DIAGNOSTIC INFORMATION AND PROCEDURES

DTC C1201

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC C1201

Transmission Range Redundant Command Message Counter Incorrect

Circuit/System Description

Control modules connected to the serial data circuits monitor the communication during normal vehicle operation. Operating information and commands are exchanged among the control modules. Each module on the serial data circuit maintains a transmit error counter and a receive error counter. The counter values increase with detected errors and decrease with error-free messages.

Conditions for Running the DTC

- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Serial Data = Message Counter Incorrect - Between the following control modules:

- K38 Chassis Control Module
- K71 Transmission Control Module

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

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Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Verify there are no DTCs set related to the following component/system: Serial Data
    - **If a related DTC is set**

      Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**

    - **If a related DTC is not set**

    1. Ignition/Vehicle - Off
    2. Replace the component: K71 Transmission Control Module
    3. Operate the vehicle within the Conditions for Running the DTC.
    4. Verify the DTC does not set.
        - If the DTC sets - Replace the component: K38 Chassis Control Module
        - Go to next step: If the DTC is not set
    5. All OK.

    - **Go to next step: If no DTC is set**
3. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

For control module replacement, programming, and setup refer to **Control Module References**

DTC P0601-P0604, P0606, P0607, P060A, P062F, P16F3, OR P16FB

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P0601

Control Module Read Only Memory Performance

DTC P0602

Control Module Not Programmed

DTC P0603

Control Module Long Term Memory Reset

DTC P0604

Control Module Random Access Memory Performance

DTC P0606

Control Module Processor Performance

DTC P0607

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Control Module Performance

DTC P062F

Control Module Long Term Memory Performance

DTC P16F3

Control Module Redundant Memory Performance

DTC P16FB

Control Module Vehicle Speed System Circuitry Performance

Circuit/System Description

For an overview of the component/system, refer to **Electronic Component Description**

This diagnostic applies to microprocessor integrity conditions within the control module. This diagnostic also checks if the control module is not programmed, or is programmed incorrectly.

Conditions for Running the DTC

- DTC P0601, P0602, P0603, P0604, P0606, P062F, P16F3, P16FB = Not set
- Battery Voltage = Greater than 11 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Control Module = Internal Malfunction or Not Programmed

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled - If equipped
- Default shift pattern = Disabled
- Grade braking = Disabled
- High Side Driver 1, 2 = Off
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Torque Management = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- {P16FB} Transmission gear allowed = Reverse or Gear 7

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

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Schematic Reference

Automatic Transmission Controls Wiring Schematics

Connector End View Reference

Master Electrical Component List , or **Component Connector End Views - Index**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Verify DTC P0602 is not set.
   - **If the DTC is set**
   1. Perform all necessary programming and setup procedures for the control module: K71 Transmission Control Module
   2. Verify the DTC does not set.
      - If the DTC sets - Replace the component: K71 Transmission Control Module
      - Go to next step: If the DTC does not set
   3. All OK.
   - **Go to next step: If the DTC is not set**
3. Ignition/Vehicle & All vehicle systems - Off
4. Disconnect the electrical connector: K71 Transmission Control Module
5. Verify a condition does not exist with the component: K71 Transmission Control Module @ Wiring Harness Connector - Defective/Loose/Poor Connection/Visible Damage
   - **If a condition exists**

     Repair or replace as necessary

   - **Go to next step: If no condition exists**
6. Connect the electrical connector: K71 Transmission Control Module
7. Ignition - On / Vehicle - In Service Mode
8. Clear the DTCs.
9. Ignition/Vehicle & All vehicle systems - Off
10. Ignition - On / Vehicle - In Service Mode
11. Verify DTC P0601, P0603, P0604, P0606, P0607, P062F, P16F3, P16FB is not set.
    - **If any DTC is set**

      Replace the component: K71 Transmission Control Module

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- **Go to next step: If none of the DTCs are set**

12. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- For control module replacement, programming, and setup refer to **Control Module References**

DTC P0658, P0659, P2812, P2814, P2815, P281B, P281D, OR P281E

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P0658

High Side Driver Control Circuit Low

DTC P0659

High Side Driver Control Circuit High

DTC P2812

Transmission Control Solenoid Valve 7 Control Circuit Open

DTC P2814

Transmission Control Solenoid Valve 7 Control Circuit Low

DTC P2815

Transmission Control Solenoid Valve 7 Control Circuit High

DTC P281B

Transmission Control Solenoid Valve 8 Control Circuit Open

DTC P281D

Transmission Control Solenoid Valve 8 Control Circuit Low

DTC P281E

Transmission Control Solenoid Valve 8 Control Circuit High

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 11	1	P0658	P0659	-
Control - Terminal 24	P2814	P2812	P2815	-
Control - Terminal 25	P281D	P281B	P281E	-

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Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
1. Lost Communication with Transmission Control Module				

Typical Scan Tool Data

Transmission Control Solenoid Valve 7, 8 Control Circuit High Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Not Run or Okay			
Control - Terminal 11	Not Run or Okay	Not Run or Okay	Malfunction
Control - Terminal 24, 25	Not Run or Okay	Not Run or Okay	Malfunction

Transmission Control Solenoid Valve 7, 8 Control Circuit Low Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Not Run or Okay			
Control - Terminal 11	Malfunction	Malfunction	Not Run or Okay
Control - Terminal 24, 25	Malfunction	Malfunction	Not Run or Okay

Transmission Control Solenoid Valve 7, 8 Control Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Not Run or Okay			
Control - Terminal 11	Malfunction	Malfunction	Not Run or Okay
Control - Terminal 24, 25	Malfunction	Malfunction	Not Run or Okay

Circuit/System Description

For an overview of the component/system, refer to **Electronic Component Description**

Circuit	Description
Control - Terminal 11	The output circuit is switched to 12 V to activate the component.
Control - Terminal 24, 25	The output circuit is switched to ground to activate the component. The output is PWM controlled.

Component	Description
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.
Q77 Transmission Control Solenoid Valve	A linear solenoid actuator is an electro-mechanical device that converts electrical power into a mechanical pushing or pulling force or motion. • The solenoid actuator varies the force depending on the current applied to the solenoid coil. • The solenoid actuator applies minimum force with minimum current applied to the solenoid coil.

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Component	Description
	• The solenoid actuator applies maximum force with maximum current applied to the solenoid coil.

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

Control Circuit = Commanded state does not match the actual state - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- {P0658, P2812, P2814, P2815, P281D} Autostart/Autostop = Disabled
- {P0658, P2814, P281D} Neutral Idle Mode = Disabled
- {P0658, P2814, P281B, P281E} TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- {P0658, P2814}
  - Grade braking = Disabled
  - High Side Driver Command = Disabled
  - Manual Shift Control = Disabled
  - Powertrain braking = Disabled
  - Tap Up & Tap Down = Disabled

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics

Connector End View Reference

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- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

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Scan Tool Reference

Control Module References

Circuit/System Verification

1. Engine - Running
2. Verify the scan tool parameter:
   - High Side Driver Circuit High Test Status = Not Run or Okay
   - High Side Driver Circuit Low Test Status = Not Run or Okay
   - High Side Driver Circuit Open Test Status = Not Run or Okay
   - Transmission Control Solenoid Valve 7, 8 Control Circuit High Test Status = Not Run or Okay
   - Transmission Control Solenoid Valve 7, 8 Control Circuit Low Test Status = Not Run or Okay
   - Transmission Control Solenoid Valve 7, 8 Control Circuit Open Test Status = Not Run or Okay
   - **If not the specified state**

     Refer to: Circuit/System Testing

   - **Go to next step: If the specified state**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

   Verify the DTC does not set.

   - **If the DTC sets**

     Refer to: Circuit/System Testing

   - **Go to next step: If the DTC is not set**
4. All OK.

Circuit/System Testing

1. Ignition/Vehicle - Off

   NOTE: **When the following connector is disconnected, the ignition cannot be turned off due to lack of a valid park input to the TCM. If the ignition needs to be turned off, the connector will need to be reconnected.**

2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission
3. Connect a test lamp between the test points: Control circuit terminal 11 @ Component harness & Ground
4. Ignition - On / Vehicle - In Service Mode

   NOTE: **If unable to perform the scan tool control function due to Device Limits Exceeded and/or DTC Present, jumper the component B14A circuits between the component T12 connector and the X1 harness connector.**

   - **Connect a 3 A fused jumper wire between the test points: 9 V Reference circuit terminal 7 X1 (harness side) & 9 V Reference circuit terminal 7 X1 (component side)**
   - **Connect a 3 A fused jumper wire between the test points: Signal circuit terminal 4 X1 (harness side) & Signal circuit terminal 4 X1 (component side)**

5. Perform the scan tool control function: High Side Driver Command - On and Off

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Verify the test lamp turns On and Off.

- **If the test lamp is always Off**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: K71 Transmission Control Module
3. Test for infinite resistance between the test points: Control circuit terminal 11 @ Component harness & Ground
    - If less than infinite resistance - Repair the short to ground on the circuit.
    - Go to next step: If infinite resistance
4. Test for less than 2 ohms between the test points: Control circuit terminal 11 @ Component harness & The other end of the circuit
    - If 2 ohms or greater - Repair the open/high resistance in the circuit.
    - If less than 2 ohms - Replace the component: K71 Transmission Control Module

- **If the test lamp is always On**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: K71 Transmission Control Module
3. Ignition - On / Vehicle - In Service Mode
4. Test for less than 1 V between the test points: Control circuit terminal 11 @ Component harness & Ground
    - If 1 V or greater - Repair the short to voltage on the circuit.
    - If less than 1 V - Replace the component: K71 Transmission Control Module

- **Go to next step: If the test lamp turns On and Off**

6. Verify DTC P0658, P0659 is not set.
    - **If the DTC is set**

      Refer to step 9

    - **Go to next step: If the DTC is not set**
7. Connect a test lamp between the test points:
    - {P2812, P2814, P2815} Control circuit terminal 24 @ Component harness & Control circuit terminal 11 @ Component harness
    - {P281B, P281D, P281E} Control circuit terminal 25 @ Component harness & Control circuit terminal 11 @ Component harness
8. Perform the scan tool control function: Transmission Control Solenoid Valve 7, 8 - On and Off

Verify the test lamp turns On and changes brightness.

- **If the test lamp is always Off**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: K71 Transmission Control Module
3. Test for less than 2 ohms between the test points:
    - {P2812, P2814, P2815} Control circuit terminal 24 @ Component harness & The other end of the circuit
    - {P281B, P281D, P281E} Control circuit terminal 25 @ Component harness & The other end of the circuit
    - If 2 ohms or greater - Repair the open/high resistance in the circuit.
    - Go to next step: If less than 2 ohms
4. Ignition - On / Vehicle - In Service Mode
5. Test for less than 1 V between the test points:

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- {P2812, P2814, P2815} Control circuit terminal 24 @ Component harness & Ground
- {P281B, P281D, P281E} Control circuit terminal 25 @ Component harness & Ground
- If 1 V or greater - Repair the short to voltage on the circuit.
- If less than 1 V - Replace the component: K71 Transmission Control Module

- **If the test lamp is always On**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: K71 Transmission Control Module
3. Test for infinite resistance between the test points:
    - {P2812, P2814, P2815} Control circuit terminal 24 @ Component harness & Ground
    - {P281B, P281D, P281E} Control circuit terminal 25 @ Component harness & Ground
    - If less than infinite resistance - Repair the short to ground on the circuit.
    - If infinite resistance - Replace the component: K71 Transmission Control Module

- **Go to next step: If the test lamp turns On and changes brightness**

9. Connect the electrical connector: X1 @ T12 Automatic Transmission
10. Remove the component:
    - Transmission Fluid Pan
    - G5 Automatic Transmission Auxiliary Fluid Pump
11. Disconnect the electrical connector: X176
12. Connect a test lamp between the test points:
    - {P0658, P0659} Control circuit terminal 4 @ Component harness & Ground
    - {P2812, P2814, P2815} Control circuit terminal 2 @ Component harness & Control circuit terminal 4 @ Component harness
    - {P281B, P281D, P281E} Control circuit terminal 3 @ Component harness & Control circuit terminal 4 @ Component harness
13. Perform the scan tool control function:
    - {P0658, P0659} High Side Driver - On and Off
    - {P2812, P2814, P2815, P281B, P281D, P281E} Transmission Control Solenoid Valve 7, 8 - On and Off
        - Verify the test lamp turns On and changes brightness.
    - **If the test lamp is always Off**

      Replace the component: Automatic Transmission Wiring Harness - (Pass-Thru)

    - **Go to next step: If the test lamp turns On and changes brightness**
14. Connect the electrical connector: X176
15. Disconnect the electrical connector: X177
16. Connect a test lamp between the test points:
    - {P0658, P0659} Control circuit terminal 1 @ Component harness & Ground
    - {P2812, P2814, P2815} Control circuit terminal 2 @ Component harness & Control circuit terminal 1 @ Component harness
    - {P281B, P281D, P281E} Control circuit terminal 3 @ Component harness & Control circuit terminal 1 @ Component harness
17. Perform the scan tool control function:
    - {P0658, P0659} High Side Driver - On and Off
    - {P2812, P2814, P2815, P281B, P281D, P281E} Transmission Control Solenoid Valve 7, 8 - On and Off
        - Verify the test lamp turns On and changes brightness.

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- **If the test lamp is always Off**

  Replace the component: Automatic Transmission Wiring Harness - (Main/Solenoid)

- **Go to next step: If the test lamp turns On and changes brightness**

18. Connect the electrical connector: X177
19. Disconnect the appropriate electrical connector: Q77 Transmission Control Solenoid Valve
20. Connect a test lamp between the test points: Control circuit terminal 2 @ Component harness & Control circuit terminal 1 @ Component harness
21. Perform the scan tool control function: Transmission Control Solenoid Valve 7, 8 - On and Off

    Verify the test lamp turns On and changes brightness.

    - **If the test lamp is always Off**

      Replace the component: Automatic Transmission Wiring Harness - (Jumper)

    - **Go to next step: If the test lamp turns On and changes brightness**
22. Test or replace the component: Q77 Transmission Control Solenoid Valve

Component Testing

1. Remove the component:
   - Transmission Fluid Pan
   - Control Valve Body
2. Disconnect the appropriate electrical connector: Q77 Transmission Control Solenoid Valve

   NOTE: **The component's temperature should be 19 to 21B°C (66 to 70B°F) while testing.**

3. Test for 5.0 to 5.4 ohms between the test points: Terminal 1 @ Q77 Transmission Control Solenoid Valve & Terminal 2 @ Q77 Transmission Control Solenoid Valve
   - **If not between 5.0 and 5.4 ohms**

     Replace the appropriate component: Q77 Transmission Control Solenoid Valve

   - **Go to next step: If between 5.0 and 5.4 ohms**
4. Test for infinite resistance between the test points: Terminal 1 @ Q77 Transmission Control Solenoid Valve & The component's housing
   - **If less than infinite resistance**

     Replace the component: Q77 Transmission Control Solenoid Valve

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Q77 Transmission Control Solenoid Valve Characterization Programming (10L60)**
- **Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement**
- **Automatic Transmission Wiring Harness Replacement**
- **Control Valve Body Replacement** - Q77 Transmission Control Solenoid Valve
- **Transmission Service Fast Learn Procedure**
- For control module replacement, programming, and setup refer to **Control Module References**

DTC P06AF

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Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P06AF

Torque Management System Performance - Forced Engine Shutdown

Circuit/System Description

For an overview of the component/system, refer to **Electronic Component Description**

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Conditions for Setting the DTC

Invalid Data Received From Engine Control Module

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Connector End View Reference

Master Electrical Component List , or **Component Connector End Views - Index**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode

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2. Verify DTC P06AF is not set.
    - **If the DTC is set**

      Replace the component: K20 Engine Control Module

    - **Go to next step: If the DTC is not set**
3. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

For control module replacement, programming, and setup refer to **Control Module References**

DTC P0711-P0713

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P0711

Transmission Fluid Temperature Sensor Performance

DTC P0712

Transmission Fluid Temperature Sensor Circuit Low

DTC P0713

Transmission Fluid Temperature Sensor Circuit High

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	P0712	P0713	P0713*	P0711
Low Reference	-	P0713	P0713*	P0711
*Internal control module or component damage may occur if the circuit shorts to B+.				

Typical Scan Tool Data

Transmission Fluid Temperature

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** 35 to 100B°C (95 to 212B°F)			
Signal	150B°C (302B°F)	-40B°C (-40B°F)	-40B°C (-40B°F)
Low Reference	-	-40B°C (-40B°F)	-40B°C (-40B°F)

Circuit/System Description

For an overview of the component/system, refer to **Electronic Component Description**

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Circuit	Description
Signal	The control module input circuit has an internal resistance connected to 5 V.
Low Reference	Grounded through the control module.

Component	Description
B13 Automatic Transmission Fluid Temperature Sensor	The temperature sensor is a negative temperature coefficient thermistor, a resistor which changes based on temperature. • Low temperature produces a high resistance: 46 kohms @ -40B°C (-40B°F) • High temperature produces a low resistance: 60 ohms @ 150B°C (302B°F)
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.

The sensor is an input to the control module K71. The input signal is used to determine the temperature of the fluid: Transmission

Conditions for Running the DTC

P0711 Condition 1

- DTC P0712, P0713, P2818 = Not set
- DTCs related to the following system/component = Not Set
  - B14A Automatic Transmission Output Speed Sensor
  - B26 Crankshaft Position Sensor
  - B34 Engine Coolant Temperature Sensor
  - B74 Manifold Absolute Pressure Sensor
  - B75 Mass Airflow Sensor
  - B107 Accelerator Pedal Position Sensor
  - Q17 Fuel Injector
  - Engine Misfire
  - Fuel Trim System
- Accelerator Pedal Position Sensor = Greater than 4%
- Battery Voltage = Greater than 9 V
- Engine Coolant Temperature = -40 to 150B°C (-40 to 302B°F)
- Engine Speed = Greater than 500 RPM
- Engine Torque = Greater than 50 Nm (37 lb ft)
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Transmission Fluid Temperature = -40 to 150B°C (-40 to 302B°F)
- Vehicle Speed = Greater than 10 km/h (7 MPH)

Frequency the DTC runs = Continuously - After the running conditions are met

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P0711 Condition 2, 3 & P0712, P0713

- Battery Voltage = Greater than 9 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- {P0711 Condition 3} Transmission Fluid Temperature = -40 to 150B°C (-40 to 302B°F)

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P0711

Transmission Fluid Temperature = The temperature does not change within a predetermined time.

P0712

Transmission Fluid Temperature = Warmer than 149B°C (300B°F) - For greater than 1 s

P0713

Transmission Fluid Temperature = Colder than -39B°C (-38B°F) - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

Transmission Adaptive Values Learn = Disabled

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Diagnostic Aids

The following parameters should be within 8B°C (14B°F) of each other if the ignition has been Off for greater than 8 h:

- Ambient Air Temperature
- Engine Coolant Temperature
- Transmission Fluid Temperature

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics

Connector End View Reference

Master Electrical Component List , or **Component Connector End Views - Index**

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- **Wiring Repairs**

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DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Verify the scan tool parameter: Transmission Fluid Temperature = -39 to 149B°C (-38 to 300B°F)
   - **If not between -39 and 149B°C (-38 and 300B°F)**

     Refer to: Circuit/System Testing

   - **Go to next step: If between -39 and 149B°C (-38 and 300B°F)**
3. Verify DTC P0711 is not set.
   - **If the DTC is set**
   1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to **Transmission Fluid Level and Condition Check**
      - If a condition exists - Repair or replace as necessary
      - Go to next step: If no condition exists
   2. Operate the cold vehicle above 64 km/h (40 MPH) for 10 min.

      Verify the scan tool parameter: Transmission Fluid Temperature = Temperature increases greater than 15B°C (27B°F)

      - If the temperature does not increase 15B°C (27B°F) or greater - Refer to: Circuit/System Testing
      - Go to next step: If the temperature increases greater than 15B°C (27B°F)
   3. All OK.
   - **Go to next step: If the DTC is not set**
4. Verify the scan tool parameter: Transmission Fluid Temperature = The value should not spike or drop out.

   Perform the action while monitoring the parameter:

   - Wiggle the harness and connector: X1 @ T12 Automatic Transmission
   - Wiggle the harness and connector: K71 Transmission Control Module
   - **If the value spikes or drops out**

     Repair as necessary - Wiring / Terminal(s) / Electrical Connector(s)

   - **Go to next step: If the value does not spike or drop out**
5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

   Verify the DTC does not set.

   - **If the DTC sets**

     Refer to: Circuit/System Testing

   - **Go to next step: If the DTC is not set**
6. All OK.

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Circuit/System Testing

NOTE: **It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.**

1. Ignition/Vehicle & All vehicle systems - Off

NOTE: **When the following connector is disconnected, the ignition cannot be turned off due to lack of a valid park input to the TCM. If the ignition needs to be turned off, the connector will need to be reconnected.**

2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission

NOTE: **Testing for steps 3 to 7 is performed on the control module K71 side of the harness connector.**

3. Test for less than 10 ohms between the test points: Low Reference circuit terminal 26 & Ground
   - **If 10 ohms or greater**
   1. Disconnect the electrical connector: K71 Transmission Control Module
   2. Test for less than 2 ohms between the test points: Low Reference circuit terminal 26 @ Component harness & The other end of the circuit @ Control module harness
      - If 2 ohms or greater - Repair the open/high resistance in the circuit.
      - If less than 2 ohms - Replace the component: K71 Transmission Control Module
   - **Go to next step: If less than 10 ohms**
4. Ignition - On / Vehicle - In Service Mode
5. Verify the scan tool parameter: Transmission Fluid Temperature = Colder than -39B°C (-38B°F)
   - **If -39B°C (-38B°F) or warmer**
   1. Ignition/Vehicle - Off
   2. Disconnect the electrical connector: K71 Transmission Control Module
   3. Test for infinite resistance between the test points: Signal circuit terminal 13 @ Component harness & Ground
      - If less than infinite resistance - Repair the short to ground on the circuit.
      - If infinite resistance - Replace the component: K71 Transmission Control Module
   - **Go to next step: If colder than -39B°C (-38B°F)**
6. Connect a 3 A fused jumper wire between the test points: Signal circuit terminal 13 & Low Reference circuit terminal 26
7. Verify the scan tool parameter: Transmission Fluid Temperature = Warmer than 149B°C (300B°F)
   - **If 149B°C (300B°F) or colder**
   1. Ignition/Vehicle - Off & Remove - Jumper wire(s)
   2. Disconnect the electrical connector: K71 Transmission Control Module
   3. Ignition - On / Vehicle - In Service Mode
   4. Test for less than 1 V between the test points: Signal circuit terminal 13 @ Component harness & Ground
      - If 1 V or greater - Repair the short to voltage on the circuit.
      - Go to next step: If less than 1 V
   5. Ignition/Vehicle - Off
   6. Test for less than 2 ohms between the test points: Signal circuit terminal 13 @ Component harness & The other end of the circuit @ Control module harness
      - If 2 ohms or greater - Repair the open/high resistance in the circuit.
      - If less than 2 ohms - Replace the component: K71 Transmission Control Module

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- **Go to next step: If warmer than 149B°C (300B°F)**

8. Ignition/Vehicle - Off
9. Connect the electrical connector: X1 @ T12 Automatic Transmission
10. Remove the component: Automatic Transmission Fluid Pan
11. Disconnect the electrical connector: X176
12. Ignition - On / Vehicle - In Service Mode

NOTE: **Testing for steps 13 to 17 is performed on the control module K71 side of the harness connector.**

13. Test for 4.8 to 5.2 V between the test points: Signal circuit terminal 14 & Low Reference terminal 13
    - **If not between 4.8 and 5.2 V**

      Replace the appropriate component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 4.8 and 5.2 V**
14. Remove the component: Control Valve Assembly
15. Connect the electrical connector: X176
16. Disconnect the electrical connector: B13 Automatic Transmission Fluid Temperature Sensor
17. Test for 4.8 to 5.2 V between the test points: Signal circuit terminal 2 & Low Reference circuit terminal 1
    - **If not between 4.8 and 5.2 V**

      Replace the appropriate component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 4.8 and 5.2 V**
18. Test or replace the component: B13 Automatic Transmission Fluid Temperature Sensor

Component Testing

1. Ignition/Vehicle - Off
2. Remove the component: Automatic Transmission Fluid Pan
3. Remove the component: Control Valve Assembly
4. Disconnect the electrical connector: B13 Automatic Transmission Fluid Temperature Sensor
5. Test for 20 to 200, 000 ohms between the test points: Signal terminal 2 & Low Reference terminal 1
    - **If not between 20 and 200, 000 ohms**

      Replace the component: B13 Automatic Transmission Fluid Temperature Sensor

    - **Go to next step: If between 20 and 200, 000 ohms**
6. Verify the value is within the range listed in the table: **Temperature Versus Resistance - B13 Automatic Transmission Fluid Temperature Sensor**
    - **If not in the specified range**

      Replace the component: B13 Automatic Transmission Fluid Temperature Sensor

    - **Go to next step: If in the specified range**
7. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement**

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- **Automatic Transmission Wiring Harness Replacement**
- **Control Valve Assembly and Transmission Wiring Harness Removal**
- **Control Valve Assembly Disassemble** , / **Control Valve Assembly Assemble** - B13 Automatic Transmission Fluid Temperature Sensor
- **Transmission Service Fast Learn Procedure**
- For control module replacement, programming, and setup refer to **Control Module References**

DTC P0716, P0717, P07BF, P07C0, P1783, OR P17CE

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P0716

Input Shaft Speed Sensor Performance

DTC P0717

Input Shaft Speed Sensor Circuit No Signal

DTC P07BF

Input Shaft Speed Sensor Circuit Low

DTC P07C0

Input Shaft Speed Sensor Circuit High

DTC P1783

Input Shaft Speed Sensor Direction Not Plausible - Forward

DTC P17CE

Input Shaft Speed Sensor Direction Not Plausible

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Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P07BF**	P07BF**	P07C0	P0716, P0717
Signal	P07BF	P07BF	P07C0*	P0716, P0717, P1783, P17CE
*Internal control module or component damage may occur if the circuit shorts to B+. **Additional DTCs may set.				

Typical Scan Tool Data

Input Shaft Speed Sensor

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running			

Circuit	Short to Ground	Open	Short to Voltage
Parameter Normal Range: 500 to 7, 500 RPM			
Signal	0 RPM	0 RPM	0 RPM

Sensor Supply Circuit Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On **Parameter Normal Range:** Okay			
9 V Reference	Malfunction	Okay	Malfunction

Circuit/System Description

For an overview of the component/system, refer to **Electronic Component Description**

Circuit	Description
9 V Reference	Regulated voltage supplied by the control module.
Signal	The sensor produces a frequency modulated signal.

Component	Description
B14C Automatic Transmission Input Speed Sensor	The sensor contains a hall-effect sensor and additional electronics that processes the signal. It detects the change of strength of the magnetic field caused by the reluctor ring. When the strength changes, the sensor changes the amount of current it consumes. This results in a square wave signal of current and voltage. The control module detects the frequency in which the signal changes, which is proportional to the rotational speed.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.
Reluctor Ring	• The reluctor ring has 40 teeth, magnetic segments, or indentations. • The reluctor ring is part of the component: Input Shaft

The sensor is an input to the control module K71. The input signal is used to determine the rotational speed of the component: Input Shaft

Conditions for Running the DTC

P0716

- DTC P0717, P07BF, P07C0 = Not set
- DTCs related to the following system/component = Not Set
  - B74 Manifold Absolute Pressure Sensor
  - B75 Mass Airflow Sensor
  - B107 Accelerator Pedal Position Sensor
  - Q14 Exhaust Gas Recirculation Valve
  - Q17 Fuel Injector
  - Engine Misfire

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    - Fuel Trim System
- Accelerator Pedal Position Sensor = Greater than 4%
- Battery Voltage = Greater than 9 V
- Engine Torque = Greater than 30 Nm (22 lb ft)
- High Side Driver 1, 2 = On
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Output Shaft Speed Sensor = Greater than 239 RPM
- Transmission Service Fast Learn = Disabled

Frequency the DTC runs = Continuously - After the running conditions are met

P0717

- DTC P0716, P07BF, P07C0 = Not set
- DTCs related to the following system/component = Not Set
    - B14A Automatic Transmission Output Speed Sensor
    - B74 Manifold Absolute Pressure Sensor
    - B75 Mass Airflow Sensor
    - B107 Accelerator Pedal Position Sensor
    - Q14 Exhaust Gas Recirculation Valve
    - Q17 Fuel Injector
    - Engine Misfire
    - Fuel Trim System
- Accelerator Pedal Position Sensor = Greater than 4%
- Battery Voltage = Greater than 9 V
- Brake Pedal Position = Less than 70%
- Engine Torque = Greater than 30 Nm (22 lb ft)
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Output Shaft Speed Sensor = Greater than a predefined threshold
- Transmission Service Fast Learn = Disabled

Frequency the DTC runs = Continuously - After the running conditions are met

P07BF, P07C0

- {P07BF} DTC P07C0 = Not set
- {P07C0} DTC P07BF = Not set
- Battery Voltage = Greater than 10 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Transmission Service Fast Learn = Disabled

Frequency the DTC runs = Continuously - After the running conditions are met

P1783

- Battery Voltage = Greater than 9 V
- Engine Speed = Greater than 499 RPM

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- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Transmission Service Fast Learn = Disabled

Frequency the DTC runs = Continuously - After the running conditions are met

P17CE

- Battery Voltage = Greater than 9 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Input Shaft Speed Sensor = Greater than 224 RPM

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P0716

Input Speed Sensor = Decreases greater than 1999 RPM - For greater than 7.5 s

P0717

Input Speed Sensor = Less than 169 RPM - For greater than 4 s

P07BF

Input Speed Sensor = Less than 0.25 V/Short to Ground - For greater than 1 s

P07C0

Input Speed Sensor = Greater than 4.75 V/Short to Voltage - For greater than 1 s

P1783 Condition 1

Current Gear = Forward Gear & Input Shaft Speed Sensor Direction = Reverse - For greater than 2.5 s

Condition 2

Current Gear = Reverse Gear & Input Shaft Speed Sensor Direction = Forward - For greater than 2.5 s

P17CE

Input Speed Sensor Direction Signal = Not Plausible - For greater than 3.5 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled - If equipped
- Grade braking = Disabled
- Neutral Idle Mode = Disabled
- Manual Shift Control = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values

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- Transmission gear allowed = Reverse or Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics

Connector End View Reference

Master Electrical Component List , or **Component Connector End Views - Index**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Special Tools

EL-38522 Variable Signal Generator

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Verify the scan tool parameter: Sensor Supply Circuit Status = Okay
    - **If not the specified state**

      Refer to: Circuit/System Testing

    - **Go to next step: If the specified state**
3. Engine - Running
4. Transmission - Park
5. Verify the scan tool parameter: Input Shaft Speed Sensor = Engine Speed - The value should change smoothly and gradually as the engine speed is increased and decreased.
    - **If not the specified value**

      Refer to: Circuit/System Testing

    - **Go to next step: If the specified value**
6. Drive Wheels - Blocked
7. Parking Brake - Applied
8. Transmission - Reverse
9. Verify the scan tool parameter: Input Shaft Speed Sensor = 0 RPM

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- **If not the specified state**

  Refer to: Circuit/System Testing

- **Go to next step: If the specified state**

10. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

    Verify the DTC does not set.

