DIAGNOSTIC INFORMATION AND PROCEDURES

DTC P0601-P0604, P0606, P0607, P060A, P062F, P16F3, P16F4, 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

Control Module Performance

DTC P060A

Control Module Monitoring Processor Performance

DTC P062F

Control Module Long Term Memory Performance

DTC P16F3

Control Module Redundant Memory Performance

DTC P16F4

Control Module Transmission Range Switch Input Circuitry Performance

DTC P16FB

Control Module Vehicle Speed System Circuitry Performance

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Circuit/System Description

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General 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

P0601, P0602, P0603, P0604, P0606, P0607, P060A, P062F, P16F3, P16F4, P16FB

- Battery Voltage = Greater than 11 V
- Ignition and Start Switch Signal = Greater than 5 s
- Ignition and Start Signal = Greater than 11 V
- {P16FB} Transmission OSS = Greater than 150 RPM

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

P0601, P0603, P0604, P0606, P0607, P060A, P062F, P16F3, P16FB

- Autostart/Autostop = Disabled - If equipped
- Default shift pattern = Disabled
- Grade braking = Disabled
- High Side Driver = Disabled
- High Side Driver 2 = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up or Tap Down = Disabled
- TCC Control = Disabled
- Torque Management = Disabled
- Transmission = Freeze current adapt values
- {P16FB} Transmission gear allowed = Reverse or Gear 2, 8

P0602, P16F4

Actions Taken When the DTC Sets = None

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

- **Component Connector End Views - Index**
- **Inline Harness 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

   Verify the following conditions do not exist:

   - Defective
   - Loose
   - Poor Connection
   - Visible Damage
   - **If a condition exists**

     Repair or replace as necessary

   - **Go to next step: If no condition exists**
5. Connect the electrical connector: K71 Transmission Control Module
6. Ignition - On / Vehicle - In Service Mode
7. Clear the DTCs.
8. Ignition/Vehicle & All vehicle systems - Off
9. Ignition - On / Vehicle - In Service Mode

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10. Verify DTC P0601, P0603, P0604, P0606, P0607, P060A, P062F, P16F3, P16F4, P16FB is not set.
    - **If the DTC is set**

      Replace the component: K71 Transmission Control Module

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

Repair Instructions

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

- **Q77 Transmission Control Solenoid Valve Characterization Programming (8L45)** .
- **Transmission Service Fast Learn Procedure**
- For control module replacement, programming, and setup refer to **Control Module References**

DTC P0658, P0659, P2718, P2720, P2721, P2727, P2729, P2730, 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 2 Control Circuit Low

DTC P0659

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

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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 1 @ X175	P281D	P281B, P281D	P281E	-
Control - Terminal 2, 18 @ X175	P0658	P0659	P0659	-
Control - Terminal 13 @ X175	P2720	P2718, P2720	P2721	-
Control - Terminal 14 @ X175	P2729	P2727, P2729	P2730	-

Typical Scan Tool Data

High Side Driver Circuit High Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Okay or Not Run			
Control - Terminal 2, 18	Okay or Not Run	Okay or Not Run	Malfunction

High Side Driver Circuit Low Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Okay or Not Run			
Control - Terminal 2, 18	Malfunction	Okay or Not Run	Okay or Not Run

High Side Driver Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Okay or Not Run			
Control - Terminal 2, 18	Okay or Not Run	Malfunction	Okay or Not Run

Transmission Control Solenoid Valve 4, 5, 8 Control Circuit High Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Okay or Not Run			
Control - Terminal 1, 13, 14	Okay or Not Run	Okay or Not Run	Malfunction

Transmission Control Solenoid Valve 4, 5, 8 Control Circuit Low Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Okay or Not Run			
Control - Terminal 1, 13, 14	Malfunction	Okay or Not Run	Okay or Not Run

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Transmission Control Solenoid Valve 4, 5, 8 Control Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Okay or Not Run			
Control - Terminal 1, 13, 14	Okay or Not Run	Malfunction	Okay or Not Run

Circuit/System Description

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

- **Electronic Component Description**
- **Transmission Solenoid Information**

Circuit	Description
Control - Terminal 1 @ X175	The output circuit is switched to ground to activate the component. This is a normally closed valve that is controlled on/off.
Control - Terminal 2, 18 @ X175	The output circuit is switched to 12 V to enable the component(s).
Control - Terminal 13, 14 @ X175	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 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 solenoid valve is an electro-mechanically operated valve. The valve is controlled by an electric current through the solenoid.

Conditions for Running the DTC

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

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 - Additional actions taken:

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

- Transmission Shifting = Default shift pattern

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. Engine - Running
2. Verify the scan tool parameter:
   - High Side Driver Circuit High Test Status = Okay or Not Run
   - High Side Driver Circuit Low Test Status = Okay or Not Run
   - High Side Driver Circuit Open Test Status = Okay or Not Run
   - Transmission Control Solenoid Valve 4, 5, 8 Control Circuit High Test Status = Okay or Not Run
   - Transmission Control Solenoid Valve 4, 5, 8 Control Circuit Low Test Status = Okay or Not Run
   - Transmission Control Solenoid Valve 4, 5, 8 Control Circuit Open Test Status = Okay or Not Run
   - **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.

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Circuit/System Testing

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: X175 @ T12 Automatic Transmission Assembly

NOTE: **All testing for this procedure is performed on the control module K71 side of the circuit.**

3. Connect a test lamp between the test points: Control circuit terminal 18 & 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 X175 harness connector.**

- **Connect a 3 A fused jumper wire between the test points: 9 V Reference circuit terminal 25 X175 (harness side) & 9 V Reference circuit terminal 25 X175 (component side)**
- **Connect a 3 A fused jumper wire between the test points: Signal circuit terminal 24 X175 (harness side) & Signal circuit terminal 24 X175 (component side)**

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

   Verify the test lamp turns On and Off.

   - **If the test lamp is always 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 18 @ 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 18 @ 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 & 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 18 @ 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**

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7. Connect a test lamp between the test points:
    - {P2718, P2720, P2721} Control circuit terminal 13 & Control circuit terminal 18 @ Component harness
    - {P2727, P2729, P2730} Control circuit terminal 14 & Control circuit terminal 18 @ Component harness
    - {P281B, P281D, P281E} Control circuit terminal 1 & Control circuit terminal 18 @ Component harness
8. Perform the scan tool control function: Transmission Control Solenoid Valve 4, 5, 8 - On and Off

    Verify the test lamp turns On and Off.

    - **If the test lamp is always Off**
    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:
        - {P2718, P2720, P2721} Control circuit terminal 13 @ Component harness & Ground
        - {P2727, P2729, P2730} Control circuit terminal 14 @ Component harness & Ground
        - {P281B, P281D, P281E} Control 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 less than 2 ohms between the test points:
        - {P2718, P2720, P2721} Control circuit terminal 13 @ Component harness & The other end of the circuit
        - {P2727, P2729, P2730} Control circuit terminal 14 @ Component harness & The other end of the circuit
        - {P281B, P281D, P281E} Control circuit terminal 1 @ 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 & Remove - Test lamp
    2. Disconnect the electrical connector: K71 Transmission Control Module
    3. Test for infinite resistance between the test points:
        - {P2718, P2720, P2721} Control circuit terminal 13 @ Component harness & Ground
        - {P2727, P2729, P2730} Control circuit terminal 14 @ Component harness & Ground
        - {P281B, P281D, P281E} Control circuit terminal 1 @ 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 Off**
9. Connect the electrical connector: X175 @ T12 Automatic Transmission Assembly
10. Remove the component: Transmission Fluid Pan
11. Disconnect the electrical connector: X176
12. Connect a test lamp between the test points:
    - {P2718, P2720, P2721} Control circuit terminal 9 & Control circuit terminal 4 @ Component harness

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- {P2727, P2729, P2730} Control circuit terminal 7 & Control circuit terminal 4 @ Component harness
- {P281B, P281D, P281E} Control circuit terminal 1 & Control circuit terminal 4 @ Component harness

13. Perform the scan tool control function: Transmission Control Solenoid Valve 4, 5, 8 - On and Off

    Verify the test lamp turns On and Off.

    - **If the test lamp does not turn On and Off**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If the test lamp turns On and Off**
14. Connect the electrical connector: X176
15. Disconnect the appropriate electrical connector: Q77 Transmission Control Solenoid Valve
16. Verify a test lamp turns On between the test points: Control circuit terminal 2 & Control circuit terminal 1 @
    - **If the test lamp does not turn On and Off**

      Replace the component: Automatic Transmission Control Wiring Harness

    - **Go to next step: If the test lamp turns On and Off**
17. Replace the appropriate component: Q77 Transmission Control Solenoid Valve

Component Testing

Static Test

1. Ignition/Vehicle - Off
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 the resistance listed below between the test points: Control terminal 1 & Control terminal 2
   - Q77 Transmission Control Solenoid Valve - 4, 5 = 4.5 to 5.5 ohms
   - Q77H Transmission Control Solenoid Valve 8 = 11.0 to 13.0 ohms
   - **If the resistance is not within range**

     Replace the appropriate component: Q77 Transmission Control Solenoid Valve

   - **Go to next step: If the resistance is within range**
4. Test for infinite resistance between the test points: Each terminal of the component & The component's housing - Q77 Transmission Control Solenoid Valve
   - **If less than infinite resistance**

     Replace the appropriate component: Q77 Transmission Control Solenoid Valve

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

Repair Instructions

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

- **Transmission Control Wiring Harness Replacement**

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- **Automatic Transmission Wiring Harness Replacement**
- **Control Valve Body Replacement** - Q77 Transmission Control Solenoid Valve
- For control module replacement, programming, and setup refer to **Control Module References**

DTC P0707, P0708, P2802, P2803, OR P2805

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 P0707

Transmission Range Sensor Circuit Low

DTC P0708

Transmission Range Sensor Circuit High

DTC P2802

Transmission Range Sensor 2 Circuit Low

DTC P2803

Transmission Range Sensor 2 Circuit High

DTC P2805

Transmission Range Sensor and Sensor 2 Correlation

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
5 V Reference	P0708, P2803*	P0708, P2803*	P0708, P2803**	-
Signal 1 - Terminal 2 @ B303 Transmission Range Sensor	P0707*	P0708*	P0708**	P2805*
Signal 2 - Terminal 3 @ B303 Transmission Range Sensor	P2802	P2803	P2803**	P2805*
Low Reference	-	P0708, P2803*	P0708, P2803**	-
*Additional DTCs may set. **Internal control module or component damage may occur if the circuit shorts to B+. & Additional DTCs may set.				

Typical Scan Tool Data

Transmission Range Sensor 1 @ K71 Transmission Control Module @ Transmission Data

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: • Ignition = On			

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Circuit	Short to Ground	Open	Short to Voltage
• Transmission Range = P **Parameter Normal Range:** 7 to 96%			
5 V Reference	100%	100%	13%
Signal 1 - Terminal 2 @ B303 Transmission Range Sensor	0%	100%	100%
Low Reference	-	100%	-

Transmission Range Sensor 2 @ K20 Engine Control Module @ Automatic Transmission Data

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: • Ignition = On • Transmission Range = P **Parameter Normal Range:** 7 to 96%			
5 V Reference	100%	100%	87%
Signal 2 - Terminal 3 @ B303 Transmission Range Sensor	0%	100%	100%
Low Reference	-	100%	-

Circuit/System Description

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

Circuit	Description
5 V Reference	Regulated voltage supplied by the control module. K20 Engine Control Module
Signal 1 - Terminal 2 @ B303 Transmission Range Sensor	The control module input circuit has an internal resistance connected to 5 V. K71 Transmission Control Module
Signal 2 - Terminal 3 @ B303 Transmission Range Sensor	The control module input circuit has an internal resistance connected to 12 V. K20 Engine Control Module
Low Reference	Grounded through the control module. K20 Engine Control Module

Component	Description
B303 Transmission Range Sensor	The hall-effect sensor has 2 separate PWM signal circuits.
K20 Engine Control Module	The control module contains a microprocessor used to process input data to control outputs. 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 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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- The control module K71 uses the information from the sensor signal 1 to determine what transmission gear range the vehicle operator selected.
- The control module K20 uses the information from the sensor signal 2 to determine if the transmission is in neutral or park to enable the starter.

