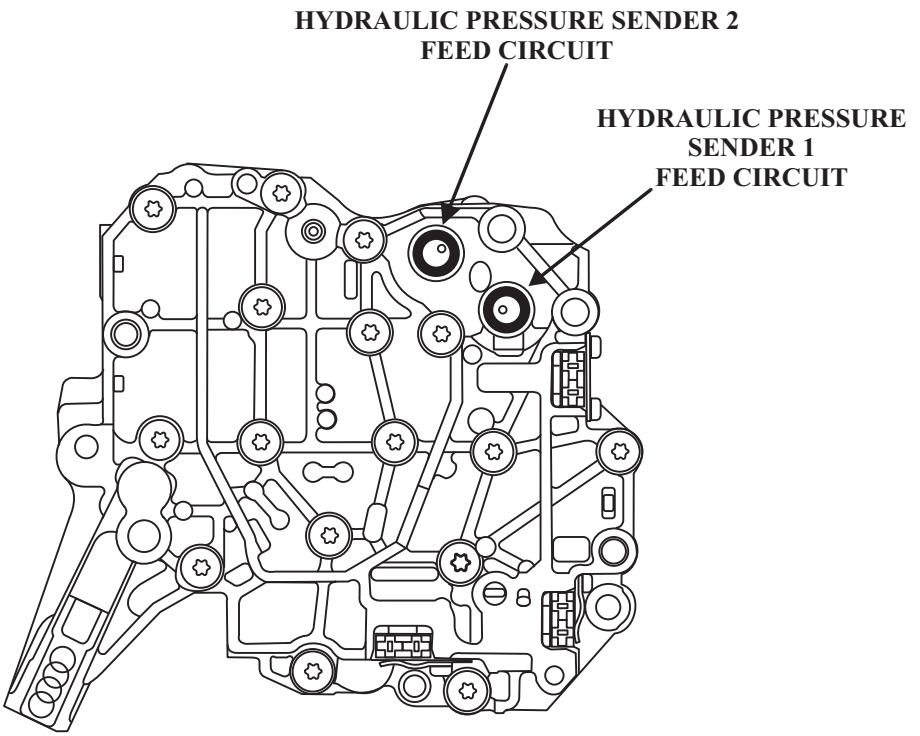


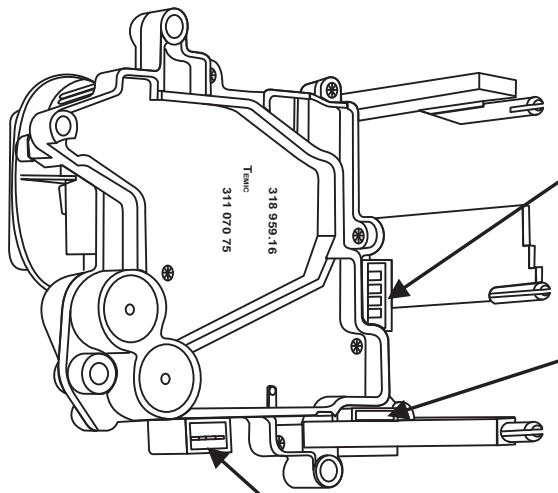
Figure 5

THE TRANSMISSION CONTROL MODULE J217
SOLENOIDS

The TCM calculates nominal clutch pressure from inputs such as Engine RPM, Transmission Input Speed, Accelerator Pedal Position, Engine Torque, Brake Signal and Transmission Fluid Temp. From these parameters the TCM controls the current to ***Pressure Control Solenoid 1***.

Pressure Control Solenoid 2 influences the position of the Hydraulic Reduction Valve which controls the Variator (Pulley Pressure) for ratio changes.

The Shift Control Solenoid is used to control the cooling valve and the safety valve.



