

2018 TRANSMISSION

Automatic Transmission - 9T45 (M3U) Or 9T50 (M3D M3H) - Diagnostic Information And Procedures - Equinox & Terrain

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC P0601, P0602, P0603, P0604, P0606, P062F, P16F3 OR P16FB: CONTROL MODULE

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 P062F

Control Module Long Term Memory Performance

DTC P16F3

Control Module Redundant Memory Performance

DTC P16FB

Control Module Vehicle Speed System Circuitry Performance

Circuit/System Description

For an overview of the component/system, refer to [Electronic Component Description](#)

Conditions for Running the DTC

- Ignition Voltage = Greater than 11 V
- {P16FB} Transmission Output Speed = Greater than a predefined threshold

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

Conditions for Setting the DTC

Control Module = Internal Malfunction/Not Programmed - For greater than 10 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled
- Default shift pattern = Enabled
- Grade braking = Disabled
- High Side Driver 1, 2 = Off
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Torque Reduction = Enabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- {P16FB} Transmission gear allowed = Reverse or Gear 5
- {RPO (EPH)} Engine Speed = Idle

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H)).

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
- If the DTC does not set

3. All OK.

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

3. Ignition/Vehicle & All vehicle systems - Off

4. Disconnect the electrical connector: K71 Transmission Control Module

5. Verify a condition does not exist with the component: K71 Transmission Control Module @ Wiring Harness Connector - Defective/Loose/Poor Connection/Visible Damage

- **If a condition exists**

Repair or replace as necessary.

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

6. Connect the electrical connector: K71 Transmission Control Module

7. Ignition - On/Vehicle - In Service Mode

8. Clear the DTCs.

9. Ignition/Vehicle & All vehicle systems - Off

10. Ignition - On/Vehicle - In Service Mode

11. Verify DTC P0601, P0603, P0604, P0606, P062F, P16F3, 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**

12. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0658, P0659, P2727, P2729, P2730, P2736, P2738, P2739, P2826, P2827, P282F OR P2830: ACTUATOR HIGH CONTROL CIRCUIT GROUP 1 VOLTAGE/TRANSMISSION CONTROL SOLENOID VALVE 5, 6, 9, 10 CONTROL CIRCUIT

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

Actuator High Control Circuit Group 1 Low Voltage

DTC P0659

Actuator High Control Circuit Group 1 High Voltage

DTC P2727

Transmission Control Solenoid Valve 5 Control Circuit Open

DTC P2729

Transmission Control Solenoid Valve 5 Control Circuit Low Voltage

DTC P2730

Transmission Control Solenoid Valve 5 Control Circuit High Voltage

DTC P2736

Transmission Control Solenoid Valve 6 Control Circuit Open

DTC P2738

Transmission Control Solenoid Valve 6 Control Circuit Low Voltage

DTC P2739

Transmission Control Solenoid Valve 6 Control Circuit High Voltage

DTC P2826

Transmission Control Solenoid Valve 9 Control Circuit Low Voltage

DTC P2827

Transmission Control Solenoid Valve 9 Control Circuit High Voltage

DTC P282F

Transmission Control Solenoid Valve 10 Control Circuit Low Voltage - If equipped

DTC P2830

Transmission Control Solenoid Valve 10 Control Circuit High Voltage - If equipped

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 1	P2738	P2736	P2739	-
Control - Terminal 17	P2729	P2727	P2730	-
Control - Terminal 21	P2826	P2826	P2827	-
Control - Terminal 23	P282F	P282F	P2830	-
Control - Terminal 33	1	P0658	P0659	-
1. Lost Communication with Transmission Control Module				

Typical Scan Tool Data

High Side Driver 1 Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running			
Parameter Normal Range: Not Run or OK			
Control - Terminal 33	Not Run or OK	Not Run or OK	Malfunction

High Side Driver 1 Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running			
Parameter Normal Range: Not Run or OK			
Control - Terminal 33	Malfunction	Malfunction	Not Run or OK

High Side Driver 1 Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: Not Run or OK			
Control - Terminal 33	Malfunction	Malfunction	Not Run or OK

Transmission Control Solenoid Valve 5, 6, 9, 10 Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: Not Run or OK			
Control - Terminal 1, 17, 21, 23	Not Run or OK	Not Run or OK	Malfunction

Transmission Control Solenoid Valve 5, 6, 9, 10 Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: Not Run or OK			
Control - Terminal 1, 17, 21, 23	Malfunction	Malfunction	Not Run or OK

Transmission Control Solenoid Valve 5, 6, 9, 10 Control Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: Not Run or OK			
Control - Terminal 1, 17, 21, 23	Malfunction	Malfunction	Not Run or OK

Circuit/System Description

For an overview of the component/system, refer to [Electronic Component Description](#)

Circuit	Description
Control - Terminal 1, 17, 21, 23	The output circuit is switched to ground to activate the component. The output is PWM controlled.
Control - Terminal 33	The output circuit is switched to 12 V to activate the component.

Component	Description
Q77 Transmission Control Solenoid Valve	A linear solenoid actuator is an electro-mechanical device that converts electrical power into a mechanical pushing or pulling force or motion. • The solenoid actuator varies the force depending on the current applied to the solenoid coil. • The solenoid actuator applies minimum force with minimum current applied to the solenoid coil. • The solenoid actuator applies maximum force with maximum current applied to the solenoid coil.