Conditions for Running the DTC

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

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

Conditions for Setting the DTC

P0707, P2802

Signal circuit = Short to Ground - For greater than 1 s

P0708, P2803

Signal circuit = Short to Voltage/Open/High Resistance - For greater than 1 s

P2805

Transmission Range Sensor 1, 2 = Not Plausible

Actions Taken When the DTC Sets

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

- Autostart/Autostop = Disabled - If equipped
- Grade braking = Disabled
- Line Pressure = Maximum
- 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

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 DTC P0641, P0651, P0697, P06A3, or P2805 is not set.
   - **If DTC P0641, P0651, P0697 or P06A3 is set**

     Refer to Diagnostic Trouble Code (DTC) List - Vehicle

   - **If DTC P2805 is set**

     Replace the component: B303 Transmission Range Sensor

   - **Go to next step: If none of the DTCs are set**
3. Verify the condition does not exist: Incorrect adjustment - Refer to Range Selector Lever Cable Adjustment
   - **If a condition exists**

     Repair or replace as necessary

   - **Go to next step: If no condition exists**
4. Operate the component: S2 Automatic Transmission Manual Shift Shaft Position Switch - Select each position

   Verify the scan tool parameter:

   - Transmission Range Sensor 1 = The value should be within the range listed in the table: Transmission Range Sensor Duty Cycles
   - Transmission Range Sensor 2 = The value should be within the range listed in the table: Transmission Range Sensor Duty Cycles
   - **If not in the specified range**

     Refer to: Circuit/System Testing

   - **Go to next step: If in the specified range**
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**

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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: **To turn the ignition off on vehicles equipped with a push button ignition switch, the wiring harness connector must be connected to the component T12. A valid park input signal to the control module K71 is required to turn the ignition off.**

2. Disconnect the electrical connector: X175 @ T12 Automatic Transmission Assembly
3. Test for less than 10 ohms between the test points: Low Reference circuit terminal 30 & Ground
   - **If 10 ohms or greater**
   1. Disconnect the electrical connector: K20 Engine Control Module
   2. Test for less than 2 ohms between the test points: Low Reference circuit terminal 30 @ 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: K20 Engine Control Module
   - **Go to next step: If less than 10 ohms**
4. Ignition - On / Vehicle - In Service Mode
5. Test for 4.8 to 5.2 V between the test points: 5 V Reference circuit terminal 29 & Low Reference circuit terminal 30
   - **If less than 4.8 V**
   1. Connect the electrical connector: X175 @ T12 Automatic Transmission Assembly
   2. Ignition/Vehicle - Off
   3. Disconnect the appropriate electrical connector: K20 Engine Control Module
   4. Disconnect the electrical connector: X175 @ T12 Automatic Transmission Assembly
   5. Test for infinite resistance between the test points: 5 V Reference circuit terminal 29 @ Component harness & Ground
      - If less than infinite resistance - Repair the short to ground on the circuit.
      - Go to next step: If infinite resistance
   6. Test for less than 2 ohms between the test points: 5 V Reference circuit terminal 29 @ 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: K20 Engine Control Module
   - **If greater than 5.2 V**
   1. Connect the electrical connector: X175 @ T12 Automatic Transmission Assembly
   2. Ignition/Vehicle - Off
   3. Disconnect the appropriate electrical connector: K20 Engine Control Module
   4. Disconnect the electrical connector: X175 @ T12 Automatic Transmission Assembly
   5. Ignition - On / Vehicle - In Service Mode
   6. Test for less than 1 V between the test points: 5 V Reference circuit terminal 29 @ Component harness & Ground
      - If 1 V or greater - Repair the short to voltage on the circuit.
      - If less than 1 V - Replace the component: K20 Engine Control Module

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- **Go to next step: If between 4.8 and 5.2 V**

6. Verify the scan tool parameter:
    - Transmission Range Sensor 1 @ K71 Transmission Control Module @ Transmission Data = 100%
    - Transmission Range Sensor 2 @ K20 Engine Control Module @ Automatic Transmission Data = 100%
    - **If not the specified values**
    1. Connect the electrical connector: X175 @ T12 Automatic Transmission Assembly
    2. Ignition/Vehicle - Off
    3. Disconnect the appropriate electrical connector: K20 Engine Control Module
    4. Disconnect the electrical connector: K71 Transmission Control Module
    5. Disconnect the electrical connector: X175 @ T12 Automatic Transmission Assembly
    6. Test for infinite resistance between the test points:
        - {P0707, P0708} Signal circuit terminal 22 & Ground
        - {P2802, P2803} Signal circuit terminal 21 & Ground
        - If less than infinite resistance - Repair the short to ground on the circuit.
        - {P0707, P0708} If infinite resistance - Replace the component: K71 Transmission Control Module
        - {P2802, P2803} If infinite resistance - Replace the component: K20 Engine Control Module
    - **Go to next step: If the specified values**

7. Connect a 3 A fused jumper wire between the test points:
    - {P0707, P0708} Signal circuit terminal 22 & Low Reference circuit terminal 30
    - {P2802, P2803} Signal circuit terminal 21 & Low Reference circuit terminal 30

8. Verify the scan tool parameter:
    - Transmission Range Sensor 1 @ K71 Transmission Control Module @ Transmission Data = 0%
    - Transmission Range Sensor 2 @ K20 Engine Control Module @ Automatic Transmission Data = 0%
    - **If not the specified values**
    1. Remove - Jumper Wire(s)
    2. Connect the electrical connector: X175 @ T12 Automatic Transmission Assembly
    3. Ignition/Vehicle - Off
    4. Disconnect the appropriate electrical connector: K20 Engine Control Module
    5. Disconnect the electrical connector: X175 @ T12 Automatic Transmission Assembly
    6. Ignition - On / Vehicle - In Service Mode
    7. Test for less than 1 V between the test points: Ground &
        - {P0707, P0708} Signal circuit terminal 22 & Ground
        - {P2802, P2803} Signal circuit terminal 21 & Ground
        - If 1 V or greater - Repair the short to voltage on the circuit.
        - Go to next step: If less than 1 V
    8. Ignition/Vehicle - Off
    9. Test for less than 2 ohms between the test points:
        - {P0707, P0708} Signal circuit terminal 22 & The other end of the circuit
        - {P2802, P2803} Signal circuit terminal 21 & The other end of the circuit
        - If 2 ohms or greater - Repair the open/high resistance in the circuit.
        - {P0707, P0708} If less than 2 ohms - Replace the component: K71 Transmission Control Module
        - {P2802, P2803} If less than 2 ohms - Replace the component: K20 Engine Control Module

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

9. Remove the component: Automatic Transmission Fluid Pan
10. Disconnect the component: B303 Transmission Range Sensor
11. Connect the electrical connector: X175 @ T12 Automatic Transmission Assembly
12. Test for less than 10 ohms between the test points: Low Reference circuit terminal 2 @ Component harness & Ground
    - **If greater than 10 ohms**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If less than 10 ohms**
13. Test for the voltage listed below between the test points:
    - Signal circuit terminal 3 @ Component harness & Ground = 4.8 to 5.2 V
    - Signal circuit terminal 4 @ Component harness & Ground = Greater than 10 V
    - 5 V Reference circuit terminal 1 @ Component harness = 4.8 to 5.2 V
    - **If not in the specified range**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If in the specified range**
14. Test or replace the component: B303 Transmission Range Sensor

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**
- **Manual Shift Shaft Position Switch Replacement** - B303 Transmission Range Sensor
- 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 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

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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 Sensor

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** 35 to 100B°C (95 to 212B°F)			
Signal	170B°C (338B°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**
- Review the description of Strategy Based Diagnosis: **Strategy Based Diagnosis**
- An overview of each diagnostic category can be found here: **Diagnostic Procedure Instructions**

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 @ 170B°C (338B°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

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- DTC P0712, P0713, P2818 = Not set
- DTCs related to the following system/component = Not Set
  - B14A Automatic Transmission Output Speed Sensor/B115 Vehicle 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 130B°C (-40 to 226B°F)
- Engine Speed = Greater than 500 RPM
- Engine Torque = Greater than 50 Nm (37 lb ft)
- Ignition = On
- Ignition and Start Signal = Greater than 9 V
- Transmission Fluid Temperature Sensor = -40 to 170B°C (-40 to 338B°F)
- Vehicle Speed = Greater than 10 km/h (7 MPH)

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

P0711 Condition 2, 3 & P0712, P0713

- Battery Voltage = Greater than 9 V
- Ignition and Start Switch Signal = On
- Ignition and Start Signal = Greater than 9 V
- {P0711Condition 3} Transmission Fluid Temperature = -40 to 170B°C (-40 to 338B°F)

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

Conditions for Setting the DTC

P0711

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

P0712

Transmission Fluid Temperature Sensor = Warmer than 169B°C (336B°F) - For greater than 1 s

P0713

Transmission Fluid Temperature Sensor = 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

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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 Sensor

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics

Connector End View Reference

- **Component Connector End Views - Index**
- **Inline Harness 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 the scan tool parameter: Transmission Fluid Temperature Sensor = -39 to 169B°C (-38 to 336B°F)
    - **If not between -39 and 169B°C (-38 and 336B°F)**

      Refer to: Circuit/System Testing

    - **Go to next step: If between -39 and 169B°C (-38 and 336B°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 Sensor = Temperature increases greater than 15B°C (27B°F)

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- 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 Sensor = The value should not spike or drop out.

   Perform the action while monitoring the parameter:

   - Wiggle the harness and connector: X175 @ T12 Automatic Transmission Assembly
   - 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.

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
2. Disconnect the electrical connector: X175 @ T12 Automatic Transmission Assembly

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 11 @ Component harness & 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 11 @ 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 Sensor = Colder than -39B°C (-38B°F)
   - **If -39B°C (-38B°F) or warmer**
   1. Ignition/Vehicle - Off

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2. Disconnect the electrical connector: K71 Transmission Control Module
3. Test for infinite resistance between the test points: Signal circuit terminal 12 @ 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 12 & Low Reference circuit terminal 11 @ Component harness
7. Verify the scan tool parameter: Transmission Fluid Temperature Sensor = Warmer than 169B°C (336B°F)
    - **If 169B°C (336B°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 12 @ 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 12 @ 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 warmer than 169B°C (336B°F)**
8. Ignition/Vehicle - Off
9. Connect the electrical connector: X175 @ T12 Automatic Transmission Assembly
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 15 & Low Reference terminal 16 @ Component harness
    - **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. 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

NOTE: **Testing for steps 4 to 7 is performed on the component side of the harness connector.**

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4. Disconnect the electrical connector: X176
5. Test for 65 to 47, 000 ohms between the test points: Signal circuit terminal 14 & Low Reference terminal 16 @ X176
    - **If not between 65 and 47, 000 ohms**

      Replace the component: B13 Automatic Transmission Fluid Temperature Sensor

    - **Go to next step: If between 65 and 47, 000 ohms**
6. 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**
- **Automatic Transmission Wiring Harness Replacement**
- **Transmission Control Wiring Harness 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 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 - Reverse

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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 **Parameter Normal Range:** 500 to 7, 500 RPM			
9 V Reference	0 RPM	0 RPM	0 RPM
Signal	0 RPM	0 RPM	0 RPM

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 control module input circuit has an internal resistance connected to ground.

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

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- 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
    - 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 = On
- High Side Driver 2 = On
- Ignition and Start Switch Signal = On
- Ignition and Start Signal = Greater than 9 V
- 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 Switch Signal = On
- Ignition and Start Signal = Greater than 9 V
- 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

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- Battery Voltage = Greater than 10 V
- Ignition and Start Switch Signal = On
- Ignition and Start Signal = Greater than 10 V
- 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
- Ignition and Start Switch Signal = On
- Ignition and Start Signal = Greater than 9 V
- 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 Switch Signal = On
- Ignition and Start Signal = Greater than 9 V
- 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 Shaft Speed Sensor = Decreases greater than 1999 RPM - For greater than 7.5 s

P0717

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

P07BF

Signal circuit = Short to Ground - For greater than 1 s

P07C0

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

Actions Taken When the DTC Sets

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DTCs listed in the DTC Descriptor Category = Type A DTC

- {If equipped} Autostart/Autostop = Disabled
- 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
- 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

- **Component Connector End Views - Index**
- **Inline Harness 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**
3. Engine - Running

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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
    - **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

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
2. Disconnect the electrical connector: X175 @ T12 Automatic Transmission Assembly
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 27 @ Component harness & Ground

NOTE: **Testing for steps 4.1 to 8.7 is performed on the control module K71 side of the harness connector.**

- **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 27 @ 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 27 @ Component harness & The other end of the circuit @ Control module harness
    - If 2 ohms or greater - Repair the open/high resistance in the circuit.

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- 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 @ Control module 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 - 300 Hz
    - Duty Cycle - 50%
    - Black lead @ Ground
    - Red lead @ Signal circuit terminal 26
7. Ignition - On / Vehicle - In Service Mode
8. Verify the scan tool parameter: Input Shaft Speed Sensor = 250 to 270 RPM
    - **If not between 250 and 270 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 26 @ 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 26 @ 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 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 between 250 and 270 RPM**
9. Ignition/Vehicle - Off
10. Connect the electrical connector. X175 @ T12 Automatic Transmission Assembly
11. Remove the component: Automatic Transmission Fluid Pan
12. Disconnect the electrical connector: X177
13. Ignition - On / Vehicle - In Service Mode
14. Test for 8.3 to 9.6 V between the test points: 9 V Reference circuit terminal 4 & Signal circuit terminal 5 @ Component harness
    - **If not between 8.3 and 9.6 V**

      Replace the component: Automatic Transmission Wiring Harness

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

15. Replace the component: B14C Transmission Input Shaft Speed Sensor

Repair Instructions

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

- **Q77 Transmission Control Solenoid Valve Characterization Programming (8L45)** .
- **Automatic Transmission Fluid, Fluid Pan and/or Filter Replacement**
- **Input and Output 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

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

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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:** 0 to 7, 500 RPM			
9 V Reference	0 RPM	0 RPM	0 RPM
Signal	0 RPM	0 RPM	0 RPM

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 control module input circuit has an internal resistance connected to ground.

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

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P0721, P172A, P172B

- Battery Voltage = Greater than 9 V
- Engine Speed = Greater than 499 RPM
- Ignition and Start Switch Signal = On
- Ignition and Start Signal = Greater than 9 V
- Transmission Service Fast Learn = Disabled

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

P0722, P0723

- {P0722} Accelerator Pedal Position Sensor = Greater than 3%
- Battery Voltage = Greater than 9 V
- 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} DTC P0723, P077C, P077D = Not set
- {P0722} Engine Torque = Greater than 30 Nm (22 lb ft)
- Ignition and Start Switch Signal = On
- Ignition and Start Signal = Greater than 9 V
- Transmission Service Fast Learn = Disabled

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

P077C, P077D

- Battery Voltage = Greater than 10 V
- {P077C} DTC P077D = Not set
- {P077D} DTC P077C = Not set
- Engine Speed = Greater than 499 RPM
- Ignition and Start Switch Signal = On
- Ignition and Start Signal = Greater than 10 V
- 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 Shaft Speed Sensor = Less than 31 RPM - For greater than 4 s

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P0723

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

P077C

Signal circuit = Short to Ground - For greater than 1 s

P077D

Signal circuit = 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

- {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
- 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

- **Component Connector End Views - Index**
- **Inline Harness Connector End Views - Index**

Electrical Information Reference

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

DTC Type Reference

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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. 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

   - **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

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
2. Disconnect the electrical connector: X175 @ T12 Automatic Transmission Assembly
3. Ignition - On / Vehicle - In Service Mode

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NOTE: **Testing for steps 4 to 20 is performed on the control module K71 side of the harness connector.**

4.