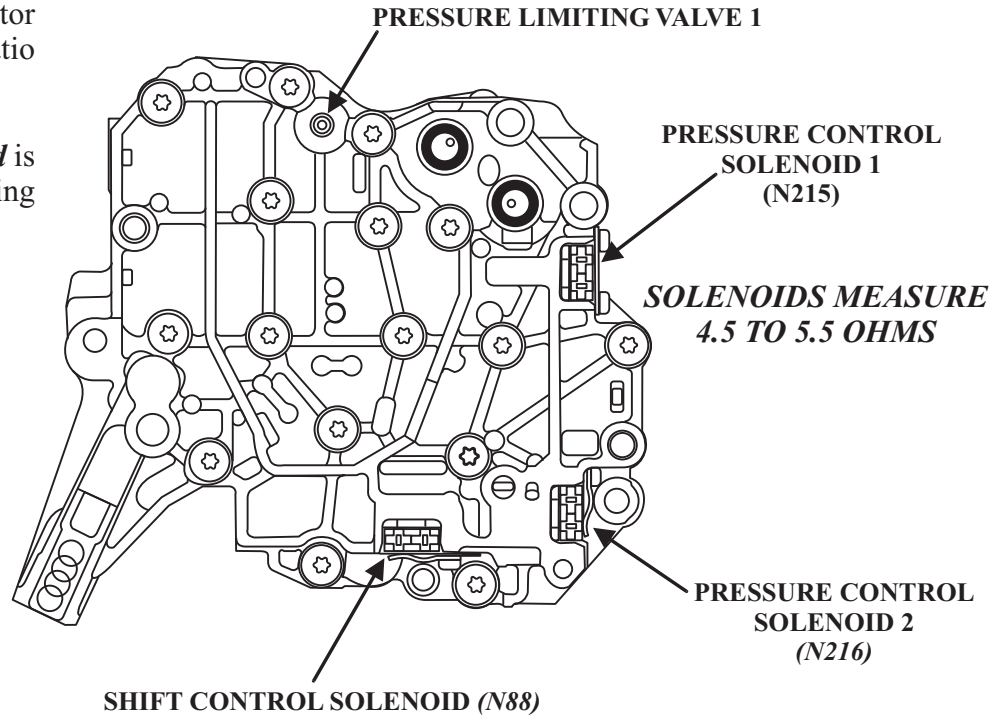


Figure 6

VALVE BODY VALVE IDENTIFICATION AND LOCATION