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

- Battery Voltage = Greater than 9 V
- Ignition = On
- Ignition Voltage = 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
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Disabled
- {P2727, P2730} Transmission gear allowed = Reverse or Gear 1-4, 6, 8, 9
- {P2729} Transmission gear allowed = Reverse or Gear 5, 7
- {P2736, P2739} Transmission gear allowed = Reverse or Gear 6-9
- {P2738} Transmission gear allowed = Gear 1-5
- {P2826} Transmission gear allowed = Gear 1-9
- {P2827} Transmission gear allowed = Park or Reverse

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\)](#)

Connector End View Reference

- **[COMPONENT CONNECTOR END VIEWS - INDEX](#)**
- **[INLINE HARNESS CONNECTOR END VIEWS - INDEX](#)**

Component View Reference

Transmission Solenoid Information

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition/Vehicle - On
2. Engine - Running
3. Verify the scan tool parameter:
 - High Side Driver 1 Circuit Open Test Status = Not Run or OK
 - High Side Driver 1 Circuit Low Voltage Test Status = Not Run or OK
 - High Side Driver 1 Circuit High Voltage Test Status = Not Run or OK
 - Transmission Control Solenoid Valve 5, 6, 9, 10 Control Circuit Open Test Status = Not Run or OK
 - Transmission Control Solenoid Valve 5, 6, 9, 10 Control Circuit Low Voltage Test Status = Not Run or OK
 - Transmission Control Solenoid Valve 5, 6, 9, 10 Control Circuit High Voltage Test Status = Not Run or OK
 - **If not the specified state**

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

Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing
 - **Go to next step: If the DTC is not set**
5. All OK.

Circuit/System Testing

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: T12 Automatic Transmission Assembly
3. Connect a test lamp between the test points: Control circuit terminal 15 & Ground
4. Ignition - On/Vehicle - In Service Mode
5. Perform the scan tool control function: High Side Driver 1 - On and Off

Verify the test lamp turns On and Off.

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

1. Connect the electrical connector: T12 Automatic Transmission Assembly

2. Ignition/Vehicle - Off

3. Disconnect the electrical connector:

- K71 Transmission Control Module
- T12 Automatic Transmission Assembly

4. Test for infinite resistance between the test points: Control circuit terminal 15 @ Component harness & Ground

- If less than infinite resistance - Repair the short to ground on the circuit.
- If infinite resistance

5. Test for less than 2 Ω between the test points: Control circuit terminal 15 @ Component harness & The other end of the circuit @ Control module harness

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K71 Transmission Control Module

• **If the test lamp is always On**

1. Connect the electrical connector: T12 Automatic Transmission Assembly

2. Ignition/Vehicle - Off

3. Disconnect the electrical connector:

- K71 Transmission Control Module
- T12 Automatic Transmission Assembly

4. Ignition - On/Vehicle - In Service Mode

5. Test for less than 1 V between the test points: Control circuit terminal 15 @ 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. Connect the electrical connector: T12 Automatic Transmission Assembly

7. Ignition/Vehicle - Off

8. Disconnect the electrical connector:

- K71 Transmission Control Module
- T12 Automatic Transmission Assembly

9. Test for less than 2 Ω between the test points:

- {P2727, P2729, P2730} Control circuit terminal 5 @ Component harness & The other end of the circuit @ Control module harness
- {P2736, P2738, P2739} Control circuit terminal 4 @ Component harness & The other end of the circuit @ Control module harness
- {P2826, P2827} Control circuit terminal 3 @ Component harness & The other end of the circuit @ Control module harness
- {P282F, P2830} Control circuit terminal 2 @ Component harness & The other end of the circuit @ Control module harness
- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

• **Go to next step: If less than 2 Ω**

10. Test for infinite resistance between the test points:

- {P2727, P2729, P2730} Control circuit terminal 5 @ Component harness & Ground
- {P2736, P2738, P2739} Control circuit terminal 4 @ Component harness & Ground
- {P2826, P2827} Control circuit terminal 3 @ Component harness & Ground
- {P282F, P2830} Control circuit terminal 2 @ Component harness & Ground
- **If less than infinite resistance**

Repair the short to ground on the circuit.

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

11. Ignition - On/Vehicle - In Service Mode

12. Test for less than 1 V between the test points:

- {P2727, P2729, P2730} Control circuit terminal 5 @ Component harness & Ground
- {P2736, P2738, P2739} Control circuit terminal 4 @ Component harness & Ground
- {P2826, P2827} Control circuit terminal 3 @ Component harness & Ground
- {P282F, P2830} 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**

13. Connect the electrical connector: T12 Automatic Transmission Assembly

14. Ignition/Vehicle - Off

15. Remove the component: Transmission Cover

16. Connect the electrical connector: T12 Automatic Transmission Assembly

17. Disconnect the electrical connector: Q77 Transmission Control Solenoid Valve

18. Test for less than 2 Ω between the test points: Control circuit terminal 33 &

- {P2727, P2729, P2730} Terminal 1 @ Q77E Transmission Control Solenoid Valve 5 @ Component harness
- {P2736, P2738, P2739} Terminal 1 @ Q77F Transmission Control Solenoid Valve 6 @ Component harness
- {P2826, P2827} Terminal 1 @ Q77J Transmission Control Solenoid Valve 9 @ Component harness
- {P282F, P2830} Terminal 1 @ Q77K Transmission Control Solenoid Valve 10 @ Component harness
- **If 2 Ω or greater**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If less than 2 Ω**