5. Test for 8.4 to 9.6 V between the test points: 9 V Reference circuit terminal 25 @ Component harness & Ground
    - **If less than 8.4 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 25 @ 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 25 @ 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 9.6 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 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
    - **Go to next step: If between 8.4 and 9.6 V**
6. Ignition/Vehicle - Off
7. Install - EL-38522 Variable Signal Generator
    - Voltage - 5 V
    - Frequency - 300 Hz
    - Duty Cycle - 50%
    - Black lead @ Ground
    - Red lead @ Signal circuit terminal 24 @ Component harness
8. Ignition - On / Vehicle - In Service Mode
9. Verify the scan tool parameter: Output Shaft Speed Sensor = 236 to 256 RPM
    - **If not between 236 and 256 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 24 @ 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 24 @ Component harness & 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

7. Test for less than 2 ohms between the test points: Signal circuit terminal 24 @ 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 236 and 256 RPM**

10. Ignition/Vehicle - Off
11. Connect the electrical connector. X175 @ T12 Automatic Transmission Assembly
12. Remove the component: Automatic Transmission Fluid Pan
13. Disconnect the electrical connector: X177
14. Ignition - On / Vehicle - In Service Mode
15. Test for 8.4 to 9.6 V between the test points: 9 V Reference circuit terminal 2 & Signal circuit terminal 1 @ Component harness
    - **If not between 8.4 and 9.6 V**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 8.4 and 9.6 V**
16. Replace the component: B14A Automatic Transmission Output Speed Sensor

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**
- **Input and Output Speed Sensor Replacement** - B14A Automatic Transmission Output Speed Sensor
- **Q77 Transmission Control Solenoid Valve Characterization Programming (8L45)** .
- 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

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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.**
- **Verify the conditions listed in the table do not exist**

Component	DTC	Condition

Q77A Transmission Control Solenoid Valve 1	P0746, P0747	• Retaining Clip
		  • Missing
		  • Visible Damage
		• Solenoid Valve
		  • Binding or Sticking
		  • Stuck
		  • Visible Damage

1-2-7-8-R Clutch Regulator Valve	P0746, P0747	• Bore
		  • Scored
		  • Debris
		• Valve
		  • Binding or Sticking
		  • Debris
		  • Scored
		  • Stuck
		  • Visible Damage
		• Valve Spring
		  • Visible Damage

1-2-7-8-R Clutch Assembly	P0746, P0747	• Clutch Housing
		  • Scored
		  • Visible Damage
		• Clutch Piston
		  • Scored
		  • Visible Damage
		• Clutch Plates
		  • Binding or Sticking
		  • Visible Damage
		  • Worn
		• Fluid/oil passage
		  • Blocked by debris
		  • Restricted
		• Gasket
		  • Leaking
		• O-Ring
		  • Leaking

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Component	DTC	Condition
		• Seal • Leaking

Circuit/System Description

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

Conditions for Running the DTC

- DTC P0101-P0108, P0171-P0175, P0201-P0208, P0300-P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A-P182F, P1838-P1841, P18B5-P18BF, P18C0-P18C3, P1915, P2534 = Not set
- Accelerator Pedal Position Sensors = Greater than 1%
- Battery Voltage = 9 to 32 V
- High Side Driver 2 = On
- Ignition and Start Signal = 9 to 32 V
- Output Shaft Speed Sensor = Greater than 100 RPM

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

Conditions for Setting the DTC

P0746

Clutch 1-2-7-8-R = Not applied

P0747

Clutch 1-2-7-8-R = Not released

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
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- {P0746} Transmission gear allowed = Reverse or Gear 4
- {P0747} Transmission gear allowed = Reverse or Gear 2

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).

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Reference Information

Description and Operation

- **Park - Engine Running**
- **Reverse**
- **Neutral - Engine Running**
- **Drive Range, First Gear**
- **Drive Range, Second Gear**
- **Drive Range, Third Gear**
- **Drive Range, Fourth Gear**
- **Drive Range, Fifth Gear**
- **Drive Range, Sixth Gear**
- **Drive Range, Seventh Gear**
- **Drive Range, Eighth Gear**

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 DTCs
4. Road test the vehicle. Refer to **Road Test**
5. Verify that no DTC listed in the DTC Descriptor Category is set.
   - **If any DTC listed in the DTC Descriptor Category 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 that no DTC listed in the DTC Descriptor Category is set.

   - **If any other DTCs are set**

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

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- **If any DTC listed in the DTC Descriptor Category 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**

- **1-2-7-8 Reverse Clutch Piston Removal**
- **1-2-7-8 Reverse Clutch Plate Assembly and Input Sun Gear Assembly Removal**
- **Control Valve Body Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

- **Q77 Transmission Control Solenoid Valve Characterization Programming (8L45)** .
- **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.**
- **DTC P0777 will set with a hydraulic/mechanical condition or high resistance in the circuit of the component Q77B without setting component/control circuit DTCs.**
- **The components are listed from the least to the most intrusive to service.**
- **Verify the conditions listed in the table do not exist**

Component	DTC	Condition

Q77B Transmission Control Solenoid Valve 2	P0776, P0777	• Retaining Clip
		  • Missing
		  • Visible Damage
		• Solenoid Valve
		  • Binding or Sticking

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Component	DTC	Condition
		• Stuck • Visible Damage

1-2-3-4-5-R Clutch Regulator Valve	P0776, P0777	• Bore
		  • Scored
		  • Debris
		• Valve
		  • Binding or Sticking
		  • Debris
		  • Scored
		  • Stuck
		  • Visible Damage
		• Valve Spring
		  • Visible Damage

1-2-3-4-5-R Clutch Assembly	P0776, P0777	• Clutch Housing
		  • Scored
		  • Visible Damage
		• Clutch Piston
		  • Scored
		  • Visible Damage
		• Clutch Plates
		  • Binding or Sticking
		  • Visible Damage
		  • Worn
		• Fluid/oil passage
		  • Blocked by debris
		  • Restricted
		• Gasket
		  • Leaking
		• O-Ring
		  • Leaking
		• Seal
		  • Leaking

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Circuit/System Description

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

Conditions for Running the DTC

P0776, P0777

- DTC P0101-P0108, P0171-P0175, P0201-P0208, P0300-P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A-P182F, P1838-P1841, P18B5-P18BF, P18C0-P18C3, P1915, P2534 = Not set

- Accelerator Pedal Position = Greater than 1%
- Battery Voltage = 9 to 32 V
- High Side Driver = On
- High Side Driver 2 = On
- Ignition and Start Signal = 9 to 32 V
- Transmission Gear = Drive
- Output Shaft Speed Sensor = Greater than 100 RPM

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

Conditions for Setting the DTC

P0776

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

P0777

Clutch 1-2-3-4-5-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
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- {P0776} Transmission gear allowed = Reverse or Gear 6
- {P0777} Transmission gear allowed = Reverse or Gear 2

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 P0777 without setting control circuit DTC(s).

Reference Information

Description and Operation

- **Park - Engine Running**
- **Reverse**
- **Neutral - Engine Running**
- **Drive Range, First Gear**
- **Drive Range, Second Gear**
- **Drive Range, Third Gear**
- **Drive Range, Fourth Gear**

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- **Drive Range, Fifth Gear**
- **Drive Range, Sixth Gear**
- **Drive Range, Seventh Gear**
- **Drive Range, Eighth Gear**

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 DTCs
4. Road test the vehicle. Refer to **Road Test**
5. Verify that no DTC listed in the DTC Descriptor Category is set.
   - **If any DTC listed in the DTC Descriptor Category 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 that no DTC listed in the DTC Descriptor Category is set.

   - **If any other DTCs are set**

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

   - **If any DTC listed in the DTC Descriptor Category 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 Assembly Disassemble**
- **Control Valve Body Replacement**

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- Reaction Internal Gear and 1-2-3-4-5 Reverse Hub and 1-2-3-4-5 Reverse Clutch Plate Assembly Removal
- For control module replacement, programming, and setup refer to Control Module References

Additional Procedures

- Q77 Transmission Control Solenoid Valve Characterization Programming (8L45) .
- 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.**
- **DTC P0797 will set with a hydraulic/mechanical condition or high resistance in the circuit of the component Q77C without setting component/control circuit DTCs.**
- **The components are listed from the least to the most intrusive to service.**
- **Verify the conditions listed in the table do not exist**

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Component	DTC	Condition

Q77C Transmission Control Solenoid Valve 3	P0796, P0797	• Retaining Clip
		  • Missing
		  • Visible Damage
		• Solenoid Valve
		  • Binding or Sticking
		  • Stuck
		  • Visible Damage

1-3-5-6-7Clutch Regulator Valve	P0796, P0797	• Bore
		  • Scored
		  • Debris
		• Valve
		  • Binding or Sticking
		  • Debris

Component	DTC	Condition
		• Scored • Stuck • Visible Damage • Valve Spring • Visible Damage

1-3-5-6-7 Clutch Assembly	P0796, P0797	• Clutch Housing
		  • Scored
		  • Visible Damage
		• Clutch Piston
		  • Scored
		  • Visible Damage
		• Clutch Plates
		  • Binding or Sticking
		  • Visible Damage
		  • Worn
		• Fluid/oil passage
		  • Blocked by debris
		  • Restricted
		• Gasket
		  • Leaking
		• O-Ring
		  • Leaking
		• Seal
		  • Leaking

Circuit/System Description

The solenoid actuator controls fluid pressure by moving the clutch 1-3-5-6-7 regulator valve that controls the fluid pressure to the 1-3-5-6-7 clutch.

Conditions for Running the DTC

P0796, P0797

- DTC P0101-P0108, P0171-P0175, P0201-P0208, P0300-P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A-P182F, P1838-P1841, P18B5-P18BF, P18C0-P18C3, P1915, P2534 = Not set
- Accelerator Pedal Position = Greater than 1%
- Battery Voltage = 9 to 32 V
- High Side Driver = On
- High Side Driver 2 = On
- Ignition and Start Signal = 9 to 32 V
- Transmission Gear = Drive
- Output Shaft Speed Sensor = Greater than 100 RPM

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

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Conditions for Setting the DTC

P0796

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

P0797

Clutch 1-3-5-6-7 = 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
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- {P0796} Transmission gear allowed = Reverse or Gear 4
- {P0797} Transmission gear allowed = Reverse or Gear 3

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 P0797 without setting control circuit DTC(s).

Reference Information

Description and Operation

- **Park - Engine Running**
- **Reverse**
- **Neutral - Engine Running**
- **Drive Range, First Gear**
- **Drive Range, Second Gear**
- **Drive Range, Third Gear**
- **Drive Range, Fourth Gear**
- **Drive Range, Fifth Gear**
- **Drive Range, Sixth Gear**
- **Drive Range, Seventh Gear**
- **Drive Range, Eighth Gear**

Component View Reference

Transmission Solenoid Information

DTC Type Reference

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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 DTCs
4. Road test the vehicle. Refer to **Road Test**
5. Verify that no DTC listed in the DTC Descriptor Category is set.
   - **If any DTC listed in the DTC Descriptor Category 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 that no DTC listed in the DTC Descriptor Category is set.

   - **If any other DTCs are set**

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

   - **If any DTC listed in the DTC Descriptor Category 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**

- **1-3-5-6-7 Clutch Disassemble**
- **Control Valve Body Assembly Disassemble**
- **Control Valve Body Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

- **Q77 Transmission Control Solenoid Valve Characterization Programming (8L45)** .
- **Transmission Service Fast Learn Procedure** - Perform only when the component/system is serviced.

DTC P0815, P0816, OR P0826

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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 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 Switch @ K9 Body Control Module

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

Up and Down Shift Switch @ K71 Transmission Control Module

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On **Parameter Normal Range:** • Downshift			

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Circuit	Short to Ground	Open	Short to Voltage
• None • Upshift			
Signal	Invalid	Invalid	Invalid
Ground	-	Invalid	-

Circuit/System Description

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.
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

- {P0816} DTC P0815 = Not set
- {P0815} DTC P0816 = Not set
- DTC P0826, P1761, P182E, P1876, P1877, P1915 = Not set
- {If equipped} DTCs related to the following system/component = Not Set
  - 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
- 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

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- Ignition and Start Signal = 9 to 32 V

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

Conditions for Setting the DTC

P0815

Up and Down Shift Switch = Upshift - For greater than 2 min

P0816

Up and Down Shift Switch = Downshift - For greater than 2 min

P0826

Up and Down Shift Switch = 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

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 the scan tool parameter: Driver Shift Control Mode Switch @ K9 Body Control Module = Inactive
    - **If not the specified state**

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Refer to: Circuit/System Testing

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

3. Press and hold the switch: S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left

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

   - **If not the specified state**

     Refer to: Circuit/System Testing

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

4. Press and hold the switch: S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right

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

   - **If not the specified state**

     Refer to: Circuit/System Testing

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

5. 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 Switch @ K9 Body Control Module = Inactive - 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**

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 the DTC sets**

     Refer to: Circuit/System Testing

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

7. 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

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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 ground connection: G201
    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) & Ground terminal G201
        - Ground circuit terminal 1 @ S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right (harness side) & Ground terminal G201
        - 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 = Invalid
    - **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**
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 @ Control module harness
        - 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**

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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 Automatic Transmission Manual Shift Auxiliary Position 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
2. Disconnect the electrical connector: S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left
3. Test for 5, 300 to 5, 800 ohms between the test points: Signal circuit terminal 3 & Ground terminal 1
    - **If not between 5, 300 and 5, 800 ohms**

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

    - **Go to next step: If between 5, 300 and 5, 800 ohms**
4. Press and hold the switch: S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left
5. Test for 1, 300 to 1, 440 ohms between the test points: Signal circuit terminal 3 & Ground terminal 1
    - **If not between 1, 300 and 1, 440 ohms**

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

    - **Go to next step: If between 1, 300 and 1, 440 ohms**
6. 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: S2L Automatic Transmission Manual Shift Auxiliary Position Switch - Left

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

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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 600 to 660 ohms between the test points: Signal circuit terminal 4 & Signal terminal 3
   - **If not between 600 and 660 ohms**

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

   - **Go to next step: If between 600 and 660 ohms**
4. 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**
5. Press and hold the switch: S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right
6. Test for 600 to 660 ohms between the test points: Signal terminal 4 & Ground terminal 1
   - **If not between 600 and 660 ohms**

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

   - **Go to next step: If between 600 and 660 ohms**
7. 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: S2R Automatic Transmission Manual Shift Auxiliary Position Switch - Right

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

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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, P2736, P2738, P2739, P2812, P2814, P2815, 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

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 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

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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 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

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 3 @ X175	P2814	P2812, P2814	P2815	-
Control - Terminal 4 @ X175	P2738	P2736, P2738	P2739	-
Control - Terminal 5 @ X175	P0962	P0960, P0962	P0963	-
Control - Terminal 6 @ X175	P0966	P0964, P0966	P0967	-
Control - Terminal 7 @ X175	P2824	P2824, P2826	P2727	-
Control - Terminal 10 @ X175	P0970	P0968, P0970	P0971	-
Control - Terminal 19 @ X175	P2670	P2671	P2671	-

Typical Scan Tool Data

High Side Driver 2 Circuit High Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Okay or Not Run			
Control - Terminal 19	Okay or Not Run	Okay or Not Run	Malfunction

High Side Driver 2 Circuit Low Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Okay or Not Run			
Control - Terminal 19	Malfunction	Okay or Not Run	Okay or Not Run

High Side Driver 2 Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Okay or Not Run			
Control - Terminal 19	Okay or Not Run	Malfunction	Okay or Not Run

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Transmission Control Solenoid Valve 1, 2, 3, 6, 7, 9 Control Circuit High Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Okay or Not Run			
Control - Terminal 3, 4, 5, 6, 7, 10	Okay or Not Run	Okay or Not Run	Malfunction

Transmission Control Solenoid Valve 1, 2, 3, 6, 7, 9 Control Circuit Low Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Okay or Not Run			
Control - Terminal 3, 4, 5, 6, 7, 10	Malfunction	Okay or Not Run	Okay or Not Run

Transmission Control Solenoid Valve 1, 2, 3, 6, 7, 9 Control Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Okay or Not Run			
Control - Terminal 3, 4, 5, 6, 7, 10	Okay or Not Run	Malfunction	Okay or Not Run

Circuit/System Description

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

- **Electronic Component Description**
- **Transmission Solenoid Information**

Circuit	Description
Control - Terminal 3, 4, 5, 6, 10 @ X175	The output circuit is switched to ground to activate the component. The output is PWM controlled.
Control - Terminal 7 @ X175	The output circuit is switched to ground to activate the component. This is a normally closed valve that is controlled on/off.
Control - Terminal 19 @ X175	The output circuit is switched to 12 V to enable the component(s).