    - **If the DTC sets**

      Refer to: Circuit/System Testing

    - **Go to next step: If the DTC is not set**

11. All OK.

Circuit/System Testing

1. Ignition/Vehicle & All vehicle systems - Off

   NOTE: **When the following connector is disconnected, the ignition cannot be turned off due to lack of a valid park input to the TCM. If the ignition needs to be turned off, the connector will need to be reconnected.**

2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission
3. Ignition - On / Vehicle - In Service Mode
4. Test for 8.3 to 9.6 V between the test points: 9 V Reference circuit terminal 8 & Ground
   - **If less than 8.3 V**
   1. Ignition/Vehicle - Off
   2. Disconnect the electrical connector: K71 Transmission Control Module
   3. Test for infinite resistance between the test points: 9 V Reference circuit terminal 8 @ Component harness & Ground
      - If less than infinite resistance - Repair the short to ground on the circuit.
      - Go to next step: If infinite resistance
   4. Test for less than 2 ohms between the test points: 9 V Reference circuit terminal 8 @ Component harness & Terminal 8 @ Control module harness
      - If 2 ohms or greater - Repair the open/high resistance in the circuit.
      - If less than 2 ohms - Replace the component: K71 Transmission Control Module
   - **If greater than 9.6 V**
   1. Ignition/Vehicle - Off
   2. Disconnect the electrical connector: K71 Transmission Control Module
   3. Ignition - On / Vehicle - In Service Mode
   4. Test for less than 1 V between the test points: 9 V Reference circuit terminal 8 @ Component harness & Ground
      - If 1 V or greater - Repair the short to voltage on the circuit.
      - If less than 1 V - Replace the component: K71 Transmission Control Module
   - **Go to next step: If between 8.3 and 9.6 V**
5. Ignition/Vehicle - Off
6. Install - EL-38522 Variable Signal Generator
   - Voltage - 5 V

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- Frequency - 5 kHz
- Duty Cycle - 10%
- Black lead @ Battery Negative Post
- Red lead @ Signal circuit terminal 1

7. Ignition - On / Vehicle - In Service Mode
8. Verify the scan tool parameter: Input Shaft Speed Sensor = 7, 400 to 7, 600 RPM
    - **If not between 7, 400 and 7, 600 RPM**
    1. Ignition/Vehicle - Off
    2. Disconnect the electrical connector: K71 Transmission Control Module
    3. Ignition - On / Vehicle - In Service Mode
    4. Test for less than 1 V between the test points: Signal circuit terminal 1 @ Component harness & Ground
        - If 1 V or greater - Repair the short to voltage on the circuit.
        - Go to next step: If less than 1 V
    5. Ignition/Vehicle - Off
    6. Test for infinite resistance between the test points: Signal circuit terminal 1 @ Component harness & Ground
        - If less than infinite resistance - Repair the short to ground on the circuit.
        - Go to next step: If infinite resistance
    7. Test for less than 2 ohms between the test points: Signal circuit terminal 1 @ Component harness & Terminal 12 @ Control module harness
        - If 2 ohms or greater - Repair the open/high resistance in the circuit.
        - If less than 2 ohms - Replace the component: K71 Transmission Control Module
    - **Go to next step: If between 7, 400 and 7, 600 RPM**
9. Verify the scan tool parameter: Input Speed Sensor Direction = Forward
    - **If not the specified state**

      Replace the component: K71 Transmission Control Module

    - **Go to next step: If the specified state**
10. Setup - EL-38522 Variable Signal Generator
    - Voltage - 5 V
    - Frequency - 600 Hz
    - Duty Cycle - 10%
    - Black lead @ Battery Negative Post
    - Red lead @ Signal circuit terminal 1
11. Verify the scan tool parameter: Input Speed Sensor Direction = Reverse
    - **If not the specified state**

      Replace the component: K71 Transmission Control Module

    - **Go to next step: If the specified state**
12. Remove - EL-38522 Variable Signal Generator
13. Connect the electrical connector. X1 @ T12 Automatic Transmission
14. Ignition/Vehicle - Off
15. Remove the component: Automatic Transmission Fluid Pan
16. Disconnect the electrical connector: B14C Automatic Transmission Input Speed Sensor
17. Ignition - On / Vehicle - In Service Mode

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18. Test for 8.3 to 9.6 V between the test points: 9 V Reference circuit terminal 2 & Ground
    - **If not between 8.3 and 9.6 V**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 8.3 and 9.6 V**
19. Ignition/Vehicle - Off
20. Install - EL-38522 Variable Signal Generator
    - Voltage - 5 V
    - Frequency - 5 kHz
    - Duty Cycle - 10%
    - Black lead @ Battery Negative Post
    - Red lead @ Signal circuit terminal 1
21. Ignition - On / Vehicle - In Service Mode
22. Verify the scan tool parameter: Input Shaft Speed Sensor = 7, 400 to 7, 600 RPM
    - **If not between 7, 400 and 7, 600 RPM**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 7, 400 and 7, 600 RPM**
23. Test or replace the component: B14C Automatic Transmission Input Speed Sensor

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Q77 Transmission Control Solenoid Valve Characterization Programming (10L60)**
- **Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement**
- **Automatic Transmission Turbine Speed Sensor Replacement** - B14C Automatic Transmission Input Speed Sensor
- **Automatic Transmission Wiring Harness Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P0721-P0723, P077C, P077D, P172A, OR P172B

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P0721

Output Shaft Speed Sensor Performance

DTC P0722

Output Shaft Speed Sensor Circuit No Signal

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DTC P0723

Output Shaft Speed Sensor Circuit Intermittent

DTC P077C

Output Shaft Speed Sensor Circuit Low

DTC P077D

Output Shaft Speed Sensor Circuit High

DTC P172A

Output Shaft Speed Sensor Direction Not Plausible - Forward

DTC P172B

Output Shaft Speed Sensor Direction Not Plausible - Reverse

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P077C**	P077C**	P077D	P0721, P0722, P0723, P172A, P172B
Signal	P077C	P077C	P077D*	P0721, P0722, P0723, P172A, P172B
*Internal control module or component damage may occur if the circuit shorts to B+. **Additional DTCs may set.				

Typical Scan Tool Data

Output Shaft Speed Sensor

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** 500 to 7, 500 RPM			
Signal	0 RPM	0 RPM	0 RPM

Sensor Supply Circuit Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On **Parameter Normal Range:** Okay			
9 V Reference	Malfunction	Okay	Malfunction

Circuit/System Description

For an overview of the component/system, refer to **Electronic Component Description**

Circuit	Description
9 V Reference	Regulated voltage supplied by the control module.
Signal	The sensor produces a frequency modulated signal.

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Component	Description
B14A Automatic Transmission Output Speed Sensor	The sensor contains a hall-effect sensor and additional electronics that processes the signal. It detects the change of strength of the magnetic field caused by the reluctor ring. When the strength changes, the sensor changes the amount of current it consumes. This results in a square wave signal of current and voltage. The control module detects the frequency in which the signal changes, which is proportional to the rotational speed.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.
Reluctor Ring	• The reluctor ring has 68 teeth, magnetic segments, or indentations. • The reluctor ring is part of the component: Output Shaft Assembly

The sensor is an input to the control module K71. The input signal is used to determine the rotational speed of the component: Output Shaft Assembly

Conditions for Running the DTC

P0721, P172A, P172B

- {P077C, P077D} Engine Speed = Greater than 499 RPM
- Battery Voltage = Greater than 9 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- {P077C, P077D} Transmission Service Fast Learn = Disabled

Frequency the DTC runs = Continuously - After the running conditions are met

P0722, P0723

- {P0722} DTC P0723, P077C, P077D = Not set
- DTCs related to the following system/component = Not Set
  - B14A Automatic Transmission Output Speed Sensor
  - B74 Manifold Absolute Pressure Sensor
  - B75 Mass Airflow Sensor
  - B107 Accelerator Pedal Position Sensor
  - Q14 Exhaust Gas Recirculation Valve
  - Q17 Fuel Injector
  - Engine Misfire
  - Fuel Trim System
- {P0722} Accelerator Pedal Position Sensor = Greater than 3%
- Battery Voltage = Greater than 9 V
- {P0722} Engine Torque = Greater than 30 Nm (22 lb ft)
- Ignition and Start Signal = 9 to 32 V

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- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met

P077C, P077D

- {P077C} DTC P077D = Not set
- {P077D} DTC P077C = Not set
- Battery Voltage = Greater than 10 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Transmission Service Fast Learn = Disabled

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P0721

Output Speed Sensor Direction Signal = Not Plausible - For greater than 3.5 s

P0722

Output Speed Sensor = Less than 31 RPM - For greater than 4 s

P0723

Output Speed Sensor = Decreases greater than 649 RPM - For greater than 7.5 s

P077C

Output Speed Sensor = Less than 0.25 V/Short to Ground - For greater than 1 s

P077D

Output Speed Sensor = Greater than 4.75 V/Short to Voltage - For greater than 1 s

P172A

Current Gear = Forward Gear & Output Shaft Speed Sensor Direction Forward - For greater than 2.5 s

P172B

Current Gear = Reverse Gear & Output Shaft Speed Sensor Direction Reverse - For greater than 2.5 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled - If equipped
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values

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- Transmission gear allowed = Reverse or Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics

Connector End View Reference

Master Electrical Component List , or **Component Connector End Views - Index**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Special Tools

EL-38522 Variable Signal Generator

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Verify the scan tool parameter: Sensor Supply 2 Circuit Status = Okay
   - **If not the specified state**

     Refer to: Circuit/System Testing

   - **Go to next step: If the specified state**

   CAUTION: **Support the lower control arms in the normal horizontal position in order to avoid damage to the drive axles. Do not operate the vehicle in gear with the wheels hanging down at full travel.**

3. Raise and support the vehicle.
4. Engine - Running
5. Transmission - D
6. Verify the scan tool parameter: Output Shaft Speed Sensor = The value should change smoothly and gradually as the vehicle speed is increased and decreased.
   - **If the value does not change smoothly and gradually**

     Refer to: Circuit/System Testing

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- **Go to next step: If the value changes smoothly and gradually**

7. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

   Verify the DTC does not set.

   - **If the DTC sets**

     Refer to: Circuit/System Testing

   - **Go to next step: If the DTC is not set**

8. All OK.

Circuit/System Testing

1. Ignition/Vehicle & All vehicle systems - Off

   NOTE: **When the following connector is disconnected, the ignition cannot be turned off due to lack of a valid park input to the TCM. If the ignition needs to be turned off, the connector will need to be reconnected.**

2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission
3. Ignition - On / Vehicle - In Service Mode
4. Test for 8.3 to 9.6 V between the test points: 9 V Reference circuit terminal 7 & Ground
   - **If less than 8.3 V**
   1. Ignition/Vehicle - Off
   2. Disconnect the electrical connector: K71 Transmission Control Module
   3. Test for infinite resistance between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground
      - If less than infinite resistance - Repair the short to ground on the circuit.
      - Go to next step: If infinite resistance
   4. Test for less than 2 ohms between the test points: 9 V Reference circuit terminal 7 @ Component harness & Terminal 7 @ Control module harness
      - If 2 ohms or greater - Repair the open/high resistance in the circuit.
      - If less than 2 ohms - Replace the component: K71 Transmission Control Module
   - **If greater than 9.6 V**
   1. Ignition/Vehicle - Off
   2. Disconnect the electrical connector: K71 Transmission Control Module
   3. Ignition - On / Vehicle - In Service Mode
   4. Test for less than 1 V between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground
      - If 1 V or greater - Repair the short to voltage on the circuit.
      - If less than 1 V - Replace the component: K71 Transmission Control Module
   - **Go to next step: If between 8.3 and 9.6 V**
5. Ignition/Vehicle - Off
6. Install - EL-38522 Variable Signal Generator
   - Voltage - 5 V
   - Frequency - 5 kHz
   - Duty Cycle - 10%
   - Black lead @ Battery Negative Post

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- Red lead @ Signal circuit terminal 4

7. Ignition - On / Vehicle - In Service Mode
8. Verify the scan tool parameter: Output Shaft Speed Sensor = 4, 300 to 4, 500 RPM
    - **If not between 4, 300 and 4, 500 RPM**
    1. Ignition/Vehicle - Off
    2. Disconnect the electrical connector: K71 Transmission Control Module
    3. Ignition - On / Vehicle - In Service Mode
    4. Test for less than 1 V between the test points: Signal circuit terminal 4 @ Component harness & Ground
        - If 1 V or greater - Repair the short to voltage on the circuit.
        - Go to next step: If less than 1 V
    5. Ignition/Vehicle - Off
    6. Test for infinite resistance between the test points: Signal circuit terminal 4 @ Component harness & Ground
        - If less than infinite resistance - Repair the short to ground on the circuit.
        - Go to next step: If infinite resistance
    7. Test for less than 2 ohms between the test points: Signal circuit terminal 4 @ Component harness & Terminal 14 @ Control module harness
        - If 2 ohms or greater - Repair the open/high resistance in the circuit.
        - If less than 2 ohms - Replace the component: K71 Transmission Control Module
    - **Go to next step: If between 4, 300 and 4, 500 RPM**
9. Verify the scan tool parameter: Output Speed Sensor Direction = Forward
    - **If not the specified state**

      Replace the component: K71 Transmission Control Module

    - **Go to next step: If the specified state**
10. Setup - EL-38522 Variable Signal Generator
    - Voltage - 5 V
    - Frequency - 600 Hz
    - Duty Cycle - 10%
    - Black lead @ Battery Negative Post
    - Red lead @ Signal circuit terminal 1
11. Verify the scan tool parameter: Output Speed Sensor Direction = Reverse
    - **If not the specified state**

      Replace the component: K71 Transmission Control Module

    - **Go to next step: If the specified state**
12. Remove - EL-38522 Variable Signal Generator
13. Connect the electrical connector. X1 @ T12 Automatic Transmission
14. Ignition/Vehicle - Off
15. Remove the component: Automatic Transmission Fluid Pan
16. Disconnect the electrical connector: B14A Automatic Transmission Output Speed Sensor
17. Ignition - On / Vehicle - In Service Mode
18. Test for 8.3 to 9.6 V between the test points: 9 V Reference circuit terminal 2 & Ground
    - **If not between 8.3 and 9.6 V**

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Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If between 8.3 and 9.6 V**

19. Ignition/Vehicle - Off
20. Install - EL-38522 Variable Signal Generator
    - Voltage - 5 V
    - Frequency - 5 kHz
    - Duty Cycle - 10%
    - Black lead @ Battery Negative Post
    - Red lead @ Signal circuit terminal 1
21. Ignition - On / Vehicle - In Service Mode
22. Verify the scan tool parameter: Output Shaft Speed Sensor = 4, 300 to 4, 500 RPM
    - **If not between 4, 300 and 4, 500 RPM**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 256 and 276 RPM**
23. Test or replace the component: B14A Automatic Transmission Output Speed Sensor

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Q77 Transmission Control Solenoid Valve Characterization Programming (10L60)**
- **Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement**
- **Automatic Transmission Output Speed Sensor Replacement** - B14A Automatic Transmission Output Speed Sensor
- **Automatic Transmission Wiring Harness Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P0741, P2817, OR P2818

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P0741

Torque Converter Clutch Performance

DTC P2817

Transmission Control Solenoid Valve 8 Stuck Off

DTC P2818

Transmission Control Solenoid Valve 8 Stuck On

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Diagnostic Fault Information

NOTE:

- **DTC P0741, P2817, P2818 will set with a hydraulic/mechanical condition.**
- **The components are listed from the least to the most intrusive to service.**

Component	DTC	Condition
Q77H Transmission Control Solenoid Valve 8	P0741, P2817, P2818	• Binding or Sticking • Mechanically damaged • Missing components
• Torque Converter Clutch Regulator Apply Valve • Valve Spring • Valve Body Bore	P0741, P2817, P2818	• Binding or Sticking • Debris on the component. • Mechanically damaged
• Torque Converter Clutch Blowoff Ball Valve • Torque Converter Clutch Blowoff Ball Valve Spring • Torque Converter Clutch Blowoff Ball Valve Retainer	P0741, P2817, P2818	• Binding or Sticking • Debris on the component. • Mechanically damaged
Torque Converter Clutch - Anti Drainback Valve	P0741, P2817, P2818	• Binding or Sticking • Debris on the component. • Mechanically damaged
Control Valve Body	P0741, P2817, P2818	• Fluid/oil passage - Restricted/Leaking
Torque Converter	P0741, P2817, P2818	• Binding or Sticking • Debris on the component. • Mechanically damaged

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Circuit/System Description

For an overview of the component/system, refer to:

- Park - Engine Running (Mechanical Powerflow) , or Park - Engine Running (Hydraulic Circuits)
- Reverse (Mechanical Powerflow) , or Reverse (Hydraulic Circuits)
- Neutral - Engine Running (Mechanical Powerflow) , or Neutral - Engine Running (Hydraulic Circuits)
- Drive Range, First Gear (Mechanical Powerflow) , or Drive Range, First Gear (Hydraulic Circuits)
- Drive Range, Second Gear (Mechanical Powerflow) , or Drive Range, Second Gear (Hydraulic Circuits)
- Drive Range, Third Gear (Mechanical Powerflow) , or Drive Range, Third Gear (Hydraulic Circuits)
- Drive Range, Fourth Gear (Mechanical Powerflow) , or Drive Range, Fourth Gear (Hydraulic Circuits)
- Drive Range, Fifth Gear (Mechanical Powerflow) , or Drive Range, Fifth Gear (Hydraulic Circuits)

- **Drive Range, Sixth Gear (Mechanical Powerflow)** , or **Drive Range, Sixth Gear (Hydraulic Circuits)**
- **Drive Range, Seventh Gear (Mechanical Powerflow)** , or **Drive Range, Seventh Gear (Hydraulic Circuits)**
- **Drive Range, Eighth Gear (Mechanical Powerflow)** , or **Drive Range, Eighth Gear (Hydraulic Circuits)**
- **Drive Range, Ninth Gear (Mechanical Powerflow)** , or **Drive Range, Ninth Gear (Hydraulic Circuits)**
- **Drive Range, Tenth Gear (Mechanical Powerflow)** , or **Drive Range, Tenth Gear (Hydraulic Circuits)**
- **Electronic Component Description**

The solenoid valve is used to regulate fluid pressure to other transmission control valves for torque converter clutch operation.

Conditions for Running the DTC

P0741

- DTC P0746, P0747, P0776, P0777, P0796, P0797, P2714, P2715, P2723, P2724, P2732, P2733, P281B, P281D, P281E, P2820 = Not set
- DTCs related to the following system/component = Not Set
  - B14A Automatic Transmission Output Speed Sensor
  - B14C Automatic Transmission Input Speed Sensor
  - B26 Crankshaft Position Sensor
  - B74 Manifold Absolute Pressure Sensor
  - B75 Mass Airflow Sensor
  - B107 Accelerator Pedal Position Sensor
  - Q17 Fuel Injector
  - Engine Misfire
  - Fuel Trim System
- Accelerator Pedal Position Sensor = 0 to 100%
- Battery Voltage = Greater than 9 V
- Engine Speed = Greater than 499 RPM
- Engine Torque = Greater than 4 Nm (3 lb ft)
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Transmission Fluid Temperature = -6 to 130B°C (21 to 266B°F)
- Transmission Range P, N

Frequency the DTC runs = Continuously - After the running conditions are met

P2817

- DTC P281B, P281D, P281E = Not set
- DTCs related to the following system/component = Not Set
  - B14A Automatic Transmission Output Speed Sensor
  - B14C Automatic Transmission Input Speed Sensor
  - B26 Crankshaft Position Sensor
  - B74 Manifold Absolute Pressure Sensor

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    - B75 Mass Airflow Sensor
    - B107 Accelerator Pedal Position Sensor
    - Q17 Fuel Injector
    - Engine Misfire
    - Fuel Trim System
- Accelerator Pedal Position Sensor = 8 to 99%
- Battery Voltage = Greater than 9 V
- Engine Speed = Greater than 499 RPM
- Engine Torque = Greater than 50 Nm (47 lb ft)
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Transmission Control Solenoid Valve 8 = On
- Transmission Fluid Temperature = -6 to 130B°C (21 to 266B°F)

Frequency the DTC runs = Continuously - After the running conditions are met

P2818

- DTC P0746, P0747, P0776, P0777, P0796, P0797, P2714, P2715, P2723, P2724, P2732, P2733, P281B, P281D, P281E, P2820 = Not set
- DTCs related to the following system/component = Not Set
    - B14A Automatic Transmission Output Speed Sensor
    - B14C Automatic Transmission Input Speed Sensor
    - B26 Crankshaft Position Sensor
    - B74 Manifold Absolute Pressure Sensor
    - B75 Mass Airflow Sensor
    - B107 Accelerator Pedal Position Sensor
    - Q17 Fuel Injector
    - Engine Misfire
    - Fuel Trim System
- 4WD Low = Disengaged
- Accelerator Pedal Position Sensor = Less than 6%
- Battery Voltage = Greater than 9 V
- Engine Speed = 200 to 600 RPM
- Engine Torque = -25 to 800 Nm (-18 to 590 lb ft)
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Transmission Control Solenoid Valve 8 = Off
- Transmission Range P, N
- Transmission Fluid Temperature = -6 to 130B°C (21 to 266B°F)
- Vehicle Speed = Less than 4 km/h (3 MPH)

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P0741

Torque Converter Clutch Control Valve = Stuck On

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P2817

Torque Converter Clutch Slip Speed = Greater than 129 RPM - For greater than 12 s

P2818

Torque Converter Clutch Slip Speed = Less than 31 RPM - Greater than a predefined time.

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- {If equipped} Autostart/Autostop = Disabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

High resistance in the circuits of the component Q77H may set DTC P2817 without setting control circuit DTC(s).

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to **Transmission Fluid Level and Condition Check**
   - **If a condition exists**

     Repair or replace as necessary

   - **Go to next step: If no condition exists**
2. Ignition - On / Vehicle - In Service Mode
3. Clear the DTCs.
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. Refer to **Road Test**

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Verify that no DTC listed in the DTC Descriptor Category is set.

- **If any of the DTCs are set**

  Refer to: Diagnostic Fault Information & Verify the conditions listed in the table do not exist

- **Go to next step: If none of the DTCs are set**

5. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement**
- **Control Valve Body Replacement**
- **Torque Converter Diagnosis**
- **Torque Converter Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P0746 OR P0747

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P0746

Transmission Control Solenoid Valve 1 Stuck Off

DTC P0747

Transmission Control Solenoid Valve 1 Stuck On

Diagnostic Fault Information

NOTE:

- **DTC P0746 will set with a hydraulic/mechanical condition or high resistance in the circuit of the component Q77A without setting component/control circuit DTCs.**
- **DTC P0747 will set with a hydraulic/mechanical condition.**
- **The components are listed from the least to the most intrusive to service.**

Component	DTC	Condition
Q77A Transmission Control Solenoid Valve 1	P0746, P0747	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip

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Component	DTC	Condition
		• Solenoid Valve

• 1-2-3-4-5-6 Clutch Regulator Valve
• Valve Spring
• Valve Body Bore
	P0746, P0747	• Binding, sticking or stuck component: Valve
		• Debris on the component.
		• Damaged component:
		  • Valve or Bore - Scored
		  • Spring

• 1-2-3-4-5-6-R Clutch Latch Valve
• Valve Spring
• Valve Body Bore
	P0746, P0747	• Binding, sticking or stuck component: Valve
		• Debris on the component.
		• Damaged component:
		  • Valve or Bore - Scored
		  • Spring

1-2-3-4-5-6-R Clutch Assembly Oil Feed Circuit	P0746, P0747	Blocked or restricted component: Screen

1-2-3-4-5-6-R Clutch Assembly	P0746, P0747	• Blocked or restricted component: Fluid/oil passage
		• Leaking component:
		  • Clutch Piston
		  • Clutch Housing
		  • Gasket
		  • O-Ring
		  • Seal
		• Binding, sticking or stuck component: Clutch Plates
		• Damaged or worn component:
		  • Clutch Plates
		  • Clutch Piston
		  • Clutch Housing

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Circuit/System Description

For an overview of the component/system, refer to:

- **Park - Engine Running (Mechanical Powerflow)** , or **Park - Engine Running (Hydraulic Circuits)**
- **Reverse (Mechanical Powerflow)** , or **Reverse (Hydraulic Circuits)**
- **Neutral - Engine Running (Mechanical Powerflow)** , or **Neutral - Engine Running (Hydraulic Circuits)**
- **Drive Range, First Gear (Mechanical Powerflow)** , or **Drive Range, First Gear (Hydraulic Circuits)**
- **Drive Range, Second Gear (Mechanical Powerflow)** , or **Drive Range, Second Gear (Hydraulic Circuits)**
- **Drive Range, Third Gear (Mechanical Powerflow)** , or **Drive Range, Third Gear (Hydraulic Circuits)**
- **Drive Range, Fourth Gear (Mechanical Powerflow)** , or **Drive Range, Fourth Gear (Hydraulic Circuits)**

- **Drive Range, Fifth Gear (Mechanical Powerflow)** , or **Drive Range, Fifth Gear (Hydraulic Circuits)**
- **Drive Range, Sixth Gear (Mechanical Powerflow)** , or **Drive Range, Sixth Gear (Hydraulic Circuits)**
- **Drive Range, Seventh Gear (Mechanical Powerflow)** , or **Drive Range, Seventh Gear (Hydraulic Circuits)**
- **Drive Range, Eighth Gear (Mechanical Powerflow)** , or **Drive Range, Eighth Gear (Hydraulic Circuits)**
- **Drive Range, Ninth Gear (Mechanical Powerflow)** , or **Drive Range, Ninth Gear (Hydraulic Circuits)**
- **Drive Range, Tenth Gear (Mechanical Powerflow)** , or **Drive Range, Tenth Gear (Hydraulic Circuits)**
- **Electronic Component Description**

The solenoid actuator controls fluid pressure by moving the clutch 1-2-3-4-5-6-R regulator valve that controls the fluid pressure to the 1-2-3-4-5-6-R clutch.

Conditions for Running the DTC

- DTC P2534 = Not set
- DTCs related to the following system/component = Not Set
  - B14A Automatic Transmission Output Speed Sensor
  - B14C Automatic Transmission Input Speed Sensor
  - B14DA Automatic Transmission Intermediate Speed Sensor 1
  - B14DB Automatic Transmission Intermediate Speed Sensor 2
  - B303 Transmission Range Sensor
  - Transmission Control Solenoid Valves - Circuit DTCs
- Battery Voltage = Greater than 9 V
- Engine = Running
- High Side Driver 1, 2 = On
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Scan Tool Control Function = Not Activated
- Transmission Range = D, L or M
- One of the following conditions listed below is true:
  - Accelerator Pedal Position = Greater than 0.5%
  - Engine Speed = Greater than 1, 000 RPM
  - Transmission Input Speed = Greater than 349 RPM
  - Transmission Output Shaft Speed = Greater than 35 RPM

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P0746

Clutch 1-2-3-4-5-6-R = Not applied

P0747

Clutch 1-2-3-4-5-6-R = Not released

Actions Taken When the DTC Sets

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DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled - If equipped
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- {P0746} Transmission gear allowed = Reverse or Gear 7
- {P0747} Transmission gear allowed = Reverse or Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

High resistance in the circuits of the component Q77A may set DTC P0746 without setting control circuit DTC(s).

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to **Transmission Fluid Level and Condition Check**
   - **If a condition exists**

     Repair or replace as necessary

   - **Go to next step: If no condition exists**
2. Ignition - On / Vehicle - In Service Mode
3. Clear the DTCs.
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. Refer to **Road Test**

   Verify that no DTC listed in the DTC Descriptor Category is set.

   - **If any of the DTCs are set**

     Refer to: Diagnostic Fault Information & Verify the conditions listed in the table do not exist

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- **Go to next step: If none of the DTCs are set**

5. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Control Valve Body Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P0776 OR P0777

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P0776

Transmission Control Solenoid Valve 2 Stuck Off

DTC P0777

Transmission Control Solenoid Valve 2 Stuck On

Diagnostic Fault Information

NOTE:

- **DTC P0776 will set with a hydraulic/mechanical condition or high resistance in the circuit of the component Q77B without setting component/control circuit DTCs.**
- **DTC P0777 will set with a hydraulic/mechanical condition.**
- **The components are listed from the least to the most intrusive to service.**

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Component	DTC	Condition

Q77B Transmission Control Solenoid Valve 2	P0776, P0777	• Binding, sticking or stuck component: Solenoid Valve
		• Damaged or missing component:
		  • Retaining Clip
		  • Solenoid Valve

• 1-2-8-9-10-Reverse Clutch Regulator Valve
• Valve Spring
• Valve Body Bore
	P0776, P0777	• Binding, sticking or stuck component: Valve
		• Debris on the component.
		• Damaged component:
		  • Valve or Bore - Scored
		  • Spring

1-2-8-9-10-R Clutch Assembly - Oil Feed Circuit	P0776, P0777	Blocked or restricted component: Screen

1-2-8-9-10-R Clutch Assembly	P0776, P0777	• Blocked or restricted component: Fluid/oil passage
		• Leaking component:
		  • Clutch Piston
		  • Clutch Housing
		  • Gasket
		  • O-Ring
		  • Seal
		• Binding, sticking or stuck component: Clutch Plates
		• Damaged or worn component:
		  • Clutch Plates
		  • Clutch Piston
		  • Clutch Housing

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Circuit/System Description

For an overview of the component/system, refer to:

- **Park - Engine Running (Mechanical Powerflow)** , or **Park - Engine Running (Hydraulic Circuits)**
- **Reverse (Mechanical Powerflow)** , or **Reverse (Hydraulic Circuits)**
- **Neutral - Engine Running (Mechanical Powerflow)** , or **Neutral - Engine Running (Hydraulic Circuits)**
- **Drive Range, First Gear (Mechanical Powerflow)** , or **Drive Range, First Gear (Hydraulic Circuits)**
- **Drive Range, Second Gear (Mechanical Powerflow)** , or **Drive Range, Second Gear (Hydraulic Circuits)**
- **Drive Range, Third Gear (Mechanical Powerflow)** , or **Drive Range, Third Gear (Hydraulic Circuits)**
- **Drive Range, Fourth Gear (Mechanical Powerflow)** , or **Drive Range, Fourth Gear (Hydraulic Circuits)**
- **Drive Range, Fifth Gear (Mechanical Powerflow)** , or **Drive Range, Fifth Gear (Hydraulic Circuits)**

- **Drive Range, Sixth Gear (Mechanical Powerflow)** , or **Drive Range, Sixth Gear (Hydraulic Circuits)**
- **Drive Range, Seventh Gear (Mechanical Powerflow)** , or **Drive Range, Seventh Gear (Hydraulic Circuits)**
- **Drive Range, Eighth Gear (Mechanical Powerflow)** , or **Drive Range, Eighth Gear (Hydraulic Circuits)**
- **Drive Range, Ninth Gear (Mechanical Powerflow)** , or **Drive Range, Ninth Gear (Hydraulic Circuits)**
- **Drive Range, Tenth Gear (Mechanical Powerflow)** , or **Drive Range, Tenth Gear (Hydraulic Circuits)**
- **Electronic Component Description**

The solenoid actuator controls fluid pressure by moving the clutch 1-2-8-9-10-R regulator valve that controls the fluid pressure to the 1-2-8-9-10-R clutch.

Conditions for Running the DTC

- DTC P2534 = Not set
- DTCs related to the following system/component = Not Set
  - B14A Automatic Transmission Output Speed Sensor
  - B14C Automatic Transmission Input Speed Sensor
  - B14DA Automatic Transmission Intermediate Speed Sensor 1
  - B14DB Automatic Transmission Intermediate Speed Sensor 2
  - B303 Transmission Range Sensor
  - Transmission Control Solenoid Valves - Circuit DTCs
- Battery Voltage = Greater than 9 V
- Engine = Running
- High Side Driver 1, 2 = On
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Scan Tool Control Function = Not Activated
- Transmission Range = D, L or M
- One of the following conditions listed below is true:
  - Accelerator Pedal Position = Greater than 0.5%
  - Engine Speed = Greater than 1, 000 RPM
  - Transmission Input Speed = Greater than 349 RPM
  - Transmission Output Shaft Speed = Greater than 35 RPM

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P0776

Clutch 1-2-8-9-10-R = Not applied

P0777

Clutch 1-2-8-9-10-R = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC - Additional actions taken:

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- Autostart/Autostop = Disabled - If equipped
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- {P0776} Transmission gear allowed = Reverse or Gear 7
- {P0777} Transmission gear allowed = Reverse or Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

High resistance in the circuits of the component Q77B may set DTC P0776 without setting control circuit DTC(s).

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to **Transmission Fluid Level and Condition Check**
   - **If a condition exists**

     Repair or replace as necessary

   - **Go to next step: If no condition exists**
2. Ignition - On / Vehicle - In Service Mode
3. Clear the DTCs.
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. Refer to **Road Test**

   Verify that no DTC listed in the DTC Descriptor Category is set.

   - **If any of the DTCs are set**

     Refer to: Diagnostic Fault Information & Verify the conditions listed in the table do not exist

   - **Go to next step: If none of the DTCs are set**
5. All OK.