19. Test for infinite resistance between the test points: Control circuit terminal 33 @ Control module harness & Ground

- **If less than infinite resistance**

Replace the component: Automatic Transmission Wiring Harness

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

20. Test for less than 2 Ω between the test points:

- {P2727, P2729, P2730} Terminal 2 @ Q77E Transmission Control Solenoid Valve 5 @ Component harness & The other end of the circuit @ Control module harness
- {P2736, P2738, P2739} Terminal 2 @ Q77F Transmission Control Solenoid Valve 6 @ Component harness & The other end of the circuit @ Control module harness
- {P2826, P2827} Terminal 2 @ Q77J Transmission Control Solenoid Valve 9 @ Component harness & The other end of the circuit @ Control module harness
- {P282F, P2830} Terminal 2 @ Q77K Transmission Control Solenoid Valve 10 @ Component harness & The other end of the circuit @ Control module harness
- **If 2 Ω or greater**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If less than 2 Ω**

21. Test for infinite resistance between the test points: Ground &

- {P2727, P2729, P2730} Terminal 2 @ Q77E Transmission Control Solenoid Valve 5 @ Component harness

- {P2736, P2738, P2739} Terminal 2 @ Q77F Transmission Control Solenoid Valve 6 @ Component harness
- {P2826, P2827} Terminal 2 @ Q77J Transmission Control Solenoid Valve 9 @ Component harness
- {P282F, P2830} Terminal 2 @ Q77K Transmission Control Solenoid Valve 10 @ Component harness
- **If less than infinite resistance**

Replace the component: Automatic Transmission Wiring Harness

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

22. Test for infinite resistance between the test points: Control circuit terminal 33 @ Control module harness &

- {P2727, P2729, P2730} Control circuit terminal 17 @ Component harness
- {P2736, P2738, P2739} Control circuit terminal 1 @ Component harness
- {P2826, P2827} Control circuit terminal 21 @ Component harness
- {P282F, P2830} Control circuit terminal 23 @ Component harness
- **If less than infinite resistance**

Replace the component: Automatic Transmission Wiring Harness

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

23. Test or replace the component: Q77 Transmission Control Solenoid Valve

Component Testing

1. Test the resistance between the test points: Terminal 1 @ Q77 Transmission Control Solenoid Valve & Terminal 2 @ Q77 Transmission Control Solenoid Valve

Verify the value is within the range listed in the table: [Transmission Solenoid Information](#)

- **If not in the specified range**

Replace the component: Q77 Transmission Control Solenoid Valve

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

2. Test for infinite resistance between the test points: Terminal 1 @ Q77 Transmission Control Solenoid Valve & Ground

- **If less than infinite resistance**

Replace the component: Q77 Transmission Control Solenoid Valve

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

3. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Automatic Transmission Wiring Harness Replacement](#)
- Refer to [Control Valve Body Cover Removal](#)
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0707, P0708, P2802, P2803 OR P2805: TRANSMISSION RANGE SENSOR 1-2 CIRCUIT VOLTAGE/TRANSMISSION RANGE SENSORS 1-2 NOT PLAUSIBLE

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 1 Circuit Low Voltage

DTC P0708

Transmission Range Sensor 1 Circuit High Voltage

DTC P2802

Transmission Range Sensor 2 Circuit Low Voltage

DTC P2803

Transmission Range Sensor 2 Circuit High Voltage

DTC P2805

Transmission Range Sensors 1-2 Not Plausible

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 4 @ B15 Transmission Internal Mode Switch	P0707*	P0708*	P0708**	P2805*
Signal 1 - Terminal 4 @ B15 Transmission Internal Mode Switch	P2802	P2803	P2803**	P2805*
Low Reference	-	P0708, P2803*	P0708, P2803**	-
* Additional DTCs may set. ** Additional DTCs may set. & Internal control module or component damage may occur if the circuit shorts to B+.				

Typical Scan Tool Data

Transmission Range Sensor 1, 2

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On Parameter Normal Range: 6 to 92%			
5 V Reference	100%	100%	100%
Signal 1 - Terminal 4 @ B15 Transmission Internal Mode Switch	0%	100%	100%
Signal 2 - Terminal 2 @ B15 Transmission Internal Mode Switch	0%	100%	100%
Low Reference	-	100%	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.
Signal 1 - Terminal 4 @ B15 Transmission Internal Mode Switch	The control module input circuit has an internal resistance connected to 5 V.
Signal 2 - Terminal 2 @ B15 Transmission Internal Mode Switch	The control module input circuit has an internal resistance connected to 5 V.
Low Reference	Grounded through the control module.

Component	Description
B15 Transmission Internal Mode Switch	The hall-effect sensor has 2 separate PWM signal circuits. The transmission gear selected determines the duty cycle of the PWM signal.
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.

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 = On
- Ignition Voltage = 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

- {P2802, P2803, P2805} M64 Starter Motor = Disabled
- Autostart/Autostop = Disabled

- Default shift pattern = Enabled
- Grade braking = Disabled
- High Side Driver 1 = Off
- {P0707, P0708} High Side Driver 2 = Off
- Line Pressure Command = Maximum
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Pressure Control = Freeze current adapt values
- High Side Driver 1, 2 = Off

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H)).