Component	Description
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.
Q77 Transmission Control Solenoid Valve	A solenoid valve is an electro-mechanically operated valve. The valve is controlled by an electric current through the solenoid.

Conditions for Running the DTC

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

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

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Actions Taken When the DTC Sets

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

- Autostart/Autostop = Disabled - If equipped
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- Transmission Shifting = Default shift pattern

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. Engine - Running
2. Verify the scan tool parameter:
    - High Side Driver 2 Circuit High Test Status = Okay or Not Run
    - High Side Driver 2 Circuit Low Test Status = Okay or Not Run
    - High Side Driver 2 Circuit Open Test Status = Okay or Not Run
    - Transmission Control Solenoid Valve 1, 2, 3, 6, 7, 9 Control Circuit High Test Status = Okay or Not Run
    - Transmission Control Solenoid Valve 1, 2, 3, 6, 7, 9 Control Circuit Low Test Status = Okay or Not Run
    - Transmission Control Solenoid Valve 1, 2, 3, 6, 7, 9 Control Circuit Open Test Status = Okay or Not Run

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- **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
2. Disconnect the electrical connector: X175 @ T12 Automatic Transmission Assembly

   NOTE: **All testing for this procedure is performed on the control module K71 side of the circuit.**

3. Connect a test lamp between the test points: Control circuit terminal 19 & 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 X175 harness connector.**

   - **Connect a 3 A fused jumper wire between the test points: 9 V Reference circuit terminal 25 X175 (harness side) & 9 V Reference circuit terminal 25 X175 (component side)**
   - **Connect a 3 A fused jumper wire between the test points: Signal circuit terminal 24 X175 (harness side) & Signal circuit terminal 24 X175 (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 & Remove - Test lamp
   2. Disconnect the electrical connector: K71 Transmission Control Module
   3. Test for infinite resistance between the test points: Control circuit terminal 19 @ 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 19 @ 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

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

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 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

- **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 5 & Control circuit terminal 19 @ Component harness
    - {P0964, P0966, P0967} Control circuit terminal 6 & Control circuit terminal 19 @ Component harness
    - {P0968, P0970, P0971} Control circuit terminal 10 & Control circuit terminal 19 @ Component harness
    - {P2736, P2738, P2739} Control circuit terminal 4 & Control circuit terminal 19 @ Component harness
    - {P2812, P2814, P2815} Control circuit terminal 3 & Control circuit terminal 19 @ Component harness
    - {P2824, P2826, P2827} Control circuit terminal 7 & Control circuit terminal 19 @ Component harness
8. Perform the scan tool control function: Transmission Control Solenoid Valve 1, 2, 3, 6, 7, 9 - On and Off

   Verify the test lamp turns On and Off.

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

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:
    - {P0960, P0962, P0963} Control circuit terminal 5 @ Component harness & Ground
    - {P0964, P0966, P0967} Control circuit terminal 6 @ Component harness & Ground
    - {P0968, P0970, P0971} Control circuit terminal 10 @ Component harness & Ground
    - {P2736, P2738, P2739} Control circuit terminal 4 @ Component harness & Ground
    - {P2812, P2814, P2815} Control circuit terminal 3 @ Component harness & Ground
    - {P2824, P2826, P2827} Control circuit terminal 7 @ 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:
    - {P0960, P0962, P0963} Control circuit terminal 5 @ Component harness & The other end of the circuit

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- {P0964, P0966, P0967} Control circuit terminal 6 @ Component harness & The other end of the circuit
- {P0968, P0970, P0971} Control circuit terminal 10 @ Component harness & The other end of the circuit
- {P2736, P2738, P2739} Control circuit terminal 4 @ Component harness & The other end of the circuit
- {P2812, P2814, P2815} Control circuit terminal 3 @ Component harness & The other end of the circuit
- {P2824, P2826, P2827} Control circuit terminal 7 @ 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 & Remove - Test lamp
2. Disconnect the electrical connector: K71 Transmission Control Module
3. Test for infinite resistance between the test points:
    - {P0960, P0962, P0963} Control circuit terminal 5 @ Component harness & Ground
    - {P0964, P0966, P0967} Control circuit terminal 6 @ Component harness & Ground
    - {P0968, P0970, P0971} Control circuit terminal 10 @ Component harness & Ground
    - {P2736, P2738, P2739} Control circuit terminal 4 @ Component harness & Ground
    - {P2812, P2814, P2815} Control circuit terminal 3 @ Component harness & Ground
    - {P2824, P2826, P2827} Control circuit terminal 7 @ 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 Off**

9. Connect the electrical connector: X175 @ T12 Automatic Transmission Assembly
10. Remove the component: Transmission Fluid Pan
11. Disconnect the electrical connector: X176
12. Connect a test lamp between the test points:
    - {P0960, P0962, P0963} Control circuit terminal 5 & Control circuit terminal 18 @ Component harness
    - {P0964, P0966, P0967} Control circuit terminal 6 & Control circuit terminal 18 @ Component harness
    - {P0968, P0970, P0971} Control circuit terminal 10 & Control circuit terminal 18 @ Component harness
    - {P2736, P2738, P2739} Control circuit terminal 4 & Control circuit terminal 18 @ Component harness
    - {P2812, P2814, P2815} Control circuit terminal 3 & Control circuit terminal 18 @ Component harness
    - {P2824, P2826, P2827} Control circuit terminal 7 & Control circuit terminal 18 @ Component harness
13. Perform the scan tool control function: Transmission Control Solenoid Valve 1, 2, 3, 6, 7, 9 - On and Off

    Verify the test lamp turns On and Off.

    - **If the test lamp does not turn On and Off**

      Replace the component: Automatic Transmission Wiring Harness

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

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14. Connect the electrical connector: X176
15. Disconnect the appropriate electrical connector: Q77 Transmission Control Solenoid Valve
16. Verify a test lamp turns On between the test points: Control circuit terminal 2 & Control circuit terminal 1 @
    - **If the test lamp does not turn On and Off**

      Replace the component: Automatic Transmission Control Wiring Harness

    - **Go to next step: If the test lamp turns On and Off**
17. Replace the appropriate component: Q77 Transmission Control Solenoid Valve

Component Testing

Static Test

1. Ignition/Vehicle - Off
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 the resistance listed below between the test points: Control terminal 1 & Control terminal 2
   - Q77 Transmission Control Solenoid Valve - 1, 2, 3, 6, 7 = 4.5 to 5.5 ohms
   - Q77J Transmission Control Solenoid Valve 9 = 11.0 to 13.0 ohms
   - **If the resistance is not within range**

     Replace the appropriate component: Q77 Transmission Control Solenoid Valve

   - **Go to next step: If the resistance is within range**
4. Test for infinite resistance between the test points: Each terminal of the component & The component's housing - Q77 Transmission Control Solenoid Valve
   - **If less than infinite resistance**

     Replace the appropriate component: Q77 Transmission Control Solenoid Valve

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

Repair Instructions

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

- **Transmission Control Wiring Harness Replacement**
- **Automatic Transmission Wiring Harness Replacement**
- **Control Valve Body Replacement** - Q77 Transmission Control Solenoid Valve
- For control module replacement, programming, and setup refer to **Control Module References**

DTC P171A-P171C

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**

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DTC Descriptor

DTC P171A

Transmission Fluid Pressure Accumulator Control Circuit

DTC P171B

Transmission Fluid Pressure Accumulator Control Circuit Low

DTC P171C

Transmission Fluid Pressure Accumulator Control Circuit High

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 1	P0658	P0659	P0659*	P171D*
Control - Terminal 2	P171B	P171A	P171C*	P171D*
*Internal control module or component damage may occur if the circuit shorts to B+.				

Typical Scan Tool Data

Transmission Fluid Pressure Accumulator Control Circuit High Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running **Parameter Normal Range:** Not Runor Okay			
Control - Terminal 1	Not Run or Okay	Not Run or Okay	Malfunction
Control - Terminal 2	Not Run or Okay	Not Run or Okay	Malfunction

Transmission Fluid Pressure Accumulator 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 1	Malfunction	Not Run or Okay	Not Run or Okay
Control - Terminal 2	Malfunction	Not Run or Okay	Not Run or Okay

Transmission Fluid Pressure Accumulator 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 1	Not Run or Okay	Malfunction	Not Run or Okay
Control - Terminal 2	Not Run or Okay	Malfunction	Not Run or Okay

Circuit/System Description

For an overview of the component/system, refer to **Transmission Component and System Description**

Circuit	Description
Control - Terminal 1	The output circuit is switched to 12 V to enable the component(s).
Control - Terminal 2	The output circuit is switched to ground to activate the component.

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Component	Description
B280 Automatic Transmission Accumulator Solenoid Valve	A solenoid valve is an electro-mechanically operated valve. The valve is controlled by an electric current through the solenoid. This is a normally closed valve that is controlled on/off.
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

System Voltage = 7 to 32 V

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

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1. Ignition - On / Vehicle - In Service Mode
2. Verify DTC P0658, P0659 is not set.
    - **If any of the DTCs are set**

      Refer to **DTC P0658, P0659, P2718, P2720, P2721, P2727, P2729, P2730, P281B, P281D, or P281E**

    - **Go to next step: If none of the DTCs are set**
3. Perform the scan tool control function: Transmission Fluid Pressure Accumulator - On and Off

   Verify the scan tool parameter:

    - Transmission Fluid Pressure Accumulator Control Circuit High Test Status = Not Run or Okay
    - Transmission Fluid Pressure Accumulator Control Circuit Low Test Status = Not Run or Okay
    - Transmission Fluid Pressure Accumulator 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**
4. Perform the scan tool control function: Transmission Fluid Pressure Accumulator - On and Off

   Verify a click can be heard or felt at the following component(s) when the scan tool control function was commanded: B280 Automatic Transmission Accumulator Solenoid Valve

    - **If a click cannot be heard or felt**

      Refer to: Circuit/System Testing

    - **Go to next step: If a click can be heard or felt**
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

1. Ignition/Vehicle - Off
2. Remove the component: Automatic Transmission Fluid Pan
3. Disconnect the electrical connector: B280 Automatic Transmission Accumulator Solenoid Valve
4. Ignition - On / Vehicle - In Service Mode
5. Connect a test lamp between the test points: Control circuit terminal 1 @ Component harness & Ground
6. Perform the scan tool control function: High Side Driver - On and Off

   Verify the test lamp turns On and Off.

    - **If the test lamp is always Off**
    1. Ignition/Vehicle - Off & Remove - Test lamp

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2. Disconnect the electrical connector: K71 Transmission Control Module
3. Test for infinite resistance between the test points: Control 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
4. Test for less than 2 ohms between the test points: Control circuit terminal 1 @ 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 & 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 1 @ 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**

7. Remove - Test Lamp
8. Connect a test lamp between the test points: Control circuit terminal 1 & Control circuit terminal 2 @ Component harness
9. Perform the scan tool control function: Transmission Fluid Pressure Accumulator - On and Off

    Verify the test lamp turns On and Off.

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

    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 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
    6. Test for less than 2 ohms between the test points: Control circuit terminal 2 @ 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 & Remove - Test lamp
    2. Disconnect the electrical connector: K71 Transmission Control Module
    3. Test for infinite resistance between the test points: Control circuit terminal 2 @ 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 Off**

10. Test or replace the component: B280 Automatic Transmission Accumulator Solenoid Valve

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Component Testing

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: B280 Automatic Transmission Accumulator Solenoid Valve

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

3. Test for 17 to 19 ohms between the test points: Control circuit terminal 1 & Control circuit terminal 2
   - **If not between 17 and 19 ohms**

     Replace the component: B280 Automatic Transmission Accumulator Solenoid Valve

   - **Go to next step: If between 17 and 19 ohms**
4. 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: B280 Automatic Transmission Accumulator Solenoid Valve

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

Repair Instructions

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

- **Auxiliary Fluid Accumulator Solenoid Replacement** - B280 Automatic Transmission Accumulator Solenoid Valve
- **Automatic Transmission Wiring Harness Replacement**
- **Transmission Control Wiring Harness Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

DTC P171D

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 P171D

Transmission Fluid Pressure Accumulator System Performance

Diagnostic Fault Information

Component	DTC	Condition
12345 Reverse Clutch Assembly	P171D	• Blocked or restricted component: Fluid/oil passage • Clutch Plates - Worn • Damaged O-ring.