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Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Control Valve Body Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P0796 OR P0797

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P0796

Transmission Control Solenoid Valve 3 Stuck Off

DTC P0797

Transmission Control Solenoid Valve 3 Stuck On

Diagnostic Fault Information

NOTE:

- **DTC P0796 will set with a hydraulic/mechanical condition or high resistance in the circuit of the component Q77B without setting component/control circuit DTCs.**
- **DTC P0797 will set with a hydraulic/mechanical condition.**
- **The components are listed from the least to the most intrusive to service.**

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Component	DTC	Condition

Q77C Transmission Control Solenoid Valve 3	P0796, P0797	• Binding, sticking or stuck component: Solenoid Valve
		• Damaged or missing component:
		  • Retaining Clip
		  • Solenoid Valve

• 2-3-4-5-7-9-10 and 4-5-6-7-8-9-10-Reverse Clutch Regulator Valve
• Valve Spring
• Valve Body Bore
	P0796, P0797	• Binding, sticking or stuck component: Valve
		• Debris on the component.
		• Damaged component:
		  • Valve or Bore - Scored
		  • Spring

• 2-3-4-5-7-9-10 Clutch Latch Valve	P0796, P0797	• Binding, sticking or stuck component: Valve

Component	DTC	Condition

• Valve Spring
• Valve Body Bore
		• Debris on the component.
		• Damaged component:
		  • Valve or Bore - Scored
		  • Spring

2-3-4-5-7-9-10 Clutch Assembly Oil Feed Circuit	P0796, P0797	Blocked or restricted component: Screen

2-3-4-5-7-9-10 Clutch Assembly	P0796, P0797	• Blocked or restricted component: Fluid/oil passage
		• Leaking component:
		  • Clutch Piston
		  • Clutch Housing
		  • Gasket
		  • O-Ring
		  • Seal
		• Binding, sticking or stuck component: Clutch Plates
		• Damaged or worn component:
		  • Clutch Plates
		  • Clutch Piston
		  • Clutch Housing

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Circuit/System Description

For an overview of the component/system, refer to:

- Park - Engine Running (Mechanical Powerflow) , or Park - Engine Running (Hydraulic Circuits)
- Reverse (Mechanical Powerflow) , or Reverse (Hydraulic Circuits)
- Neutral - Engine Running (Mechanical Powerflow) , or Neutral - Engine Running (Hydraulic Circuits)
- Drive Range, First Gear (Mechanical Powerflow) , or Drive Range, First Gear (Hydraulic Circuits)
- Drive Range, Second Gear (Mechanical Powerflow) , or Drive Range, Second Gear (Hydraulic Circuits)
- Drive Range, Third Gear (Mechanical Powerflow) , or Drive Range, Third Gear (Hydraulic Circuits)
- Drive Range, Fourth Gear (Mechanical Powerflow) , or Drive Range, Fourth Gear (Hydraulic Circuits)
- Drive Range, Fifth Gear (Mechanical Powerflow) , or Drive Range, Fifth Gear (Hydraulic Circuits)
- Drive Range, Sixth Gear (Mechanical Powerflow) , or Drive Range, Sixth Gear (Hydraulic Circuits)
- Drive Range, Seventh Gear (Mechanical Powerflow) , or Drive Range, Seventh Gear (Hydraulic Circuits)
- Drive Range, Eighth Gear (Mechanical Powerflow) , or Drive Range, Eighth Gear (Hydraulic Circuits)
- Drive Range, Ninth Gear (Mechanical Powerflow) , or Drive Range, Ninth Gear (Hydraulic Circuits)
- Drive Range, Tenth Gear (Mechanical Powerflow) , or Drive Range, Tenth Gear (Hydraulic Circuits)

- **Electronic Component Description**

The solenoid actuator controls fluid pressure by moving the clutch 2-3-4-5-7-9-10 regulator valve that controls the fluid pressure to the 2-3-4-5-7-9-10 clutch.

Conditions for Running the DTC

- DTC P2534 = Not set
- DTCs related to the following system/component = Not Set
  - B14A Automatic Transmission Output Speed Sensor
  - B14C Automatic Transmission Input Speed Sensor
  - B14DA Automatic Transmission Intermediate Speed Sensor 1
  - B14DB Automatic Transmission Intermediate Speed Sensor 2
  - B303 Transmission Range Sensor
  - Transmission Control Solenoid Valves - Circuit DTCs
- Battery Voltage = Greater than 9 V
- Engine = Running
- High Side Driver 1, 2 = On
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Scan Tool Control Function = Not Activated
- Transmission Range = D, L or M
- One of the following conditions listed below is true:
  - Accelerator Pedal Position = Greater than 0.5%
  - Engine Speed = Greater than 1, 000 RPM
  - Transmission Input Speed = Greater than 349 RPM
  - Transmission Output Shaft Speed = Greater than 35 RPM

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P0796

Clutch 2-3-4-5-7-9-10 = Not applied

P0797

Clutch 2-3-4-5-7-9-10 = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled - If equipped
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values

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- {P0796} Transmission gear allowed = Reverse or Gear 7
- {P0797} Transmission gear allowed = Reverse or Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

High resistance in the circuits of the component Q77C may set DTC P0796 without setting control circuit DTC(s).

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to **Transmission Fluid Level and Condition Check**
   - **If a condition exists**

     Repair or replace as necessary

   - **Go to next step: If no condition exists**
2. Ignition - On / Vehicle - In Service Mode
3. Clear the DTCs.
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. Refer to **Road Test**

   Verify that no DTC listed in the DTC Descriptor Category is set.

   - **If any of the DTCs are set**

     Refer to: Diagnostic Fault Information & Verify the conditions listed in the table do not exist

   - **Go to next step: If none of the DTCs are set**
5. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Control Valve Body Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

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DTC P0815, P0816, P0826, OR P1876 - MANUAL MODE OR TAP UP/TAP DOWN SWITCH MALFUNCTION

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P0815

Upshift Switch Circuit

DTC P0816

Downshift Switch Circuit

DTC P0826

Up and Down Shift Switch Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	P0826	-	-	-
Ground	-	-	-	-

Mechanical Condition

Component	DTC	Condition
S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left	P0816	Switch Stuck - Closed/On
S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right	P0815	Switch Stuck - Closed/On

Typical Scan Tool Data

Driver Shift Control Mode @ K9 Body Control Module

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On **Parameter Normal Range:** • Active • Downshift • Inactive • Upshift			
Signal	Invalid	Inactive	-
Ground	-	Inactive	Inactive

Circuit/System Description

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Circuit	Description
Signal	The control module input circuit has an internal resistance connected to 12 V.
Ground	Chassis Ground

Component	Description
K9 Body Control Module	The control module contains a microprocessor used to process input data to control outputs.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.
S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left	The switch S2L has an internal resistor ladder network. A specific resistance is generated dependent on the position of the switch.
S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right	The switch S2R has three terminals. The switch has a resistor between the input terminal and the internal switch. When pressed or released the switch changes between two output terminals.

The switches S2L and S2R are connected in series between the ground and the signal circuit and are inputs to the control module K9. When a switch is pressed, the voltage drop across the switches changes. The driver shift request is sent over serial data to the control module K71. The control module K71 ignores a shift request if the transmission shift lever is not in the manual mode position, or the operating conditions are out of range.

Conditions for Running the DTC

P0815, P0816 Condition 1

- {P0816} DTC P0815 = Not set
- {P0815} DTC P0816 = Not set
- DTC P0826, P1761, P182E, P1876, P1877, P1915 = Not set
- DTCs related to the following system/component = Not Set - If equipped
  - B303 Transmission Range Sensor
  - B315A Transmission Range Control Valve 1 Position Switch
  - B315B Transmission Range Control Valve 2 Position Switch
  - B316 Transmission Park Valve Position Switch
- Engine Speed = 400 to 7, 500 RPM - For greater than 5 s
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Transmission = Not Shifting - For greater than 1 s
- Transmission Range = Park/Neutral or Reverse

Frequency the DTC runs = Continuously - After the running conditions are met

P0815, P0816 Condition 2

- {P0816} DTC P0815 = Not set
- {P0815} DTC P0816 = Not set
- DTC P0826, P1761, P182E, P1876, P1877, P1915 = Not set

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- DTCs related to the following system/component = Not Set - If equipped
  - B303 Transmission Range Sensor
  - B315A Transmission Range Control Valve 1 Position Switch
  - B315B Transmission Range Control Valve 2 Position Switch
  - B316 Transmission Park Valve Position Switch
- Engine Speed = 400 to 7, 500 RPM - For greater than 5 s
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Transmission = Not Shifting - For greater than 1 s
- Transmission Range = Forward Gear

Frequency the DTC runs = Continuously - After the running conditions are met

P0826

- DTC P1761 = Not set
- Engine Speed = 400 to 7, 500 RPM
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 5 s

Conditions for Setting the DTC

P0815 Condition 1

Driver Shift Control Mode @ K9 Body Control Module = Upshift - For greater than 1 s

Condition 2

Driver Shift Control Mode @ K9 Body Control Module = Upshift - For greater than 2 min

P0816 Condition 1

Driver Shift Control Mode @ K9 Body Control Module = Downshift - For greater than 1 s

Condition 2

Driver Shift Control Mode @ K9 Body Control Module = Downshift - For greater than 2 min

P0826

Driver Shift Control Mode @ K9 Body Control Module = Invalid - For greater than 1 min

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type C DTC

- Manual Shift Control = Disabled
- Tap Up or Tap Down = Disabled

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type C DTC

Reference Information

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Schematic Reference

Automatic Transmission Controls Wiring Schematics

Connector End View Reference

Master Electrical Component List , or **Component Connector End Views - Index**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Press and hold the switch: S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left

   Verify the scan tool parameter: Driver Shift Control Mode @ K9 Body Control Module = Downshift

   - **If not the specified state**

     Refer to: Circuit/System Testing

   - **Go to next step: If the specified state**
3. Press and hold the switch: S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right

   Verify the scan tool parameter: Driver Shift Control Mode @ K9 Body Control Module = Upshift

   - **If not the specified state**

     Refer to: Circuit/System Testing

   - **Go to next step: If the specified state**
4. Perform the following action:
   1. Press and hold the switch: S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left
   2. Operate the component: Steering Wheel - Rotate the component 360B° in one direction and then 360B° in the other direction.

      Verify the scan tool parameter: Driver Shift Control Mode @ K9 Body Control Module = Downshift - The parameter state should not change.

   - **If not the specified state**

     Replace the component: X85 Steering Wheel Air Bag Coil

   - **Go to next step: If the specified state**

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5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

   Verify the DTC does not set.

   - **If the DTC sets**

     Refer to: Circuit/System Testing

   - **Go to next step: If the DTC is not set**

6. All OK.

Circuit/System Testing

NOTE:

- **Circuit/System Verification must be performed before proceeding with Circuit/System Testing.**
- **It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.**

1. Ignition/Vehicle & All vehicle systems - Off
2. Disconnect the electrical connector:
   - S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left
   - S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right
3. Test for less than 10 ohms between the test points:
   - Ground circuit terminal 1 @ S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left (harness side) & Ground
   - Ground circuit terminal 1 @ S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right (harness side) & Ground
   - **If 10 ohms or greater**
   1. Disconnect the appropriate ground connection: Ground terminal
   2. Test for less than 2 ohms between the test points:
      - Ground circuit terminal 1 @ S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left (harness side) & The other end of the circuit
      - Ground circuit terminal 1 @ S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right (harness side) & The other end of the circuit
      - If 2 ohms or greater - Repair the open/high resistance in the circuit.
      - If less than 2 ohms - Repair the open/high resistance in the ground connection.
   - **Go to next step: If less than 10 ohms**
4. Ignition - On / Vehicle - In Service Mode
5. Verify the scan tool parameter: Driver Shift Control Mode Switch @ K9 Body Control Module = Inactive
   - **If not the specified state**
   1. Ignition/Vehicle - Off
   2. Disconnect the appropriate electrical connector: K9 Body Control Module
   3. Test for infinite resistance between the test points: Signal circuit terminal 4 @ S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right (harness side) & Ground
      - If less than infinite resistance - Repair the short to ground on the circuit.
      - If infinite resistance - Replace the component: K9 Body Control Module
   - **Go to next step: If the specified state**

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6. Connect a 3 A fused jumper wire between the test points: Signal circuit terminal 4 @ S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right (harness side) & Ground circuit terminal 1 @ S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right (harness side)
7. Verify the scan tool parameter: Driver Shift Control Mode Switch @ K9 Body Control Module = Invalid
    - **If not the specified state**
    1. Ignition/Vehicle - Off & Remove - Jumper wire(s)
    2. Disconnect the appropriate electrical connector: K9 Body Control Module
    3. Ignition - On / Vehicle - In Service Mode
    4. Test for less than 1 V between the test points: Signal circuit terminal 4 @ S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right (harness side) & Ground
        - If 1 V or greater - Repair the short to voltage on the circuit.
        - Go to next step: If less than 1 V
    5. Ignition/Vehicle - Off
    6. Test for less than 2 ohms between the test points: Signal circuit terminal 4 @ S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right (harness side) & The other end of the circuit
        - If 2 ohms or greater - Repair the open/high resistance in the circuit.
        - If less than 2 ohms - Replace the component: K9 Body Control Module
    - **Go to next step: If the specified state**
8. Remove - Jumper Wire(s)
9. Test for less than 1 V between the test points: Signal circuit terminal 3 @ S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right (harness side) & Ground
    - **If 1 V or greater**

      Repair the short to voltage on the circuit.

    - **Go to next step: If less than 1 V**
10. Ignition/Vehicle - Off
11. Test for infinite resistance between the test points: Signal circuit terminal 3 @ S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right (harness side) & Ground
    - **If less than infinite resistance**

      Repair the short to ground on the circuit.

    - **Go to next step: If infinite resistance**
12. Test for less than 2 ohms between the test points: Signal circuit terminal 3 @ S2R Transmission Manual Shift Switch - Right (harness side) & Signal circuit terminal 3 @ S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left (harness side)
    - **If 2 ohms or greater**

      Repair the open/high resistance in the circuit.

    - **Go to next step: If less than 2 ohms**
13. Test or replace the component:
    - S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left
    - S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right

Component Testing

S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left

1. Ignition/Vehicle - Off

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2. Disconnect the electrical connector: S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left
3. Test for 11, 000 to 11, 800 ohms between the test points: Signal terminal 3 & Ground terminal 1
    - **If not between 11, 000 and 11, 800 ohms**

      Replace the component: S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left

    - **Go to next step: If between 11, 000 and 11, 800 ohms**
4. Press and hold the switch: S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left
5. Test for 2, 750 to 3, 150 ohms between the test points: Signal terminal 3 & Ground terminal 1
    - **If not between 2, 750 and 3, 150 ohms**

      Replace the component: S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left

    - **Go to next step: If between 2, 750 and 3, 150 ohms**
6. All OK.

S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right
3. Test for infinite resistance between the test points: Signal terminal 3 & Ground terminal 1
    - **If less than infinite resistance**

      Replace the component: S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right

    - **Go to next step: If infinite resistance**
4. Press and hold the switch: S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right Test for less than 2 ohms between the test points:
5. Test for less than 2 ohms between the test points: Signal terminal 3 & Ground terminal 1
    - **If 2 ohms or greater**

      Replace the component: S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right

    - **Go to next step: If less than 2 ohms**
6. Test for infinite resistance between the test points: Signal terminal 4 & Ground terminal 1
    - **If less than infinite resistance**

      Replace the component: S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right

    - **Go to next step: If infinite resistance**
7. Press and hold the switch: S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right
8. Test for 1, 170 to 1, 370 ohms between the test points: Signal terminal 1 & Ground terminal 2
    - **If not between 1, 170 and 1, 370 ohms**

      Replace the component: S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right

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- **Go to next step: If between 1, 170 and 1, 370 ohms**

9. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Automatic Transmission Manual Shift Auxiliary Position Switch Replacement - Left Side** - S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left
- **Automatic Transmission Manual Shift Auxiliary Position Switch Replacement - Right Side** - S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right
- **Steering Wheel Airbag Coil Replacement** - X85 Steering Wheel Air Bag Coil
- For control module replacement, programming, and setup refer to **Control Module References**

DTC P0960, P0962-P0964, P0966-P0968, P0970, P0971, P2670, P2671, P2718, P2720, P2721, P2727, P2729, P2730, P2736, P2738, P2739, P2824, P2826, OR P2827

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P0960

Transmission Control Solenoid Valve 1 Control Circuit Open

DTC P0962

Transmission Control Solenoid Valve 1 Control Circuit Low

DTC P0963

Transmission Control Solenoid Valve 1 Control Circuit High

DTC P0964

Transmission Control Solenoid Valve 2 Control Circuit Open

DTC P0966

Transmission Control Solenoid Valve 2 Control Circuit Low

DTC P0967

Transmission Control Solenoid Valve 2 Control Circuit High

DTC P0968

Transmission Control Solenoid Valve 3 Control Circuit Open

DTC P0970

Transmission Control Solenoid Valve 3 Control Circuit Low

DTC P0971

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Transmission Control Solenoid Valve 3 Control Circuit High

DTC P2670

High Side Driver 2 Control Circuit Low

DTC P2671

High Side Driver 2 Control Circuit High

DTC P2718

Transmission Control Solenoid Valve 4 Control Circuit Open

DTC P2720

Transmission Control Solenoid Valve 4 Control Circuit Low

DTC P2721

Transmission Control Solenoid Valve 4 Control Circuit High

DTC P2727

Transmission Control Solenoid Valve 5 Control Circuit Open

DTC P2729

Transmission Control Solenoid Valve 5 Control Circuit Low

DTC P2730

Transmission Control Solenoid Valve 5 Control Circuit High

DTC P2736

Transmission Control Solenoid Valve 6 Control Circuit Open

DTC P2738

Transmission Control Solenoid Valve 6 Control Circuit Low

DTC P2739

Transmission Control Solenoid Valve 6 Control Circuit High

DTC P2824

Transmission Control Solenoid Valve 9 Control Circuit Open

DTC P2826

Transmission Control Solenoid Valve 9 Control Circuit Low

DTC P2827

Transmission Control Solenoid Valve 9 Control Circuit High

Diagnostic Fault Information

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Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 9	1	P2670	P2671	-
Control - Terminal 14	P0962	P0960	P0963	-
Control - Terminal 15	P0966	P0964	P0967	-
Control - Terminal 16	P0970	P0968	P0971	-
Control - Terminal 21	P2720	P2718	P2721	-
Control - Terminal 22	P2729	P2727	P2730	-
Control - Terminal 23	P2738	P2736	P2739	-
Control - Terminal 19	P2826	P2824	P2827	-
1. Lost Communication with Transmission Control Module				

Typical Scan Tool Data

Transmission Control Solenoid Valve 1-6, 9 Control Circuit High Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Not Run or Okay			
Control - Terminal 9	-	-	Malfunction
Control - Terminal 14, 15, 16, 19, 21, 22, 23	-	-	Malfunction

Transmission Control Solenoid Valve 1-6, 9 Control Circuit Low Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Not Run or Okay			
Control - Terminal 9	Malfunction	Malfunction	-
Control - Terminal 14, 15, 16, 19, 21, 22, 23	Malfunction	Malfunction	-

Transmission Control Solenoid Valve 1-6, 9 Control Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Not Run or Okay			
Control - Terminal 9	Malfunction	Malfunction	-
Control - Terminal 14, 15, 16, 19, 21, 22, 23	Malfunction	Malfunction	-

Circuit/System Description

For an overview of the component/system, refer to **Electronic Component Description**

Circuit	Description
Control - Terminal 9	The output circuit is switched to 12 V to enable the component(s).
Control - Terminal 14, 15, 16, 19, 21, 22, 23	The output circuit is switched to ground to activate the component. The output is PWM controlled.

Component	Description
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module

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Component	Description
	receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.
Q77 Transmission Control Solenoid Valve	A linear solenoid actuator is an electro-mechanical device that converts electrical power into a mechanical pushing or pulling force or motion. • The solenoid actuator varies the force depending on the current applied to the solenoid coil. • The solenoid actuator applies minimum force with minimum current applied to the solenoid coil. • The solenoid actuator applies maximum force with maximum current applied to the solenoid coil.

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

Control Circuit = Commanded state does not match the actual state - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled
- Default shift pattern = Enabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- {P2670}
  - High Side Driver 2 Command = Disabled
  - Line Pressure Command = Maximum Pressure

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

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Automatic Transmission Controls Wiring Schematics

Connector End View Reference

Master Electrical Component List , or **Component Connector End Views - Index**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Engine - Running
2. Verify the scan tool parameter:
   - High Side Driver 2 Circuit High Test Status = Not Run or Okay
   - High Side Driver 2 Circuit Low Test Status = Not Run or Okay
   - High Side Driver 2 Circuit Open Test Status = Not Run or Okay
   - Transmission Control Solenoid Valve 1-6, 9 Control Circuit High Test Status = Not Run or Okay
   - Transmission Control Solenoid Valve 1-6, 9 Control Circuit Low Test Status = Not Run or Okay
   - Transmission Control Solenoid Valve 1-6, 9 Control Circuit Open Test Status = Not Run or Okay
   - **If not the specified state**

     Refer to: Circuit/System Testing

   - **Go to next step: If the specified state**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

   Verify the DTC does not set.

   - **If the DTC sets**

     Refer to: Circuit/System Testing

   - **Go to next step: If the DTC is not set**
4. All OK.

Circuit/System Testing

1. Ignition/Vehicle - Off

NOTE: **When the following connector is disconnected, the ignition cannot be turned off due to lack of a valid park input to the TCM. If the ignition needs to be turned off, the connector will need to be reconnected.**

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2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission
3. Connect a test lamp between the test points: Control circuit terminal 9 @ Component harness & Ground
4. Ignition - On / Vehicle - In Service Mode

NOTE: **If unable to perform the scan tool control function due to Device Limits Exceeded and/or DTC Present, jumper the component B14A circuits between the component T12 connector and the X1 harness connector.**

- **Connect a 3 A fused jumper wire between the test points: 9 V Reference circuit terminal 7 X1 (harness side) & 9 V Reference circuit terminal 7 X1 (component side)**
- **Connect a 3 A fused jumper wire between the test points: Signal circuit terminal 4 X1 (harness side) & Signal circuit terminal 4 X1 (component side)**

5. Perform the scan tool control function: High Side Driver 2 - On and Off

   Verify the test lamp turns On and Off.

   - **If the test lamp is always Off**
   1. Ignition/Vehicle - Off
   2. Disconnect the electrical connector: K71 Transmission Control Module
   3. Test for infinite resistance between the test points: Control circuit terminal 9 @ Component harness & Ground
      - If less than infinite resistance - Repair the short to ground on the circuit.
      - Go to next step: If infinite resistance
   4. Test for less than 2 ohms between the test points: Control circuit terminal 9 @ Component harness & The other end of the circuit @ Control module harness
      - If 2 ohms or greater - Repair the open/high resistance in the circuit.
      - If less than 2 ohms - Replace the component: K71 Transmission Control Module
   - **If the test lamp is always On**
   1. Ignition/Vehicle - Off
   2. Disconnect the electrical connector: K71 Transmission Control Module
   3. Ignition - On / Vehicle - In Service Mode
   4. Test for less than 1 V between the test points: Control circuit terminal 9 @ Component harness & Ground
      - If 1 V or greater - Repair the short to voltage on the circuit.
      - If less than 1 V - Replace the component: K71 Transmission Control Module
   - **Go to next step: If the test lamp turns On and Off**
6. Verify DTC P2670, P2671 is not set.
   - **If the DTC is set**

     Refer to step 9

   - **Go to next step: If the DTC is not set**
7. Connect a test lamp between the test points:
   - {P0960, P0962, P0963} Control circuit terminal 14 & Control circuit terminal 9 @ Component harness
   - {P0964, P0966, P0967} Control circuit terminal 15 & Control circuit terminal 9 @ Component harness

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- {P0968, P0970, P0971} Control circuit terminal 16 & Control circuit terminal 9 @ Component harness
- {P2718, P2720, P2721} Control circuit terminal 21 & Control circuit terminal 9 @ Component harness
- {P2727, P2729, P2730} Control circuit terminal 22 & Control circuit terminal 9 @ Component harness
- {P2736, P2738, P2739} Control circuit terminal 23 & Control circuit terminal 9 @ Component harness
- {P2824, P2826, P2827} Control circuit terminal 19 & Control circuit terminal 9 @ Component harness

8. Perform the scan tool control function: Transmission Control Solenoid Valve 1 - 6, 9 - On and Off

Verify the test lamp turns On and changes brightness.

- **If the test lamp is always Off**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: K71 Transmission Control Module
3. Test for less than 2 ohms between the test points:
    - {P0960, P0962, P0963} Control circuit terminal 14 @ Component harness & The other end of the circuit
    - {P0964, P0966, P0967} Control circuit terminal 15 @ Component harness & The other end of the circuit
    - {P0968, P0970, P0971} Control circuit terminal 16 @ Component harness & The other end of the circuit
    - {P2718, P2720, P2721} Control circuit terminal 21 @ Component harness & The other end of the circuit
    - {P2727, P2729, P2730} Control circuit terminal 22 @ Component harness & The other end of the circuit
    - {P2736, P2738, P2739} Control circuit terminal 23 @ Component harness & The other end of the circuit
    - {P2824, P2826, P2827} Control circuit terminal 19 @ Component harness & The other end of the circuit
    - If 2 ohms or greater - Repair the open/high resistance in the circuit.
    - Go to next step: If less than 2 ohms
4. Ignition - On / Vehicle - In Service Mode
5. Test for less than 1 V between the test points:
    - {P0960, P0962, P0963} Control circuit terminal 14 @ Component harness & Ground
    - {P0964, P0966, P0967} Control circuit terminal 15 @ Component harness & Ground
    - {P0968, P0970, P0971} Control circuit terminal 16 @ Component harness & Ground
    - {P2718, P2720, P2721} Control circuit terminal 21 @ Component harness & Ground
    - {P2727, P2729, P2730} Control circuit terminal 22 @ Component harness & Ground
    - {P2736, P2738, P2739} Control circuit terminal 23 @ Component harness & Ground
    - {P2824, P2826, P2827} Control circuit terminal 19 @ Component harness & Ground
    - If 1 V or greater - Repair the short to voltage on the circuit.
    - If less than 1 V - Replace the component: K71 Transmission Control Module

- **If the test lamp is always On**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: K71 Transmission Control Module
3. Test for infinite resistance between the test points:

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- {P0960, P0962, P0963} Control circuit terminal 14 @ Component harness & Ground
- {P0964, P0966, P0967} Control circuit terminal 15 @ Component harness & Ground
- {P0968, P0970, P0971} Control circuit terminal 16 @ Component harness & Ground
- {P2718, P2720, P2721} Control circuit terminal 21 @ Component harness & Ground
- {P2727, P2729, P2730} Control circuit terminal 22 @ Component harness & Ground
- {P2736, P2738, P2739} Control circuit terminal 23 @ Component harness & Ground
- {P2824, P2826, P2827} Control circuit terminal 19 @ Component harness & Ground
- If less than infinite resistance - Repair the short to ground on the circuit.
- If infinite resistance - Replace the component: K71 Transmission Control Module

- **Go to next step: If the test lamp turns On and changes brightness**

9. Connect the electrical connector: X1 @ T12 Automatic Transmission
10. Remove the component:
    - Transmission Fluid Pan
    - G5 Automatic Transmission Auxiliary Fluid Pump
11. Disconnect the electrical connector: X176
12. Connect a test lamp between the test points:
    - {P2670, P2671} Control circuit terminal 18 @ Component harness & Ground
    - {P0960, P0962, P0963} Control circuit terminal 15 & Control circuit terminal 18 @ Component harness
    - {P0964, P0966, P0967} Control circuit terminal 16 & Control circuit terminal 18 @ Component harness
    - {P0968, P0970, P0971} Control circuit terminal 17 & Control circuit terminal 18 @ Component harness
    - {P2718, P2720, P2721} Control circuit terminal 20 & Control circuit terminal 18 @ Component harness
    - {P2727, P2729, P2730} Control circuit terminal 21 & Control circuit terminal 18 @ Component harness
    - {P2736, P2738, P2739} Control circuit terminal 22 & Control circuit terminal 18 @ Component harness
    - {P2824, P2826, P2827} Control circuit terminal 1 & Control circuit terminal 18 @ Component harness
13. Perform the scan tool control function:
    - {P2670, P2671} High Side Driver 2 - On and Off
    - {P0960, P0962, P0963, P0964, P0966, P0967, P0968, P0970, P0971, P2718, P2720, P2721, P2727, P2729, P2730, P2736, P2738, P2739, P2824, P2826, P2827} Transmission Control Solenoid Valve 1 - 6, 9 - On and Off
      - Verify the test lamp turns On and changes brightness.
    - **If the test lamp is always Off**

      Replace the component: Automatic Transmission Wiring Harness - (Pass-Thru)

    - **Go to next step: If the test lamp turns On and changes brightness**
14. Remove the component: Control Valve Body
15. Connect the electrical connector: X176
16. Disconnect the electrical connector: X177
17. Connect a test lamp between the test points: Control circuit terminal 7 & Control circuit terminal 4
18. Perform the scan tool control function: Transmission Control Solenoid Valve 9 - On and Off

    Verify the test lamp turns On and changes brightness.

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- **If the test lamp is always Off**

  Replace the component: Automatic Transmission Wiring Harness - (Main/Solenoid)

- **Go to next step: If the test lamp turns On and changes brightness**

19. Connect the electrical connector: X177
20. Verify DTC P2824, P2826, P2827 is not set.
    - **If the DTC is set**
    1. Disconnect the electrical connector: Q77J Transmission Control Solenoid Valve 9
    2. Connect a test lamp between the test points: Control circuit terminal 1 & Control circuit terminal 2 @ Component harness
    3. Perform the scan tool control function: Transmission Control Solenoid Valve 9 - On and Off

       Verify the test lamp turns On and changes brightness.

       - If the test lamp is always Off - Replace the component: Automatic Transmission Wiring Harness - (Jumper)
       - If the test lamp turns On and changes brightness - Test or replace the component: Q77 Transmission Control Solenoid Valve
    - **Go to next step: If the DTC is not set**
21. Disconnect the appropriate electrical connector: Q77 Transmission Control Solenoid Valve
22. Connect a test lamp between the test points: Control circuit terminal 1 & Control circuit terminal 2 @ Component harness
23. Perform the scan tool control function: Transmission Control Solenoid Valve 1 - 6 - On and Off

    Verify the test lamp turns On and changes brightness.

    - **If the test lamp is always Off**

      Replace the component: Automatic Transmission Wiring Harness - (Main-Solenoid)

    - **Go to next step: If the test lamp turns On and changes brightness**
24. Test or replace the component: Q77 Transmission Control Solenoid Valve

Component Testing

1. Remove the component:
   - Transmission Fluid Pan
   - Control Valve Body
2. Disconnect the appropriate electrical connector: Q77 Transmission Control Solenoid Valve

   NOTE: **The component's temperature should be 19 to 21B°C (66 to 70B°F) while testing.**

3. Test for 5.0 to 5.4 ohms between the test points: Terminal 1 @ Q77 Transmission Control Solenoid Valve & Terminal 2 @ Q77 Transmission Control Solenoid Valve
   - **If not between 5.0 and 5.4 ohms**

     Replace the appropriate component: Q77 Transmission Control Solenoid Valve

   - **Go to next step: If between 5.0 and 5.4 ohms**
4. Test for infinite resistance between the test points: Terminal 1 @ Q77 Transmission Control Solenoid Valve & The component's housing
   - **If less than infinite resistance**

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Replace the component: Q77 Transmission Control Solenoid Valve

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Q77 Transmission Control Solenoid Valve Characterization Programming (10L60)**
- **Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement**
- **Automatic Transmission Wiring Harness Replacement**
- **Control Valve Body Replacement** - G5 Automatic Transmission Auxiliary Fluid Pump
- **Control Valve Body Replacement** - Q77 Transmission Control Solenoid Valve
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P175E

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P175E

Transmission Control System - Shift Limiting Active

Circuit/System Description

DTC P175E is an informational DTC.

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 2 min

Conditions for Setting the DTC

DTCs related to the following system/component = Set - 100 Ignition cycles

- B107 Accelerator Pedal Position Sensor
- B14A Automatic Transmission Output Speed Sensor
- B14C Automatic Transmission Input Speed Sensor
- B14DA Automatic Transmission Intermediate Speed Sensor 1
- B14DB Automatic Transmission Intermediate Speed Sensor 2
- B26 Crankshaft Position Sensor
- B303 Transmission Range Sensor
- B74 Manifold Absolute Pressure Sensor

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- B75 Mass Airflow Sensor
- Q14 Exhaust Gas Recirculation Valve
- Q17 Fuel Injector
- Q77 Transmission Control Solenoid Valve
- Engine Misfire
- Fuel Trim

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify there are no DTCs set related to the following component/system:
   - B107 Accelerator Pedal Position Sensor
   - B14A Automatic Transmission Output Speed Sensor
   - B14C Automatic Transmission Input Speed Sensor
   - B14D Automatic Transmission Intermediate Speed Sensor
   - B26 Crankshaft Position Sensor
   - B303 Transmission Range Sensor
   - B74 Manifold Absolute Pressure Sensor
   - B75 Mass Airflow Sensor
   - Q14 Exhaust Gas Recirculation Valve
   - Q17 Fuel Injector
   - Q77 Transmission Control Solenoid Valve
   - Engine Misfire
   - Fuel Trim
   - **If a related DTC is set**

     Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**

   - **Go to next step: If a related DTC is not set**
2. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

   Verify the DTC does not set.