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 DTC P0641, P0651, P0697, P06A3, P2805 is not set.
 - **If DTC P0641, P0651, P0697, P06A3, P06D2 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 DTC P0641, P0651, P0697, P06A3, P2805 is not 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: S3 Transmission Shift Lever - Select each position

Verify the scan tool parameter: Transmission Range Sensor 1, 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**
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: X1 @ T12 Automatic Transmission Assembly
3. Test for less than 10 Ω between the test points: Low Reference circuit terminal 10 & Ground
 - **If 10 Ω or greater**
 1. Disconnect the electrical connector: K20 Engine Control Module
 2. Test for less than 2 Ω between the test points: Low Reference circuit terminal 10 @ Component harness & Terminal 23 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K20 Engine Control Module
 - **Go to next step: If less than 10 Ω**
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 11 & Low Reference circuit terminal 10
 - **If less than 4.8 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the appropriate electrical connector: K20 Engine Control Module
 5. Test for infinite resistance between the test points: 5 V Reference circuit terminal 11 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance

6. Test for less than 2 Ω between the test points: 5 V Reference circuit terminal 11 @ Component harness & Terminal 39 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K20 Engine Control Module

• **If greater than 5.2 V**

1. Disconnect the appropriate electrical connector: K20 Engine Control Module
2. Ignition - On/Vehicle - In Service Mode
3. Test for less than 1 V between the test points: 5 V Reference circuit terminal 11 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component: K20 Engine Control Module

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

6. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
7. Ignition/Vehicle - Off
8. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
9. Install the special tool: **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 300 Hz
 - Set the duty cycle to 50%
 - Red lead @
 - {P0707, P0708} Signal circuit terminal 9
 - {P2802, P2803} Signal circuit terminal 8
 - Black lead @ Ground
10. Ignition - On/Vehicle - In Service Mode
11. Verify the scan tool parameter:

Transmission Range Sensor 1, 2 = 48 to 52%

• **If not between 48 and 52%**

1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
2. Ignition/Vehicle - Off
3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
4. Disconnect the appropriate electrical connector:
 - {P0707, P0708} K71 Transmission Control Module
 - {P2802, P2803} K20 Engine Control Module
5. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
6. Ignition - On/Vehicle - In Service Mode
7. Test for less than 1 V between the test points:
 - {P0707, P0708} Signal circuit terminal 9 @ Component harness & Ground
 - {P2802, P2803} Signal circuit terminal 8 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V
8. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
9. Ignition/Vehicle - Off
10. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
11. Test for infinite resistance between the test points:
 - {P0707, P0708} Signal circuit terminal 9 @ Component harness & Ground
 - {P2802, P2803} Signal circuit terminal 8 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance

12. Test for less than 2 Ω between the test points:

- {P0707, P0708} Signal circuit terminal 9 @ Component harness & The other end of the circuit
- {P2802, P2803} Signal circuit terminal 8 @ Component harness & The other end of the circuit
- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component:
- {P0707, P0708} K71 Transmission Control Module
- {P2802, P2803} K20 Engine Control Module

• **Go to next step: If between 48 and 52%**

12. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly

13. Ignition/Vehicle - Off

14. Remove the component: Control Valve Body Cover

15. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly

16. Disconnect the electrical connector: B15 Transmission Internal Mode Switch

17. Install the special tool: **EL-38522** Variable Signal Generator

- Set the voltage to 5 V
- Set the frequency to 300 Hz
- Set the duty cycle to 50%
- Black lead @ Ground
- Red lead @
 - {P0707, P0708} Signal circuit terminal 2
 - {P2802, P2803} Signal circuit terminal 4

18. Ignition - On/Vehicle - In Service Mode

19. Verify the scan tool parameter: Transmission Range Sensor 1 & Transmission Range Sensor 2 = 48 to 52%

• **If not between 48 and 52%**

Replace the component: Automatic Transmission Wiring Harness

• **Go to next step: If between 48 and 52%**

20. Test or replace the component: B15 Transmission Internal Mode Switch

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Automatic Transmission Wiring Harness Replacement](#)
- Refer to [Control Valve Body Cover Replacement](#)
- Refer to [Manual Shift Detent Lever Shaft Replacement](#) - B15 Transmission Internal Mode Switch
- For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC P0711, P0712, P0713: TRANSMISSION FLUID TEMPERATURE SENSOR

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

DTC P0712

Transmission Fluid Temperature Sensor Circuit Low Voltage

DTC P0713

Transmission Fluid Temperature Sensor Circuit High Voltage

Diagnostic Fault Information

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

Typical Scan Tool Data**Transmission Fluid Temperature**

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On Parameter Normal Range: 35 to 100 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (95 to 112 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)			
Signal	170 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (338 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)	-40 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (-40 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)	-40 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (-40 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)
Low Reference	-	-40 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (-40 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)	-40 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (-40 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)

Circuit/System Description

For an overview of the component/system, refer to [Electronic Component Description](#)

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 Transmission Fluid Temperature Sensor	The component B13 is part of the wiring harness: Automatic Transmission Wiring Harness The temperature sensor is a negative temperature coefficient thermistor, a resistor which changes based on temperature. - Low temperature produces a high resistance: 46 kΩ @ -40$\tilde{\text{A}}$,$\hat{\text{A}}^{\circ}\text{C}$ (-40$\tilde{\text{A}}$,$\hat{\text{A}}^{\circ}\text{F}$) - High temperature produces a low resistance: 70 Ω @ 140$\tilde{\text{A}}$,$\hat{\text{A}}^{\circ}\text{C}$ (284$\tilde{\text{A}}$,$\hat{\text{A}}^{\circ}\text{F}$)
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