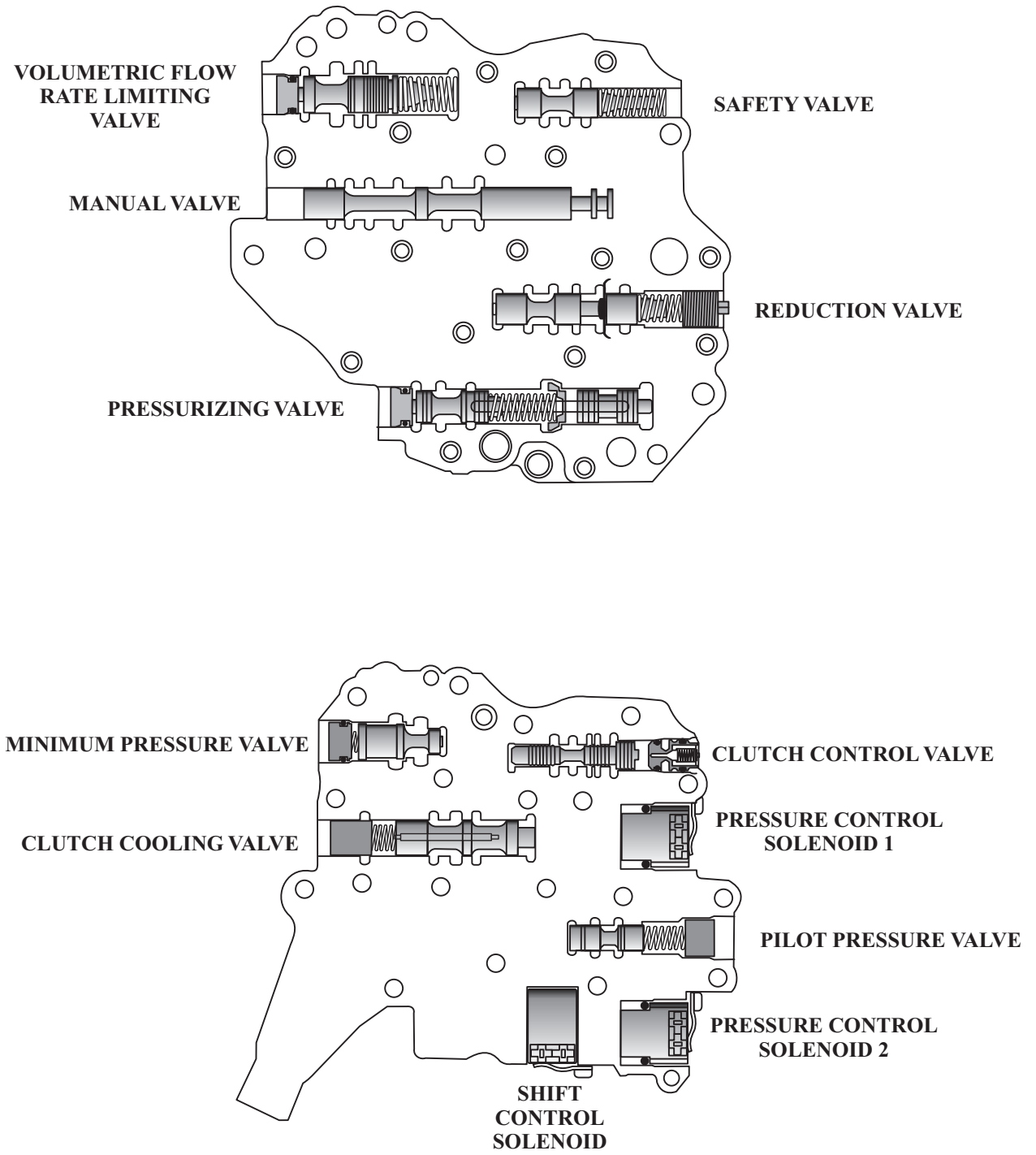
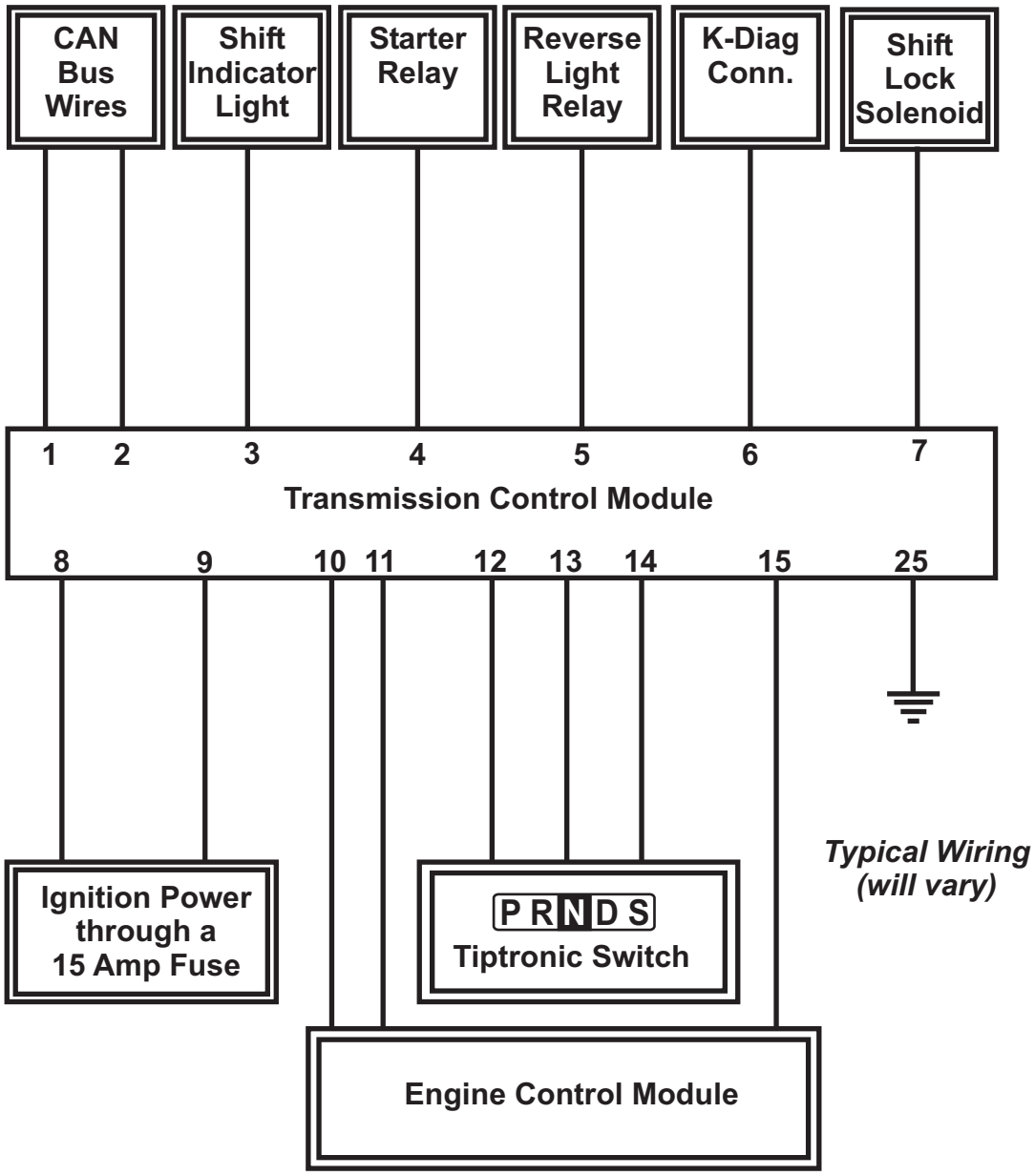