   - **If the DTC sets**

     Refer to step 1

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- **Go to next step: If the DTC is not set**

3. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P175F

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P175F

Acceleration Sensor Signal Message Counter Incorrect

Circuit/System Description

Control modules connected to the serial data circuits monitor the communication during normal vehicle operation. Operating information and commands are exchanged among the control modules. Each module on the serial data circuit maintains a transmit error counter and a receive error counter. The counter values increase with detected errors and decrease with error-free messages.

Conditions for Running the DTC

- DTC U0073 = Not set
- Battery Voltage = Greater than 11 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Serial Data = Message Counter Incorrect - Between the following control modules:

- K160 Brake System Control Module
- K71 Transmission Control Module

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type C DTC

- {If equipped} Manual Shift Control = Disabled
- {If equipped} Stop/Start System = Disabled
- {If equipped} Tap Up or Tap Down = Disabled

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Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type C DTC

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Verify there are no DTCs set related to the following component/system: Serial Data
    - **If a related DTC is set**

      Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**

    - **Go to next step: If a related DTC is not set**
3. Clear the DTCs.
4. Operate the vehicle within the Conditions for Running the DTC.

   Verify the DTC does not set.

    - **If the DTC sets**

    1. Ignition/Vehicle - Off
    2. Replace the component: K160 Brake System Control Module
    3. Operate the vehicle within the Conditions for Running the DTC.
    4. Verify the DTC does not set.
        - If the DTC sets - Replace the component: K71 Transmission Control Module
        - Go to next step: If the DTC is not set
    5. All OK.

    - **Go to next step: If the DTC is not set**
5. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P1761

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**

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- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P1761

Up and Down Shift Switch Signal Message Counter Incorrect

Circuit/System Description

Control modules connected to the serial data circuits monitor the communication during normal vehicle operation. Operating information and commands are exchanged among the control modules. Each module on the serial data circuit maintains a transmit error counter and a receive error counter. The counter values increase with detected errors and decrease with error-free messages.

Conditions for Running the DTC

- DTC U0073 = Not set
- Battery Voltage = Greater than 11 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Serial Data = Message Counter Incorrect - Between the following control modules:

- K9 Body Control Module
- K71 Transmission Control Module

The above condition(s) must occur for greater than 10 s.

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type C

Manual Shift Control = Disabled

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type C

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Verify there are no DTCs set related to the following component/system: Serial Data
    - **If a related DTC is set**

      Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**

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- **Go to next step: If a related DTC is not set**

3. Clear the DTCs.
4. Operate the vehicle within the Conditions for Running the DTC.

   Verify the DTC does not set.

   - **If the DTC sets**
   1. Ignition/Vehicle - Off
   2. Replace the component: K9 Body Control Module
   3. Operate the vehicle within the Conditions for Running the DTC.
   4. Verify the DTC does not set.
      - If the DTC sets - Replace the component: K71 Transmission Control Module
      - Go to next step: If the DTC is not set
   5. All OK.
   - **Go to next step: If the DTC is not set**
5. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P176B-P176D, P178F, OR P17D3

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P176B

Intermediate Speed Sensor Circuit Performance

DTC P176C

Intermediate Speed Sensor Circuit Low

DTC P176D

Intermediate Speed Sensor Circuit High

DTC P178F

Intermediate Speed Sensor Direction Not Plausible - Forward

DTC P17D3

Intermediate Speed Sensor Direction Signal Invalid

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Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P176C**	P176C**	P176D	P176B, P187F, P17D3
Signal	P176C	P176C	P176D*	P176B, P187F, P17D3
* Internal control module or component damage may occur if the circuit shorts to B+. **Additional DTCs may set.				

Typical Scan Tool Data

Intermediate Speed Sensor

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Vehicle Speed = Greater than 2 km/h (1.2 MPH) **Parameter Normal Range:** 500 to 7, 500 RPM			
Signal	0 RPM	0 RPM	0 RPM

Sensor Supply Circuit Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On **Parameter Normal Range:** Okay			
9 V Reference	Malfunction	Okay	Malfunction

Circuit/System Description

For an overview of the component/system, refer to **Electronic Component Description**

Circuit	Description
9 V Reference	Regulated voltage supplied by the control module.
Signal	The sensor produces a frequency modulated signal.

Component	Description
B14DA Automatic Transmission Intermediate Speed Sensor 1	The sensor contains a hall-effect sensor and additional electronics that processes the signal. It detects the change of strength of the magnetic field caused by the reluctor ring. When the strength changes, the sensor changes the amount of current it consumes. This results in a square wave signal of current and voltage. The control module detects the frequency in which the signal changes, which is proportional to the rotational speed.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.
Reluctor Ring	• The reluctor ring has 50 teeth, magnetic segments, or indentations. • The reluctor ring is part of the component: Reaction Carrier Assembly

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The sensor is an input to the control module K71. The input signal is used to determine the rotational speed of the component: Reaction Carrier Assembly

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Engine Speed = Greater than 500 RPM
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P176B

Transmission Intermediate Speed Sensor 1 - Calculated = Measured Error - Greater than 10 RPM

P176C

Transmission Intermediate Speed Sensor 1 = Less than 0.25 V - For 1 s

P176D

Transmission Intermediate Speed Sensor 1 = Greater than 4.75 V - For 1 s

P178F

Transmission Intermediate Speed Sensor 1 - Forward Gear/Gear Status = Reverse - For 2.5 s

P17D3

Transmission Intermediate Speed Sensor 1 Direction Signal = Incorrect - For 3.5 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled - If equipped
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- Transmission gear allowed = Reverse or Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics

Connector End View Reference

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Master Electrical Component List , or **Component Connector End Views - Index**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Special Tools

EL-38522 Variable Signal Generator Equivalent regional tools:

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Verify the scan tool parameter: Sensor Supply 2 Circuit Status = Okay
   - **If not the specified state**

     Refer to: Circuit/System Testing

   - **Go to next step: If the specified state**

CAUTION: **Support the lower control arms in the normal horizontal position in order to avoid damage to the drive axles. Do not operate the vehicle in gear with the wheels hanging down at full travel.**

3. Raise and support the vehicle.
4. Start and idle the engine.
5. Transmission in Drive
6. Verify the scan tool parameter: Intermediate Speed Sensor = The value should change smoothly and gradually as the vehicle speed is increased and decreased.
   - **If the value does not change smoothly and gradually**

     Refer to: Circuit/System Testing

   - **Go to next step: If the value changes smoothly and gradually**
7. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. Verify the DTC does not set.
   - **If the DTC sets**

     Refer to: Circuit/System Testing

   - **Go to next step: If the DTC is not set**
8. All OK.

Circuit/System Testing

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1. Ignition/Vehicle & All vehicle systems - Off

NOTE: **When the following connector is disconnected, the ignition cannot be turned off due to lack of a valid park input to the TCM. If the ignition needs to be turned off, the connector will need to be reconnected.**

2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission
3. Ignition - On / Vehicle - In Service Mode
4. Test for 8.3 to 9.6 V between the test points: 9 V Reference circuit terminal 7 & Ground
    - **If less than 8.3 V**
    1. Ignition/Vehicle - Off
    2. Disconnect the electrical connector: K71 Transmission Control Module
    3. Test for infinite resistance between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground
        - If less than infinite resistance - Repair the short to ground on the circuit.
        - Go to next step: If infinite resistance
    4. Test for less than 2 ohms between the test points: 9 V Reference circuit terminal 7 @ Component harness & Terminal 7 @ Control module harness
        - If 2 ohms or greater - Repair the open/high resistance in the circuit.
        - If less than 2 ohms - Replace the component: K71 Transmission Control Module
    - **If greater than 9.6 V**
    1. Ignition/Vehicle - Off
    2. Disconnect the electrical connector: K71 Transmission Control Module
    3. Ignition - On / Vehicle - In Service Mode
    4. Test for less than 1 V between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground
        - If 1 V or greater - Repair the short to voltage on the circuit.
        - If less than 1 V - Replace the component: K71 Transmission Control Module
    - **Go to next step: If between 8.3 and 9.6 V**
5. Ignition/Vehicle - Off
6. Install - EL-38522 Variable Signal Generator
    - Voltage - 5 V
    - Frequency - 5 kHz
    - Duty Cycle - 10%
    - Black lead @ Battery Negative Post
    - Red lead @ Signal circuit terminal 2
7. Ignition - On / Vehicle - In Service Mode
8. Verify the scan tool parameter: Intermediate Speed Sensor = 5, 890 to 6, 090 RPM
    - **If not between 5, 890 and 6, 090 RPM**
    1. Ignition/Vehicle - Off
    2. Disconnect the electrical connector: K71 Transmission Control Module
    3. Ignition - On / Vehicle - In Service Mode
    4. Test for less than 1 V between the test points: Signal circuit terminal 2 @ Component harness & Ground
        - If 1 V or greater - Repair the short to voltage on the circuit.
        - Go to next step: If less than 1 V
    5. Ignition/Vehicle - Off

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6. Test for infinite resistance between the test points: Signal circuit terminal 2 @ Component harness & Ground
    - If less than infinite resistance - Repair the short to ground on the circuit.
    - Go to next step: If infinite resistance
7. Test for less than 2 ohms between the test points: Signal circuit terminal 2 @ Component harness & Terminal 13 @ Control module harness
    - If 2 ohms or greater - Repair the open/high resistance in the circuit.
    - If less than 2 ohms - Replace the component: K71 Transmission Control Module

- **Go to next step: If between 5, 890 and 6, 090 RPM**

9. Verify the scan tool parameter: Intermediate Speed Sensor Direction = Forward
    - **If not the specified state**

      Replace the component: K71 Transmission Control Module

    - **Go to next step: If the specified state**
10. Setup - EL-38522 Variable Signal Generator
    - Voltage - 5 V
    - Frequency - 600 Hz
    - Duty Cycle - 10%
    - Black lead @ Battery Negative Post
    - Red lead @ Signal circuit terminal 1
11. Verify the scan tool parameter: Intermediate Speed Sensor Direction = Reverse
    - **If not the specified state**

      Replace the component: K71 Transmission Control Module

    - **Go to next step: If the specified state**
12. Remove - EL-38522 Variable Signal Generator
13. Connect the electrical connector: X1 @ T12 Automatic Transmission
14. Ignition/Vehicle - Off
15. Remove the component: Automatic Transmission Fluid Pan
16. Disconnect the electrical connector: B14DA Automatic Transmission Intermediate Speed Sensor 1
17. Ignition - On / Vehicle - In Service Mode
18. Test for 8.3 to 9.6 V between the test points: 9 V Reference circuit terminal 2 & Ground
    - **If not between 8.3 and 9.6 V**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 8.3 and 9.6 V**
19. Ignition/Vehicle - Off
20. Install - EL-38522 Variable Signal Generator
    - Voltage - 5 V
    - Frequency - 5 kHz
    - Duty Cycle - 10%
    - Black lead @ Battery Negative Post
    - Red lead @ Signal circuit terminal 1
21. Ignition - On / Vehicle - In Service Mode
22. Verify the scan tool parameter: Intermediate Speed Sensor = 5, 890 to 6, 090 RPM
    - **If not between 5, 890 and 6, 090 RPM**

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Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If between 351 and 371 RPM**

23. Test or replace the component: B14DA Automatic Transmission Intermediate Speed Sensor 1

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Q77 Transmission Control Solenoid Valve Characterization Programming (10L60)**
- **Automatic Transmission Intermediate Speed Sensor Replacement (Sensor 1)** , or **Automatic Transmission Intermediate Speed Sensor Replacement (Sensor 2)** - B14DA Automatic Transmission Intermediate Speed Sensor 1
- **Automatic Transmission Wiring Harness Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P1775

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P1775

Transmission Range Request Signal Message Counter Incorrect

Circuit/System Description

Control modules connected to the serial data circuits monitor the communication during normal vehicle operation. Operating information and commands are exchanged among the control modules. Each module on the serial data circuit maintains a transmit error counter and a receive error counter. The counter values increase with detected errors and decrease with error-free messages.

Conditions for Running the DTC

- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Serial Data = Message Counter Incorrect - Between the following control modules:

- K20 Engine Control Module
- K71 Transmission Control Module

Within 10 consecutive messages, 10 have had an incorrect value.

Actions Taken When the DTC Sets

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DTCs listed in the DTC Descriptor Category = Type A DTC

The control module K20 uses the redundant information from control module K71 to determine the gear selector lever position.

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Verify there are no DTCs set related to the following component/system: Serial Data
    - **If a related DTC is set**

      Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**

    - **If a related DTC is not set**

    1. Ignition/Vehicle - Off
    2. Replace the component: K20 Engine Control Module
    3. Operate the vehicle within the Conditions for Running the DTC.
    4. Verify the DTC does not set.
        - If the DTC sets - Replace the component: K71 Transmission Control Module
        - Go to next step: If the DTC is not set
    5. All OK.

    - **Go to next step: If no DTC is set**
3. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

For control module replacement, programming, and setup refer to **Control Module References**

DTC P17C5, P17C6, P17CC, P17CD, OR P17D6

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P17C5

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Intermediate Speed Sensor 2 Direction Signal Invalid

DTC P17C6

Intermediate Speed Sensor 2 Direction Not Plausible - Forward

DTC P17CC

Intermediate Speed Sensor 2 Circuit Low

DTC P17CD

Intermediate Speed Sensor 2 Circuit High

DTC P17D6

Intermediate Speed Sensor 2 Circuit Performance

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P17CC**	P17CC**	P17CD	P17C5, P17C6, P17D6
Signal	P17CC	P17CC	P17CD*	P17C5, P17C6, P17D6
*Internal control module or component damage may occur if the circuit shorts to B+. **Additional DTCs may set.				

Typical Scan Tool Data

Intermediate Speed Sensor 2

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Vehicle Speed = Greater than 2 km/h (1.2 MPH) **Parameter Normal Range:** 500 to 7, 500 RPM			
Signal	0 RPM	0 RPM	0 RPM

Sensor Supply 2 Circuit Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On **Parameter Normal Range:** Okay			
9 V Reference	Malfunction	Okay	Malfunction

Circuit/System Description

For an overview of the component/system, refer to **Electronic Component Description**

Circuit	Description
9 V Reference	Regulated voltage supplied by the control module.
Signal	The sensor produces a frequency modulated signal.

Component	Description
B14DB Automatic Transmission Intermediate Speed Sensor 2	The sensor contains a hall-effect sensor and additional electronics that processes the signal. It detects the change of strength of the magnetic field caused by the reluctor ring. When the strength changes, the sensor changes the amount of current it consumes. This results in a square wave signal

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Component	Description
	of current and voltage. The control module detects the frequency in which the signal changes, which is proportional to the rotational speed.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.
Reluctor Ring	• The reluctor ring has 50 teeth, magnetic segments, or indentations. • The reluctor ring is part of the component: Output Carrier Internal Gear Transfer Shell

The sensor is an input to the control module K71. The input signal is used to determine the rotational speed of the component: Output Carrier Internal Gear Transfer Shell

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- {P17C6} Engine Speed = Greater than 500 RPM
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P17C5

Transmission Intermediate Speed Sensor 2 Direction Signal = Incorrect - For greater than 3.5 s

P17C6

Transmission Intermediate Speed Sensor 2 Direction Signal = Not Plausible - For greater than 2.5 s

P17CC

Transmission Intermediate Speed Sensor 2 = Less than 0.25 V - For greater than 1 s

P17CD

Transmission Intermediate Speed Sensor 2 = Greater than 4.75 V - For greater than 1 s

P17D6

Transmission Intermediate Speed Sensor 2 - Actual & Calculated = Not within 10 RPM of each other

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled - If equipped
- Grade braking = Disabled

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- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- Transmission gear allowed = Reverse or Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics

Connector End View Reference

Master Electrical Component List , or **Component Connector End Views - Index**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Special Tools

EL-38522 Variable Signal Generator

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Verify the scan tool parameter: Sensor Supply Circuit Status = Okay
    - **If not the specified state**

      Refer to: Circuit/System Testing

    - **Go to next step: If the specified state**

    CAUTION: **Support the lower control arms in the normal horizontal position in order to avoid damage to the drive axles. Do not operate the vehicle in gear with the wheels hanging down at full travel.**

3. Raise and support the vehicle.
4. Start and idle the engine.

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5. Transmission in Drive
6. Verify the scan tool parameter: Intermediate Speed Sensor 2 = The value should change smoothly and gradually as the vehicle speed is increased and decreased.
    - **If the value does not change smoothly and gradually**

      Refer to: Circuit/System Testing

    - **Go to next step: If the value changes smoothly and gradually**
7. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. Verify the DTC does not set.
    - **If the DTC sets**

      Refer to: Circuit/System Testing

    - **Go to next step: If the DTC is not set**
8. All OK.

Circuit/System Testing

1. Ignition/Vehicle & All vehicle systems - Off

    NOTE: **When the following connector is disconnected, the ignition cannot be turned off due to lack of a valid park input to the TCM. If the ignition needs to be turned off, the connector will need to be reconnected.**

2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission
3. Ignition - On / Vehicle - In Service Mode
4. Test for 8.3 to 9.6 V between the test points: 9 V Reference circuit terminal 8 & Ground
    - **If less than 8.3 V**
    1. Ignition/Vehicle - Off
    2. Disconnect the electrical connector: K71 Transmission Control Module
    3. Test for infinite resistance between the test points: 9 V Reference circuit terminal 8 @ Component harness & Ground
        - If less than infinite resistance - Repair the short to ground on the circuit.
        - Go to next step: If infinite resistance
    4. Test for less than 2 ohms between the test points: 9 V Reference circuit terminal 8 @ Component harness & Terminal 8 @ Control module harness
        - If 2 ohms or greater - Repair the open/high resistance in the circuit.
        - If less than 2 ohms - Replace the component: K71 Transmission Control Module
    - **If greater than 9.6 V**
    1. Ignition/Vehicle - Off
    2. Disconnect the electrical connector: K71 Transmission Control Module
    3. Ignition - On / Vehicle - In Service Mode
    4. Test for less than 1 V between the test points: 9 V Reference circuit terminal 8 @ Component harness & Ground
        - If 1 V or greater - Repair the short to voltage on the circuit.
        - If less than 1 V - Replace the component: K71 Transmission Control Module
    - **Go to next step: If between 8.3 and 9.6 V**
5. Ignition/Vehicle - Off
6. Install - EL-38522 Variable Signal Generator

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- Voltage - 5 V
- Frequency - 5 kHz
- Duty Cycle - 10%
- Black lead @ Battery Negative Post
- Red lead @ Signal circuit terminal 3

7. Ignition - On / Vehicle - In Service Mode
8. Verify the scan tool parameter: Intermediate Speed Sensor 2 = 5, 890 to 6, 090 RPM
    - **If not between 5, 890 and 6, 090 RPM**
    1. Ignition/Vehicle - Off
    2. Disconnect the electrical connector: K71 Transmission Control Module
    3. Ignition - On / Vehicle - In Service Mode
    4. Test for less than 1 V between the test points: Signal circuit terminal 3 @ Component harness & Ground
        - If 1 V or greater - Repair the short to voltage on the circuit.
        - Go to next step: If less than 1 V
    5. Ignition/Vehicle - Off
    6. Test for infinite resistance between the test points: Signal circuit terminal 3 @ Component harness & Ground
        - If less than infinite resistance - Repair the short to ground on the circuit.
        - Go to next step: If infinite resistance
    7. Test for less than 2 ohms between the test points: Signal circuit terminal 3 @ Component harness & The other end of the circuit @ Control module harness
        - If 2 ohms or greater - Repair the open/high resistance in the circuit.
        - If less than 2 ohms - Replace the component: K71 Transmission Control Module
    - **Go to next step: If between 5, 890 and 6, 090 RPM**
9. Verify the scan tool parameter: Intermediate Speed Sensor 2 Direction = Forward
    - **If not the specified state**

      Replace the component: K71 Transmission Control Module

    - **Go to next step: If the specified state**
10. Setup - EL-38522 Variable Signal Generator
    - Voltage - 5 V
    - Frequency - 600 Hz
    - Duty Cycle - 10%
    - Black lead @ Battery Negative Post
    - Red lead @ Signal circuit terminal 1
11. Verify the scan tool parameter: Intermediate Speed Sensor 2 Direction = Reverse
    - **If not the specified state**

      Replace the component: K71 Transmission Control Module

    - **Go to next step: If the specified state**
12. Remove - EL-38522 Variable Signal Generator
13. Connect the electrical connector: X1 @ T12 Automatic Transmission
14. Ignition/Vehicle - Off
15. Remove the component: Automatic Transmission Fluid Pan
16. Disconnect the electrical connector: B14DB Automatic Transmission Intermediate Speed Sensor 2

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17. Ignition - On / Vehicle - In Service Mode
18. Test for 8.3 to 9.6 V between the test points: 9 V Reference circuit terminal 2 & Ground
    - **If not between 8.3 and 9.6 V**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 8.3 and 9.6 V**
19. Ignition/Vehicle - Off
20. Install - EL-38522 Variable Signal Generator
    - Voltage - 5 V
    - Frequency - 5 kHz
    - Duty Cycle - 10%
    - Black lead @ Battery Negative Post
    - Red lead @ Signal circuit terminal 1
21. Ignition - On / Vehicle - In Service Mode
22. Verify the scan tool parameter: Intermediate Speed Sensor 2 = 5, 890 to 6, 090 RPM
    - **If not between 5, 890 and 6, 090 RPM**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 5, 890 and 6, 090 RPM**
23. Test or replace the component: B14DB Automatic Transmission Intermediate Speed Sensor 2

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Automatic Transmission Intermediate Speed Sensor Replacement (Sensor 1)** , or **Automatic Transmission Intermediate Speed Sensor Replacement (Sensor 2)** - B14DB Automatic Transmission Intermediate Speed Sensor 2
- **Automatic Transmission Wiring Harness Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P17F5-P17F7 OR P17FA-P17FC

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P17F5

Transmission Park Valve Position Sensor Circuit

DTC P17F6

Transmission Park Valve Position Sensor Circuit Low

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DTC P17F7

Transmission Park Valve Position Sensor Circuit High

DTC P17FA

Transmission Park Valve Position Sensor 2 Circuit

DTC P17FB

Transmission Park Valve Position Sensor 2 Circuit Low

DTC P17FC

Transmission Park Valve Position Sensor 2 Circuit High

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P17F6, P17FB	P17F6, P17FB	-	-
Signal - Sensor 1	P17F6	P17F6	P17F7	-
Signal - Sensor 2	P17FB	P17FB	P17FC	-

Typical Scan Tool Data

Transmission Park Valve Position Sensor/Transmission Park Valve Position Sensor 2

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** 0.7 to 2.2 V			
9 V Reference	0 V	0 V	-
Signal	0 V	0 V	4.8 to 5.0 V

Circuit/System Description

Circuit	Description
9 V Reference	Regulated voltage supplied by the control module.
Signal	The control module input circuit has an internal resistance connected to ground.

Component	Description
B316 Transmission Park Valve Position Switch	The switch contains 2 hall-effect sensors and additional electronics. It detects the strength of the magnetic field caused by a magnet that is mounted to the park release lever. When the strength changes, the sensors change the amount of current they consume.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.

Conditions for Running the DTC

- Ignition and Start Signal = 9 to 32 V

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- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P17F5

Transmission Park Valve Position Sensor 1 = 1.3 to 1.5 V - For greater than 1 s

P17F6

Transmission Park Valve Position Sensor 1 = Less than 0.4 V - For greater than 1 s

P17F7

Transmission Park Valve Position Sensor 1 = Greater than 2.5 V - For greater than 1 s

P17FA

Transmission Park Valve Position Sensor 2 = 1.3 to 1.5 V - For greater than 1 s

P17FB

Transmission Park Valve Position Sensor 2 = Less than 0.4 V - For greater than 1 s

P17FC

Transmission Park Valve Position Sensor 2 = Greater than 2.5 V - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

Autostart/Autostop = Disabled

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics

Connector End View Reference

Master Electrical Component List , or **Component Connector End Views - Index**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

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Scan Tool Reference

Control Module References

Circuit/System Verification

1. Engine - Running
2. Transmission Range - Park

   Verify the scan tool parameter:

   - {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor = 0.6 to 1.0 V
   - {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = 0.6 to 1.0 V
   - **If not between 0.6 and 1.0 V**

     Refer to: Circuit/System Testing

   - **Go to next step: If between 0.6 and 1.0 V**
3. Transmission Range - Reverse Gear

   Verify the scan tool parameter:

   - {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor = 1.7 to 2.1 V
   - {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = 1.7 to 2.1 V
   - **If not between 1.7 and 2.1 V**

     Refer to: Circuit/System Testing

   - **Go to next step: If between 1.7 and 2.1 V**
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

   Verify the DTC does not set.

   - **If the DTC sets**

     Refer to: Circuit/System Testing

   - **Go to next step: If the DTC is not set**
5. All OK.

Circuit/System Testing

1. Ignition/Vehicle - Off

   NOTE: **When the following connector is disconnected, the ignition cannot be turned off due to lack of a valid park input to the TCM. If the ignition needs to be turned off, the connector will need to be reconnected.**

2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission
3. Ignition - On / Vehicle - In Service Mode
4. Test for 8.6 to 9.2 V between the test points: 9 V Reference circuit terminal 7 @ T12 Automatic Transmission (harness side) & Ground
   - **If less than 8.6 V**
   1. Disconnect the electrical connector: K71 Transmission Control Module

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2. Test for infinite resistance between the test points: 9 V Reference circuit terminal 7 @ T12 Automatic Transmission (harness side) & Ground
    - If less than infinite resistance - Repair the short to ground on the circuit.
    - Go to next step: If infinite resistance
3. Test for less than 2 ohms between the test points: 9 V Reference circuit terminal 7 @ T12 Automatic Transmission (harness side) & The other end of the circuit
    - If 2 ohms or greater - Repair the open/high resistance in the circuit.
    - If less than 2 ohms - Replace the component: K71 Transmission Control Module

- **If greater than 9.2 V**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: K71 Transmission Control Module
3. Ignition - On / Vehicle - In Service Mode
4. Test for less than 1 V between the test points: 9 V Reference circuit terminal 7 @ T12 Automatic Transmission (harness side) & Ground
    - If 1 V or greater - Repair the short to voltage on the circuit.
    - If less than 1 V - Replace the component: K71 Transmission Control Module

- **Go to next step: If between 8.6 and 9.2 V**

5. Verify the scan tool parameter:
    - {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor = Less than 0.4 V
    - {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = Less than 0.4 V
    - **If 0.4 V or greater**
    1. Ignition/Vehicle - Off
    2. Disconnect the electrical connector: K71 Transmission Control Module
    3. Ignition - On / Vehicle - In Service Mode
    4. Test for less than 0.4 V between the test points:
        - {P17F5, P17F6, P17F7} Signal circuit terminal 5 @ T12 Automatic Transmission (harness side) & Ground
        - {P17FA, P17FB, P17FC} Signal circuit terminal 6 @ T12 Automatic Transmission (harness side) & Ground
        - If 0.4 V or greater - Repair the short to voltage on the circuit.
        - If less than 0.4 V - Replace the component: K71 Transmission Control Module
    - **Go to next step: If less than 0.4 V**
6. Connect a 3 A fused jumper wire between the test points:
    - {P17F5, P17F6, P17F7} Signal circuit terminal 5 & 9 V Reference circuit terminal 7
    - {P17FA, P17FB, P17FC} Signal circuit terminal 6 & 9 V Reference circuit terminal 7
7. Verify the scan tool parameter:
    - {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor = Greater than 4.8 V
    - {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = Greater than 4.8 V
    - **If less than 4.8 V**
    1. Ignition/Vehicle - Off & Remove - Jumper wire(s)
    2. Disconnect the electrical connector: K71 Transmission Control Module
    3. Test for infinite resistance between the test points:
        - {P17F5, P17F6, P17F7} Signal circuit terminal 5 @ Component harness & Ground
        - {P17FA, P17FB, P17FC} Signal circuit terminal 6 @ Component harness & Ground
        - If less than infinite resistance - Repair the short to ground on the circuit.
        - Go to next step: If infinite resistance

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4. Test for less than 2 ohms between the test points:
    - {P17F5, P17F6, P17F7} Signal circuit terminal 5 @ Component harness & The other end of the circuit @ Control module harness
    - {P17FA, P17FB, P17FC} Signal circuit terminal 6 @ Component harness & The other end of the circuit @ Control module harness
    - If 2 ohms or greater - Repair the open/high resistance in the circuit.
    - If less than 2 ohms - Replace the component: K71 Transmission Control Module
- **Go to next step: If greater than 4.8 V**

8. Ignition/Vehicle - Off & Remove - Jumper wire(s)
9. Remove the component: Automatic Transmission Fluid Pan
10. Connect the electrical connector: X1 @ T12 Automatic Transmission
11. Disconnect the electrical connector: B316 Transmission Park Valve Position Switch
12. Ignition - On / Vehicle - In Service Mode
13. Verify the scan tool parameter:
    - {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor = Less than 0.4 V
    - {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = Less than 0.4 V
    - **If 0.4 V or greater**

      Replace the component: Automatic Transmission Wiring Harness

14. Test for 8.6 to 9.2 V between the test points: 9 V Reference circuit terminal 2 & Ground
    - **If not between 8.6 and 9.2 V**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 8.6 and 9.2 V**
15. Connect a 3 A fused jumper wire between the test points:
    - {P17F5, P17F6, P17F7} Signal circuit terminal 3 & 9 V Reference circuit terminal 2
    - {P17FA, P17FB, P17FC} Signal circuit terminal 4 & 9 V Reference circuit terminal 2
16. Verify the scan tool parameter:
    - {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor = Greater than 4.8 V
    - {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = Greater than 4.8 V
    - **If less than 4.8 V**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If 4.8 V or greater**
17. Test or replace the component: B316 Transmission Park Valve Position Switch

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Control Valve Assembly Disassemble** , / **Control Valve Assembly Assemble** - B316 Transmission Park Valve Position Switch
- **Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

DTC P187D, P187E, P18E7, OR P18E8

Diagnostic Instructions

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- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P187D

Transmission Park Valve Stuck On

DTC P187E

Transmission Park Valve Stuck Off

DTC P18E7

Transmission Park Valve Position Sensor Performance

DTC P18E8

Transmission Park Valve Position Sensor 2 Performance

Diagnostic Fault Information

NOTE:

- **DTC P187D, P187E, P18E7, P18E8 will set with a hydraulic/mechanical condition.**
- **The components are listed from the least to the most intrusive to service.**

Component	DTC	Condition
Control Valve Body • Default Disable Valve • Electronic Transmission Range Select (ETRS) Valve • Park Servo Valve • Reverse to Park (RTP) Blow Off Valve	P187D, P187E, P18E7, P18E8	• Binding or Sticking • Debris on the component. • Mechanically damaged • Missing components
M123 Transmission Park Valve Lock Solenoid Actuator/Park Inhibit Solenoid	P187D, P187E, P18E7, P18E8	• Binding or Sticking • Debris on the component. • Mechanically damaged • Missing components

Circuit/System Description

For an overview of the component/system, refer to:

- **Park - Engine Running (Mechanical Powerflow)** , or **Park - Engine Running (Hydraulic Circuits)**
- **Reverse (Mechanical Powerflow)** , or **Reverse (Hydraulic Circuits)**
- **Neutral - Engine Running (Mechanical Powerflow)** , or **Neutral - Engine Running (Hydraulic Circuits)**
- **Drive Range, First Gear (Mechanical Powerflow)** , or **Drive Range, First Gear (Hydraulic Circuits)**

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- **Drive Range, Second Gear (Mechanical Powerflow)** , or **Drive Range, Second Gear (Hydraulic Circuits)**
- **Drive Range, Third Gear (Mechanical Powerflow)** , or **Drive Range, Third Gear (Hydraulic Circuits)**
- **Drive Range, Fourth Gear (Mechanical Powerflow)** , or **Drive Range, Fourth Gear (Hydraulic Circuits)**
- **Drive Range, Fifth Gear (Mechanical Powerflow)** , or **Drive Range, Fifth Gear (Hydraulic Circuits)**
- **Drive Range, Sixth Gear (Mechanical Powerflow)** , or **Drive Range, Sixth Gear (Hydraulic Circuits)**
- **Drive Range, Seventh Gear (Mechanical Powerflow)** , or **Drive Range, Seventh Gear (Hydraulic Circuits)**
- **Drive Range, Eighth Gear (Mechanical Powerflow)** , or **Drive Range, Eighth Gear (Hydraulic Circuits)**
- **Drive Range, Ninth Gear (Mechanical Powerflow)** , or **Drive Range, Ninth Gear (Hydraulic Circuits)**
- **Drive Range, Tenth Gear (Mechanical Powerflow)** , or **Drive Range, Tenth Gear (Hydraulic Circuits)**
- **Electronic Component Description**

Conditions for Running the DTC

- DTC P2534 = Not set
- DTCs related to the following system/component = Not Set
  - B14A Automatic Transmission Output Speed Sensor
  - B14C Automatic Transmission Input Speed Sensor
  - B14DA Automatic Transmission Intermediate Speed Sensor 1
  - B14DB Automatic Transmission Intermediate Speed Sensor 2
  - B303 Transmission Range Sensor
  - Transmission Control Solenoid Valves - Circuit DTCs
- Battery Voltage = Greater than 9 V
- Engine = Running
- High Side Driver 1, 2 = On
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Scan Tool Control Function = Not Activated
- Transmission Range = D, L or M
- One of the following conditions listed below is true:
  - Accelerator Pedal Position = Greater than 0.5%
  - Engine Speed = Greater than 1, 000 RPM
  - Transmission Input Speed = Greater than 349 RPM
  - Transmission Output Shaft Speed = Greater than 35 RPM

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

B316 Transmission Park Valve Position Switch = Commanded state does not match the actual state

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

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Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to **Transmission Fluid Level and Condition Check**
   - **If a condition exists**

     Repair or replace as necessary

   - **Go to next step: If no condition exists**
2. Ignition - On / Vehicle - In Service Mode
3. Clear the DTCs.
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. Refer to **Road Test**

   Verify that no DTC listed in the DTC Descriptor Category is set.