- DTC P0300-P0304, P0712, P0713, P16F3, P2818 = Not set
- DTCs related to the following system/component = Not Set
 - B14A Transmission Output Shaft Speed Sensor
 - B34 Engine Coolant Temperature Sensor
 - B75 Mass Air Flow Sensor
 - B107 Accelerator Pedal Position Sensor
 - B115 Vehicle Speed Sensor
 - Q17 Fuel Injector
- Accelerator Pedal = Greater than 5%
- Engine Coolant Temperature = -40 to 150°C (-40 to 302°F)
- Engine Speed = Greater than 500 RPM
- Engine Torque = Greater than 50 N.m (36 lb ft)
- Ignition Voltage = Greater than 9 V
- Transmission Fluid Temperature = -40 to 150°C (-40 to 302°F)
- Vehicle Speed = Greater than 10 km/h (6 MPH)

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

P0712, P0713

- Battery Voltage = Greater than 9 V
- Run/Crank Ignition 1 Voltage = Greater than 9 V

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

Conditions for Setting the DTC

P0711

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

P0712

Transmission Fluid Temperature = Warmer than 150°C (302°F)

P0713

Transmission Fluid Temperature = Colder than -40°C (-40°F)

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

Transmission Hot Mode = Enabled

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Reference Information

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\)](#)

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. Verify the correct fluid level and condition: [Transmission Fluid Level and Condition Check](#)

- **If a condition exists**

Repair or replace as necessary.

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

2. Verify the scan tool parameter: Transmission Fluid Temperature = -39 to 169 Å, Å°C (-38 to 336 Å, Å°F)

- **If not between -39 and 169 Å, Å°C (-38 and 336 Å, Å°F)**

Refer to Circuit/System Testing

- **Go to next step: If between -39 and 169 Å, Å°C (-38 and 336 Å, Å°F)**

3. Operate the cold vehicle above 64 km/h (40 MPH) for 10 min.

Verify the scan tool parameter: Transmission Fluid Temperature = Temperature increases greater than 2 Å, Å°C (4 Å, Å°F)

- **If the temperature does not increase 2 Å, Å°C (4 Å, Å°F) or greater**

Refer to Circuit/System Testing

- **Go to next step: If the temperature increases greater than 2 Å, Å°C (4 Å, Å°F)**

4. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing

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

5. All OK.

[Circuit/System Testing](#)

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: X1 @ T12 Automatic Transmission Assembly

3. Test for less than 10 Ω between the test points: Low Reference circuit terminal 22 & Ground

- **If 10 Ω or greater**

1. Disconnect the electrical connector: K71 Transmission Control Module

2. Test for less than 2 Ω between the test points: Low Reference circuit terminal 22 @ Component harness & Terminal 28 @ Control module harness

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K71 Transmission Control Module

- **Go to next step: If less than 10 Ω**

4. Ignition - On/Vehicle - In Service Mode

5. Verify the scan tool parameter: Transmission Fluid Temperature = Less than -35 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (-31 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)

- **Warmer than -35 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (-31 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)**

1. Ignition/Vehicle - Off

2. Disconnect the electrical connector: K71 Transmission Control Module

3. Test for infinite resistance between the test points: Signal circuit terminal 23 @ 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: Colder than -35 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (-31 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)**

6. Connect a 3 A fused jumper wire between the test points: Signal circuit terminal 23 & Low Reference circuit terminal 22

7. Verify the scan tool parameter: Transmission Fluid Temperature = Greater than 149 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (300 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)

- **Colder than 149 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (300 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)**

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 23 @ Component harness & Ground

- If 1 V or greater - Repair the short to voltage on the circuit.
- If less than 1 V

5. Ignition/Vehicle - Off

6. Test for less than 2 Ω between the test points: Signal circuit terminal 23 @ Component harness & Terminal 63 @ Control module harness

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K71 Transmission Control Module

- **Go to next step: Warmer than 149 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{C}$ (300 $\tilde{\text{A}}$, $\hat{\text{A}}^{\circ}\text{F}$)**

8. Test or replace the component: B13 Transmission Fluid Temperature Sensor

Component Testing

1. Ignition/Vehicle - Off

2. Remove the component: Transmission Cover

3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly

4. Test for 45 to 44000 Ω between the test points: Signal terminal 23 & Low Reference terminal 22

- **If not between 40 and 45000 Ω**

Replace the component: B13 Transmission Fluid Temperature Sensor

- **Go to next step: If between 40 and 45000 Ω**

5. Verify the value is within the range listed in the table: Refer to [Temperature Versus Resistance \(B13 Transmission Fluid Temperature Sensor\)](#)

- If not in the specified range

Replace the component: B13 Transmission Fluid Temperature Sensor

- Go to next step: If in the specified range

6. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Automatic Transmission Wiring Harness Replacement](#) - B13 Transmission Fluid Temperature Sensor
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0716, P0717, P07BF OR P07C0: INPUT SPEED SENSOR

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 Speed Sensor Performance

DTC P0717

Input Speed Sensor Circuit No Signal

DTC P07BF

Input Speed Sensor Circuit Low Voltage

DTC P07C0

Input Speed Sensor Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P07BF, P17F6, P17FB, P176C, P187E	P07BF, P17F6, P17FB, P176C, P187E	P07C0	P0716, P0717
Signal	P07BF	P07BF	P07C0*	P0716, P0717
* Internal control module damage may occur if the circuit is shorted to B+.				