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Component	DTC	Condition

B280 Automatic Transmission Accumulator Solenoid Valve	P171D	• Binding, sticking or stuck component: Solenoid Valve
		• Damaged or missing component:
		  • Accumulator Valve Body Bolt
		  • Solenoid Valve

Transmission Accumulator	P171D	• Blocked or restricted component: Fluid/oil passage • Check ball #20, 21 missing or damaged. • Leaking component: Transmission Accumulator

Circuit/System Description

The solenoid valve directs pressurized fluid to exit the accumulator to apply the clutches for a 1st gear start, during an Auto Start event.

For an overview of the component/system, refer to **Park - Engine Running**

Conditions for Running the DTC

- Ignition and Start Signal = On
- Ignition and Start Switch Signal = Greater than 9 V
- Transmission Fluid Temperature = 0 to 110B°C (32 to 230B°F)
- Engine Off Time = Greater than 1.2 s
- Engine Speed = Less than 5 RPM - During an autostart or autostop event

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

Conditions for Setting the DTC

Turbine Speed = Greater than a predefined threshold

Actions Taken When the DTC Sets

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

- Autostart/Autostop = Disable
- Line Pressure Command = Maximum
- Transmission Adaptive Pressure Control = Freeze current adapt values

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. Verify the condition does not exist: Incorrect fluid level or condition - Transmission - 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 DTCs
4. Road test the vehicle. Refer to **Road Test**
5. Verify DTC P171D is not set.
   - **If DTC P171D 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 DTC P171D is not set.

   - **If DTC P171D 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**

- **Auxiliary Fluid Accumulator Removal (With Stop/Start)** - Transmission Accumulator
- **Auxiliary Fluid Accumulator Installation** - Transmission Accumulator
- **Auxiliary Fluid Accumulator Solenoid Replacement** - B280 Automatic Transmission Accumulator Solenoid Valve
- For control module replacement, programming, and setup refer to **Control Module References**

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

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DTC P175E is an informational DTC.

Conditions for Running the DTC

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

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
- 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

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

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- 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

   - **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 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

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General 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

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- Battery Voltage = Greater than 9 V
- Ignition Voltage = Greater than 9 V
- Serial Data = No Error

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

Conditions for Setting the DTC

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

- K71 Transmission Control Module
- K17 Electronic Brake Control Module

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type C DTC

Manual Shift Control = Disabled

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type C 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 there are no DTCs set related to the following component/system:
    - K71 Transmission Control Module
    - K17 Electronic Brake Control Module
    - **If other DTCs are set**

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

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- **If no other DTCs are set**

1. Ignition/Vehicle - Off
2. Replace the component: K17 Electronic Brake 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 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**
- 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 = On
- Ignition and Start Switch Signal = Greater than 11 V

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.

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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**

    - **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**

DTC P176B-P176D, P178F, OR P17D3

Diagnostic Instructions

- Perform the Diagnostic System Check prior to using this diagnostic procedure: **Diagnostic System Check - Vehicle**

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- 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 - Reverse

DTC P17D3

Intermediate Speed Sensor Direction Signal Invalid

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 damage may occur if the circuit is shorted to B+.				

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			
9 V Reference	0 RPM	0 RPM	0 RPM
Signal	0 RPM	0 RPM	0 RPM

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 control module input circuit has an internal resistance connected to ground.

Component	Description
B14D Transmission Intermediate Shaft 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.

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Component	Description
	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

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
- Ignition and Start Signal = Greater than 9 V
- Engine Speed = Greater than 500 RPM

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

Conditions for Setting the DTC

P176B

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

P176C

Signal circuit = Short to Ground - For 1 s

P176D

Signal circuit = Short to Voltage - For 1 s

P178F

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

P17D3

Intermediate Speed Sensor Direction = Incorrect - For 3.5 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

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

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- 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

- **Component Connector End Views - Index**
- **Inline Harness 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: 9V Reference 1 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 = 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

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
2. Disconnect the electrical connector: X175 @ T12 Automatic Transmission Assembly
3. Ignition - On / Vehicle - In Service Mode
4. Test for 8.4 to 9.6 V between the test points: 9 V Reference circuit terminal 25 @ Component harness & Ground

NOTE: **Testing for steps 4.1 to 8.7 is performed on the control module K71 side of the harness connector.**

- **If less than 8.4 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 25 @ 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 25 @ 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 9.6 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 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

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- **Go to next step: If between 8.4 and 9.6 V**

5. Ignition/Vehicle - Off
6. Install - EL-38522 Variable Signal Generator
    - Voltage - 5 V
    - Frequency - 300 Hz
    - Duty Cycle - 50%
    - Black lead @ Ground
    - Red lead @ Signal circuit terminal 32
7. Ignition - On / Vehicle - In Service Mode
8. Verify the scan tool parameter: Intermediate Speed Sensor = 236 to 256 RPM
    - **If not between 236 and 256 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 32 @ 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 32 @ 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 32 @ 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 236 and 256 RPM**
9. Ignition/Vehicle - Off
10. Connect the electrical connector. X175 @ T12 Automatic Transmission Assembly
11. Remove the component: Automatic Transmission Fluid Pan
12. Disconnect the electrical connector: X177
13. Ignition - On / Vehicle - In Service Mode
14. Test for 8.4 to 9.6 V between the test points: 9 V Reference circuit terminal 3 & Signal circuit terminal 6 @ Component harness
    - **If not between 8.4 and 9.6 V**

      Replace the component: Automatic Transmission Wiring Harness

    - **Go to next step: If between 8.4 and 9.6 V**
15. Replace the component: B14D Transmission Intermediate Shaft Speed Sensor

Repair Instructions

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

- **Input and Output Speed Sensor Replacement** - B14D Transmission Intermediate Shaft Speed Sensor
- **Automatic Transmission Wiring Harness Replacement**
- **Q77 Transmission Control Solenoid Valve Characterization Programming (8L45)** .

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- 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

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

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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 P2714 OR P2715

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.**

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- **Verify the conditions listed in the table do not exist**

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

2-3-4-6-8Clutch Regulator Valve	P2714, P2715	• Blocked or restricted component: Screen - Fluid/oil passage
		• Binding, sticking or stuck component: Valve
		• Debris on the component.
		• Damaged component:
		  • Valve or Bore - Scored
		  • Spring

2-3-4-6-8 Clutch Assembly	P2714, P2715	• 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

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

Conditions for Running the DTC

P2714, P2715

- DTC P0101-P0108, P0171-P0175, P0201-P0208, P0300-P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A-P182F, P1838-P1841, P18B5-P18BF, P18C0-P18C3, P1915, P2534 = Not set
- Accelerator Pedal Position = Greater than 1%
- Battery Voltage = 9 to 32 V
- High Side Driver = On
- High Side Driver 2 = On

- Ignition and Start Switch Signal = 9 to 32 V
- Transmission Gear = Drive
- Transmission OSS = Greater than 100 RPM

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

Conditions for Setting the DTC

P2714

Clutch 2-3-4-6-8 = Not applied

P2715

Clutch 2-3-4-6-8 = 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 or Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- {P2714} Transmission gear allowed = Reverse or Gear 5
- {P2715} Transmission gear allowed = Reverse or Gear 4

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).

Reference Information

Description and Operation

- **Park - Engine Running**
- **Reverse**
- **Neutral - Engine Running**
- **Drive Range, First Gear**
- **Drive Range, Second Gear**
- **Drive Range, Third Gear**
- **Drive Range, Fourth Gear**
- **Drive Range, Fifth Gear**
- **Drive Range, Sixth Gear**
- **Drive Range, Seventh Gear**

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- **Drive Range, Eighth Gear**

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 DTCs
4. Road test the vehicle. Refer to **Road Test**
5. Verify that no DTC listed in the DTC Descriptor Category is set.
   - **If any DTC listed in the DTC Descriptor Category 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 that no DTC listed in the DTC Descriptor Category is set.

   - **If any other DTCs are set**

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

   - **If any DTC listed in the DTC Descriptor Category 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**

- **2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Disassemble**
- **Control Valve Body Assembly Disassemble**
- **Control Valve Body Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

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Additional Procedures

- Q77 Transmission Control Solenoid Valve Characterization Programming (8L45) .
- 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

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.**
- **Verify the conditions listed in the table do not exist**

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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

4-5-6-7-8-R Clutch Regulator Valve	P2723, P2724	• Blocked or restricted component: Screen - Fluid/oil passage
		• Binding, sticking or stuck component: Valve
		• Debris on the component.
		• Damaged component:
		  • Valve or Bore - Scored
		  • Spring

4-5-6-7-8-R Clutch Assembly	P2723, P2724	• Blocked or restricted component: Fluid/oil passage • Leaking component:

Component	DTC	Condition

		• 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

Circuit/System Description

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

Conditions for Running the DTC

P2723, P2724

- DTC P0101-P0108, P0171-P0175, P0201-P0208, P0300-P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A-P182F, P1838-P1841, P18B5-P18BF, P18C0-P18C3, P1915, P2534 = Not set
- Accelerator Pedal Position = Greater than 1%
- Battery Voltage = 9 to 32 V
- High Side Driver = On
- High Side Driver 2 = On
- Ignition and Start Signal = 9 to 32 V
- Transmission Gear = Drive
- Transmission OSS = Greater than 100 RPM

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

Conditions for Setting the DTC

P2723

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

P2724

Clutch 4-5-6-7-8-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

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- Powertrain braking = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- {P2723} Transmission gear allowed = Reverse or Gear 3
- {P2724} Transmission gear allowed = Reverse or Gear 4

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

Description and Operation

- **Park - Engine Running**
- **Reverse**
- **Neutral - Engine Running**
- **Drive Range, First Gear**
- **Drive Range, Second Gear**
- **Drive Range, Third Gear**
- **Drive Range, Fourth Gear**
- **Drive Range, Fifth Gear**
- **Drive Range, Sixth Gear**
- **Drive Range, Seventh Gear**
- **Drive Range, Eighth Gear**

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 DTCs
4. Road test the vehicle. Refer to **Road Test**

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5. Verify that no DTC listed in the DTC Descriptor Category is set.
    - **If any DTC listed in the DTC Descriptor Category 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 that no DTC listed in the DTC Descriptor Category is set.

    - **If any other DTCs are set**

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

    - **If any DTC listed in the DTC Descriptor Category 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**

- **2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Disassemble**
- **Control Valve Body Assembly Disassemble**
- **Control Valve Body Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

- **Q77 Transmission Control Solenoid Valve Characterization Programming (8L45)** .
- **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

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DTC P27AA

Transmission Control Solenoid Valve 4 Calibration Incorrect

DTC P27AB

Transmission Control Solenoid Valve 5 Calibration Incorrect

DTC P27AC

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

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General Description**

The following components have a unique current versus oil pressure characteristic that is used to properly upshift or downshift the transmission: Transmission Control Solenoid Valve 1, 2, 3, 4, 5, 6, 7

The data for each solenoid valve is programmed into the control module K71.

Conditions for Running the DTC

P27A7, P27A8, P27A9, P27AA, P27AB, P27AC, P27AD, P27AE

- Ignition = On
- K71 Transmission Control Module = Initialization complete

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

Conditions for Setting the DTC

P27A7, P27A8, P27A9, P27AA, P27AB, P27AC, P27AD, P27AE

Transmission Control Solenoid Valve 1, 2, 3, 4, 5, 6, 7, 8 Calibration Data = Not Programmed

Actions Taken When the DTC Sets

The control module uses default replacement values.

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

Schematic Reference

Automatic Transmission Controls Wiring Schematics

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Connector End View Reference

- **Component Connector End Views - Index**
- **Inline Harness 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

NOTE: **This procedure is required when the following component has been repaired, replaced, removed, or serviced:**

- **Control Valve Body**
- **K71 Transmission Control Module**
- **T12 Automatic Transmission Assembly**
- **Q77 Transmission Control Solenoid Valve**

1. Ignition - On / Vehicle - In Service Mode
2. Verify DTC P27A7, P27A8, P27A9, P27AA, P27AB, P27AC, P27AD, P27AE, P27AE is not set.
   - **If any of the DTCs are set**

     Refer to **Q77 Transmission Control Solenoid Valve Characterization Programming (8L45)** .
   - **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**

- **Transmission Service Fast Learn Procedure**
- For control module replacement, programming, and setup refer to **Control Module References**

DTC P2808 OR P2809

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 P2808

Transmission Control Solenoid Valve 7 Stuck Off

DTC P2809

Transmission Control Solenoid Valve 7 Stuck On

Diagnostic Fault Information

NOTE:

- **DTC P2808 will set with a hydraulic/mechanical condition.**
- **DTC P2809 will set with a hydraulic/mechanical condition or high resistance in the circuit of the component Q77G without setting component/control circuit DTCs.**
- **The components are listed from the least to the most intrusive to service.**
- **Verify the conditions listed in the table do not exist**

Component	DTC	Condition
Q77G Transmission Control Solenoid Valve 7	P2808, P2809	• Binding or Sticking • Stuck • Visible Damage
Torque Converter Clutch Regulator Valve	P2808, P2809	• Binding or Sticking • Debris on the component. • Mechanically damaged • Restricted/Leaking - Screen or Fluid/oil passage
Torque Converter Clutch Control Valve	P2808, P2809	• Binding or Sticking • Debris on the component. • Mechanically damaged
Torque Converter	P2808, P2809	• Leaking - Gasket/O-Ring/Seal • Binding or Sticking • Mechanically damaged • Restricted/Leaking - Fluid/oil passage

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Circuit/System 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

P2808

- DTC P0101-P0108, P0171-P0175, P0201-P0208, P0300-P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A-P182F, P1838-P1841, P18B5-P18BF, P18C0-P18C3, P1915, P2534 = Not set
- Accelerator Pedal Position = Greater than 8%

- Battery Voltage = 9 to 32 V
- Engine Torque = Greater than 50 Nm (37 lb ft)
- Ignition and Start Signal = 9 to 32 V
- Transmission Fluid Temperature Sensor = Less than 130B°C (226B°F)
- Transmission Gear = Gear 4, 5, 6, 7or8
- TCC Control = On

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

P2809

- DTC P0101-P0108, P0171-P0175, P0201-P0208, P0300-P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A-P182F, P1838-P1841, P18B5-P18BF, P18C0-P18C3, P1915, P2534 = Not set
- Accelerator Pedal Position = Greater than 4%
- Battery Voltage = 9 to 32 V
- Engine Speed = Less than 550 RPM
- Engine Torque = Greater than 55 Nm (41 lb ft)
- Ignition and Start Signal = 9 to 32 V
- TCC Control = Off
- TCC Slip Speed = Less than 300 RPM
- Transmission Fluid Temperature = Less than 130B°C (226B°F)
- Transmission Gear = Drive
- Vehicle Speed = Less than 45 km/h (28 MPH)

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

Conditions for Setting the DTC

P2808

- TCC Control = On
- TCC Slip Speed = High

P2809

- TCC Control = Off
- TCC Slip Speed = Low

Actions Taken When the DTC Sets

{P2808} DTCs listed in the DTC Descriptor Category = Type B DTC

- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- Transmission Hot Mode = On

{P2809} DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled - If equipped
- Line Pressure Command = Reduced
- Neutral Idle Mode = Disabled
- TCC Control = Enabled

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- Torque Management System Performance - Forced Limited Engine Power = Requested
- Transmission Adaptive Pressure Control = Freeze current adapt values
- Transmission Hot Mode = On

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A, B DTC

Diagnostic Aids

High resistance in the circuits of the component Q77G may set DTC P2809 without setting control circuit DTC(s).