   - **If any of the DTCs are set**

     Refer to: Diagnostic Fault Information & Verify the conditions listed in the table do not exist

   - **Go to next step: If none of the DTCs are set**
5. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Control Valve Assembly Assemble**
- **Control Valve Assembly Disassemble**
- **Control Valve Body Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

DTC P189C

Diagnostic Instructions

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- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P189C

Transmission Range Command Message Performance

Circuit/System Description

Circuit	Description
Serial Data	Digitally encoded information for communication between devices.

Component	Description
K20 Engine Control Module	The control module controls a series of actuators to ensure optimal engine performance. The control module does this by reading values from a variety of sensors, interprets the data and adjusts the engine actuators accordingly.
K71 Transmission Control Module	The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.

Conditions for Running the DTC

- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Commanded state does not match the actual state

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics

Connector End View Reference

Master Electrical Component List , or **Component Connector End Views - Index**

Electrical Information Reference

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- Circuit Testing
- Connector Repairs
- Testing for Intermittent Conditions and Poor Connections
- Wiring Repairs

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Verify there are no DTCs set related to the following component/system: LIN Bus
   - **If a related DTC is set**

     Refer to Diagnostic Trouble Code (DTC) List - Vehicle

   - **Go to next step: If a related DTC is not set**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

   Verify the DTC does not set.

   - **If the DTC sets**

     Refer to Circuit/System Testing.

   - **Go to next step: If the DTC does not set**
4. All OK.

Circuit/System Testing

NOTE: **It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector.
   - K20 Engine Control Module
   - K71 Transmission Control Module
3. Test for less than 1 V between the test points: Serial Data circuit terminal 31 @ K71 Transmission Control Module & The other end of the circuit
   - **If greater than 1 V**

     Repair the short to voltage on the circuit.

   - **Go to next step: If less than 1 V**
4. Test for infinite resistance between the test points: Serial Data circuit terminal 31 @ K71 Transmission Control Module & Ground
   - **If less than infinite resistance**

     Repair the short to ground on the circuit.

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- **Go to next step: If infinite resistance**

5. Test for less than 10 ohms between the test points: Serial Data circuit terminal 31 @ K71 Transmission Control Module & The other end of the circuit
   - **If greater than 10 ohms**

     Repair the open/high resistance in the circuit.

   - **Go to next step: If less than 10 ohms**
6. Replace the component: K71 Transmission Control Module
7. Verify the DTC does not set.
   - **If the DTC sets**

     Replace the component: K20 Engine Control Module

   - **Go to next step: If the DTC does not set**
8. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

For control module replacement, programming, and setup refer to **Control Module References**

DTC P18A1, P18AA, P18AB, OR P27EC

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P18A1

Electronic Transmission Range Select Valve Performance - Stuck On

DTC P18AA

Transmission Range Control Valve Position Sensor Circuit Stuck On

DTC P18AB

Transmission Range Control Valve Position Sensor Circuit Stuck Off

DTC P27EC

Transmission Range Control Valve Position Sensor Circuit Performance

Diagnostic Fault Information

Component	DTC	Condition
Transmission Control Solenoid Valve 8	P18A1, P18AA, P18AB, P27EC	Binding or Sticking/Stuck

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Component	DTC	Condition
Control Valve Body • Electronic Transmission Range Select (ETRS) Valve	P18A1, P18AA, P18AB, P27EC	• Oil Channels or Orifices - Blocked by debris/Restricted • Valve - Binding or Sticking/Stuck

Circuit/System Description

For an overview of the component/system, refer to **Electronic Component Description**

Conditions for Running the DTC

- {P18A1} DTC P18AA, P18AB, P27EC = Not set
- {P18AA} DTC P18AB, P27EC = Not set
- {P18AB} DTC P18AA, P27EC = Not set
- {P27EC} DTC P18AA, P18AB = Not set
- DTCs related to the following system/component = Not Set - B315A Transmission Range Control Valve 1 Position Switch
- Battery Voltage = Greater than 9 V
- Engine = Running
- High Side Driver 1 & High Side Driver 2 = On
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Conditions for Setting the DTC

B315A Transmission Range Control Valve 1 Position Switch = Commanded state does not match the actual state - For greater than 0.25 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled - If equipped
- Line Pressure Command = Default

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to **Transmission Fluid Level and Condition Check**
   - **If a condition exists**

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Repair or replace as necessary

- **Go to next step: If no condition exists**

2. Ignition - On / Vehicle - In Service Mode
3. Clear DTCs
4. Road test the vehicle. Refer to **Road Test**
5. DTCs related to the following system/component = Not Set - B315A Transmission Range Control Valve 1 Position Switch
   - **If a related DTC is set**

     Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**

   - **If DTC P18A1, P18AA, P18AB, P27EC is set**

     Refer to: Diagnostic Fault Information

   - **Go to next step: If no DTC is set**
6. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

   Verify the DTC does not set.

   - **If DTC P18A1, P18AA, P18AB, P27EC is set**

     Refer to: Diagnostic Fault Information

   - **Go to next step: If no DTC is set**
7. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Control Valve Body Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

DTC P18A2-P18A4

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P18A2

Transmission Park Valve Lock Control Circuit Low

DTC P18A3

Transmission Park Valve Lock Control Circuit

DTC P18A4

Transmission Park Valve Lock Control Circuit High

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Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 11	P2670	P2671	P2671	-
Control - Terminal 12	P18A2	P18A3	P18A4	-

Circuit/System Description

Circuit	Description
Control - Terminal 11	The output circuit is switched to 12 V to enable the component(s).
Control - Terminal 12	The output circuit is switched to ground to activate the component.

Component	Description
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.
M123 Transmission Park Valve Lock Solenoid Actuator	A linear solenoid actuator is an electro-mechanical device that converts electrical power into a mechanical pushing or pulling force or motion.

When the component is commanded on, the park servo valve is held in the out of park position, preventing the transmission from going into park.

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P18A2

Control Circuit = Short to Ground - For greater than 1 s

P18A3

Control Circuit = Open - For greater than 1 s

P18A4

Control Circuit = Short to Voltage - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled

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- Default shift pattern = Enabled
- Grade braking = Disabled
- High Side Driver 1 = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics

Connector End View Reference

Master Electrical Component List , or **Component Connector End Views - Index**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Verify DTC P2670, P2671 is not set.
    - **If DTC P2670, P2671 is set**

      Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**

    - **Go to next step: If DTC P2670, P2671 is not set**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

   Verify the DTC does not set.

    - **If the DTC sets**

      Refer to: Circuit/System Testing

    - **Go to next step: If the DTC is not set**
4. All OK.

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Circuit/System Testing

1. Ignition/Vehicle - Off

NOTE: **When the following connector is disconnected, the ignition cannot be turned off due to lack of a valid park input to the TCM. If the ignition needs to be turned off, the connector will need to be reconnected.**

2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission
3. Test for 15 to 25 ohms between the test points: Control circuit terminal 11 (component side) & Control circuit terminal 12 (component side)
   - **If not between 15 and 25 ohms**
   1. Remove the component: Automatic Transmission Fluid Pan
   2. Disconnect the electrical connector: M123 Transmission Park Valve Lock Solenoid Actuator
   3. Test for 15 to 25 ohms between the test points: Control terminal 1 & Control terminal 2
      - If not between 15 and 25 ohms - Replace the component: M123 Transmission Park Valve Lock Solenoid Actuator
      - If between 15 and 25 ohms - Replace the component: Automatic Transmission Wiring Harness
   - **Go to next step: If between 15 and 25 ohms**
4. Test for infinite resistance between the test points: Control circuit terminal 11 (component side) & Transmission Case
   - **If less than infinite resistance**
   1. Remove the component: Automatic Transmission Fluid Pan
   2. Disconnect the electrical connector: M123 Transmission Park Valve Lock Solenoid Actuator
   3. Test for infinite resistance between the test points:
      - Control terminal 1 & The component's housing
      - Control terminal 2 & The component's housing
      - If less than infinite resistance - Replace the component: M123 Transmission Park Valve Lock Solenoid Actuator
      - If infinite resistance - Replace the component: Automatic Transmission Wiring Harness
   - **Go to next step: If infinite resistance**
5. Ignition - On / Vehicle - In Service Mode
6. Connect a test lamp between the test points: Control circuit terminal 11 @ Component harness (harness side) & Ground
7. Perform the scan tool control function: High Side Driver 2 - On and Off

   Verify the test lamp turns On and Off.

   - **If the test lamp does not turn On and Off**
   1. Ignition/Vehicle - Off & Remove - Test Lamp
   2. Disconnect the electrical connector: K71 Transmission Control Module
   3. Test for infinite resistance between the test points: Control circuit terminal 11 & Ground
      - If less than infinite resistance - Repair the short to ground on the circuit.
      - Go to next step: If infinite resistance
   4. Test for less than 2 ohms between the test points: Control circuit terminal 11 & The other end of the circuit
      - If 2 ohms or greater - Repair the open/high resistance in the circuit.
      - If less than 2 ohms - Replace the component: K71 Transmission Control Module
   - **If the test lamp is always On**

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1. Ignition/Vehicle - Off & Remove - Test Lamp
2. Disconnect the electrical connector: K71 Transmission Control Module
3. Ignition - On / Vehicle - In Service Mode
4. Test for less than 1 V between the test points: Control circuit terminal 11 & Ground
    - If 1 V or greater - Repair the short to voltage on the circuit.
    - If less than 1 V - Replace the component: K71 Transmission Control Module
- **Go to next step: If the test lamp turns On and Off**

8. Disconnect the electrical connector: K71 Transmission Control Module
9. Ignition - On / Vehicle - In Service Mode
10. Test for less than 1 V between the test points: Control circuit terminal 12 @ X1 (harness side) & Ground
    - **If greater than 1 V**

      Repair the short to voltage on the circuit.

    - **Go to next step: If less than 1 V**
11. Ignition/Vehicle - Off
12. Test for infinite resistance between the test points: Control circuit terminal 12 @ X1 (harness side) & Ground
    - **If less than infinite resistance**

      Repair the short to ground on the circuit.

    - **Go to next step: If infinite resistance**
13. Test for less than 5 ohms between the test points: Control circuit terminal 12 @ X1 (harness side) & The other end of the circuit
    - **If greater than 5 ohms**

      Repair the open/high resistance in the circuit.

    - **Go to next step: If less than 5 ohms**
14. Test or replace the component: K71 Transmission Control Module

Component Testing

1. Ignition/Vehicle - Off
2. Remove the component: Automatic Transmission Fluid Pan
3. Disconnect the electrical connector: M123 Transmission Park Valve Lock Solenoid Actuator
4. Test for 15 to 25 ohms between the test points: Control terminal 1 & Control terminal 2
    - **If not between 15 and 25 ohms**

      Replace the component: M123 Transmission Park Valve Lock Solenoid Actuator

    - **Go to next step: If between 15 and 25 ohms**
5. Test for infinite resistance between the test points: Each terminal of the component & The component's housing
    - **If less than infinite resistance**

      Replace the component: M123 Transmission Park Valve Lock Solenoid Actuator

    - **Go to next step: If infinite resistance**
6. All OK.

Repair Instructions

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Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Control Valve Assembly and Transmission Wiring Harness Installation** - M123 Transmission Park Valve Lock Solenoid Actuator
- For control module replacement, programming, and setup refer to **Control Module References**

DTC P18A8

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P18A8

Transmission Park Control Solenoid Actuator Stuck On

Diagnostic Fault Information

NOTE:

- **DTC P18A8 will set with a hydraulic/mechanical condition.**
- **The components are listed from the least to the most intrusive to service.**

Component	DTC	Condition
M123 Transmission Park Valve Lock Solenoid Actuator	P18A8	Binding or Sticking/Stuck
Control Valve Body • Control Valve Body Spacer Plate • Park Servo Valve /Spring	P18A8	• Oil Channels or Orifices - Blocked by debris/Restricted • Valve - Binding or Sticking/Stuck

Circuit/System Description

For an overview of the component/system, refer to:

- **Park - Engine Running (Mechanical Powerflow)** , or **Park - Engine Running (Hydraulic Circuits)**
- **Reverse (Mechanical Powerflow)** , or **Reverse (Hydraulic Circuits)**
- **Neutral - Engine Running (Mechanical Powerflow)** , or **Neutral - Engine Running (Hydraulic Circuits)**
- **Drive Range, First Gear (Mechanical Powerflow)** , or **Drive Range, First Gear (Hydraulic Circuits)**
- **Drive Range, Second Gear (Mechanical Powerflow)** , or **Drive Range, Second Gear (Hydraulic Circuits)**
- **Drive Range, Third Gear (Mechanical Powerflow)** , or **Drive Range, Third Gear (Hydraulic Circuits)**
- **Drive Range, Fourth Gear (Mechanical Powerflow)** , or **Drive Range, Fourth Gear (Hydraulic Circuits)**
- **Drive Range, Fifth Gear (Mechanical Powerflow)** , or **Drive Range, Fifth Gear (Hydraulic Circuits)**

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- **Drive Range, Sixth Gear (Mechanical Powerflow)** , or **Drive Range, Sixth Gear (Hydraulic Circuits)**
- **Drive Range, Seventh Gear (Mechanical Powerflow)** , or **Drive Range, Seventh Gear (Hydraulic Circuits)**
- **Drive Range, Eighth Gear (Mechanical Powerflow)** , or **Drive Range, Eighth Gear (Hydraulic Circuits)**
- **Drive Range, Ninth Gear (Mechanical Powerflow)** , or **Drive Range, Ninth Gear (Hydraulic Circuits)**
- **Drive Range, Tenth Gear (Mechanical Powerflow)** , or **Drive Range, Tenth Gear (Hydraulic Circuits)**
- **Electronic Component Description**

The Park Servo Valve is held out of park by fluid pressure or the M123 Transmission Park Valve Lock Solenoid Actuator.

In neutral, there is not enough fluid pressure to hold the park servo valve out of park. The park servo valve is held out of the park position when the pin on the M123 is extended, holding the park servo valve.

If the B316 Transmission Park Valve Position Switch detects the park position when in neutral, DTC P18A8 will set.

Conditions for Running the DTC

- DTC P187D, P187E, P18A3, P18A4, P18AA, P18AB, P27EC = Not set
- DTCs related to the following system/component = Not Set
  - B315A Transmission Range Control Valve 1 Position Switch
  - B316 Transmission Park Valve Position Switch
- G5 Automatic Transmission Auxiliary Fluid Pump = Not Activated
- High Side Driver 1, 2 = On
- Battery Voltage = Greater than 9 V
- Engine = Running
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Transmission Range = N

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Transmission Range Command Actual - Transmission Range Control Valve 1 Position Switch

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

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Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to **Transmission Fluid Level and Condition Check**
   - **If a condition exists**

     Repair or replace as necessary

   - **Go to next step: If no condition exists**
2. Ignition - On / Vehicle - In Service Mode
3. Clear the DTCs.
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. Refer to **Road Test**

   Verify that no DTC listed in the DTC Descriptor Category is set.

   - **If any of the DTCs are set**

     Refer to: Diagnostic Fault Information & Verify the conditions listed in the table do not exist

   - **Go to next step: If none of the DTCs are set**
5. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Control Valve Body Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

DTC P18AE

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P18AE

Transmission Range Control Enable Valve Stuck On

Diagnostic Fault Information

NOTE:

- **DTC P18AE will set with a hydraulic/mechanical condition.**
- **The components are listed from the least to the most intrusive to service.**

Component	DTC	Condition
Q77J Transmission Control Solenoid Valve 9	P18AE	• Binding or Sticking • Mechanically damaged

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Component	DTC	Condition
		• Missing components
• Line Enable Anti-Backflow Valve • Valve Spring • Valve Body Bore	P18AE	• Binding or Sticking • Debris on the component. • Mechanically damaged
Control Valve Body	P18AE	Fluid/oil passage - Restricted/Leaking

Circuit/System Description

For an overview of the component/system, refer to:

- **Park - Engine Running (Mechanical Powerflow)** , or **Park - Engine Running (Hydraulic Circuits)**
- **Reverse (Mechanical Powerflow)** , or **Reverse (Hydraulic Circuits)**
- **Neutral - Engine Running (Mechanical Powerflow)** , or **Neutral - Engine Running (Hydraulic Circuits)**
- **Drive Range, First Gear (Mechanical Powerflow)** , or **Drive Range, First Gear (Hydraulic Circuits)**
- **Drive Range, Second Gear (Mechanical Powerflow)** , or **Drive Range, Second Gear (Hydraulic Circuits)**
- **Drive Range, Third Gear (Mechanical Powerflow)** , or **Drive Range, Third Gear (Hydraulic Circuits)**
- **Drive Range, Fourth Gear (Mechanical Powerflow)** , or **Drive Range, Fourth Gear (Hydraulic Circuits)**
- **Drive Range, Fifth Gear (Mechanical Powerflow)** , or **Drive Range, Fifth Gear (Hydraulic Circuits)**
- **Drive Range, Sixth Gear (Mechanical Powerflow)** , or **Drive Range, Sixth Gear (Hydraulic Circuits)**
- **Drive Range, Seventh Gear (Mechanical Powerflow)** , or **Drive Range, Seventh Gear (Hydraulic Circuits)**
- **Drive Range, Eighth Gear (Mechanical Powerflow)** , or **Drive Range, Eighth Gear (Hydraulic Circuits)**
- **Drive Range, Ninth Gear (Mechanical Powerflow)** , or **Drive Range, Ninth Gear (Hydraulic Circuits)**
- **Drive Range, Tenth Gear (Mechanical Powerflow)** , or **Drive Range, Tenth Gear (Hydraulic Circuits)**
- **Electronic Component Description**

Conditions for Running the DTC

- Q77B Transmission Control Solenoid Valve 2 = Enabled
- Battery Voltage = Greater than 9 V
- Engine Speed = Greater than 499 RPM
- High Side Driver 1, 2 = On
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Input Shaft Speed Sensor = Greater than 300 RPM
- Transmission Fluid Temperature = Greater than 0B°C (32B°F)
- Transmission Service Fast Learn = Disabled

Frequency the DTC runs = Continuously - After the running conditions are met

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Conditions for Setting the DTC

Gear Ratio = Incorrect

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to **Transmission Fluid Level and Condition Check**
   - **If a condition exists**

     Repair or replace as necessary

   - **Go to next step: If no condition exists**
2. Ignition - On / Vehicle - In Service Mode
3. Clear the DTCs.
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. Refer to **Road Test**

   Verify that no DTC listed in the DTC Descriptor Category is set.

   - **If any of the DTCs are set**

     Refer to: Diagnostic Fault Information & Verify the conditions listed in the table do not exist

   - **Go to next step: If none of the DTCs are set**
5. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement**
- **Control Valve Body Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P2714 OR P2715

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Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P2714

Transmission Control Solenoid Valve 4 Stuck Off

DTC P2715

Transmission Control Solenoid Valve 4 Stuck On

Diagnostic Fault Information

NOTE:

- **DTC P2714 will set with a hydraulic/mechanical condition or high resistance in the circuit of the component Q77D without setting component/control circuit DTCs.**
- **DTC P2715 will set with a hydraulic/mechanical condition.**
- **The components are listed from the least to the most intrusive to service.**

Component	DTC	Condition

Q77D Transmission Control Solenoid Valve 4	P2714, P2715	• Binding, sticking or stuck component: Solenoid Valve
		• Damaged or missing component:
		  • Retaining Clip
		  • Solenoid Valve

• 1-2-3-4-6-7-8-10-R Clutch Regulator Valve Gain Valve
• Valve Body Bore
• Valve Spring
	P2714, P2715	• Binding, sticking or stuck component: Valve
		• Debris on the component.
		• Damaged component:
		  • Spring
		  • Valve or Bore - Scored

• 1-2-3-4-6-7-8-10-Reverse and 1-3-5-6-7-8-9 Clutch Regulator Valve
• Valve Spring
• Valve Body Bore
	P2714, P2715	• Binding, sticking or stuck component: Valve
		• Debris on the component.
		• Damaged component:
		  • Spring
		  • Valve or Bore - Scored

1-2-3-4-6-7-8-10-R Clutch Assembly - Oil Feed Circuit	P2714, P2715	Blocked or restricted component: Screen
1-2-3-4-6-7-8-10-R Clutch Assembly	P2714, P2715	• Blocked or restricted component: Fluid/oil passage • Leaking component:

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Component	DTC	Condition

		• Clutch Piston
		• Clutch Housing
		• Gasket
		• O-Ring
		• Seal
		• Binding, sticking or stuck component: Clutch Plates
		• Damaged or worn component:
		  • Clutch Housing
		  • Clutch Plates
		  • Clutch Piston

Circuit/System Description

For an overview of the component/system, refer to:

- **Park - Engine Running (Mechanical Powerflow)** , or **Park - Engine Running (Hydraulic Circuits)**
- **Reverse (Mechanical Powerflow)** , or **Reverse (Hydraulic Circuits)**
- **Neutral - Engine Running (Mechanical Powerflow)** , or **Neutral - Engine Running (Hydraulic Circuits)**
- **Drive Range, First Gear (Mechanical Powerflow)** , or **Drive Range, First Gear (Hydraulic Circuits)**
- **Drive Range, Second Gear (Mechanical Powerflow)** , or **Drive Range, Second Gear (Hydraulic Circuits)**
- **Drive Range, Third Gear (Mechanical Powerflow)** , or **Drive Range, Third Gear (Hydraulic Circuits)**
- **Drive Range, Fourth Gear (Mechanical Powerflow)** , or **Drive Range, Fourth Gear (Hydraulic Circuits)**
- **Drive Range, Fifth Gear (Mechanical Powerflow)** , or **Drive Range, Fifth Gear (Hydraulic Circuits)**
- **Drive Range, Sixth Gear (Mechanical Powerflow)** , or **Drive Range, Sixth Gear (Hydraulic Circuits)**
- **Drive Range, Seventh Gear (Mechanical Powerflow)** , or **Drive Range, Seventh Gear (Hydraulic Circuits)**
- **Drive Range, Eighth Gear (Mechanical Powerflow)** , or **Drive Range, Eighth Gear (Hydraulic Circuits)**
- **Drive Range, Ninth Gear (Mechanical Powerflow)** , or **Drive Range, Ninth Gear (Hydraulic Circuits)**
- **Drive Range, Tenth Gear (Mechanical Powerflow)** , or **Drive Range, Tenth Gear (Hydraulic Circuits)**
- **Electronic Component Description**

The solenoid actuator controls fluid pressure by moving the clutch 1-2-3-4-6-7-8-10-R regulator valve that controls the fluid pressure to the 1-2-3-4-6-7-8-10-R clutch.

Conditions for Running the DTC

- DTC P2534 = Not set
- DTCs related to the following system/component = Not Set
  - B14A Automatic Transmission Output Speed Sensor
  - B14C Automatic Transmission Input Speed Sensor

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    - B14DA Automatic Transmission Intermediate Speed Sensor 1
    - B14DB Automatic Transmission Intermediate Speed Sensor 2
    - B303 Transmission Range Sensor
    - Transmission Control Solenoid Valves - Circuit DTCs
- Battery Voltage = Greater than 9 V
- Engine = Running
- High Side Driver 1, 2 = On
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Scan Tool Control Function = Not Activated
- Transmission Range = D, L or M
- One of the following conditions listed below is true:
    - Accelerator Pedal Position = Greater than 0.5%
    - Engine Speed = Greater than 1, 000 RPM
    - Transmission Input Speed = Greater than 349 RPM
    - Transmission Output Shaft Speed = Greater than 35 RPM

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P2714

Clutch 1-2-3-4-6-7-8-10-R = Not applied

P2715

Clutch 1-2-3-4-6-7-8-10-R = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled - If equipped
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- {P2714} Transmission gear allowed = Reverse or Gear 7
- {P2715} Transmission gear allowed = Reverse or Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

High resistance in the circuits of the component Q77D may set DTC P2714 without setting control circuit DTC(s).

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Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to **Transmission Fluid Level and Condition Check**
   - **If a condition exists**

     Repair or replace as necessary

   - **Go to next step: If no condition exists**
2. Ignition - On / Vehicle - In Service Mode
3. Clear the DTCs.
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. Refer to **Road Test**

   Verify that no DTC listed in the DTC Descriptor Category is set.

   - **If any of the DTCs are set**

     Refer to: Diagnostic Fault Information & Verify the conditions listed in the table do not exist

   - **Go to next step: If none of the DTCs are set**
5. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Control Valve Body Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P2723 OR P2724

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

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DTC P2723

Transmission Control Solenoid Valve 5 Stuck Off

DTC P2724

Transmission Control Solenoid Valve 5 Stuck On

Diagnostic Fault Information

NOTE:

- **DTC P2723 will set with a hydraulic/mechanical condition or high resistance in the circuit of the component Q77E without setting component/control circuit DTCs.**
- **DTC P2724 will set with a hydraulic/mechanical condition.**
- **The components are listed from the least to the most intrusive to service.**

Component	DTC	Condition

Q77E Transmission Control Solenoid Valve 5	P2723, P2724	• Binding, sticking or stuck component: Solenoid Valve
		• Damaged or missing component:
		  • Retaining Clip
		  • Solenoid Valve

• 1-2-3-4-6-7-8-10-Reverse and 1-3-5-6-7-8-9 Clutch Regulator Valve
• Valve Body Bore
• Valve Spring
	P2723, P2724	• Binding, sticking or stuck component: Valve
		• Debris on the component.
		• Damaged component:
		  • Spring
		  • Valve or Bore - Scored

• 1-3-5-6-7-8-9 Latch Valve
• Valve Body Bore
• Valve Spring
	P2723, P2724	• Binding, sticking or stuck component: Valve
		• Debris on the component.
		• Damaged component:
		  • Spring
		  • Valve or Bore - Scored

1-3-5-6-7-8-9 Clutch Assembly - Oil Feed Circuit	P2723, P2724	Blocked or restricted component: Screen

1-3-5-6-7-8-9 Clutch Assembly	P2723, P2724	• Blocked or restricted component: Fluid/oil passage
		• Leaking component:
		  • Clutch Piston
		  • Clutch Housing
		  • Gasket
		  • O-Ring
		  • Seal
		• Binding, sticking or stuck component: Clutch Plates

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Component	DTC	Condition

		• Damaged or worn component:
		  • Clutch Housing
		  • Clutch Plates
		  • Clutch Piston

Circuit/System Description

For an overview of the component/system, refer to:

- **Park - Engine Running (Mechanical Powerflow)** , or **Park - Engine Running (Hydraulic Circuits)**
- **Reverse (Mechanical Powerflow)** , or **Reverse (Hydraulic Circuits)**
- **Neutral - Engine Running (Mechanical Powerflow)** , or **Neutral - Engine Running (Hydraulic Circuits)**
- **Drive Range, First Gear (Mechanical Powerflow)** , or **Drive Range, First Gear (Hydraulic Circuits)**
- **Drive Range, Second Gear (Mechanical Powerflow)** , or **Drive Range, Second Gear (Hydraulic Circuits)**
- **Drive Range, Third Gear (Mechanical Powerflow)** , or **Drive Range, Third Gear (Hydraulic Circuits)**
- **Drive Range, Fourth Gear (Mechanical Powerflow)** , or **Drive Range, Fourth Gear (Hydraulic Circuits)**
- **Drive Range, Fifth Gear (Mechanical Powerflow)** , or **Drive Range, Fifth Gear (Hydraulic Circuits)**
- **Drive Range, Sixth Gear (Mechanical Powerflow)** , or **Drive Range, Sixth Gear (Hydraulic Circuits)**
- **Drive Range, Seventh Gear (Mechanical Powerflow)** , or **Drive Range, Seventh Gear (Hydraulic Circuits)**
- **Drive Range, Eighth Gear (Mechanical Powerflow)** , or **Drive Range, Eighth Gear (Hydraulic Circuits)**
- **Drive Range, Ninth Gear (Mechanical Powerflow)** , or **Drive Range, Ninth Gear (Hydraulic Circuits)**
- **Drive Range, Tenth Gear (Mechanical Powerflow)** , or **Drive Range, Tenth Gear (Hydraulic Circuits)**
- **Electronic Component Description**

The solenoid actuator controls fluid pressure by moving the clutch 1-3-5-6-7-8-9 regulator valve that controls the fluid pressure to the 1-3-5-6-7-8-9 clutch. For an overview of the component/system, refer to:

Conditions for Running the DTC

- DTC P2534 = Not set
- DTCs related to the following system/component = Not Set
  - B14A Automatic Transmission Output Speed Sensor
  - B14C Automatic Transmission Input Speed Sensor
  - B14DA Automatic Transmission Intermediate Speed Sensor 1
  - B14DB Automatic Transmission Intermediate Speed Sensor 2
  - B303 Transmission Range Sensor
  - Transmission Control Solenoid Valves - Circuit DTCs
- Battery Voltage = Greater than 9 V
- Engine = Running
- High Side Driver 1, 2 = On

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- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Scan Tool Control Function = Not Activated
- Transmission Range = D, L or M
- One of the following conditions listed below is true:
  - Accelerator Pedal Position = Greater than 0.5%
  - Engine Speed = Greater than 1, 000 RPM
  - Transmission Input Speed = Greater than 349 RPM
  - Transmission Output Shaft Speed = Greater than 35 RPM

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P2723

Clutch 1-3-5-6-7-8-9 = Not applied

P2724

Clutch 1-3-5-6-7-8-9 = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled - If equipped
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- {P2723} Transmission gear allowed = Reverse or Gear 4
- {P2724} Transmission gear allowed = Reverse or Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

High resistance in the circuits of the component Q77E may set DTC P2723 without setting control circuit DTC(s).

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

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Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to **Transmission Fluid Level and Condition Check**
   - **If a condition exists**

     Repair or replace as necessary

   - **Go to next step: If no condition exists**
2. Ignition - On / Vehicle - In Service Mode
3. Clear the DTCs.
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. Refer to **Road Test**

   Verify that no DTC listed in the DTC Descriptor Category is set.