Typical Scan Tool Data

Transmission Input Speed

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

For an overview of the component/system, refer to [Electronic Component Description](#)

Circuit	Description
9 V Reference	The control module input circuit has an internal resistance connected to 9 V.
Signal	Grounded through the control module.

Component	Description
B14C Transmission Input 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. When the strength changes, the sensor changes the amount of current it consumes. This results in a square wave signal of the current, while the voltage stays constant. The control module detects the frequency in which the current 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 60 teeth, magnetic segments, or indentations. - The reluctor ring is part of the component: 5-7-R and 6-7-8-9 clutch sub assembly. The clutch sub assembly is splined to the 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

- Accelerator Pedal Position = Greater than 5%
- Engine Torque = 30 to 8, 191 N.m (22 to 6, 041 lb ft)
- Power Mode Status = Run
- Transmission Input Speed = 160 to 254 RPM

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

P0717

- Accelerator Pedal Position = Greater than 5%
- Brake Pedal Position Less than 70%
- Engine Torque 30 to 8, 191 N.m (22 to 6, 041 lb ft)
- Power Mode Status = Run
- Transmission Input Speed = Greater than 320 RPM

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

P07BF, P07C0

- Battery Voltage = Greater than 10 V
- Power Mode Status = Run
- Run/Crank Voltage = Greater than 10 V

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

Conditions for Setting the DTC

P0716

Input Speed Sensor = Greater than 850 RPM For greater than 1.5 s

P0717

Input Speed Sensor = Less than 100 RPM For greater than 4 s

P07BF

Input Speed Sensor = Less than 0.25 V - Signal circuit For greater than 1 s

P07C0

Input Speed Sensor = Greater than 4.75 V - Signal circuit For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category P0716, P0717, P07BF, P07C0 = Type A

- Autostart/Autostop = Disabled
- 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
- Transmission gear allowed = 5th Gear & Reverse

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A

Diagnostic Aids

The following components are combined into one housing:

- B14C Transmission Input Shaft Speed Sensor
- B14D Transmission Intermediate Shaft Speed Sensor

Each sensor is triggered by a separate reluctor ring inside the transmission.

Reference Information

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\)](#)

Connector End View Reference

- [COMPONENT CONNECTOR END VIEWS - INDEX](#)
- [INLINE HARNESS CONNECTOR END VIEWS - INDEX](#)

- [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: 9 V Reference 1 Circuit Status = OK
 - **If not the specified state**
Refer to Circuit/System Testing
 - **Go to next step: If the specified state**
3. Engine - Running
4. Transmission - Park
5. Verify the scan tool parameter: Transmission ISS & Engine Speed. - The difference between the following parameters is less than 50 RPM:
 - **If not the specified state**
Refer to Circuit/System Testing
 - **Go to next step: If the specified state**
6. Transmission - Reverse
7. Verify the scan tool parameter: Transmission ISS 0 RPM
 - **If not the specified state**
Refer to: Circuit/System Testing
 - **Go to next step: If the specified state**
8. 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**
9. 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: B14C Transmission Input Shaft Speed Sensor
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 12
 - **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 2 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
 4. Test for less than 2 Ω between the test points: 9 V Reference circuit terminal 2 @ Component harness & Terminal 8 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - 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 2 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component: K71 Transmission Control Module
 - **Go to next step: If between 8.3 and 9.6 V**
5. Ignition/Vehicle - Off
6. Install the special tool: **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 300 Hz
 - Set the duty cycle to 50%
 - Black lead @ Ground
 - Red lead @ Signal circuit terminal 3
7. Ignition - On/Vehicle - In Service Mode
8. Verify the scan tool parameter: Transmission Input Speed 291 to 311 RPM
 - **If not between 291 and 311 RPM**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: K71 Transmission Control Module
 3. Ignition - On/Vehicle - In Service Mode
 4. Test for less than 1 V between the test points: Signal circuit terminal 3 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V
 5. Ignition/Vehicle - Off
 6. Test for infinite resistance between the test points: Signal circuit terminal 3 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
 7. Test for less than 2 Ω between the test points: Signal circuit terminal 3 @ Component harness & Terminal 15 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module

- Go to next step: If between 291 and 311 RPM

9. Test or replace the component: B14E Transmission Input/Intermediate Shaft Speed Sensor

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Automatic Transmission Input Speed Sensor Replacement](#) - B14E Transmission Input/Intermediate Shaft Speed Sensor
- For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC P0721, P0722, P0723, P077C OR P077D: OUTPUT SPEED SENSOR

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 Speed Sensor Performance

DTC P0722

Output Speed Sensor Circuit No Signal

DTC P0723

Output Speed Sensor Circuit Intermittent

DTC P077C

Output Speed Sensor Circuit Low Voltage

DTC P077D

Output Speed Sensor Circuit High Voltage

Diagnostic Fault Information

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

Typical Scan Tool Data

Transmission Output Speed

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Vehicle Speed = Greater than 2 km/h (1.2 MPH) Parameter Normal Range: 0 to 7, 500 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 sensor produces a frequency modulated signal.