Reference Information

Description and Operation

- **Park - Engine Running**
- **Reverse**
- **Neutral - Engine Running**
- **Drive Range, First Gear**
- **Drive Range, Second Gear**
- **Drive Range, Third Gear**
- **Drive Range, Fourth Gear**
- **Drive Range, Fifth Gear**
- **Drive Range, Sixth Gear**
- **Drive Range, Seventh Gear**
- **Drive Range, Eighth Gear**

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 DTCs
4. Road test the vehicle. Refer to **Road Test**
5. Verify that no DTC listed in the DTC Descriptor Category is set.
   - **If any DTC listed in the DTC Descriptor Category is set**

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

   - **If any other DTCs are set**

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

   - **If any DTC listed in the DTC Descriptor Category 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 Assembly Disassemble**
- **Control Valve Body Replacement**
- **Torque Converter Replacement**
- For control module replacement, programming, and setup refer to **Control Module References**

Additional Procedures

- **Q77 Transmission Control Solenoid Valve Characterization Programming (8L45)** .
- **Transmission Service Fast Learn Procedure** - Perform only when the component/system is serviced.

DTC 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 P2817

Transmission Control Solenoid Valve 8 Stuck Off

DTC P2818

Transmission Control Solenoid Valve 8 Stuck On

Diagnostic Fault Information

NOTE:

- **DTC P0776 will set with a hydraulic/mechanical condition.**
- **DTC P0777 will set with a hydraulic/mechanical condition or high resistance in the circuit of the component Q77B without setting component/control circuit DTCs.**

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- **The components are listed from the least to the most intrusive to service.**
- **Verify the conditions listed in the table do not exist**

Component	DTC	Condition

Q77H Transmission Control Solenoid Valve 8	P2817, P2818	• Binding, sticking or stuck component: Solenoid Valve
		• Damaged or missing component:
		  • Retaining Clip
		  • Solenoid Valve

Default Valve	P2817, P2818	• Blocked or restricted component: Screen - Fluid/oil passage
		• Binding, sticking or stuck component: Valve
		• Debris on the component.
		• Damaged component:
		  • Valve or Bore - Scored
		  • Spring
		• Leaking component:
		  • Gasket
		  • O-Ring
		  • Seal

Circuit/System Description

The solenoid valve controls the flow of transmission fluid to the hydraulic valve that controls the system pressure in the transmission.

Conditions for Running the DTC

P2817

- DTC P0101-P0108, P0171-P0175, P0201-P0208, P0300-P0308, P0716, P0717, P0722, P0723, P077C, P077D, P07BF, P07C0, P1824, P182A-P182F, P1838-P1841, P18B5-P18BF, P18C0-P18C3, P1915, P2534 = Not set
- Accelerator Pedal Position = Greater than 1%
- Battery Voltage = 9 to 32 V
- High Side Driver 1, 2 = On
- Ignition and Start Signal = 9 to 32 V
- Transmission Gear = Drive
- Transmission OSS = Greater than 100 RPM

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

P2818

- DTC P0716, P0717, P07BF, P07C0, P2812, P2814, P2815 = Not set
- Battery Voltage = 9 to 32 V
- Engine Speed = 400 to 900 RPM
- Ignition and Start Signal = 9 to 32 V

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- Transmission Gear = Drive
- Transmission Fluid Temperature = 0 to 40B°C (32 to 104B°F)

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

Conditions for Setting the DTC

P2817

- Transmission Control Solenoid Valve 8 = Stuck Off
- Transmission Shifting = 3-4 Gear Shift Malfunction

P2818

- TCC Control = On
- TCC Slip Speed = Low
- Transmission Gear = Park
- Transmission Control Solenoid Valve 8 = Stuck On

Actions Taken When the DTC Sets

P2817 = Type A DTC

- Autostart/Autostop = Disable
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- Transmission gear allowed = Reverse or Gear 3

P2818 = Type B DTC

- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values

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Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A, B DTC

Diagnostic Aids

High resistance in the circuits of the component Q77H may set DTC P2818 without setting control circuit DTC(s).

Reference Information

Description and Operation

- **Park - Engine Running**
- **Reverse**
- **Neutral - Engine Running**
- **Drive Range, First Gear**
- **Drive Range, Second Gear**

- **Drive Range, Third Gear**
- **Drive Range, Fourth Gear**
- **Drive Range, Fifth Gear**
- **Drive Range, Sixth Gear**
- **Drive Range, Seventh Gear**
- **Drive Range, Eighth Gear**

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 DTCs
4. Road test the vehicle. Refer to **Road Test**
5. Verify that no DTC listed in the DTC Descriptor Category is set.
   - **If any DTC listed in the DTC Descriptor Category 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 that no DTC listed in the DTC Descriptor Category is set.

   - **If any other DTCs are set**

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

   - **If any DTC listed in the DTC Descriptor Category 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**

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

Additional Procedures

- Q77 Transmission Control Solenoid Valve Characterization Programming (8L45) .
- 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
- 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 Voltage = Greater than 11 V

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

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

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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**
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 .**

Visual/Physical Inspection

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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, Third, Fifth, Sixth or Seventh Shift**
  - **Harsh, Soft, Delayed or Slipping Second, Third, Fourth, Sixth or Eighth Shift**
  - **Harsh, Soft, Delayed or Slipping Fourth, Fifth, Sixth, Seventh, Eighth, or Reverse Shift**
  - **Harsh, Soft, Delayed or Slipping First, Second, Seventh, Eighth, or Reverse Shift**
  - **Harsh, Soft, Delayed or Slipping First, Second, Third, Fourth, Fifth, or Reverse Shift**
- Shift Pattern
  - **No First, Third, Fifth, Sixth or Seventh Gear**
  - **No Second, Third, Fourth, Sixth or Eighth Gear**
  - **No Fourth, Fifth, Sixth, Seventh, Eighth or Reverse Gear**
  - **No First, Second, Seventh, Eighth or Reverse Gear**
  - **No First, Second, Third, Fourth, Fifth 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**

TRANSMISSION FLUID LEVEL AND CONDITION CHECK

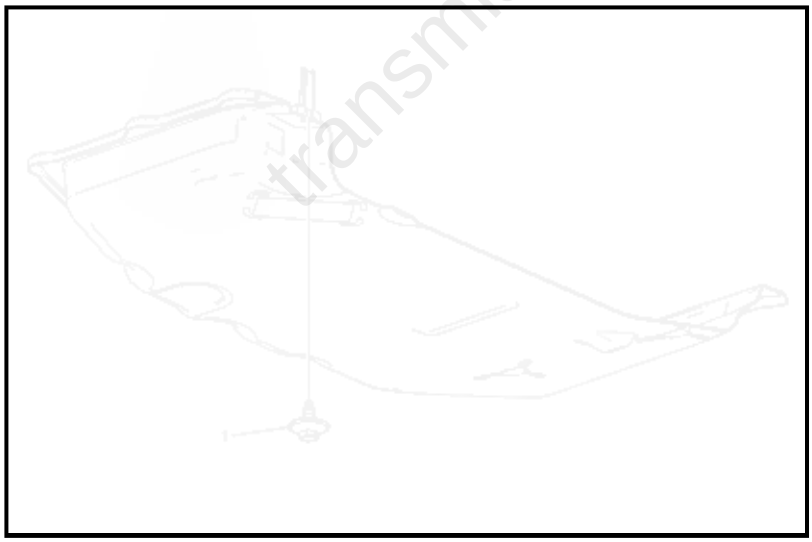
This procedure checks both the transmission fluid level, as well as the condition of the fluid itself. Since the transmission on this vehicle is not equipped with a fill tube and dipstick, a tube in the bottom pan is used to set the fluid level.

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WARNING: **The transmission fluid level must be checked when the transmission fluid temperature (TFT) is between 35 - 45B°C (95 - 113B°F). If the TFT is not within this range, either idle or brake torque the vehicle to raise the fluid temperature, or 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 under or over-filled transmission. TFT>45B°C = under-filled, TFT<35B°C = over-filled. An under-filled transmission will cause premature component wear or damage. An over-filled transmission will cause fluid to discharge out the vent tube, possibly causing a fire that may result in serious bodily injury or severe vehicle damage, fluid foaming, or pump cavitation.**

NOTE:

- **CTS-V/LT1 Camaro, if running a track session, should have the transmission fluid level checked when the TFT is between 55-65B°C (131 - 149B°F).**
- **If vehicle is equipped with a thermal bypass valve, the transmission fluid level should be checked only after the TFT has reached or exceeded an operating temperature of 90B°C (194B°F). Once the TFT has reached or exceeded 90B°C (194B°F), then turn OFF the vehicle and allow the TFT to cool back down to 35 - 45B°C (95 - 113B°F) before checking the fluid level as required. Reaching or exceeding an operating temperature of 90B°C (194B°F) opens the bypass valve and allows the cooler to fill up with fluid, which will result in a more accurate fluid level check.**

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.
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.**

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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.
- If no fluid comes out, add fluid until fluid 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. Reinstall 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-51190 Transmission Fluid Fill Adapter

Equivalent regional tools: **Special Tools**

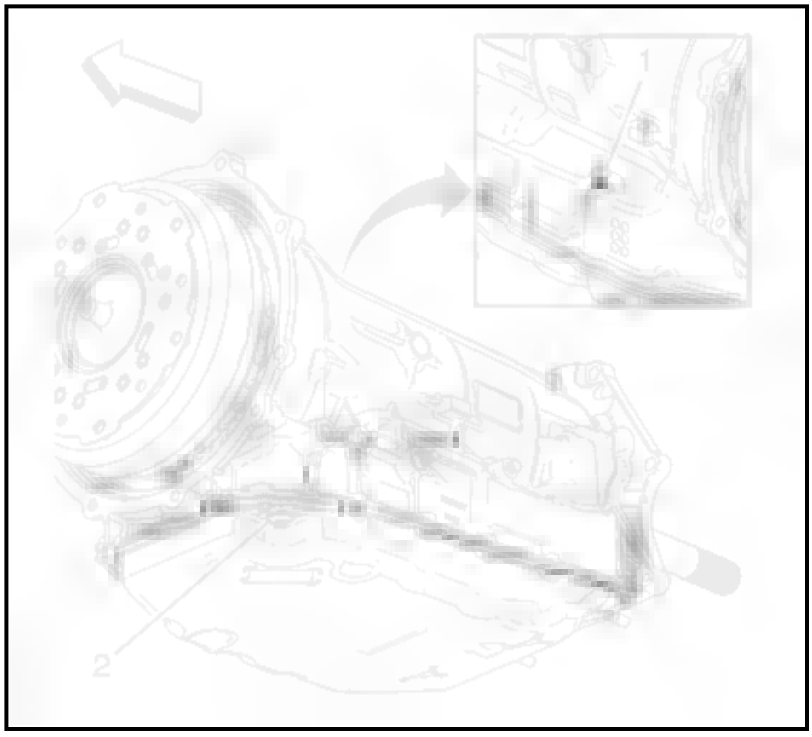
CAUTION: **Use DexronB® HP transmission fluid only. Failure to use the proper fluid may result in transmission internal damage.**

CAUTION: **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. Overfilling will result in possible damage to the transmission.**

Check the transmission fluid level, refer to **Transmission Fluid Level and Condition Check**.

Fill Tube Plug Method

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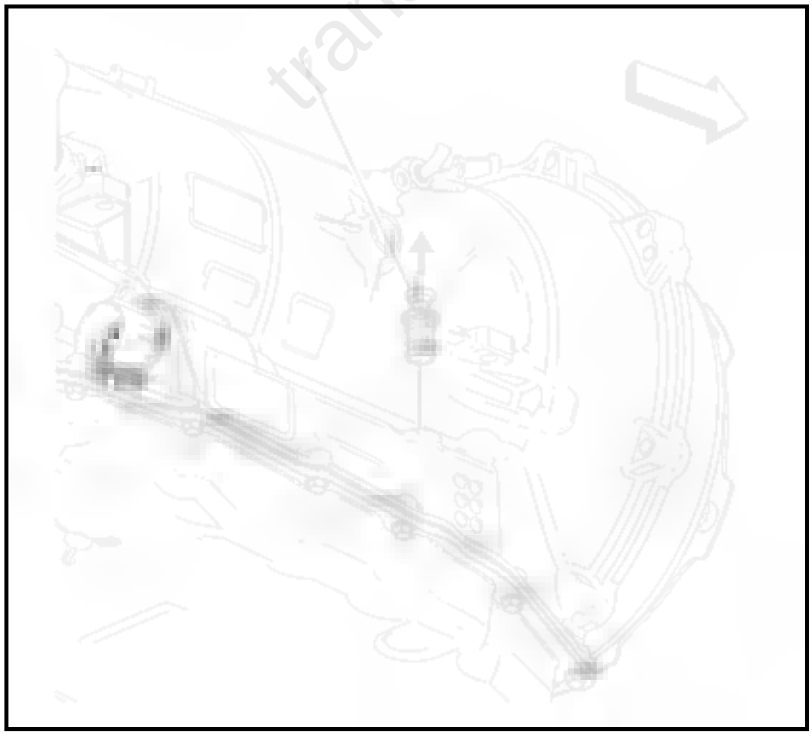
1. 