   - **If any of the DTCs are set**

     Refer to: Diagnostic Fault Information & Verify the conditions listed in the table do not exist

   - **Go to next step: If none of the DTCs are set**
5. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Control Valve Body Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P2732 OR P2733

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P2732

Transmission Control Solenoid Valve 6 Stuck Off

DTC P2733

Transmission Control Solenoid Valve 6 Stuck On

Diagnostic Fault Information

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NOTE:

- **DTC P2732 will set with a hydraulic/mechanical condition or high resistance in the circuit of the component Q77F without setting component/control circuit DTCs.**
- **DTC P2733 will set with a hydraulic/mechanical condition.**
- **The components are listed from the least to the most intrusive to service.**

Component	DTC	Condition

Q77F Transmission Control Solenoid Valve 6	P2732, P2733	• Binding, sticking or stuck component: Solenoid Valve
		• Damaged or missing component:
		  • Retaining Clip
		  • Solenoid Valve

• 4-5-6-7-8-9-10-R Clutch Regulator Valve
• Valve Body Bore
• Valve Spring
	P2732, P2733	• Binding, sticking or stuck component: Valve
		• Debris on the component.
		• Damaged component:
		  • Spring
		  • Valve or Bore - Scored

• 4-5-6-7-8-9-10-R Clutch Assembly - Latch Valve • Valve Body Bore • Valve Spring	P2732, P2733	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Spring • Valve or Bore - Scored
4-5-6-7-8-9-10-R Clutch Assembly - Oil Feed Circuit	P2732, P2733	Blocked or restricted component: Screen

4-5-6-7-8-9-10-R Clutch Assembly	P2732, P2733	• Blocked or restricted component: Fluid/oil passage
		• Leaking component:
		  • Clutch Piston
		  • Clutch Housing
		  • Gasket
		  • O-Ring
		  • Seal
		• Binding, sticking or stuck component: Clutch Plates
		• Damaged or worn component:
		  • Clutch Housing
		  • Clutch Plates
		  • Clutch Piston

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Circuit/System Description

For an overview of the component/system, refer to:

- **Park - Engine Running (Mechanical Powerflow)** , or **Park - Engine Running (Hydraulic Circuits)**
- **Reverse (Mechanical Powerflow)** , or **Reverse (Hydraulic Circuits)**
- **Neutral - Engine Running (Mechanical Powerflow)** , or **Neutral - Engine Running (Hydraulic Circuits)**
- **Drive Range, First Gear (Mechanical Powerflow)** , or **Drive Range, First Gear (Hydraulic Circuits)**
- **Drive Range, Second Gear (Mechanical Powerflow)** , or **Drive Range, Second Gear (Hydraulic Circuits)**
- **Drive Range, Third Gear (Mechanical Powerflow)** , or **Drive Range, Third Gear (Hydraulic Circuits)**
- **Drive Range, Fourth Gear (Mechanical Powerflow)** , or **Drive Range, Fourth Gear (Hydraulic Circuits)**
- **Drive Range, Fifth Gear (Mechanical Powerflow)** , or **Drive Range, Fifth Gear (Hydraulic Circuits)**
- **Drive Range, Sixth Gear (Mechanical Powerflow)** , or **Drive Range, Sixth Gear (Hydraulic Circuits)**
- **Drive Range, Seventh Gear (Mechanical Powerflow)** , or **Drive Range, Seventh Gear (Hydraulic Circuits)**
- **Drive Range, Eighth Gear (Mechanical Powerflow)** , or **Drive Range, Eighth Gear (Hydraulic Circuits)**
- **Drive Range, Ninth Gear (Mechanical Powerflow)** , or **Drive Range, Ninth Gear (Hydraulic Circuits)**
- **Drive Range, Tenth Gear (Mechanical Powerflow)** , or **Drive Range, Tenth Gear (Hydraulic Circuits)**
- **Electronic Component Description**

The solenoid actuator controls fluid pressure by moving the clutch 4-5-6-7-8-9-10-R regulator valve that controls the fluid pressure to the 4-5-6-7-8-9-10-R clutch.

Conditions for Running the DTC

- DTC P2534 = Not set
- DTCs related to the following system/component = Not Set
  - B14A Automatic Transmission Output Speed Sensor
  - B14C Automatic Transmission Input Speed Sensor
  - B14DA Automatic Transmission Intermediate Speed Sensor 1
  - B14DB Automatic Transmission Intermediate Speed Sensor 2
  - B303 Transmission Range Sensor
  - Transmission Control Solenoid Valves - Circuit DTCs
- Battery Voltage = Greater than 9 V
- Engine = Running
- High Side Driver 1, 2 = On
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Scan Tool Control Function = Not Activated
- Transmission Range = D, L or M
- One of the following conditions listed below is true:
  - Accelerator Pedal Position = Greater than 0.5%
  - Engine Speed = Greater than 1, 000 RPM
  - Transmission Input Speed = Greater than 349 RPM
  - Transmission Output Shaft Speed = Greater than 35 RPM

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Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P2732

Clutch 4-5-6-7-8-9-10-R = Not applied

P2733

Clutch 4-5-6-7-8-9-10-R = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled - If equipped
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- {P2732} Transmission gear allowed = Reverse or Gear 7
- {P2733} Transmission gear allowed = Reverse or Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

A speed sensor reporting an incorrect direction could cause a clutch stuck Off DTC before setting a speed sensor DTC.

High resistance in the circuits of the component Q77F may set DTC P2732 without setting control circuit DTC(s).

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to **Transmission Fluid Level and Condition Check**
    - **If a condition exists**

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Repair or replace as necessary

- **Go to next step: If no condition exists**

2. Ignition - On / Vehicle - In Service Mode
3. Clear the DTCs.
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. Refer to **Road Test**

   Verify that no DTC listed in the DTC Descriptor Category is set.

   - **If any of the DTCs are set**

     Refer to: Diagnostic Fault Information & Verify the conditions listed in the table do not exist

   - **Go to next step: If none of the DTCs are set**

5. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Control Valve Body Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P27A7-P27AE

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P27A7

Transmission Control Solenoid Valve 1 Calibration Incorrect

DTC P27A8

Transmission Control Solenoid Valve 2 Calibration Incorrect

DTC P27A9

Transmission Control Solenoid Valve 3 Calibration Incorrect

DTC P27AA

Transmission Control Solenoid Valve 4 Calibration Incorrect

DTC P27AB

Transmission Control Solenoid Valve 5 Calibration Incorrect

DTC P27AC

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Transmission Control Solenoid Valve 6 Calibration Incorrect

DTC P27AD

Transmission Control Solenoid Valve 7 Calibration Incorrect

DTC P27AE

Transmission Control Solenoid Valve 8 Calibration Incorrect

Circuit/System Description

- DTC P27A7, P27A8, P27A9, P27AA, P27AB, P27AC, P27AD, P27AE is an informational DTC.
- The data for each solenoid valve is programmed into the control module K71.
- For an overview of the component/system, refer to **Electronic Component Description**

Conditions for Running the DTC

- K71 Transmission Control Module = Initialization complete
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Transmission Control Solenoid Valve 1 - 8 Calibration Data = Not Programmed

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

The control module uses default replacement values.

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Verify DTC P27A7, P27A8, P27A9, P27AA, P27AB, P27AC, P27AD, P27AE is not set.
   - **If any of the DTCs are set**

     Refer to **Q77 Transmission Control Solenoid Valve Characterization Programming (10L60)**

   - **Go to next step: If no DTC is set**
3. All OK.

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Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P2796-P2799

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P2796

Automatic Transmission Auxiliary Fluid Pump Control Circuit

DTC P2797

Automatic Transmission Auxiliary Fluid Pump Performance

DTC P2798

Automatic Transmission Auxiliary Fluid Pump Control Circuit Low

DTC P2799

Automatic Transmission Auxiliary Fluid Pump Control Circuit High

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+ - Terminal 1 @ G5 Automatic Transmission Auxiliary Fluid Pump	1	P2797	-	P2797
Control - Terminal 3 @ G5 Automatic Transmission Auxiliary Fluid Pump	P0658	P0658	P0659	P2797
Control - Terminal 4 @ G5 Automatic Transmission Auxiliary Fluid Pump	P2798	P2796	P2799	P2797
Ground - Terminal 6 @ G5 Automatic Transmission Auxiliary Fluid Pump	-	P2797	1	P2797

1. Fuse - Open
2. Autostart/Autostop = Disabled - G5 Automatic Transmission Auxiliary Fluid Pump - Inoperative

Circuit/System Description

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For an overview of the component/system, refer to **Electronic Component Description**

Circuit	Description
B+ - Terminal 1 @ G5 Automatic Transmission Auxiliary Fluid Pump	Supplied from a fuse.
Control - Terminal 3 @ G5 Automatic Transmission Auxiliary Fluid Pump	The output circuit is switched to 12 V to activate the component.
Control - Terminal 4 @ G5 Automatic Transmission Auxiliary Fluid Pump	The output circuit is switched to ground to activate the component. The output is PWM controlled.
Ground - Terminal 6 @ G5 Automatic Transmission Auxiliary Fluid Pump	Chassis Ground

Component	Description
G5 Automatic Transmission Auxiliary Fluid Pump	An electric DC motor.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.

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Conditions for Running the DTC

P2796, P2798, P2799

- Battery Voltage = Greater than 9 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

P2797

- DTC P171A, P171B, P171C, U0101, P182E, P1915 = Not set
- DTCs related to the following system/component = Not Set
  - B13 Automatic Transmission Fluid Temperature Sensor
  - B14A Automatic Transmission Output Speed Sensor
  - B14C Automatic Transmission Input Speed Sensor
  - B26 Crankshaft Position Sensor
  - B303 Transmission Range Sensor
- Autostop = Active - For greater than 1.2 s
- Battery Voltage = Greater than 9 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Propulsion Active = Yes
- Transmission Fluid Temperature = 0 to 110B°C (32 to 230B°F)
- Transmission Range = D, L, M

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

P2796

Control Circuit = Open/High Resistance - For greater than 1 s

P2797

Input Shaft Speed Sensor = Greater than a predefined threshold - For greater than 1 s

P2798

Control Circuit = Short to Ground - For greater than 1 s

P2799

Control Circuit = Short to Voltage - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics

Connector End View Reference

Component Connector End Views - Index

Component View Reference

Disassembled Views (2WD) , or **Disassembled Views (AWD)**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode & Engine - Off
2. Verify DTC P0658, P0659 is not set.
    - **If DTC P0658, P0659 is set**

      Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**

    - **Go to next step: If DTC P0658, P0659 is not set**

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3. Engine - Running
4. Verify the scan tool parameter:
    - Automatic Transmission Auxiliary Fluid Pump Control Circuit High Test Status = Not Run or Okay
    - Automatic Transmission Auxiliary Fluid Pump Control Circuit Low Test Status = Not Run or Okay
    - Auxiliary Transmission Fluid Pump Relay Control Circuit Open Test Status = Not Run or Okay
    - **If not the specified state**

      Refer to: Circuit/System Testing

    - **Go to next step: If the specified state**
5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

   Verify the DTC does not set.

    - **If the DTC sets**

      Refer to: Circuit/System Testing

    - **Go to next step: If the DTC does not set**
6. All OK.

Circuit/System Testing

NOTE: **It may take up to 2 min for all vehicle systems to power down before an accurate ground or low reference circuit continuity test can be performed.**

1. Ignition/Vehicle & All vehicle systems - Off

NOTE: **When the following connector is disconnected, the ignition cannot be turned off due to lack of a valid park input to the TCM. If the ignition needs to be turned off, the connector will need to be reconnected.**

2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission
3. Test for less than 10 ohms between the test points: Ground circuit terminal 17 @ X1 (harness side) & Ground
    - **If 10 ohms or greater**
    1. Disconnect the ground connection: G103
    2. Test for less than 2 ohms between the test points: Ground circuit terminal 17 @ X1 (harness side) & G103
        - If 2 ohms or greater - Repair the open/high resistance in the circuit.
        - If less than 2 ohms - Repair the open/high resistance in the ground connection.
    - **Go to next step: If less than 10 ohms**
4. Verify a test lamp turns On between the test points: B+ circuit terminal 10 @ X1 (harness side) & Ground
    - **If the test lamp does not turn On and the circuit fuse is OK**
    1. Remove - Test Lamp
    2. Test for less than 2 ohms between the test points: B+ circuit terminal 10 @ X1 (harness side) & Output terminal @ X50A
        - If 2 ohms or greater - Repair the open/high resistance in the circuit.
        - If less than 2 ohms - Verify the fuse is OK and there is voltage at the fuse.

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- **If the test lamp does not turn On and the circuit fuse is open**

1. Remove - Test Lamp
2. Test for infinite resistance between the test points: B+ circuit terminal 10 @ X1 (harness side) & Ground
    - If less than infinite resistance - Repair the short to ground on the circuit.
    - If infinite resistance If infinite resistance - Replace the component:

- **Go to next step: If the test lamp turns On**

5. Disconnect the electrical connector: K71 Transmission Control Module
6. Ignition - On / Vehicle - In Service Mode
7. Test for less than 1 V between the test points: Control circuit terminal 18 @ X1 (harness side) & Ground
    - **If greater than 1 V**

      Repair the short to voltage on the circuit.

    - **Go to next step: If less than 1 V**
8. Test for greater than 5 ohms between the test points: Control circuit terminal 18 @ X1 & Ground
    - **If less than 5 ohms**

      Repair the short to ground on the circuit.

    - **Go to next step: If greater than 5 ohms**
9. Test for less than 5 ohms between the test points: Control circuit terminal 18 @ X1 & The other end of the circuit
    - **If greater than 5 ohms**

      Repair the open/high resistance in the circuit.

    - **Go to next step: If less than 5 ohms**
10. Remove the component: Automatic Transmission Fluid Pan
11. Disconnect the component: G5 Automatic Transmission Auxiliary Fluid Pump
12. Connect the electrical connector: X1 @ T12 Automatic Transmission
13. Test for battery voltage between the test points: B+ circuit terminal 1 & Ground circuit terminal 3 @ G5 Automatic Transmission Auxiliary Fluid Pump
    - **If less than battery voltage**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If battery voltage**
14. Test for less than 5 ohms between the test points: Control circuit terminal 4 & The other end of the circuit
    - **If greater than 5 ohms**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If less than 5 ohms**
15. Test for less than 5 ohms between the test points: Control circuit terminal 3 & The other end of the circuit
    - **If greater than 5 ohms**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If less than 5 ohms**
16. Test or replace the component: G5 Transmission Fluid Pump - Electric/Auxiliary

Repair Instructions

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Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement**
- **Automatic Transmission Wiring Harness Replacement**
- **Auxiliary Fluid Pump Removal** , / **Auxiliary Fluid Pump Installation** - G5 Automatic Transmission Auxiliary Fluid Pump
- **Transmission Service Fast Learn Procedure**
- For control module replacement, programming, and setup refer to **Control Module References**

DTC P27EB, P27ED, OR P27EE

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P27EB

Transmission Range Control Valve Position Sensor Circuit

DTC P27ED

Transmission Range Control Valve Position Sensor Circuit Low

DTC P27EE

Transmission Range Control Valve Position Sensor Circuit High

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P27ED*	P27ED*	-	-
Signal	P27ED	P27ED	P27EE	-
*Additional DTCs may set.				

Typical Scan Tool Data

Transmission Range Control Valve Position Sensor

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On **Parameter Normal Range:** • 0.6 to 1.0 V - Default • 1.7 to 2.2 V - Active			
9 V Reference	0 V	0 V	0.6 to 1.0 V
Signal	0 V	0 V	4.9 to 5.0 V

Circuit/System Description

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Circuit	Description
9 V Reference	Regulated voltage supplied by the control module.
Signal	The control module input circuit has an internal resistance connected to ground.

Component	Description
B315A Transmission Range Control Valve 1 Position Switch	A linear hall effect sensor that changes current flow based on the magnetic field's position relative to the sensor.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.

The B315A Transmission Range Control Valve 1 Position Switch monitors the position of the Mode 1 Electronic Transmission Range Selector Valve

- Default = Low Voltage - 0.6 to 1.0 V
- Active = High Voltage - 1.7 to 2.2 V

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 1 s

Conditions for Setting the DTC

P27EB

Transmission Range Control Valve 1 Position Switch = 1.26 to 1.50 V - For greater than 1 s

P27ED

Transmission Range Control Valve 1 Position Switch = Less than 0.41 V - For greater than 1 s

P27EE

Transmission Range Control Valve 1 Position Switch = Greater than 2.54 V - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

P27EB

Autostart/Autostop = Disabled

P27ED, P27EE

- Autostart/Autostop = Disabled
- Line Pressure Command = Default

Conditions for Clearing the DTC

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DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics

Connector End View Reference

Master Electrical Component List , or **Component Connector End Views - Index**

Electrical Information Reference

- **Circuit Testing**
- **Connector Repairs**
- **Testing for Intermittent Conditions and Poor Connections**
- **Wiring Repairs**

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

WARNING: **Apply the parking brake and block the drive wheels before performing this procedure in order to prevent bodily injury.**

1. Ignition - On / Vehicle - In Service Mode
2. Transmission Range - P
3. Verify the scan tool parameter: Transmission Range Control Valve Position Sensor = 0.6 to 1.0 V
   - **If not between 0.6 and 1.0 V**

     Refer to: Circuit/System Testing

   - **Go to next step: If between 0.6 and 1.0 V**
4. Engine - Running
5. Transmission Range - D
6. Verify the scan tool parameter: Transmission Range Control Valve Position Sensor = 1.7 to 2.2 V
   - **If not between 1.7 and 2.2 V**

     Refer to: Circuit/System Testing

   - **Go to next step: If between 1.7 and 2.2 V**
7. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

   Verify the DTC does not set.

   - **If the DTC sets**

     Refer to: Circuit/System Testing

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- **Go to next step: If the DTC is not set**

8. All OK.

Circuit/System Testing

1. Ignition/Vehicle - Off

> **NOTE:** **When the following connector is disconnected, the ignition cannot be turned off due to lack of a valid park input to the TCM. If the ignition needs to be turned off, the connector will need to be reconnected.**

2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission
3. Ignition - On / Vehicle - In Service Mode
4. Test for 8.8 to 9.2 V between the test points: 9 V Reference circuit terminal 8 & Ground
    - **If less than 8.8 V**
    1. Disconnect the electrical connector: K71 Transmission Control Module
    2. Test for infinite resistance between the test points: 9 V Reference circuit terminal 8 @ Component harness & Ground
        - If less than infinite resistance - Repair the short to ground on the circuit.
        - Go to next step: If infinite resistance
    3. Test for less than 2 ohms between the test points: 9 V Reference circuit terminal 8 @ Component harness & The other end of the circuit @ Control module harness
        - If 2 ohms or greater - Repair the open/high resistance in the circuit.
        - If less than 2 ohms - Replace the component: K71 Transmission Control Module
    - **If greater than 9.2 V**
    1. Disconnect the electrical connector: K71 Transmission Control Module
    2. Ignition - On / Vehicle - In Service Mode
    3. Test for less than 1 V between the test points: 9 V Reference circuit terminal 8 @ Component harness & Ground
        - If 1 V or greater - Repair the short to voltage on the circuit.
        - If less than 1 V - Replace the component: K71 Transmission Control Module
    - **Go to next step: If between 8.8 and 9.2 V**
5. Install - EL-38522 Variable Signal Generator
    - Voltage - 5 V
    - Frequency - 10 kHz
    - Duty Cycle - 40%
    - Black lead @ Battery Negative Post
    - Red lead @ Signal circuit terminal 20
6. Verify the scan tool parameter: Transmission Range Control Valve Position Sensor = 2.0 to 2.3 V
    - **If less than 2.0 V**
    1. Remove - EL-38522 Variable Signal Generator
    2. Ignition/Vehicle - Off
    3. Disconnect the electrical connector: K71 Transmission Control Module
    4. Test for infinite resistance between the test points: Signal circuit terminal 20 @ Component harness & Ground
        - If less than infinite resistance - Repair the short to ground on the circuit.
        - Go to next step: If infinite resistance

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5. Test for less than 2 ohms between the test points: Signal circuit terminal 20 @ Component harness & The other end of the circuit @ Control module harness
    - If 2 ohms or greater - Repair the open/high resistance in the circuit.
    - If less than 2 ohms - Replace the component: K71 Transmission Control Module
- **If greater than 2.3 V**

1. Disconnect the electrical connector: K71 Transmission Control Module
2. Ignition - On / Vehicle - In Service Mode
3. Test for less than 1 V between the test points: Signal circuit terminal 20 @ Component harness & Ground
    - If 1 V or greater - Repair the short to voltage on the circuit.
    - If less than 1 V - Replace the component: K71 Transmission Control Module
- **Go to next step: If between 2.0 and 2.3 V**

7. Remove the component: Automatic Transmission Fluid Pan
8. Connect the electrical connector: X1 @ T12 Automatic Transmission
9. Disconnect the electrical connector: X176
10. Test for 8.8 to 9.2 V between the test points: 9 V Reference circuit terminal 11 @ Control module harness & Ground
    - **If not between 8.8 and 9.2 V**

      Replace the appropriate component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 8.8 and 9.2 V**
11. Install - EL-38522 Variable Signal Generator
    - Voltage - 5 V
    - Frequency - 10 kHz
    - Duty Cycle - 40%
    - Black lead @ Battery Negative Post
    - Red lead @ Signal circuit terminal 10
12. Verify the scan tool parameter: Transmission Range Control Valve Position Sensor = 2.0 to 2.3 V
    - **If not between 2.0 and 2.3 V**

      Replace the appropriate component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 2.0 and 2.3 V**
13. Connect the electrical connector: X176
14. Disconnect the electrical connector: X177
15. Test for 8.8 to 9.2 V between the test points: 9 V Reference circuit terminal 6 @ Control module harness & Ground
    - **If not between 8.8 and 9.2 V**

      Replace the appropriate component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 8.8 and 9.2 V**
16. Install - EL-38522 Variable Signal Generator
    - Voltage - 5 V
    - Frequency - 10 kHz
    - Duty Cycle - 40%
    - Black lead @ Battery Negative Post
    - Red lead @ Signal circuit terminal 5

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17. Verify the scan tool parameter: Transmission Range Control Valve Position Sensor = 2.0 to 2.3 V
    - **If not between 2.0 and 2.3 V**

      Replace the appropriate component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 2.0 and 2.3 V**
18. Connect the electrical connector: X177
19. Disconnect the electrical connector: B315A Transmission Range Control Valve 1 Position Switch
20. Test for 8.8 to 9.2 V between the test points: 9 V Reference circuit terminal 1 @ Control module harness & Ground
    - **If not between 8.8 and 9.2 V**

      Replace the appropriate component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 8.8 and 9.2 V**
21. Install - EL-38522 Variable Signal Generator
    - Voltage - 5 V
    - Frequency - 10 kHz
    - Duty Cycle - 40%
    - Black lead @ Battery Negative Post
    - Red lead @ Signal circuit terminal 1
22. Verify the scan tool parameter: Transmission Range Control Valve Position Sensor = 2.0 to 2.3 V
    - **If not between 2.0 and 2.3 V**

      Replace the appropriate component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 2.0 and 2.3 V**
23. Test or replace the component: B315A Transmission Range Control Valve 1 Position Switch

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement**
- **Automatic Transmission Wiring Harness Replacement**
- **Control Valve Body Replacement** - B315A Transmission Range Control Valve 1 Position Switch
- For control module replacement, programming, and setup refer to **Control Module References**

DTC P2820 OR P2821

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P2820

Transmission Control Solenoid Valve 9 Stuck Off

DTC P2821

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Transmission Control Solenoid Valve 9 Stuck On

Diagnostic Fault Information

NOTE:

- **DTC P2820 will set with a hydraulic/mechanical condition or high resistance in the circuit of the component Q77J without setting component/control circuit DTCs.**
- **DTC P2821 will set with a hydraulic/mechanical condition.**
- **The components are listed from the least to the most intrusive to service.**

Component	DTC	Condition
Q77J Transmission Control Solenoid Valve 9	P2820, P2821	• Binding or Sticking • Mechanically damaged • Missing components
• Default Disable Valve • Valve Body Bore • Valve Spring	P2820, P2821	• Binding or Sticking • Debris on the component. • Mechanically damaged
• Default Select Valve • Valve Body Bore • Valve Spring	P2820, P2821	• Binding or Sticking • Debris on the component. • Mechanically damaged
Control Valve Body	P2820, P2821	Fluid/oil passage - Restricted/Leaking

Circuit/System Description

For an overview of the component/system, refer to:

- Park - Engine Running (Mechanical Powerflow) , or Park - Engine Running (Hydraulic Circuits)
- Reverse (Mechanical Powerflow) , or Reverse (Hydraulic Circuits)
- Neutral - Engine Running (Mechanical Powerflow) , or Neutral - Engine Running (Hydraulic Circuits)
- Drive Range, First Gear (Mechanical Powerflow) , or Drive Range, First Gear (Hydraulic Circuits)
- Drive Range, Second Gear (Mechanical Powerflow) , or Drive Range, Second Gear (Hydraulic Circuits)
- Drive Range, Third Gear (Mechanical Powerflow) , or Drive Range, Third Gear (Hydraulic Circuits)
- Drive Range, Fourth Gear (Mechanical Powerflow) , or Drive Range, Fourth Gear (Hydraulic Circuits)
- Drive Range, Fifth Gear (Mechanical Powerflow) , or Drive Range, Fifth Gear (Hydraulic Circuits)
- Drive Range, Sixth Gear (Mechanical Powerflow) , or Drive Range, Sixth Gear (Hydraulic Circuits)
- Drive Range, Seventh Gear (Mechanical Powerflow) , or Drive Range, Seventh Gear (Hydraulic Circuits)
- Drive Range, Eighth Gear (Mechanical Powerflow) , or Drive Range, Eighth Gear (Hydraulic Circuits)
- Drive Range, Ninth Gear (Mechanical Powerflow) , or Drive Range, Ninth Gear (Hydraulic Circuits)

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- **Drive Range, Tenth Gear (Mechanical Powerflow)** , or **Drive Range, Tenth Gear (Hydraulic Circuits)**
- **Electronic Component Description**

Conditions for Running the DTC

- DTC P126C, P2534, P2820, P2821 = Not set
- DTCs related to the following system/component = Not Set
  - B14A Automatic Transmission Output Speed Sensor
  - B14C Automatic Transmission Input Speed Sensor
  - B14DA Automatic Transmission Intermediate Speed Sensor 1
  - B14DB Automatic Transmission Intermediate Speed Sensor 2
  - B26 Crankshaft Position Sensor
  - B303 Transmission Range Sensor
  - Q77A Transmission Control Solenoid Valve 1
  - Q77B Transmission Control Solenoid Valve 2
  - Q77C Transmission Control Solenoid Valve 3
  - Q77D Transmission Control Solenoid Valve 4
  - Q77E Transmission Control Solenoid Valve 5
- Battery Voltage = Greater than 9 V
- Engine Speed = Greater than 499 RPM
- High Side Driver 1, 2 = On
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On
- Transmission Service Fast Learn = Disabled

Frequency the DTC runs = Continuously - After the running conditions are met

Conditions for Setting the DTC

Gear Ratio = Incorrect

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC - Additional actions taken:

- Autostart/Autostop = Disabled
- Grade braking = Disabled
- High Side Driver 1 = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- Transmission gear allowed = 2, 7

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC - Exceptions listed below

Diagnostic Aids

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High resistance in the circuits of the component Q77J may set DTC P2820 without setting control circuit DTC(s).

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to **Transmission Fluid Level and Condition Check**
   - **If a condition exists**

     Repair or replace as necessary

   - **Go to next step: If no condition exists**
2. Ignition - On / Vehicle - In Service Mode
3. Clear the DTCs.
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. Refer to **Road Test**

   Verify that no DTC listed in the DTC Descriptor Category is set.

   - **If any of the DTCs are set**

     Refer to: Diagnostic Fault Information & Verify the conditions listed in the table do not exist

   - **Go to next step: If none of the DTCs are set**
5. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- **Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement**
- **Control Valve Body Replacement**
- **Torque Converter Diagnosis**
- **Torque Converter Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

Transmission Service Fast Learn Procedure - Perform only when the component/system is serviced.

DTC P30BD

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**

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- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

DTC Descriptor

DTC P30BD

Engine Stall Prevention Active Signal Message Counter Incorrect

Circuit/System Description

Control modules connected to the serial data circuits monitor the communication during normal vehicle operation. Operating information and commands are exchanged among the control modules. Each module on the serial data circuit maintains a transmit error counter and a receive error counter. The counter values increase with detected errors and decrease with error-free messages.

Conditions for Running the DTC

- Battery Voltage = Greater than 11 V
- Ignition and Start Signal = 9 to 32 V
- Ignition and Start Switch Signal = On

Frequency the DTC runs = Continuously After the running conditions are met - For greater than 3 s

Conditions for Setting the DTC

Serial Data = Message Counter Incorrect - Between the following control modules:

- K20 Engine Control Module
- K71 Transmission Control Module

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type C DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type C DTC

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition - On / Vehicle - In Service Mode
2. Verify there are no DTCs set related to the following component/system:
   - K20 Engine Control Module
   - Serial Data
   - **If a related DTC is set**

     Refer to **Diagnostic Trouble Code (DTC) List - Vehicle**

   - **Go to next step: If a related DTC is not set**

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3. Clear the DTCs.
4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data.

   Verify the DTC does not set.

   - **If the DTC sets**

   1. Ignition/Vehicle - Off
   2. Replace the component: K20 Engine Control Module
   3. Operate the vehicle within the Conditions for Running the DTC.

      Verify the DTC does not set.

      - If the DTC sets - Replace the component: K71 Transmission Control Module
      - Go to next step: If the DTC is not set

   4. All OK.

   - **Go to next step: If the DTC is not set**

5. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: **Diagnostic Repair Verification**

- For control module replacement, programming, and setup refer to **Control Module References**

SYMPTOMS - AUTOMATIC TRANSMISSION

NOTE: **Use the symptom tables only if the following conditions are met:**

- **Refer to Diagnostic Starting Point - Vehicle .**
- **There are no DTCs set.**
- **The control modules can communicate via the serial data link.**
- **Review the system operation in order to familiarize yourself with the system functions. Refer to Transmission General Description , or Transmission Component and System Description .**

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Visual/Physical Inspection

Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to **Testing for Intermittent Conditions and Poor Connections** .

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- Fluid Diagnosis
  - **Transmission Fluid Level and Condition Check**
  - **Automatic Transmission Fluid Leaks**
  - **Fluid Leak Diagnosis**
- Noise and Vibration Diagnosis

    - Whine/Growl Noise That Changes with Vehicle Speed
    - Vibration
    - Flex Plate/Torque Converter Vibration Test
    - Noise and Vibration Analysis
- Range Performance Diagnosis
    - No Park or Drive
    - No Drive in All Ranges
- Shift Quality Feel Diagnosis
    - Harsh Garage Shift
    - Harsh, Soft, Delayed or Slipping First, Second, Third, Fourth, Fifth, Sixth, or Reverse Shift
    - Harsh, Soft, Delayed or Slipping First, Second, Eighth, Ninth, Tenth, or Reverse Shift
    - Harsh, Soft, Delayed or Slipping Second, Third, Fourth, Fifth, Seventh, Ninth, or Tenth Shift
    - Harsh, Soft, Delayed or Slipping First, Second, Third, Fourth, Sixth, Seventh, Eighth, Tenth, or Reverse Shift
    - Harsh, Soft, Delayed or Slipping First, Third, Fifth, Sixth, Seventh, Eighth, or Ninth Shift
    - Harsh, Soft, Delayed or Slipping Fourth, Fifth, Sixth, Seventh, Eighth, Ninth, Tenth, or Reverse Shift
- Shift Pattern
    - No First, Second, Third, Fourth, Fifth, Sixth, or Reverse Gear
    - No First, Second, Eighth, Ninth, Tenth, or Reverse Shift Gear
    - No Second, Third, Fourth, Fifth, Seventh, Ninth, or Tenth Gear
    - No First, Second, Third, Fourth, Sixth, Seventh, Eighth, Tenth, or Reverse Gear
    - No First, Third, Fifth, Sixth, Seventh, Eighth, or Ninth Gear
    - No Fourth, Fifth, Sixth, Seventh, Eighth, Ninth, Tenth, or Reverse Gear
- Torque Converter Diagnosis
    - Torque Converter Diagnosis
    - No Torque Converter Clutch Apply
    - No Torque Converter Clutch Release
- Symptom Not Found or No Symptom Detected
    - Transmission Fluid Level and Condition Check
    - Road Test

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TRANSMISSION FLUID LEVEL AND CONDITION CHECK

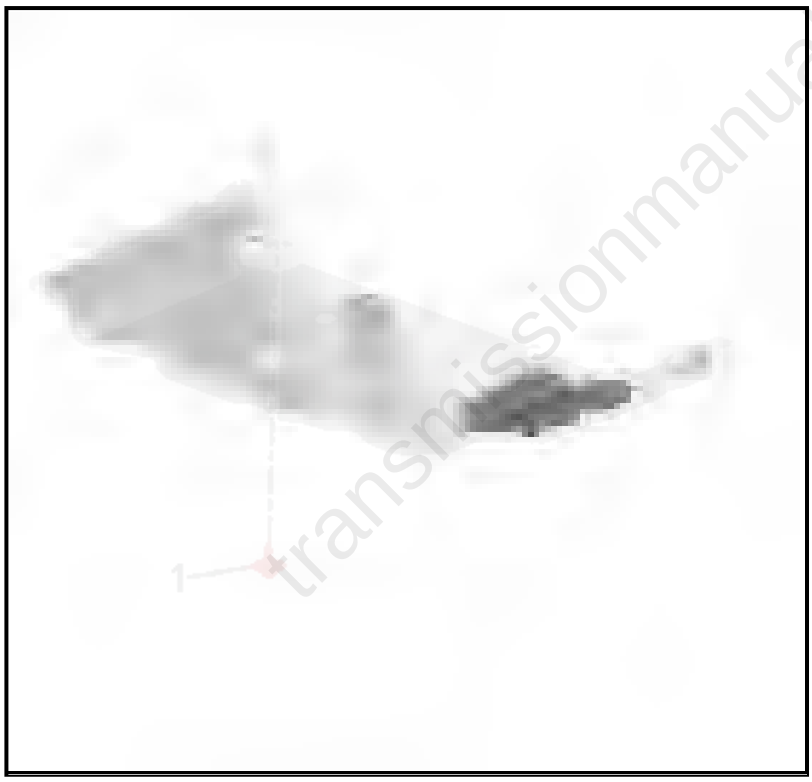
This procedure checks both the transmission fluid level, as well as the condition of the fluid itself. Since the transmission on this vehicle is not equipped with a fill tube and dipstick, a tube in the bottom pan is used to set the fluid level.