Figure 7

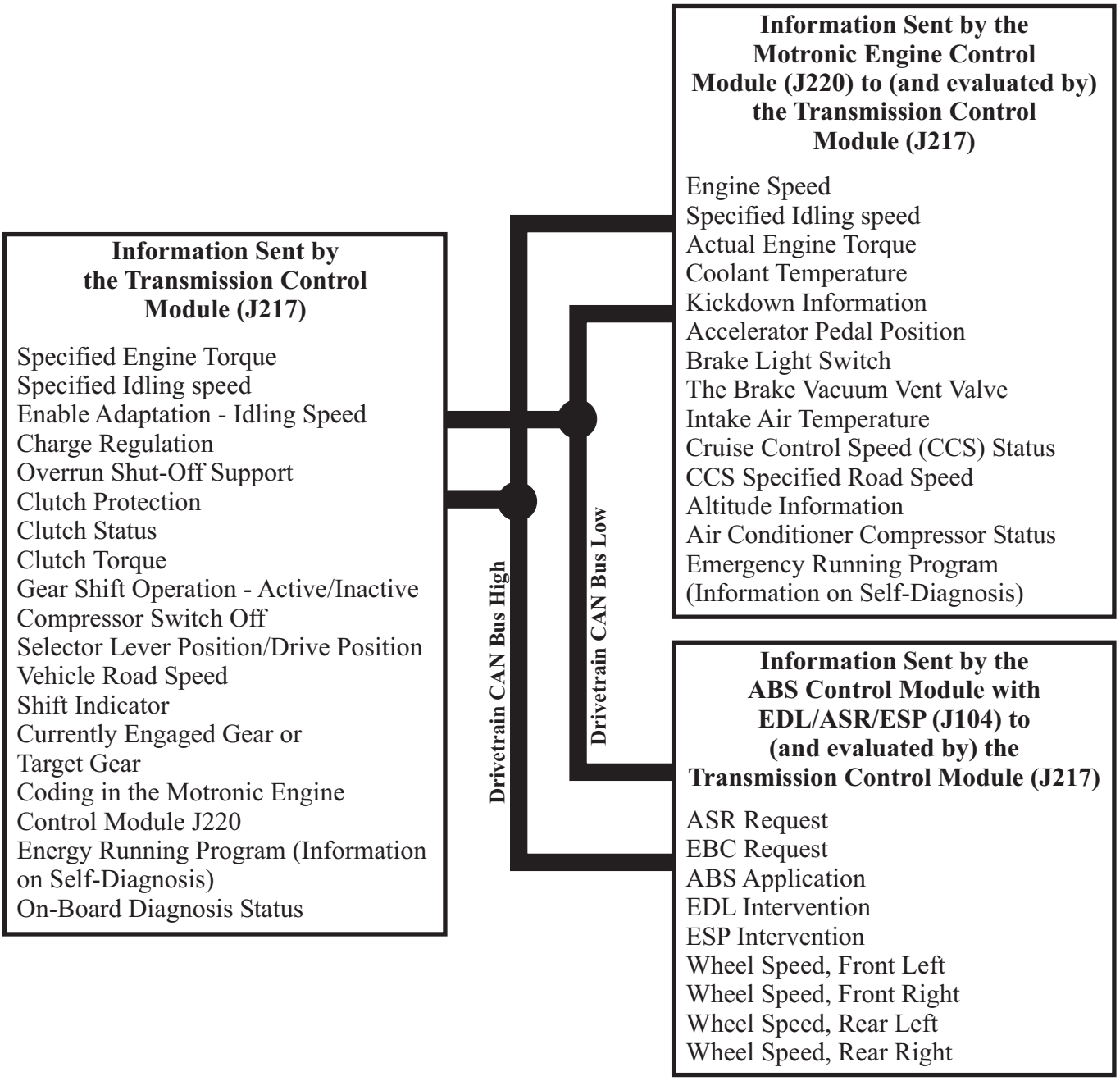
THE TRANSMISSION CONTROL MODULE J217
EXTERNAL CIRCUITS & COMPONENTS



Power and ground are supplied through the vehicle harness that plugs into its 25 pin connector. The TCM operates several external relays through this harness as well as the Shift Lock Solenoid. It has dedicated lines to send a road speed signal and receive an engine speed signal. It also interfaces with other computers on the CAN network.

Figure 8

CONTROLLER AREA NETWORK (CAN) INTERFACE



The Transmission Control Module (J217), sends and receives information over the Controller Area Network (CAN), to the Motronic® Engine Control Module (J220) and to the ABS Control Module (J104) for evaluation.

The ECM and ABS modules are the only modules the TCM interfaces with over the network. Signals that travel between these three (3) modules are Engine Speed Signal, Shift Indicator Signal, Road Speed Signal, Diagnosis and programming interface, Tiptronic Recognition Signal, Tiptronic Downshift Signal and Tiptronic Upshift Signal.

Figure 9

FAULT INDICATION

The fault is stored and a substitute program enables continued operation of the vehicle with some restrictions. The fault is not indicated to the driver, since it is not critical with regard to safe operation of the vehicle. However, the vehicle will not operate properly.

CATEGORY 1 - CODES STORED; NO DISPLAY CHANGE

The fault is stored and a substitute program enables continued operation of the vehicle with some restrictions. The Selector Lever Position Indicator also indicates the presence of a fault by ***inverting the display.*** The situation is not critical for the safe operation of the vehicle, however, the vehicle will not operate properly.