Component	Description
B14A Transmission Output 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. When the strength changes, the sensor changes the amount of current it consumes. This results in a square wave signal of the current, while the voltage stays constant. The control module detects the frequency in which the current 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 27 teeth, magnetic segments, or indentations. - The reluctor ring is part of the component: Park Gear

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

Conditions for Running the DTC

P0721

- Battery Voltage = Greater than 9 V
- Power Mode Status = Run
- Run/Crank Ignition 1 Voltage = Greater than 9 V

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

P0722, P0723

- Power Mode Status = Run
- Run/Crank Ignition 1 Voltage = Greater than 9 V
- {P0722} Transmission Fluid Temperature = Greater than -40°C (-40°F)

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

P077C, P077D

- Battery Voltage = Greater than 10 V
- Power Mode Status = Run
- Run/Crank Voltage = Greater than 10 V

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

Conditions for Setting the DTC

P0721

Output Speed Sensor = Less than 25 RPM Increase Forward & Reverse Gear

P0722

Output Speed Sensor = Greater than 30 RPM

P0723

Output Speed Sensor = Greater than 500 RPM Decrease - For 1.5 s

P077C

Output Speed Sensor = Less than 0.25 V - Signal circuit For greater than 1 s

P077D

Output Speed Sensor = Greater than 4.75 V - Signal circuit For greater than 1 s

Actions Taken When the DTC Sets

DTC P0721, P0722, P0723, P077C, P077D = Type A

- Autostart/Autostop = Disabled
- Default shift pattern = Disabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = 1st Gear Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Freeze current adapt values
- Transmission gear allowed = Reverse & Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A

Reference Information

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\).](#)

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

Special Tools

EL-38522 Variable Signal Generator

Circuit/System Verification

1. Ignition - On/Vehicle - In Service Mode
2. Verify the scan tool parameter: 9 V Reference 2 Circuit Status = OK

- **If not the specified state**

Refer to Circuit/System Testing

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

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

3. Raise and support the vehicle.
4. Start and idle the engine.
5. Transmission in Drive
6. Verify the scan tool parameter: Transmission OSS = 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: X1 @ 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 7 & Ground
 - **If less than 8.3 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: X1 @ K71 Transmission Control Module
 5. Test for infinite resistance between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.

- If infinite resistance
6. Test for less than 2 Ω between the test points: 9 V Reference circuit terminal 7 @ Component harness & Terminal 7 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module
- **If greater than 9.6 V**
1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Clear DTCs
 3. Ignition/Vehicle - Off
 4. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 5. Disconnect the electrical connector: K71 Transmission Control Module
 6. Ignition - On/Vehicle - In Service Mode
 7. Test for less than 1 V between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component: K71 Transmission Control Module
- **Go to next step: If between 8.3 and 9.6 V**
5. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 6. Ignition/Vehicle - Off
 7. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 8. Install the special tool: - **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 300 Hz
 - Set the duty cycle to 50%
 - Black lead @ Ground
 - Red lead @ Signal circuit terminal 6
 9. Ignition - On/Vehicle - In Service Mode
 10. Verify the scan tool parameter: Transmission OSS = 640 to 700 RPM
 - **If not between 640 and 700 RPM**
1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: K71 Transmission Control Module
 5. Ignition - On/Vehicle - In Service Mode
 6. Test for less than 1 V between the test points: Signal circuit terminal 6 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V
 7. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 8. Ignition/Vehicle - Off
 9. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 10. Test for infinite resistance between the test points: Signal circuit terminal 6 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
 11. Test for less than 2 Ω between the test points: Signal circuit terminal 6 @ Component harness & Terminal 14 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module
- **Go to next step: If between 640 and 700 RPM**

11. Remove the component: Transmission Cover
12. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
13. Ignition/Vehicle - Off
14. Disconnect the electrical connector: B14A Transmission Output Shaft Speed Sensor
15. Ignition - On/Vehicle - In Service Mode
16. Test for 8.3 to 9.6 V between the test points: 9 V Reference circuit terminal 1 & Ground
 - **If not between 8.3 and 9.6 V**

Replace the component: Automatic Transmission Wiring Harness

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

17. Ignition Off
18. Install the special tool: - **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 300 Hz
 - Set the duty cycle to 50%
 - Black lead @ Ground
 - Red lead @ Signal circuit terminal 2
19. Ignition - On/Vehicle - In Service Mode
20. Verify the scan tool parameter: Transmission OSS = 640 to 700 RPM
 - **If not between 640 and 700 RPM**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If between 640 and 700 RPM**

21. Replace the component: B14A Transmission Output Shaft Speed Sensor

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Automatic Transmission Output Speed Sensor Replacement](#)
- Refer to [Automatic Transmission Wiring Harness Replacement](#)
- Perform the necessary programming and setup procedure: [Solenoid Valve Characterization Reprogramming](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0741, P2817 OR P2818: TORQUE CONVERTER CLUTCH (TCC) SYSTEM STUCK OFF/TRANSMISSION CONTROL SOLENOID VALVE 8 STUCK