WARNING: **The transmission fluid temperature (TFT) must be between 75-80B°C (167-176B°F). If the TFT is lower than this temperature range, either idle or brake torque the vehicle to raise the fluid temperature. If the TFT is higher than this range, shut off the vehicle to allow the fluid to cool as required. Setting the fluid level with a TFT outside this range will result in either an over-fill or under-fill condition. If TFT is greater than 80B°C = under-filled. If TFT is less than 75B°C = over-filled. An under-filled transmission will cause premature component wear or damage. An over-filled transmission will cause fluid to overflow from the vent tube, possibly causing a fire that may result in serious bodily injury or severe vehicle damage, fluid foaming, or pump cavitation.**

NOTE: **This vehicle is equipped with an internal thermal bypass valve, the transmission fluid level should be checked only after the TFT has reached or exceeded an operating temperature of 70B°C (158B°F). Once the TFT has reached or exceeded 70B°C (158B°F), then you can check the fluid level.**

1. Observe the TFT using the driver information center (DIC) or a scan tool.
2. Start and idle the engine.
3. Depress the brake pedal and move the shift lever through each gear range. Pause for at least 3 seconds in each range. Move the shift lever back to PARK. Ensure the engine RPM is low (500 - 800 RPM).
4. Allow the engine to idle for at least 1 minute.

CAUTION: **To obtain the required transmission temperature, set the vehicle parking brake, run converter stalls while also applying the foot brake and placing the transmission in drive gear range to heat the transmission oil. Run 10 seconds on, then 10 seconds off converter stall. Brake torque is not to exceed 1500 engine RPM's. Failure to maintain 10 second intervals or exceeding 1500 engine RPM's may result in transmission internal damage.**

5. Raise the vehicle on a hoist. The vehicle must be level, with the engine running and the shift lever in the PARK range.
6. 

CAUTION: **THE ENGINE MUST BE RUNNING when the trans oil level check plug is removed or excessive fluid loss will occur, resulting in an under-filled condition. An under-filled transmission will cause premature component wear or damage.**

NOTE: **Continue to monitor the TFT. If the TFT is not within the specified values, reinstall the trans oil level check plug and repeat the previous steps.**

Remove the transmission oil level check plug (1) from the transmission fluid pan. Allow any fluid to drain.

- If the fluid is flowing as a steady stream, wait until the fluid begins to drip.

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- If no fluid comes out, add fluid until fluid comes out in a steady stream and then drips out. Refer to **Transmission Fluid Fill Procedure**.

7. Inspect the fluid color. The fluid should be red or dark brown.
    - If the fluid color is very dark or black and has a burnt odor, inspect the fluid and inside of the bottom pan for excessive metal particles or other debris. A small amount of "friction" material in the bottom pan is a "normal" condition. If large pieces and/or metal particles are noted in the fluid or bottom pan, flush the oil cooler and cooler lines and overhaul the transmission. If there are no signs of transmission internal damage noted, replace the fluid filter assembly, repair the oil cooler, and flush the cooler lines.
    - Fluid that is cloudy or milky or appears to be contaminated with water indicates engine coolant or water contamination. Refer to **Engine Coolant/Water in Transmission**.

CAUTION: **Refer to Fastener Caution .**

8. Replace the transmission oil level check plug and tighten to 9 N.m (80 lb in).
9. Inspect for external leaks. Refer to **Fluid Leak Diagnosis**.

TRANSMISSION FLUID FILL PROCEDURE

Special Tools

- **DT-45096** Transmission Oil Cooling System Flush and Flow Test Tool
- **DT-45096-30** Transmission Cooler Flush Adapters
- **DT-45096-40** Transflow Oil Fill Adapter
- **DT-51190** Transmission Fluid Fill Adapter

Equivalent regional tools: **Special Tools**

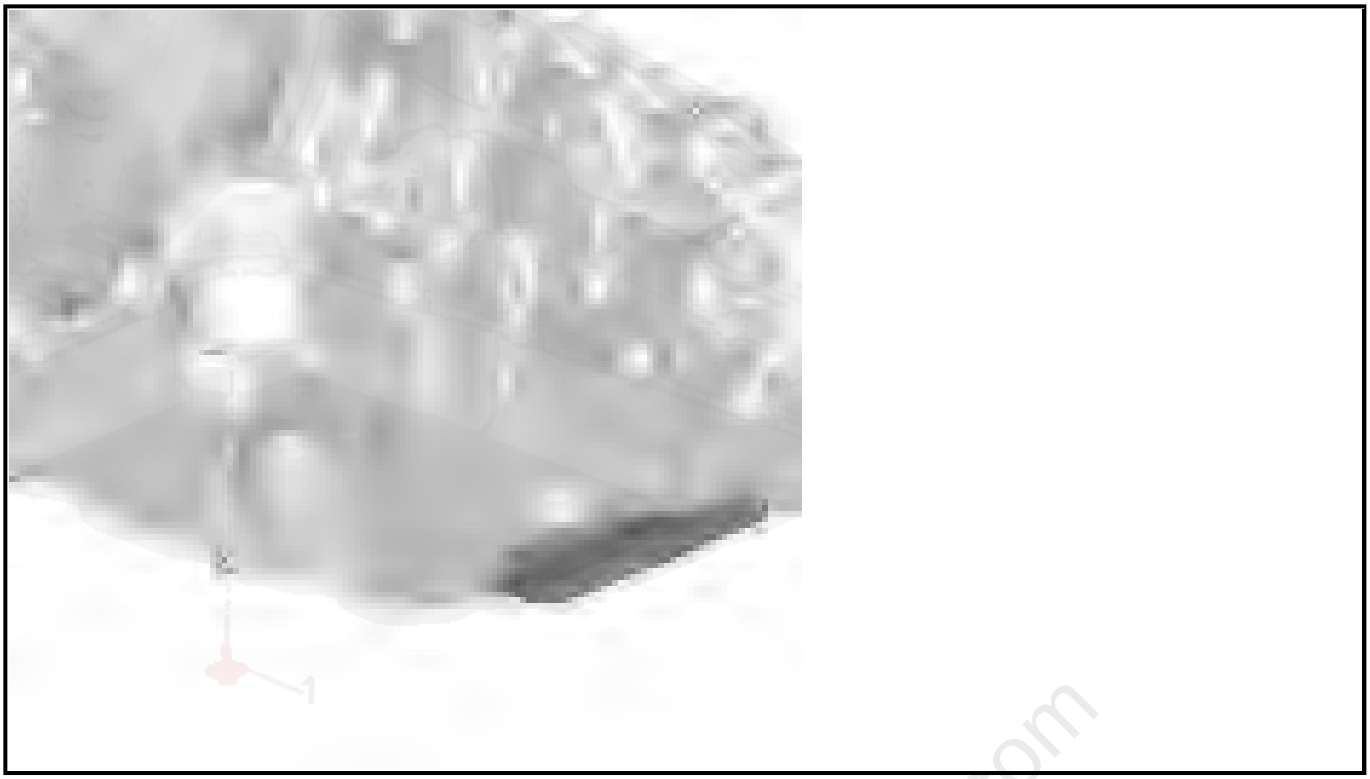
NOTE:

- **If the transmission has the check plug (standpipe design), then follow that method for oil fill procedure. This is the preferred method.**

Check the transmission fluid level. **Transmission Fluid Level and Condition Check**

Check Plug Method (Standpipe Design)

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CAUTION: **For all 10 speed RWD transmission applications, use ONLY Dexron B® ULV transmission fluid. Failure to use the proper fluid may result in damaging the transmission internally.**

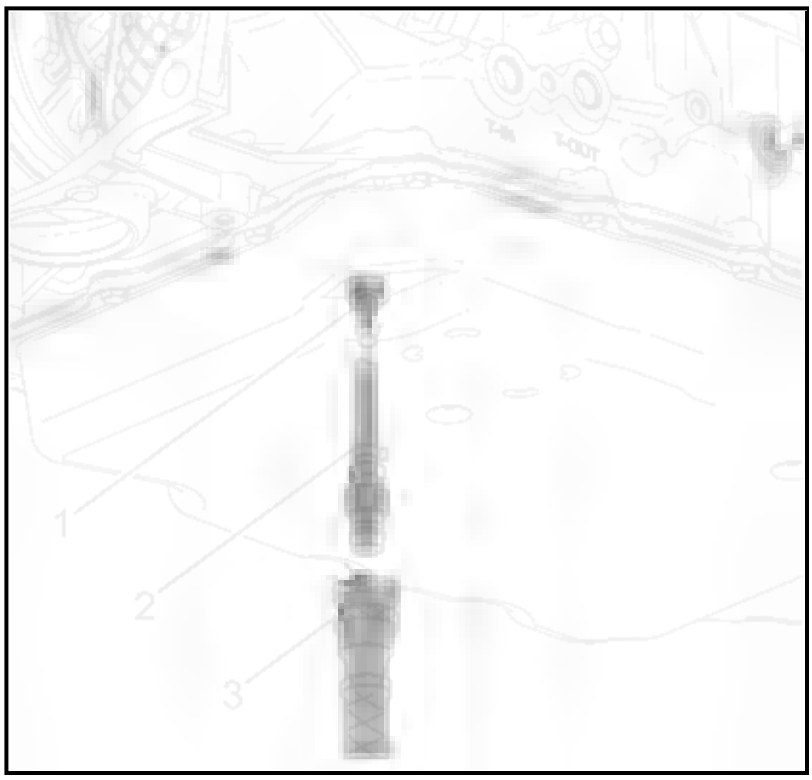
WARNING: **The area around the automatic transmission case plug is hot due to the proximity to the exhaust system components. Always wear protective gloves to avoid personal injury.**

WARNING: **Transmission fluid is flammable and the area around the automatic transmission case plug is hot due to the proximity of the exhaust system components. Always wear protective gloves to avoid personal injury. When draining the transmission, protect all exhaust components including the catalytic converter and catalytic converter heat shield from making contact with transmission fluid. Failure to do this could cause smoke and/or a fire resulting in serious bodily injury or severe vehicle damage.**

NOTE:

- **The quart containers of DexronB® ULV must be shaken to stir up the additives before pouring.**
- **When the oil level check plug is removed with the engine OFF, transmission fluid may drain from the hole.**

1. Remove the oil level check plug.

2. 

   Install the **DT-51190** fluid fill pan adapter (1) and, if necessary, one adapter from the **DT 45096-30** cooler flush adapters (2).

3. Determine the approximate amount of fluid needed to fill the transmission, based on the repair performed. To avoid an under-fill condition, slightly overfill the transmission, and then allow the extra fluid to drain out through the oil level check plug during the transmission fluid level and condition check procedure. **Approximate Fluid Capacities**

   NOTE: **The DT-45096 flush and flow test tool is being utilized as a convenient method to pump the fluid into the bottom pan. A suitable hand pump may also be used instead. When using the DT-45096 flush and flow test tool, monitor the display panel to determine the amount of fluid being pumped from the tool supply tank into the transmission.**

4. Using the **DT-51190** fluid fill pan adapter (1), **DT-45096-30** cooler flush adapters (2), and the **DT-45096** flush and flow test tool (3), add transmission fluid through the check plug hole. Use the FLOW position on the main function switch to pump the fluid.

   NOTE: **Failure to start the engine and move the shift lever through the gear ranges before removing the DT-51190 fluid fill pan adapter and DT-45096-30 cooler flush adapters from the bottom pan will result in an excess amount of fluid draining from the check plug hole. This may lead to an under-fill condition.**

5. Start the engine and move the shift lever through each gear range. Pause for at least 3 seconds in each gear range.

   WARNING: **Check the transmission fluid level immediately after adding fluid and before vehicle operation. Do not overfill the transmission. An overfilled transmission may result in foaming or fluid to be expelled out the vent tube when the vehicle is operated, possibly causing a fire that may result in serious bodily injury or severe vehicle damage. Overfilling will result in possible damage to the transmission.**

6. With the engine still running, remove the **DT-51190** fluid fill pan adapter (1), (2), and **DT-45096** flush and flow test tool (3) and then check the fluid level. **Transmission Fluid Level and Condition Check**

ROAD TEST

The following test provides a method of evaluating the condition of the automatic transmission. The test is structured so that most driving conditions would be achieved. The test is divided into the following parts:

- Electrical Function Check
- Upshift Control and Torque Converter Clutch (TCC) Apply
- Part Throttle Step-In Downshifts
- Manual Downshifts
- Coasting Downshifts
- Manual Gear Range Selection
  - REVERSE
  - Driver Shift Control

NOTE: **Complete the test in the sequence given. Incomplete testing cannot guarantee an accurate evaluation.**

Before the road test, ensure the following:

- The engine is performing properly.
- Transmission fluid level is correct. Refer to **Transmission Fluid Level and Condition Check**.
- Tire pressure is correct.

During the road test:

- Perform the test only when traffic conditions permit.
- Operate the vehicle in a controlled, safe manner.
- Observe all traffic regulations.
- View the scan tool data while conducting this test.

  Take along qualified help in order to operate the vehicle safely.

- Observe any unusual sounds or smells.

After the road test, check the following:

- Inspect for proper transmission fluid level. Refer to **Transmission Fluid Level and Condition Check**.
- Inspect for any diagnostic trouble codes (DTCs) that may have set during the testing. Refer to the applicable DTC.
- Monitor the scan tool data for any abnormal readings or data.
- Inspect for fluid leaks. Refer to **Fluid Leak Diagnosis**.

Electrical Function Check

Perform this procedure first in order to ensure the electronic transmission components are functioning properly. If these components are not checked, a simple electrical condition could be misdiagnosed.

1. Connect the scan tool.
2. Ensure the gear selector is in PARK and set the parking brake.
3. Start the engine.
4. Verify that the following scan tool data can be obtained and is functioning properly.

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- Engine Speed
- Transmission ISS
- Transmission OSS
- Vehicle Speed
- IMS
- Commanded Gear
- Gear Ratio
- Line PC Sol. Pressure Cmd.
- Brake Switch
- ECT, Engine Data List
- Trans. Fluid Temp.
- TCM Temperature
- Calc. Throttle Position
- Ignition Voltage
- PC Sol. 2 Pressure Cmd.
- PC Sol. 3 Pressure Cmd.
- PC Sol. 4 Pressure Cmd.
- PC Sol. 5 Pressure Cmd.
- TCC Slip Speed

5. Check the garage shifts.
    1. Apply the brake pedal and ensure the parking brake is set.
    2. Move the gear selector through the following ranges:
        - PARK to REVERSE
        - REVERSE to NEUTRAL
        - NEUTRAL to DRIVE
        - DRIVE to REVERSE
        - REVERSE to DRIVE
    3. Pause 2 to 3 seconds in each gear position.
    4. Verify the gear engagements are immediate (less than 2 seconds to complete if trans fluid temperature is above 20B°C) and not harsh. Note that these shifts may be almost imperceptible in some applications. Using the scan tool to monitor Transmission ISS achieving 0 rpm can be used to check delay in these cases.

NOTE: **Harsh engagement may be caused by any of the following conditions:**

- **High engine idle speed - Compare engine idle speed to desired idle speed.**
- **Incorrect line pressure - Investigate Line PC Sol. Pressure Cmd. kPa (psi), also perform Line Pressure Check.**
- **A default condition caused by certain DTCs that result in maximum line pressure to prevent clutch slippage.**
- **Incomplete adapting or incorrect adapting - Repeat maneuver multiple times to see if shift quality improves. If it does not, refer to the service procedures for Harsh Garage Shift.**

NOTE: **Delayed engagement may be caused by any of the following conditions:**

- **Low idle speed - Compare engine idle speed to desired idle speed.**

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- **Low fluid level**
- **Incorrect line pressure - Investigate Line PC Sol. Pressure Cmd. kPa (psi), also perform Line Pressure Check.**
- **Cold transmission fluid temperature (TFT) - Use the scan tool to determine TFT.**
- **Selector linkage - Inspect and adjust as necessary.**
- **Incomplete adapting or incorrect adapting - Repeat maneuver multiple times to see if delay improves. If it does not, refer to the service procedures for Harsh, Soft, Delayed or Slipping First, Second, Third, Fourth, Fifth, Sixth, or Reverse Shift.**

6. Monitor transmission range on the scan tool, transmission data list.
    1. Apply the brake pedal and ensure the parking brake is set.
    2. Move the gear selector through all ranges.
    3. Pause 2 to 3 seconds in each range.
    4. Return gear selector to PARK.
    5. Verify that all selector positions match the scan tool display.
7. Check throttle position input.
    1. Apply the brake pedal and ensure the parking brake is set.
    2. Ensure the gear selector is in PARK.
    3. Monitor the scan tool Calc. Throttle Position while increasing and decreasing engine speed with the throttle pedal. The scan tool Calc. Throttle Position percentage should increase and decrease with engine speed.

If any of the above checks do not perform properly, record the result for reference after completion of the road test.

Upshift Control and Torque Converter Clutch (TCC) Apply

The TCM calculates the upshift points based primarily on 2 inputs: throttle position and vehicle speed. When the TCM determines that conditions are met for a shift to occur, the TCM commands the shift by varying current to the appropriate PC solenoids to control oncoming and offgoing clutch pressures.

Perform the following steps:

1. Monitor the following scan tool parameters:
    - Calc. Throttle Position
    - Vehicle Speed
    - Engine Speed
    - Transmission ISS
    - Transmission OSS
    - Commanded Gear
    - TCC PC Sol. Pressure Cmd.
    - TCC Slip Speed
    - PC Sol. 2 Pressure Cmd.
    - PC Sol. 3 Pressure Cmd.
    - PC Sol. 4 Pressure Cmd.
    - PC Sol. 5 Pressure Cmd.
2. Place the gear selector in the DRIVE position.
3. Accelerate the vehicle using a steady throttle position between 15 and 20 percent. Hold the throttle steady.

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4. As the transmission upshifts, there should be a noticeable shift feel or engine speed change within 1 to 2 seconds of the commanded gear change. The PC solenoid pressure command should change to "YES" for the oncoming clutch and the PC solenoid pressure command should change to "NO" for the offgoing clutch.
5. Note any harsh, soft or delayed shifts or slipping. Note any noise or vibration.
6. The TCC feel may not be noticeable. In many applications the TCC will apply after the 1-2 shift and TCC events will not be easily detected using engine speed.

NOTE: **This transmission is equipped with an electronically controlled capacity clutch (ECCC), which allows operation of the clutch without fully locking to the torque converter cover. The clutch maintains a small amount of slippage, approximately 20 RPM, in 2nd, 3rd, 4th, 5th, and 6th gears, depending on the vehicle application. ECCC was developed to reduce the possibility of noise, vibration or chuggle caused by TCC apply. Full lockup is available at highway speeds on some applications.**

7. Monitor TCC PC solenoid pressure command while driving and check TCC slip speed when the pressure command indicates that the TCC is commanded to apply:

   When the TCC applies, slip speed should be controlled to below 100 RPM when the transmission is not shifting and the throttle is held steady. If the TCC slip exceeds this value for more than 6 seconds after the TCC PC Sol. Pressure Command indicates that the TCC is commanded on:

   - Check for DTCs.
   - Refer to **Torque Converter Diagnosis**.

Part Throttle Step-In Downshifts

1. Place the gear selector in the DRIVE position.
2. Accelerate the vehicle at light throttle (5 - 15 percent) until 3rd gear is just achieved.
3. Quickly increase throttle angle until commanded gear indicates that a downshift to 2nd gear is commanded.
4. Verify that the transmission downshifts within 2 seconds of the throttle movement.
5. Repeat steps 2 to 4 at higher speed to achieve 4th gear and then step in to command a 4th gear to 3rd gear downshift.
6. Repeat steps 2 to 4 at higher speed to achieve 5th gear and then step in to command a 5th to 4th gear downshift.
7. Repeat steps 2 to 4 at higher speed to achieve 6th gear and then step in to command a 6th gear to 5th gear downshift.
8. Repeat steps 2 to 4 at higher speed to achieve 7th gear and then step in to command a 7th gear to 6th gear downshift.
9. Repeat steps 2 to 4 at higher speed to achieve 8th gear and then step in to command a 8th gear to 7th gear downshift.
10. Repeat steps 2 to 4 at higher speed to achieve 9th gear and then step in to command a 9th gear to 8th gear downshift.
11. Repeat steps 2 to 4 at higher speed to achieve 10th gear and then step in to command a 10th gear to 9th gear downshift.
12. Note any harsh, soft or delayed shifts or slipping. Note any noise or vibration.

Manual Downshifts

Manual downshift testing is not required since all vehicles equipped with the 10R90 are also equipped with some form of Driver Shift Control (DSC). The TCM will automatically override DSC downshifts to protect the transmission from damage.

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Coasting Downshifts

1. Place the gear selector in the DRIVE position.
2. Accelerate the vehicle to 10th gear with the TCC applied.
3. Release the throttle and apply the brakes.
4. Verify that the downshifts occur as commanded by monitoring gear ratio, which should change after commanded gear changes.

Manual Gear Range Selection

This application does not utilize manual forward gear ranges.

Reverse

Perform the following test using a 10 - 15 percent throttle position.

1. With the vehicle stopped, move the gear selector to REVERSE.
2. Slowly accelerate the vehicle.
3. Verify that there is no noticeable slip, noise or vibration.

Driver Shift Control (DSC)

Refer to the owner's manual for specific instructions on the type of DSC available in this application. Utilize the DSC to ensure that the transmission responds appropriately to driver's commands. The TCM will protect from any downshift which may cause excessive engine RPMs.

TORQUE CONVERTER DIAGNOSIS

Torque Converter Stator

The torque converter stator roller clutch can have 2 different malfunctions.

- The stator assembly freewheels in both directions.
- The stator assembly remains locked up in both directions.

Poor Acceleration at Low Speed - Stator Roller Clutch Freewheels at All Times

If the stator is freewheeling at all times, the vehicle tends to have poor acceleration from a standstill and at speeds below 48 - 55 km/h (30 - 34 mph). At speeds above 48 - 55 km/h (30 - 34 mph), the vehicle may act normally.

For poor acceleration at low speeds, you should first determine that the exhaust system is not blocked, and the transmission is in First gear when starting out. If the engine freely accelerates to high RPM in NEUTRAL, you can assume that the engine and the exhaust system are normal. Check for poor performance in DRIVE and REVERSE to help determine if the stator is freewheeling at all times.

Poor Acceleration at High Speed - Stator Roller Clutch is Locked Up at All Times

If the stator is locked up at all times, performance is normal when accelerating from a standstill. Engine RPM and vehicle speed are limited or restricted at speeds above 48 - 55 km/h (30 - 34 mph). Visual examination of the converter may reveal a blue color from overheating.

Torque Converter Bearing Noise

NOTE: **Do not confuse this noise with pump whine noise, which is usually noticeable in all gear ranges. Pump whine will vary with line pressure.**

Torque converter whine is noticed when the vehicle is stopped and the transmission is in DRIVE or REVERSE. This noise will increase as you increase the engine RPM. The noise will stop when the vehicle is moving or

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when you apply the torque converter clutch, because there is no slip speed across the bearings.

Perform a stall test to verify that the noise is actually coming from the torque converter:

1. Place your foot on the brake.
2. Put the gear selector in DRIVE.

CAUTION: **You may damage the transmission if you depress the accelerator for more than 6 seconds.**

3. Depress the accelerator to approximately 1, 200 RPM for no more than six seconds.

A torque converter noise will increase under this load.

Torque Converter Clutch

The torque converter clutch (TCC) is applied by fluid pressure, which is controlled by a TCC pressure control (PC) solenoid. This solenoid is part of the control solenoid valve assembly, which is located inside the automatic transmission assembly. The solenoid is controlled through a combination of computer controlled switches and sensors. Electronically controlled capacity clutch (ECCC) is controlled slip across the TCC.

Torque Converter Clutch Shudder

The key to diagnosing torque converter clutch (TCC) shudder is to note when it happens and under what conditions. TCC shudder should only occur during the apply, release, or ECCC conditions of the converter clutch. Shudder should never occur after the TCC is fully locked (approximately 0 RPM slip).

If Shudder Occurs During TCC Apply, Release, and ECCC

If the shudder occurs while the TCC is applying, the problem can be within the transmission or the torque converter. Something is causing one of the following conditions to occur:

- The clutch is not engaging completely.
- The clutch is not releasing completely.
- The clutch is releasing and applying rapidly and continuously.

One of the following conditions may be causing the TCC Shudder to occur:

- Leaking turbine shaft/TCC seals
- A restricted release orifice
- A distorted clutch or converter cover due to long flexplate to converter bolts
- Defective friction material on the TCC plate
- Contaminated Transmission Fluid

If Shudder Occurs After TCC has Locked

Engine problems may go unnoticed under light throttle and load, but they become noticeable after the TCC has locked when going up a hill or accelerating.

Refer to Symptoms - Engine Controls in order to avoid misdiagnosis of TCC shudder and the unnecessary disassembly of a transmission or the unnecessary replacement of a torque converter.

Torque Converter Vibration Test

NOTE: **The Noise and Vibration Analysis procedure should be performed prior to performing this test.**

Isolating Vibration

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NOTE: **Some engine/transmission combinations cannot be balanced in this manner due to restricted access or limited clearances between the torque converter bolts and the engine.**

To isolate and correct a flexplate or torque converter vibration:

1. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration.
2. Turn the engine OFF.
3. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
4. Remove the torque converter access cover and the bolts (if equipped).
5. Mark the relationship of the torque converter to the flexplate.
6. Rotate the torque converter to inspect for defects or missing balance weights.
7. Index the converter according to "Indexing Torque Converter" procedure located within this procedure.
8. If the vibration remains, it is most likely caused by the engine.
9. Refer to "Torque Converter Replacement Guide" located within this procedure.

Indexing Torque Converter

To determine and correct a torque converter vibration, the following procedure may have to be performed several times to achieve the best possible torque converter to flexplate balance.

1. Remove the torque converter bolts.
2. Rotate the torque converter one bolt position from the original marked position.
3. 

CAUTION: **When installing the torque converter to the flexplate, make sure to use specified bolts. DO NOT use longer bolts. Using longer bolts will result in deformation of the torque converter cover and cause internal damage.**

CAUTION: **Refer to Fastener Caution .**

Align the torque converter pilot (1) in the engine crankshaft (2). Install the torque converter to flexplate bolts (3), and tighten according to **Fastener Specifications** .

4. Lower the vehicle.
5. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration.

Repeat this procedure until the best possible balance is obtained.

6. Install the torque converter access cover and bolts (if equipped) and tighten according to **Fastener Specifications** .

Torque Converter Replacement Guide

Condition	Action
• Transmission Fluid Oxidized/Discolored • Clutch Fiber Material	Do not replace the torque converter. Refer to **Transmission Fluid Level and Condition Check**.
Transmission Fluid Contaminated with Metal Particles	Do not replace the torque converter for clutch system or gearset component damage. Fine metallic debris or clutch plate material that is suspended in the fluid will not cause damage to the internal torque converter components nor any internal transmission components.
Harsh Gear Shifts	Do not replace the torque converter. Refer to **Symptoms - Automatic Transmission**.
Noise - Whine	• Refer to **Symptoms - Automatic Transmission**. • Do not replace the torque converter if noise is present in Neutral/Park. Refer to Symptoms - Engine Mechanical.
Vibration - Out of Balance	Refer to **Torque Converter Vibration Test** in this procedure.
No Drive/Slips in Drive	Do not replace the torque converter until completing all engine and transmission diagnostics.
Idle Surge/Rough Idle	Do not replace the torque converter. Refer to Symptoms - Engine Controls.
TCC Apply/Release Shudder	Do not replace the torque converter. Refer to **Torque Converter Clutch Shudder** in this procedure.
TCC Chuggle	Do not replace the torque converter. Refer to Symptoms - Engine Controls.
Transmission Fluid Contaminated with Sludge/Metal Particles as a result of: • Engine Coolant/Oil • Pump damage • Drive sprocket support damage • Turbine/stator shaft damage • Internal converter damage with no damage found in the transmission	Replace the torque converter.
Poor Acceleration above 48 km/h (30 mph) - Good Launch	Do not replace the torque converter until completing all engine and transmission diagnostics. • Refer to **Torque Converter Stator** in this procedure. • Refer to Symptoms - Engine Controls.
Poor Launch - Good Acceleration above 48 km/h (30 mph)	Do not replace the torque converter until completing all engine and transmission

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Condition	Action
	diagnostics. • Refer to **Torque Converter Stator** in this procedure. • Refer to Symptoms - Engine Controls.
Stripped Converter Bolt Holes	• Replace the torque converter. • Inspect flexplate.
Torque Converter Pilot Damaged	Replace the torque converter.
Torque Converter Hub surface is damaged - scored, raised/transferred metal.	Replace the torque converter.
External Leaks in the weld areas - hub, lug or closure weld.	Replace the torque converter.
Broken/Cracked Flexplate	Replace the torque converter.
Torque Converter Discolored/Overheated	Replace the torque converter.

FLEX PLATE/TORQUE CONVERTER VIBRATION TEST

Isolating Vibration

CAUTION: **Some engine/transaxle combinations cannot be balanced in this manner due to restricted access or limited clearances between the torque converter bolts and the engine. Ensure that the bolts do not bottom out in the lug nuts or the torque converter cover which could dent and cause internal damage.**

To isolate and correct a flywheel or torque converter vibration, separate the torque converter from the flywheel to determine if vibration is in the engine or transmission.

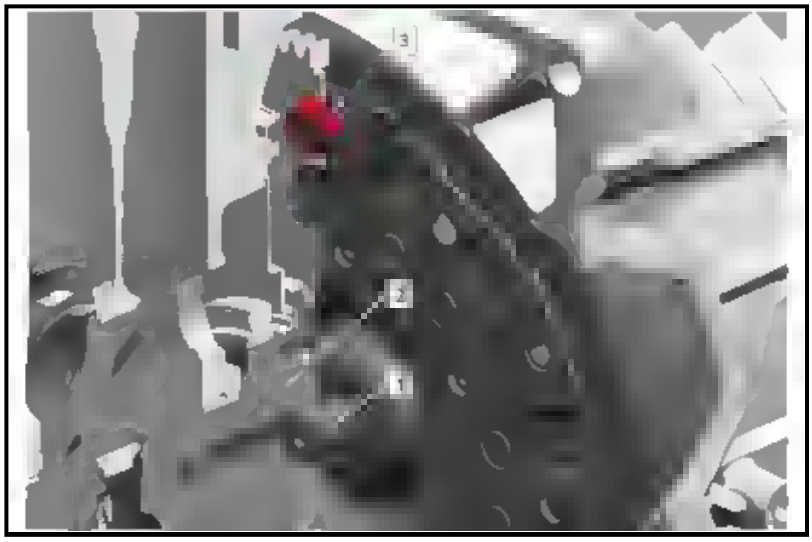
1. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration.
2. Turn the engine OFF.
3. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
4. Remove the transmission converter cover bolts and the cover.
5. Mark the relationship of the converter to the flywheel.
6. Remove the bolts attaching the converter to the flywheel.
7. Slide the torque converter away from the flywheel.
8. Rotate the flywheel and torque converter to inspect for defects or missing balance weights.
9. Lower the vehicle.
10. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration. Refer to **Diagnostic System Check - Vehicle** .
11. Turn the engine OFF.