CATEGORY 2 - CODES STORED; DISPLAY INVERTED

The fault is stored and a substitute program enables continued operation of the vehicle with some restrictions, at least until it stops. The Selector Lever Indicator Lever indicates the presence of a fault by ***flashing***. This state is critical with regard to safe vehicle operation. Therefore, driving the vehicle is not recommended.

CATEGORY 3 - CODES STORED; DISPLAY INVERTED AND FLASHING

When the Multitronic® system detects a fault, the selector lever position indicator in the instrument cluster will inform the driver in one of three ways, depending on the type of fault. In some cases when the display is flashing, vehicle operation will only be maintained until the next time the vehicle stops. The vehicle can no longer be driven. In other cases, vehicle operation can be resumed by restarting the vehicle.

Figure 10

MULTITRONIC® 01J SPECIFICATIONS

Designation:	multitronic® 01J
Factory designation:	VL 30
Code:	DZN
Maximum Transferable Torque:	Maximum 229 lbs-ft (310 Nm)
Range of Ratios of the Variator:	2:40:1 to 0.40:1
Spread:	6
Ratio of Auxiliary Reduction Gear Step:	51/46 = 1.109:1
Final Drive Ratio:	43/9 = 4.778:1
Operating Pressure of Oil Pump:	MAXIMUM approximately 870 PSI (6000kPa)
ATF for multitronic®:	G 052 180 A2
Axle Oil for multitronic®:	G 052 190 A2
Fluid Quantities:	
ATF new filling:	7.9 quarts (7.5 liters)
ATF change:	4.8 quarts (4.5 liters)
Axle Oil:	1.4 quarts (1.3 liters)
Gross Weight (without flywheel):	194 lbs (88 kg)
Overall Length:	24” (610mm)

Figure 11