CAUTION: **Use DexronB® HP transmission fluid only. Failure to use the proper fluid may result in transmission internal damage.**

Based on accessibility, transmission fluid may be added through the fluid fill tube plug assembly (1) hole or through the oil level check plug (2) hole in the bottom of the transmission fluid pan.

CAUTION: **Before removing the transmission fluid fill tube plug assembly, thoroughly clean around the plug to prevent dirt or contaminants from entering the transmission during plug removal. Use compressed air to dislodge any caked dirt that may be stuck on and around the plug area. Use a mirror to confirm the area is free of dirt before removing the plug. Failure to clean around the plug may result in transmission contamination.**

2. Clean around the fluid fill tube plug (1).

3. 

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NOTE: **It may be necessary to use a long pair of 90 degree needle nose pliers to lift the plunger and remove the plug assembly.**

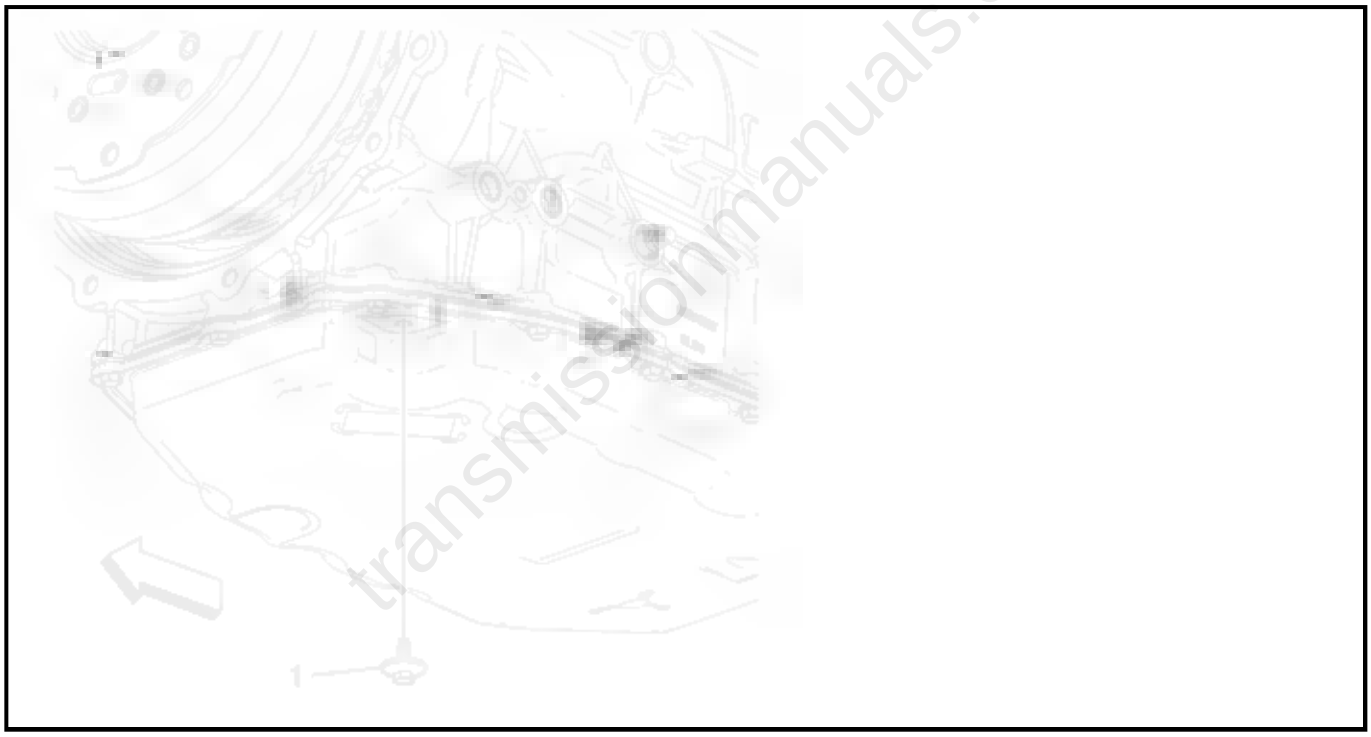
Unlock the fill tube plug by lifting the plunger. Once the plunger is lifted, remove the entire plug assembly (1).

4. Determine the approximate amount of fluid needed to fill the transmission, based on the repair performed. Refer to **Approximate Fluid Capacities** . 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.
5. Using a pneumatic air fluid dispenser pump tool or a suitable hand pump, add transmission fluid through the fill tube plug opening.

CAUTION: **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. Overfilling will result in possible damage to the transmission.**

6. Check the fluid level. Refer to **Transmission Fluid Level and Condition Check**.

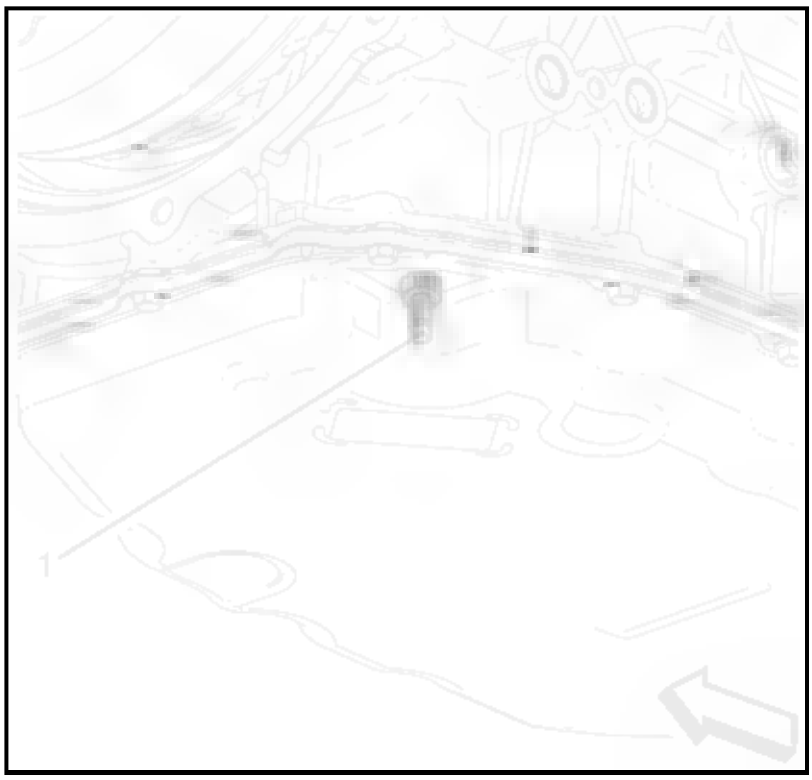
Check Plug Method



CAUTION: **Use DexronB® HP transmission fluid only. Failure to use the proper fluid may result in transmission internal damage.**

NOTE: **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 **DT-51190** fluid fill pan adapter (1).

3. Determine the approximate amount of fluid needed to fill the transmission, based on the repair performed. Refer to **Approximate Fluid Capacities** . 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.
4. Using the **DT-51190** fluid fill pan adapter (1), and a pneumatic air fluid dispenser pump tool or a suitable hand pump, add transmission fluid through the check plug hole.

   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 fluid dispenser pump tool 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.

   CAUTION: **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. Overfilling will result in possible damage to the transmission.**

6. With the engine still running, remove the **DT-51190** fluid fill pan adapter (1), and fluid dispenser pump tool, then check the fluid level. Refer to **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

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- 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.**

NOTE: **If the vehicle you are testing is a Hybrid/Electric Vehicle and is equipped with an eAssist or BAS propulsion system, please refer to the applicable vehicle Owner Manual/Supplement for a complete description and an explanation of operating conditions for the automatic stop/start feature. When performing this Road Test, the auto stop/start must be verified to ensure the shifting characteristics of this feature are operating as designed.**

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**.

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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.
   - Engine Speed
   - Transmission ISS
   - Transmission OSS

- Vehicle Speed
- IMS
- Commanded Gear
- Gear Ratio
- Brake Pedal Position
- ECT, Engine Data List
- Trans. Fluid Temp.
- Calc. Throttle Position
- Ignition Voltage
- Transmission Control Solenoid Valve 1-9
- 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 Transmission Control Solenoid Valve 1-7 Cmd.**
- **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 service procedures and field bulletins for Harsh Garage Shift.**

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NOTE: **Delayed engagement may be caused by any of the following conditions:**

- **Low idle speed - Compare engine idle speed to desired idle speed.**
- **Low fluid level**
- **Incorrect line pressure - Investigate Transmission Control Solenoid Valve 1-7 Cmd.**
- **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 service procedures and field bulletins for Harsh, Soft, Delayed or Slipping First, Second, Seventh, Eighth, 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 transmission control 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
    - Transmission Control Solenoid Valve 1-9
    - TCC Slip Speed
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 transmission control solenoid valve pressure command should change to "ON" for the oncoming clutch and "OFF" 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 0-50 RPM, depending on the vehicle application. TCC may apply in 1st through 8th gear. 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 Transmission Control Solenoid Valve 7 current 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 Transmission Control Solenoid Valve 7 current 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 to a 7th to 6th gear downshift.
9. Repeat steps 2 to 4 at a higher speed to achieve 8th gear and then step in to command an 8th to 7th gear downshift.
10. 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 8L90 are also equipped with some form of Driver Shift Control (DSC). The TCM will automatically override DSC downshifts to protect the transmission from damage.

Coasting Downshifts

1. Place the gear selector in the DRIVE position.
2. Accelerate the vehicle to 8th gear with the TCC applied.
3. Release the throttle and apply the brakes.

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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 upshift automatically when maximum engine speed is achieved and 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 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:

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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

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

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.**

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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 diagnostics.

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Condition	Action
	• 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.

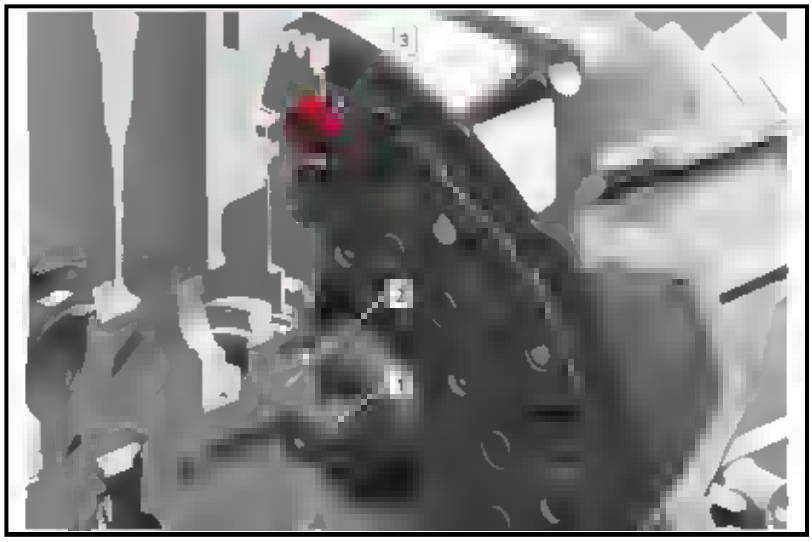
1. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration.
2. Turn the engine OFF.
3. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
4. Remove the transmission converter cover bolts and the cover.
5. Mark the relationship of 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 (411)	Inspect for damaged case extension.

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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

WHINE/GROWL NOISE THAT CHANGES WITH VEHICLE SPEED

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Checks	Causes
2 - 3 - 4 - 6 - 8 and 4 - 5 - 6 - 7 - 8 Reverse Clutch Thrust Bearing (58)	Inspect the bearing for wear or damage.
Output Carrier Assembly (73)	• Inspect the carrier assembly for damaged pinion gears, thrust washers, pins, and rollers. • Inspect for a damaged center support roller bearing assembly. • Inspect for damaged thrust bearings. • Inspect for damaged sun gears. • Inspect the carrier assembly for damaged output carrier rear sun gear thrust bearing (captured). • Inspect for damaged or stripped splines on the output carrier assembly.
Output Sun Gear Thrust Bearing (75)	Inspect the bearing for wear or damage.
Input Sun Gear Thrust Bearing (61)	Inspect the bearing for wear or damage.
Input Sun Gear Assembly (69)	Inspect for spline wear or damage.
1 - 2 - 3 - 4 - 5 Reverse Clutch Hub Thrust Bearing (70)	Inspect the bearing for wear or damage.
A/Trans Fluid Filter (46)	• Inspect for damaged or restricted fluid filter assembly (26) • Inspect for damaged fluid filter seal assembly (25) or improper sealing interface (leaks, fluid aeration).
A/Trans Fluid Pump Seal (302)	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
- 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

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- 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.