Indexing Torque Converter

To determine and correct a torque converter vibration, the following procedure may have to be performed several times to achieve the best possible torque converter to flywheel balance.

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Rotate the torque converter one bolt position.

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3. 

   Align the torque converter hub (2) in the engine crankshaft (3) and install the torque converter to flywheel bolts.

4. Lower the vehicle.
5. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration. Refer to **Noise and Vibration Analysis** .

   Repeat this procedure until you obtain the best possible balance.

6. Install the transmission converter cover bolts and the cover.

BUSHING AND MATING SHAFT INSPECTION

NOTE: **Proper bushing and corresponding mating shaft inspection should be performed before replacing the bushing, shaft, and in some cases, the component which houses the bushing. Thoroughly clean and dry the bushing and shaft surfaces before inspecting for damage.**

Any of the following bushing conditions require replacement of the bushing and/or housing:

- Discoloration due to heat distress
- Misalignment or displacement of bushing as a result of spinning in housing
- Medium to heavy scoring that can be easily detected with fingernail. Light scoring is a normal condition.
- Debris embedded into the bushing lining material
- Obvious damage, including excessive and uneven wear
- Excessive polishing. Minor polishing of the bushing is an indication of normal wear and does not require replacement.

Any of the following conditions require replacement of the bushing's mating shaft:

- Discoloration due to heat distress
- Rough surface finish that can be easily detected with finger
- Obvious shaft abnormalities, including warping or uneven surfaces
- Obvious damage or cracking

VIBRATION

Checks	Causes
Transmission Case Extension (42)	Inspect for damaged case extension.
Automatic Transmission Case (4)	Inspect for cracked or damaged transmission case.

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Checks	Causes
Torque Converter (1)	Inspect torque converter. Flex Plate/Torque Converter Vibration Test

NOISE AND VIBRATION ANALYSIS

NOTE: **The following is only a general noise and vibration analysis. For more detailed and vehicle specific noise and vibration analysis, refer to the latest published Preliminary Information documents and Field Service Bulletins available in ESI.**

A noise or vibration that is noticeable when the vehicle is in motion MAY NOT be the result of the transmission.

If noise or vibration is noticeable in PARK and NEUTRAL with the engine at idle, but is less noticeable as RPM increases, the cause may be from poor engine performance.

- Vibration may also be caused by a small amount of water inside the converter.
- Inspect the tires for the following conditions:
  - Uneven wear
  - Imbalance
  - Mixed sizes
  - Mixed radial and bias ply
- Inspect the suspension components for the following conditions:
  - Alignment wear or damage
  - Loose fasteners
  - Driveline damage or wear
- Inspect the engine and transmission mounts for damage and loose bolts.
- Inspect the transmission case mounting holes for the following conditions:
  - Missing bolts, nuts, and studs
  - Stripped threads
  - Cracks
- Inspect the flywheel for the following conditions:
  - Missing or loose bolts
  - Cracks
  - Imbalance
- Inspect the torque converter for the following conditions:
  - Missing or loose bolts or lugs
  - Missing or loose balance weights
  - Imbalance caused by heat distortion or fluid contamination

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NOISY IN ALL GEARS

Checks	Causes
Automatic Transmission Fluid Pump Driven Gear (23)	Inspect the gear for damage or wear.
Automatic Transmission Fluid Pump Drive Gear (403)	Inspect the gear for damage or wear.
Automatic Transmission Fluid Pump Idler Gear (405)	Inspect the gear for damage or wear.

NOISY IN REVERSE ONLY

Checks	Causes
Output Carrier Thrust Bearing Assembly (37)	Inspect the bearing for wear or damage.

WHINE/GROWL NOISE THAT CHANGES WITH VEHICLE SPEED

Checks	Causes
Output Carrier Assembly (38)	• Inspect the carrier assembly for damaged pinion gears, thrust washers, pins, and rollers. • Inspect for damaged sun gears. • Inspect for damaged or stripped splines on the output carrier assembly.
Reaction Internal Gear Thrust Bearing (75)	Inspect the bearing for wear or damage.
Output Carrier Thrust Bearing Assembly (72)	Inspect the bearing for wear or damage.
Direct Overdrive Sun Gear Thrust Bearing (69)	Inspect the bearing for wear or damage.
Input Sun Gear Thrust Bearing Assembly (64)	Inspect the bearing for wear or damage.
Input Sun Gear Thrust Bearing Assembly (61)	Inspect the bearing for wear or damage.
Reaction Sun Gear Thrust Bearing (57)	Inspect the bearing for wear or damage.
Reaction Carrier Hub Bearing (54)	Inspect the bearing for wear or damage.
Automatic Transmission Fluid Pump Bearing (406)	Inspect the bearing for wear or damage.
Output Carrier Thrust Bearing Assembly (39)	Inspect the bearing for wear or damage.
Output Sun Gear Thrust Bearing Assembly (571)	Inspect the bearing for wear or damage.
Output Shaft Bearing Assembly (40)	Inspect the bearing for wear or damage.
Output Shaft Bearing (46)	Inspect the bearing for wear or damage.
A/Trans Fluid Filter (14)	• Inspect for damaged or restricted fluid filter assembly (14) • Inspect for damaged fluid filter seal assembly (26) or improper sealing interface (leaks, fluid aeration).
A/Trans Fluid Pump Seal (27)	Inspect for worn or damaged seal.

CLUTCH PLATE DIAGNOSIS

Composition Plates

Dry the plates and inspect the plates for the following conditions:

- Pitting
- Flaking
- Delamination - splitting or separation of bonded clutch material
- Wear
- Glazing
- Cracking

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- Charring
- Chips or metal particles embedded in the lining

Replace a composition plate which shows any of these conditions.

Steel Plates

Wipe the plates dry and check the plates for heat discoloration. If the surfaces are smooth, even if color smear is indicated, you can reuse the plate. If the plate is discolored with heat spots or if the surface is scuffed, replace the plate.

Causes of Burned Clutch Plates

The following conditions can result in a burned clutch plate:

- Incorrect usage of clutch or apply plates
- Engine coolant or water in the transmission fluid
- A cracked clutch piston
- Damaged or missing seals
- Low line pressure
- Valve body conditions
  - The valve body face is not flat.
  - Porosity is between channels.
  - The valve bushing clips are improperly installed.
  - The checkballs are misplaced.
- The TeflonB® seal rings are worn or damaged.

ENGINE COOLANT/WATER IN TRANSMISSION

CAUTION: **The antifreeze or water will deteriorate the seals, gaskets and the glue that bonds the clutch material to the pressure plate. Both conditions may cause damage to the transmission.**

If antifreeze or water has entered the transmission, perform the following:

1. Disassemble the transmission.
2. Replace all of the rubber type seals. The coolant will attack the seal material which will cause leakage.
3. Replace the composition-faced clutch plate assemblies. The facing material may separate from the steel center portion.
4. Replace all of the nylon parts - washers.
5. Replace the torque converter.
6. Thoroughly clean and rebuild the transmission, using new gaskets and oil filter.
7. Flush the cooler lines after the transmission cooler has been properly repaired or replaced.

FLUID LEAK DIAGNOSIS

General Method

1. Verify that the leak is transmission fluid.

   CAUTION: **Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings.**

2. Thoroughly clean the suspected leak area using a rag.

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NOTE: **Do not idle vehicle, this will not actuate transmission systems, and do not drive the vehicle on the freeway as this will splatter oil inhibiting leak diagnosis.**

3. Operate the vehicle for 15 - 20 minutes under city driving conditions until normal operating temperatures are reached.
4. Park the vehicle over clean paper or cardboard.
5. Shut OFF the engine.
6. Look for fluid spots on the paper.
7. Make the necessary repairs.

Powder Method

CAUTION: **Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings.**

1. Thoroughly clean the suspected leak area using a rag.
2. Apply an aerosol type powder, such as foot powder, to the suspected leak area.

NOTE: **Do not idle vehicle, this will not actuate transmission systems, and do not drive the vehicle on the freeway as this will splatter oil inhibiting leak diagnosis.**

3. Operate the vehicle for 15 - 20 minutes under city driving conditions until normal operating temperatures are reached.
4. Shut OFF the engine.
5. Inspect the suspected leak area.
6. Trace the leak path through the powder in order to find the source of the leak.
7. Make the necessary repairs.

Dye and Black Light Method

A fluid dye and black light kit is available from various tool manufacturers.

1. Follow the manufacturer's instructions in order to determine the amount of dye to use.
2. Detect the leak with the black light.
3. Make the necessary repairs.

Find the Cause of the Leak

Pinpoint the leak and trace the leak back to the source. You must determine the cause of the leak in order to repair the leak properly. For example, if you replace a gasket, but the sealing flange is bent, the new gasket will not repair the leak. You must also repair the bent flange. Before you attempt to repair a leak, check for the following conditions, and make repairs as necessary:

Gaskets

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Improperly tightened fasteners
- Dirty or damaged threads
- Warped flanges or sealing surface
- Scratches, burrs, or other damage to the sealing surface
- Damaged or worn gasket

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- Cracking or porosity of the component
- Improper sealant used, where applicable
- Incorrect gasket

Seals

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Damaged seal bore
- Damaged or worn seal
- Improper installation
- Cracks in component
- Manual or output shaft surface is scratched, nicked, or damaged
- Loose or worn bearing causing excess seal wear

Possible Points of Fluid Leaks

Transmission Oil Pan

- Incorrectly tightened oil pan bolts
- Improperly installed or damaged oil pan gasket
- Damaged oil pan or mounting face
- Incorrect oil pan gasket

Case Leak

- Worn or damaged extension case seal
- Damaged manual shaft seal
- Loose or damaged oil cooler connector fittings
- Worn or damaged propeller shaft oil seal
- Loose line pressure pipe plug
- Porous casting warped torque converter housing

Leak at the Torque Converter End

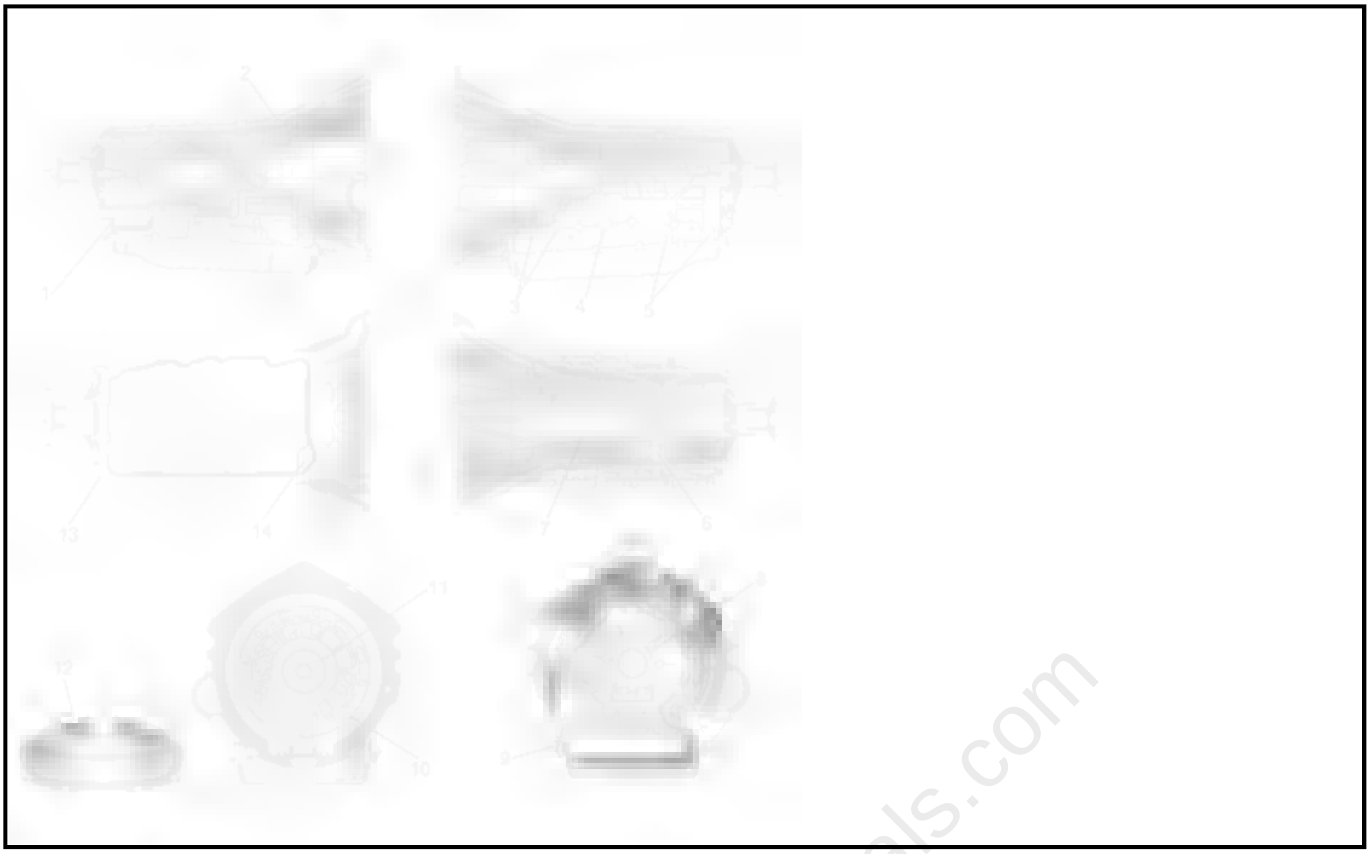
- Converter leak in the weld area
- Converter seal lip cut. Check the converter hub for damage
- Converter seal bushing moved forward and damaged
- Converter seal garter spring missing from the seal
- Porous casting of the transmission case or the oil pump
- Worn or damaged stator shaft support seal.

Leak at the Vent Pipe

- Overfilled system
- Water or coolant in the fluid; The fluid will appear milky
- Transmission case porous
- Incorrect fluid level indicator
- Plugged vent
- Drain-back holes plugged

Leak Inspection Points

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1. Automatic Transmission Wiring Harness
2. Automatic Transmission Vent
3. Transmission Cooler Pipe Fitting Seal
4. Manual Shift Shaft Seal
5. Automatic Transmission Side Case Plug
6. Automatic Transmission Top Case Plug
7. Automatic Transmission Case Assembly
8. Propeller Shaft Transmission Flange Fluid Seal
9. Automatic Transmission Fluid Pan Gasket
10. Automatic Transmission Case Front Cover Seal
11. Torque Converter Fluid Seal
12. Torque Converter
13. Automatic Transmission Case Extension Seal
14. Transmission Fluid Fill Tube Plug

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CASE POROSITY REPAIR

Some external leaks are caused by case porosity in non-pressurized areas. You can usually repair these leaks with the transmission in the vehicle.

1. Thoroughly clean the area to be repaired with a cleaning solvent. Air dry the area.

   WARNING: **Epoxy adhesive may cause skin irritations and eye damage. Read and follow all information on the container label as provided by the manufacturer.**

2. Using instructions from the manufacturer, mix a sufficient amount of an epoxy to make the repair.
3. While the transmission case is still hot, apply the epoxy. You can use a clean, dry soldering acid brush to clean the area and also to apply the epoxy cement. Make certain that the area to be repaired is fully

covered.

4. Allow the epoxy cement to cure for three hours before starting the engine.
5. Repeat the fluid leak diagnosis procedures.

AUTOMATIC TRANSMISSION FLUID LEAKS

Checks	Causes
Torque Converter (1)	Inspect for damage, cracks at the lug, hub and seal welds.
Stator Shaft Support Assembly Seal (408)	Inspect for cut, wear, or damage.
A/Trans Case Assembly (4)	• Inspect for porosity or damage. • Inspect manual shaft seal. • Inspect control wiring input sleeve seals.
A/Trans Case Extension Assembly (42)	• Inspect extension seal assembly. • Inspect extension to case seal.
A/Trans Fluid Pan (17)	• Inspect the pan assembly for damage. • Inspect gasket for damage or wear. • Inspect case and pan for damage and flatness at gasket interface area.
Cooler Lines/Coolers	• Inspect and follow cooler lines to front radiator and external coolers. • Some vehicles may have rear differential external and internal coolers.

SHIFT INDICATOR INDICATES WRONG GEAR SELECTION

Checks	Causes
Shift Cable	• Inspect for damage. • Verify proper attachment to shifter. • Verify cable is locked into shifter bracket. • Verify cable is properly attached to the transmission. • Verify that the cable is locked into the transmission bracket. • Verify proper shift cable adjustment.
Manual Shaft	• Verify shift lever is properly attached to the manual shaft. • Verify manual shaft is not twisted or damaged.
Manual Shift Detent Lever with Shaft Position Switch Assembly, IMS	Verify proper operation.

NO PARK OR DRIVE

Checks	Causes
Output Shaft Assembly (38)	Inspect for a broken or damaged output shaft. Inspect for worn splines.

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Checks	Causes
A/Trans Case Assembly (4)	• Inspect for broken or damaged case. • Inspect for broken or bent park pawl actuator. • Inspect for broken or missing park pawl actuator guide pin or manual shaft pin. • Inspect for broken, loose or misaligned park pawl guide. • Inspect for binding or broken park pawl or actuator assembly.
Manual Shift Shaft Position Switch Assembly (606)	Inspect for broken or damaged manual shift shaft position switch assembly.

HARSH GARAGE SHIFT

Checks	Causes
NOTE: **On cold days, approximately 32B°F (0B°C) or colder, the transmission is designed to shift differently. The transmission uses a warm-up mode shift schedule until the engine reaches normal operating temperature. While the transmission is in warm-up mode, it is normal for transmission upshifts to be delayed or held longer. This feature improves heater performance by giving quicker vehicle warm-ups.**	
Engine	Elevated engine RPM - Verify correct engine operating rpm per application.
Control Solenoid (w/Body and Valve) Valve Assembly (12)	• Incorrect or inadequate adapt activity - Perform **Q77 Transmission Control Solenoid Valve Characterization Programming (10L60)** procedure.

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Checks	Causes
	• Incorrect TCM temperature reporting - Monitor TCM temperature using appropriate scan tool. • Line pressure control solenoid incorrect pressure.

NO DRIVE IN ALL RANGES

Checks	Causes
A/Trans Fluid Pan (17)	Verify proper fluid level and condition, inspect transmission assembly for leaks.
A/Trans Fluid Filter (14)	• Inspect for damaged or restricted fluid filter (14). • Inspect for damaged fluid filter seal (26) or improper sealing interface, leaks, and fluid aeration.
A/Trans Fluid Pump Seal (26)	Inspect for worn or damaged seal.
A/Trans Cooling/Lubrication System	Inspect transmission oil cooler (radiator) and cooler line seals for restrictions, damage, kinks, or leaks.
Torque Converter Assembly (1)	Inspect for overheating (blued), ballooning, leaks, or other damage.
Manual Shift Shaft Position Switch Assembly (606)	Inspect PRNDL commands to and from vehicle using appropriate scan tool.
Control Solenoid (w/Body and Valve) Valve Assembly (12)	Inspect PRNDL commands to and from vehicle using appropriate scan tool.
Output Shaft (38)	Inspect for spline wear or damage.
Output Carrier Assembly (38)	• Inspect the carrier assembly for damaged pinion gears, thrust washers, pins, and rollers. • Inspect for damaged thrust bearings. • Inspect for damaged sun gears. • Inspect the carrier assembly for damaged output carrier rear sun gear thrust bearing (captured).
Input Carrier Assembly (62)	Inspect carrier assembly for damaged pinion gears, thrust washers, pins, and rollers.
Input Sun Gear Assembly (60)	Inspect for spline wear or damage.

HARSH, SOFT, DELAYED OR SLIPPING FIRST, SECOND, THIRD, FOURTH, FIFTH, SIXTH, OR REVERSE SHIFT

Checks	Causes
1-2-3-4-5-6-Reverse Clutch Assembly	• Inspect for damaged or worn 1-2-3-4-5-6-Reverse clutch plates (32, 34). • Inspect for damaged 1-2-3-4-5-6-Reverse clutch piston (411), clutch piston return spring-pack (412), and return spring-separator (33). • Inspect for cut, worn or damaged 1-2-3-4-5-6-Reverse clutch piston seals (409, 410) • Inspect for damaged 1-2-3-4-5-6-Reverse clutch piston retaining ring (413). • Inspect for damaged or improper selective 1-2-3-4-5-6-Reverse clutch apply plate-selective (30).

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Checks	Causes
	• Inspect for damaged or improper selective 1-2-3-4-5-6-Reverse clutch wave plate (31). • Inspect for damaged 1-2-3-4-5-6-Reverse clutch backing plate (35). Inspect for worn splines on backing plate.

NO FIRST, SECOND, THIRD, FOURTH, FIFTH, SIXTH, OR REVERSE GEAR

Checks	Causes
1-2-3-4-5-6-Reverse Clutch Assembly	• Inspect for damaged or worn 1-2-3-4-5-6-Reverse clutch plates (32, 34). • Inspect for damaged 1-2-3-4-5-6-Reverse clutch piston (411), clutch piston return spring-pack (412), and return spring-separator (33). • Inspect for cut, worn or damaged 1-2-3-4-5-6-Reverse clutch piston seals (409, 410) • Inspect for damaged 1-2-3-4-5-6-Reverse clutch piston retaining ring (413). • Inspect for damaged or improper selective 1-2-3-4-5-6-Reverse clutch apply plate-selective (30). • Inspect for damaged or improper selective 1-2-3-4-5-6-Reverse clutch wave plate (31). • Inspect for damaged 1-2-3-4-5-6-Reverse clutch backing plate (35). Inspect for worn splines on backing plate. • Check the one way clutch for not holding (421).

HARSH, SOFT, DELAYED OR SLIPPING FIRST, SECOND, EIGHTH, NINTH, TENTH, OR REVERSE SHIFT

Checks	Causes
1-2-8-9-10-Reverse Clutch Assembly	• Inspect for damaged or worn 1-2-8-9-10-Reverse clutch plates (417, 418). • Inspect for damaged 1-2-8-9-10-Reverse clutch piston (414), return spring (416), and apply plate (415). • Inspect for damaged 1-2-8-9-10-Reverse clutch backing plate retaining ring - selective (420). • Inspect for damaged 1-2-8-9-10-Reverse clutch backing plate (419). Inspect for worn splines on backing plate.

NO FIRST, SECOND, EIGHTH, NINTH, TENTH, OR REVERSE SHIFT GEAR

Checks	Causes
1-2-8-9-10-Reverse Clutch Assembly	• Inspect for damaged or worn 1-2-8-9-10-Reverse clutch plates (417, 418). • Inspect for damaged 1-2-8-9-10-Reverse clutch piston (414), return spring (416), and apply plate (415). • Inspect for damaged 1-2-8-9-10-Reverse clutch backing plate retaining ring - selective (420).

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Checks	Causes
	• Inspect for damaged 1-2-8-9-10-Reverse clutch backing plate (419). Inspect for worn splines on backing plate. • Check the one way clutch for not holding (421).

HARSH, SOFT, DELAYED OR SLIPPING SECOND, THIRD, FOURTH, FIFTH, SEVENTH, NINTH, OR TENTH SHIFT

Checks	Causes
2 - 3 - 4 - 5 - 7 - 9 - 10 Clutch Assembly	• Inspect for damaged or worn 2 - 3 - 4 - 5 - 7 - 9 - 10 clutch plates (507, 508). • Inspect for damaged 2 - 3 - 4 - 5 - 7 - 9 - 10 clutch piston (515), return spring (514), piston dam (513). • Inspect for damaged 2 - 3 - 4 - 5 - 7 - 9 - 10 clutch piston dam retaining ring (510). • Inspect for cut, worn or damaged 2 - 3 - 4 - 5 - 7 - 9 - 10 clutch piston seal (512, 516, 517), and dam seals (511). • Inspect for improper selective 2 - 3 - 4 - 5 - 7 - 9 - 10 clutch backing plate retaining ring (505). • Inspect for damaged 2 - 3 - 4 - 5 - 7 - 9 - 10 clutch backing plate (506). Inspect for worn splines on backing plate. • Inspect for damaged triple clutch housing (518).

NO SECOND, THIRD, FOURTH, FIFTH, SEVENTH, NINTH, OR TENTH GEAR

Checks	Causes
2 - 3 - 4 - 5 - 7 - 9 - 10 Clutch Assembly	• Inspect for damaged or worn 2 - 3 - 4 - 5 - 7 - 9 - 10 clutch plates (507, 508). • Inspect for damaged 2 - 3 - 4 - 5 - 7 - 9 - 10 clutch piston (515), return spring (514), piston dam (513). • Inspect for damaged 2 - 3 - 4 - 5 - 7 - 9 - 10 clutch piston dam retaining ring (510). • Inspect for cut, worn or damaged 2 - 3 - 4 - 5 - 7 - 9 - 10 clutch piston seal (512, 516, 517), and dam seals (511). • Inspect for improper selective 2 - 3 - 4 - 5 - 7 - 9 - 10 clutch backing plate retaining ring (505). • Inspect for damaged 2 - 3 - 4 - 5 - 7 - 9 - 10 clutch backing plate (506). Inspect for worn splines on backing plate. • Inspect for damaged triple clutch housing (518). • Check the one way clutch for not holding (421).

HARSH, SOFT, DELAYED OR SLIPPING FIRST, SECOND, THIRD, FOURTH, SIXTH, SEVENTH, EIGHTH, TENTH, OR REVERSE SHIFT

Checks	Causes
1-2-3-4-6-7-8-10-Reverse Clutch Assembly	• Inspect for damaged or worn 1-2-3-4-6-7-8-10-Reverse clutch plates (544 - 545). • Inspect for damaged 1-2-3-4-6-7-8-10-Reverse clutch piston (538), return spring (539), and piston dam (540).

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Checks	Causes
	• Inspect for damaged 1-2-3-4-6-7-8-10-Reverse clutch piston dam retaining ring (541). • Inspect for cut, worn or damaged 1-2-3-4-6-7-8-10-Reverse clutch piston seals (536, 537). • Inspect for improper selective 1-2-3-4-6-7-8-10-Reverse clutch backing plate retaining ring (547). • Inspect for damaged 1-2-3-4-6-7-8-10-Reverse clutch backing plate (546). Inspect for worn splines on backing plate. • Inspect for damaged 1-2-3-4-6-7-8-10-Reverse clutch apply plate (542). Inspect for worn splines on apply plate. • Inspect for damaged triple clutch housing (520).

NO FIRST, SECOND, THIRD, FOURTH, SIXTH, SEVENTH, EIGHTH, TENTH, OR REVERSE GEAR

Checks	Causes
1-3-5-6-7 Clutch Assembly (57)	• Inspect for damaged or worn 1-2-3-4-6-7-8-10-Reverse clutch plates (544 - 545). • Inspect for damaged 1-2-3-4-6-7-8-10-Reverse clutch piston (538), return spring (539), and piston dam (540). • Inspect for damaged 1-2-3-4-6-7-8-10-Reverse clutch piston dam retaining ring (541). • Inspect for cut, worn or damaged 1-2-3-4-6-7-8-10-Reverse clutch piston seals (536, 537). • Inspect for improper selective 1-2-3-4-6-7-8-10-Reverse clutch backing plate retaining ring (547). • Inspect for damaged 1-2-3-4-6-7-8-10-Reverse clutch backing plate (546). Inspect for worn splines on backing plate. • Inspect for damaged 1-2-3-4-6-7-8-10-Reverse clutch apply plate (542). Inspect for worn splines on apply plate. • Inspect for damaged triple clutch housing (520). • Check the one way clutch for not holding (421).

HARSH, SOFT, DELAYED OR SLIPPING FIRST, THIRD, FIFTH, SIXTH, SEVENTH, EIGHTH, OR NINTH SHIFT

Checks	Causes
1-3-5-6-7-8-9 Clutch Assembly	• Inspect for damaged or worn 1-3-5-6-7-8-9 clutch plates (556 - 557). • Inspect for damaged 1-3-5-6-7-8-9 clutch piston (561), return spring (559), piston dam (563), and apply plate (573). • Inspect for damaged 1-3-5-6-7-8-9 clutch piston dam retaining ring (565). • Inspect for cut, worn or damaged 1-3-5-6-7-8-9 clutch piston seal (560), and dam seals (562, 564). • Inspect for damaged or improper 1-3-5-6-7-8-9 clutch backing plate (555). Inspect for worn splines on backing

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Checks	Causes
	plate. • Inspect for rolled turbine shaft seals (569)

NO FIRST, THIRD, FIFTH, SIXTH, SEVENTH, EIGHTH, OR NINTH GEAR

Checks	Causes
1-3-5-6-7-8-9 Clutch Assembly	• Inspect for damaged or worn 1-3-5-6-7-8-9 clutch plates (556 - 557). • Inspect for damaged 1-3-5-6-7-8-9 clutch piston (561), return spring (559), piston dam (563), and apply plate (573). • Inspect for damaged 1-3-5-6-7-8-9 clutch piston dam retaining ring (565). • Inspect for cut, worn or damaged 1-3-5-6-7-8-9 clutch piston seal (560), and dam seals (562, 564). • Inspect for damaged or improper 1-3-5-6-7-8-9 clutch backing plate (555). Inspect for worn splines on backing plate.

HARSH, SOFT, DELAYED OR SLIPPING FOURTH, FIFTH, SIXTH, SEVENTH, EIGHTH, NINTH, TENTH, OR REVERSE SHIFT

Checks	Causes
4-5-6-7-8-9-10-Reverse Clutch Assembly	• Inspect for damaged or worn 4-5-6-7-8-9-10-Reverse clutch plates (530, 531). • Inspect for damaged 4-5-6-7-8-9-10-Reverse clutch piston (524), return spring (525), piston dam (526). • Inspect for damaged 4-5-6-7-8-9-10-Reverse clutch piston dam retaining ring (527). • Inspect for damaged 4-5-6-7-8-9-10-Reverse clutch piston stop (523). • Inspect for cut, worn or damaged 4-5-6-7-8-9-10-Reverse clutch piston seals (521, 522). • Inspect for improper selective4-5-6-7-8-9-10-Reverse clutch backing plate retaining ring (533). • Inspect for improper 4-5-6-7-8-9-10-Reverse clutch backing plate retaining ring (534, 535). • Inspect for damaged 4-5-6-7-8-9-10-Reverse clutch backing plate (532). Inspect for worn splines on backing plate. • Inspect for damaged 4-5-6-7-8-9-10-Reverse clutch apply plate (528). Inspect for worn splines on apply plate. • Inspect for damaged triple clutch housing (520).

NO FOURTH, FIFTH, SIXTH, SEVENTH, EIGHTH, NINTH, TENTH, OR REVERSE GEAR

Checks	Causes
4-5-6-7-8-9-10-Reverse Clutch Assembly	• Inspect for damaged or worn 4-5-6-7-8-9-10-Reverse clutch plates (530, 531).

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Checks	Causes
	• Inspect for damaged 4-5-6-7-8-9-10-Reverse clutch piston (524), return spring (525), piston dam (526). • Inspect for damaged 4-5-6-7-8-9-10-Reverse clutch piston dam retaining ring (527). • Inspect for damaged 4-5-6-7-8-9-10-Reverse clutch piston stop (523). • Inspect for cut, worn or damaged 4-5-6-7-8-9-10-Reverse clutch piston seals (521, 522). • Inspect for improper selective4-5-6-7-8-9-10-Reverse clutch backing plate retaining ring (533). • Inspect for improper 4-5-6-7-8-9-10-Reverse clutch backing plate retaining ring (534, 535). • Inspect for damaged 4-5-6-7-8-9-10-Reverse clutch backing plate (532). Inspect for worn splines on backing plate. • Inspect for damaged 4-5-6-7-8-9-10-Reverse clutch apply plate (528). Inspect for worn splines on apply plate. • Inspect for damaged triple clutch housing (520).

NO TORQUE CONVERTER CLUTCH APPLY

Checks	Causes
Torque Converter Assembly (1)	Diagnose torque converter for possible internal damage. Refer to **Torque Converter Diagnosis**.

NO TORQUE CONVERTER CLUTCH RELEASE

Checks	Causes
Torque Converter Assembly (1)	Diagnose torque converter for possible internal damage. Refer to **Torque Converter Diagnosis**.

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