    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

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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
- 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

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- 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

- Damaged vehicle speed sensor 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

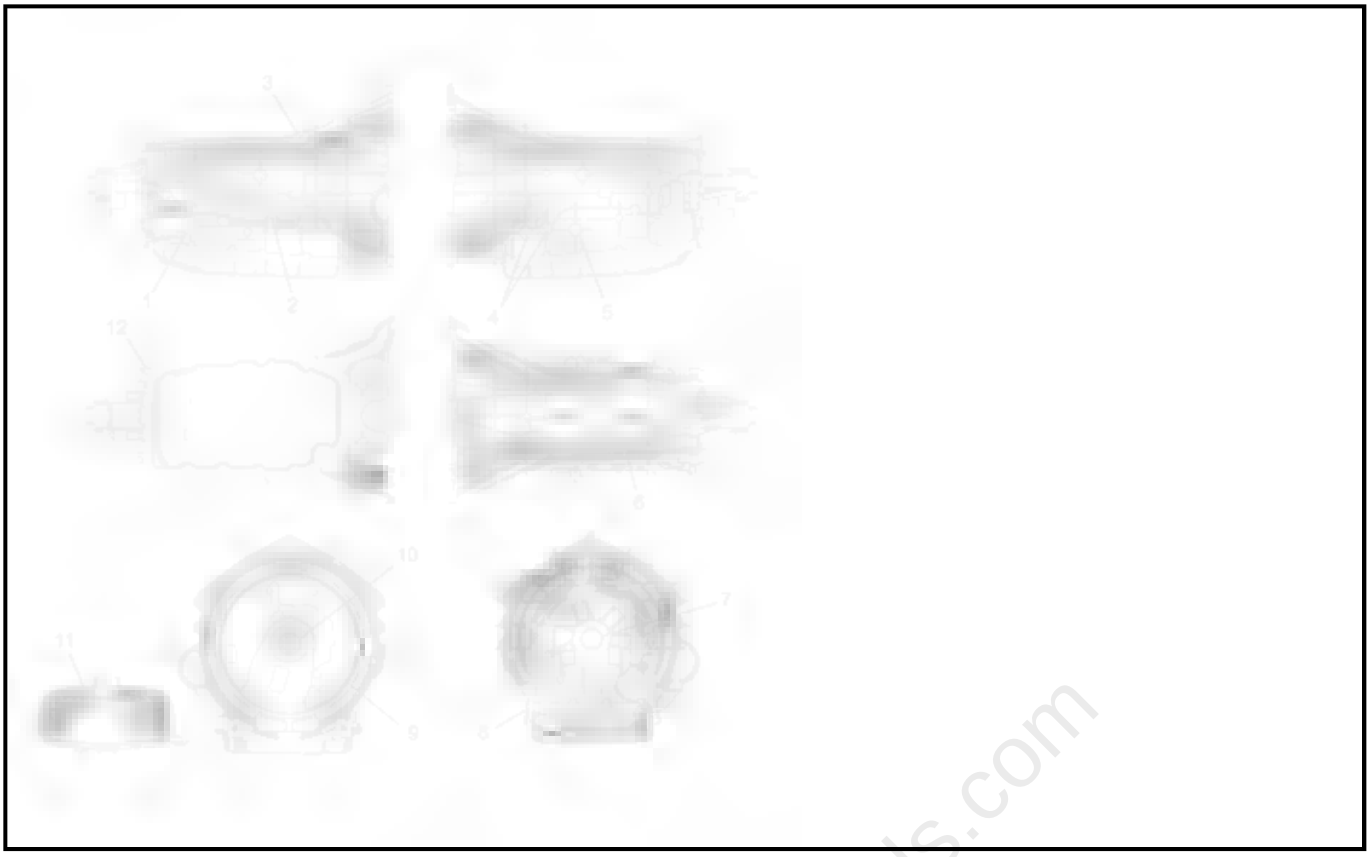
- Converter leak in the weld area
- Converter seal lip cut. Check the converter hub for damage
- Converter seal bushing moved forward and damaged
- Converter seal garter spring missing from the seal
- Porous casting of the transmission case or the oil pump

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
- Mispositioned oil pump to case gasket, if equipped

Leak Inspection Points

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1. A/Trans Wiring Harness
2. Transmission Fluid Fill Tube Plug
3. A/Trans Vent
4. Transmission Cooler Pipe Fitting Seal
5. Manual Shift Shaft Seal
6. A/Trans Case Assembly
7. Propeller Shaft Transmission Flange Fluid Seal
8. A/Trans Fluid Pan Gasket
9. A/Trans Case Front Cover Seal
10. Torque Converter Fluid Seal
11. Torque Converter
12. A/Trans Case Extension Seal

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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.
Automatic Transmission Fluid Pump Seal (5)	Inspect for cut, wear, or damage.
A/Trans Case Assembly (16)	• Inspect for porosity or damage. • Inspect manual shaft seal. • Inspect control wiring input sleeve seals.
A/Trans Case Extension Assembly (22)	• Verify oil is from transmission and not transfer case assembly (4WD/AWD). • Inspect extension seal assembly (inner seal behind boot - 2WD only). • Inspect extension to case seal (2WD only).
A/Trans Fluid Pan (49)	• 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 (76)	Inspect for a broken or damaged output shaft. Inspect for worn splines.
A/Trans Case Assembly (16)	• Inspect for broken or damaged case.

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Checks	Causes
	• 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 (604)	Inspect for broken or disengaged manual valve detent.

HARSH GARAGE SHIFT

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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 (40)	• Incorrect or inadequate adapt activity. • Incorrect TCM temperature reporting - Monitor TCM temperature using Tech 2. • Line pressure control solenoid incorrect pressure.

NO DRIVE IN ALL RANGES

Checks	Causes
A/Trans Fluid Pan (49)	Verify proper fluid level and condition, inspect transmission assembly for leaks.
A/Trans Fluid Filter (46)	• Inspect for damaged or restricted fluid filter (46). • Inspect for damaged fluid filter seal (45) or improper sealing interface, leaks, and fluid aeration.
A/Trans Fluid Pump Seal (302)	Inspect for worn or damaged seal.

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Checks	Causes
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 Valve (384)	Inspect the manual valve detent lever assembly and connection to the manual valve (384).
A/Trans Manual Shift Shaft Position Switch Assembly (308)	Inspect the switch assembly (308) and connection to the manual valve (354).
Manual Shift Shaft Position Switch Assembly (604)	Inspect PRNDL commands to and from vehicle using GDS2.
Control Solenoid (w/Body and Valve) Valve Assembly (40)	Inspect PRNDL commands to and from vehicle using GDS2.
Output Shaft (76)	Inspect for spline wear or damage.
Output Carrier Assembly (73)	• 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 (67)	Inspect carrier assembly for damaged pinion gears, thrust washers, pins, and rollers.
Input Sun Gear Assembly (69)	Inspect for spline wear or damage.

HARSH, SOFT, DELAYED OR SLIPPING FIRST, THIRD, FIFTH, SIXTH OR SEVENTH SHIFT

Checks	Causes
1-3-5-6-7 Clutch Assembly (57)	• Inspect for damaged or worn 1-3-5-6-7 clutch plates (511 - 512). • Inspect for damaged 1-3-5-6-7 clutch piston (509), clutch housing (506), return spring (515), and piston dam (516). • Inspect for damaged 1-3-5-6-7 clutch piston dam retaining ring (517). • Inspect for cut, worn or damaged 1-3-5-6-7 clutch piston seals (507, 508), and dam seal (510). • Inspect for improper selective 1-3-5-6-7 clutch backing plate retaining ring (514). • Inspect for damaged 1-3-5-6-7 clutch backing plate (513). Inspect for worn splines on backing plate.

NO FIRST, THIRD, FIFTH, SIXTH OR SEVENTH GEAR

Checks	Causes
1-3-5-6-7 Clutch Assembly (57)	• Inspect for damaged or worn 1-3-5-6-7 clutch plates (511 - 512). • Inspect for damaged 1-3-5-6-7 clutch piston (509), clutch housing (506), return spring (515), and piston dam (516). • Inspect for damaged 1-3-5-6-7 clutch piston dam retaining ring (517).

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Checks	Causes
	• Inspect for cut, worn or damaged 1-3-5-6-7 clutch piston seals (507, 508), and dam seal (510). • Inspect for improper selective 1-3-5-6-7 clutch backing plate retaining ring (514). • Inspect for damaged 1-3-5-6-7 clutch backing plate (513). Inspect for worn splines on backing plate.

HARSH, SOFT, DELAYED OR SLIPPING SECOND, THIRD, FOURTH, SIXTH OR EIGHTH SHIFT

Checks	Causes
2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assembly (60)	• Inspect for damaged or worn 2-3-4-6-8 clutch plates (545 - 548). • Inspect for damaged 2-3-4-6-8 clutch piston (526), clutch housing (521), return spring (527), piston dam (529), and apply ring (544). • Inspect for damaged 2-3-4-6-8 clutch piston dam retaining ring (531). • Inspect for cut, worn or damaged 2-3-4-6-8 clutch piston seal (525), and dam seals (522, 528, 530). • Inspect for improper selective 2-3-4-6-8 clutch backing plate retaining ring (550). • Inspect for damaged 2-3-4-6-8 clutch backing plate (549). Inspect for worn splines on backing plate.

NO SECOND, THIRD, FOURTH, SIXTH OR EIGHTH GEAR

Checks	Causes
2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assembly (60)	• Inspect for damaged or worn 2-3-4-6-8 clutch plates (545 - 548). • Inspect for damaged 2-3-4-6-8 clutch piston (526), clutch housing (521), return spring (527), piston dam (529), and apply ring (544). • Inspect for damaged 2-3-4-6-8 clutch piston dam retaining ring (531). • Inspect for cut, worn or damaged 2-3-4-6-8 clutch piston seal (525), and dam seals (522, 528, 530). • Inspect for improper selective 2-3-4-6-8 clutch backing plate retaining ring (550). • Inspect for damaged 2-3-4-6-8 clutch backing plate (549). Inspect for worn splines on backing plate.

HARSH, SOFT, DELAYED OR SLIPPING FOURTH, FIFTH, SIXTH, SEVENTH, EIGHTH, OR REVERSE SHIFT

Checks	Causes
2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assembly (60)	• Inspect for damaged or worn 4-5-6-7-8 Reverse clutch plates (539 - 541). • Inspect for damaged 4-5-6-7-8 Reverse clutch piston (534), clutch housing (521), return spring (535), piston dam (537),

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Checks	Causes
	and piston stop (532). • Inspect for damaged 4-5-6-7-8 Reverse clutch piston dam retaining ring (538). • Inspect for cut, worn or damaged 4-5-6-7-8 Reverse clutch piston seals (524, 533), piston stop O-ring seal (523) and dam seal (536). • Inspect for improper selective 4-5-6-7-8 Reverse clutch backing plate retaining ring (543). • Inspect for damaged 4-5-6-7-8 Reverse clutch backing plate (542). Inspect for worn splines on backing plate.

NO FOURTH, FIFTH, SIXTH, SEVENTH, EIGHTH OR REVERSE GEAR

Checks	Causes
2-3-4-6-8 and 4-5-6-7-8 Reverse Clutch Assembly (60)	• Inspect for damaged or worn 4-5-6-7-8 Reverse clutch plates (539 - 541). • Inspect for damaged 4-5-6-7-8 Reverse clutch piston (534), clutch housing (521), return spring (535), piston dam (537), and piston stop (532). • Inspect for damaged 4-5-6-7-8 Reverse clutch piston dam retaining ring (538). • Inspect for cut, worn or damaged 4-5-6-7-8 Reverse clutch piston seals (524, 533), piston stop O-ring seal (523) and dam seal (536). • Inspect for improper selective 4-5-6-7-8 Reverse clutch backing plate retaining ring (543). • Inspect for damaged 4-5-6-7-8 Reverse clutch backing plate (542). Inspect for worn splines on backing plate.

HARSH, SOFT, DELAYED OR SLIPPING FIRST, SECOND, SEVENTH, EIGHTH, OR REVERSE SHIFT

Checks	Causes
1-2-7-8 Reverse Clutch Assembly	• Inspect for damaged or worn 1-2-7-8 Reverse clutch plates (585 - 588). • Inspect for damaged 1-2-7-8 Reverse clutch piston (582), clutch piston housing (581), return spring (583), and apply ring (584). • Inspect for damaged 1-2-7-8 Reverse clutch piston housing retaining ring (580). • Inspect for damaged or improper selective 1-2-7-8 Reverse clutch backing plate (589). Inspect for worn splines on backing plate.

NO FIRST, SECOND, SEVENTH, EIGHTH OR REVERSE GEAR

Checks	Causes
1-2-7-8 Reverse Clutch Assembly	• Inspect for damaged or worn 1-2-7-8 Reverse clutch plates (585 - 588).

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Checks	Causes
	• Inspect for damaged 1-2-7-8 Reverse clutch piston (582), clutch piston housing (581), return spring (583), and apply ring (584). • Inspect for damaged 1-2-7-8 Reverse clutch piston housing retaining ring (580). • Inspect for damaged or improper selective 1-2-7-8 Reverse clutch backing plate (589). Inspect for worn splines on backing plate.

HARSH, SOFT, DELAYED OR SLIPPING FIRST, SECOND, THIRD, FOURTH, FIFTH, OR REVERSE SHIFT

Checks	Causes
1-2-3-4-5 Reverse Clutch Assembly	• Inspect for damaged or worn 1-2-3-4-5 Reverse clutch plates (592 - 595). • Inspect for damaged 1-2-3-4-5 Reverse clutch piston (406), clutch piston dam (402), and return spring (405). • Inspect for cut, worn or damaged 1-2-3-4-5 Reverse clutch piston seals (403, 408), piston O-ring seal (404), dam seal (401), and dam inner O-ring seal (409). • Inspect for damaged 1-2-3-4-5 Reverse clutch piston dam retaining ring (400). • Inspect for damaged or improper selective 1-2-3-4-5 Reverse clutch backing plate retaining ring (590). • Inspect for damaged 1-2-3-4-5 Reverse clutch backing plate (591). Inspect for worn splines on backing plate.

NO FIRST, SECOND, THIRD, FOURTH, FIFTH OR REVERSE GEAR

Checks	Causes
1-2-3-4-5 Reverse Clutch Assembly	• Inspect for damaged or worn 1-2-3-4-5 Reverse clutch plates (592 - 595). • Inspect for damaged 1-2-3-4-5 Reverse clutch piston (406), clutch piston dam (402), and return spring (405). • Inspect for cut, worn or damaged 1-2-3-4-5 Reverse clutch piston seals (403, 408), piston O-ring seal (404), dam seal (401), and dam inner O-ring seal (409). • Inspect for damaged 1-2-3-4-5 Reverse clutch piston dam retaining ring (400). • Inspect for damaged or improper selective 1-2-3-4-5 Reverse clutch backing plate retaining ring (590). • Inspect for damaged 1-2-3-4-5 Reverse clutch backing plate (591). Inspect for worn splines on backing plate.

NO TORQUE CONVERTER CLUTCH APPLY

Checks	Causes
Torque Converter Assembly (1)	Diagnose torque converter for possible internal damage. Refer to **Torque Converter Diagnosis**.

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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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