Diagnostic Instructions

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

DTC Descriptor

DTC P0741

Torque Converter Clutch (TCC) System Stuck Off

DTC P2817

Transmission Control Solenoid Valve 8 Stuck Off

DTC P2818

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Q77H Transmission Control Solenoid Valve 8	P0741, P2817, P2818	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
Torque Converter Clutch Control Valve	P0741, P2817, P2818	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
• Torque Converter Clutch Regulator Apply Valve • Valve Spring • Valve Body Bore	P0741, P2817, P2818	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
• Torque Converter Clutch Blowoff Ball Valve • Torque Converter Clutch Blowoff Ball Valve Spring • Torque Converter Clutch Blowoff Ball Valve Retainer	P0741, P2817, P2818	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
Torque Converter Assembly - Torque Converter Clutch	P0741, P2817, P2818	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Clutch Piston • Clutch Housing • Gasket • O-Ring • Seal • Damaged or worn component: • Torque converter clutch friction lining worn. • Clutch Piston • Clutch Housing

The solenoid valve is used to regulate fluid pressure to other transmission control valves for torque converter clutch operation. DTC P0741, P2817, P2818 sets only when there is a hydraulic/mechanical problem.

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

Description and Operation

- Park - Engine Running (Hydraulic Circuits Without ETRS) Park - Engine Running (Hydraulic Circuits With ETRS) Park - Engine Running (Mechanical Powerflow)
- Reverse (Hydraulic Circuits Without ETRS) Reverse (Hydraulic Circuits With ETRS) Reverse (Mechanical Powerflow)
- Neutral - Engine Running (Hydraulic Circuits Without ETRS) Neutral - Engine Running (Hydraulic Circuits With ETRS) Neutral - Engine Running (Mechanical Powerflow)
- Drive Range, First Gear (Hydraulic Circuits Without ETRS) Drive Range, First Gear (Hydraulic Circuits With ETRS) Drive Range, First Gear (Mechanical Powerflow)
- Drive Range, Second Gear (Hydraulic Circuits Without ETRS) Drive Range, Second Gear (Hydraulic Circuits With ETRS) Drive Range, Second Gear (Mechanical Powerflow)
- Drive Range, Third Gear (Hydraulic Circuits Without ETRS) Drive Range, Third Gear (Hydraulic Circuits With ETRS) Drive Range, Third Gear (Mechanical Powerflow)
- Drive Range, Fourth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fourth Gear (Hydraulic Circuits With ETRS) Drive Range, Fourth Gear (Mechanical Powerflow)
- Drive Range, Fifth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fifth Gear (Hydraulic Circuits With ETRS) Drive Range, Fifth Gear (Mechanical Powerflow)
- Drive Range, Sixth Gear (Hydraulic Circuits Without ETRS) Drive Range, Sixth Gear (Hydraulic Circuits With ETRS) Drive Range, Sixth Gear (Mechanical Powerflow)
- Drive Range, Seventh Gear (Hydraulic Circuits Without ETRS) Drive Range, Seventh Gear (Hydraulic Circuits With ETRS) Drive Range, Seventh Gear (Mechanical Powerflow)
- Drive Range, Eighth Gear (Hydraulic Circuits Without ETRS) Drive Range, Eighth Gear (Hydraulic Circuits With ETRS) Drive Range, Eighth Gear (Mechanical Powerflow)
- Drive Range, Ninth Gear (Hydraulic Circuits Without ETRS) Drive Range, Ninth Gear (Hydraulic Circuits With ETRS) Drive Range, Ninth Gear (Mechanical Powerflow)

Conditions for Running the DTC

- DTC P281B, P281D, P281E = Not set
- Accelerator Pedal Position = 0 to 1%
- Battery Voltage = Greater than 9 V
- Engine Speed = Greater than 400 RPM
- Engine Torque = 55 to 800 N.m (40 to 590 lb ft)
- High Side Driver 2 = On
- Ignition = On
- Power Mode Status = Accessory or Ignition
- Transmission Fluid Temperature = 7 to 130 °C (20 to 266 °F)
- Transmission Range = P, R, N
- Vehicle Speed = 3 to 9 km/h (2 to 6 MPH)

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

Conditions for Setting the DTC

P0741

Torque Converter Clutch Control Valve = Stuck Off

P2817

Torque Converter Clutch = Not applied

P2818

Torque Converter Clutch = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC - Exceptions listed below

- Autostart/Autostop = Disabled
- Neutral Idle Mode = Disabled
- Torque Converter Clutch = On
- Transmission Adaptive Pressure Control = Freeze current adapt values

DTC P2817 = Type B DTC

- Torque Converter Clutch = Off
- Transmission Adaptive Pressure Control = Freeze current adapt values

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC - Exceptions listed below

DTC P2817 = Type B DTC

Diagnostic Aids

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

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

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

Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. Ignition - On/Vehicle - In Service Mode
3. Clear DTCs
4. Road test the vehicle. - Refer to **Road Test**
5. Verify DTC P0716, P0717, P0721, P0722, P0723, P0741, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2817, P2818 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077D, P07C0, P176B, P176C, P176C, P176D, P17D3 is set**

Refer to: [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- If DTC P0741, P2817, P2818 is set

Refer to Diagnostic Fault Information

- Go to next step: If none of the DTCs are 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 P0716, P0717, P0721, P0722, P0723, P0741, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2817, P2818 is not set.

- If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077D, P07C0, P176B, P176C, P176C, P176D, P17D3 is set

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- If DTC P0741, P2817, P2818 is set

Refer to Diagnostic Fault Information

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

7. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Torque Converter Replacement](#)
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#), [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0746 OR P0747: TRANSMISSION CONTROL SOLENOID VALVE 1 STUCK OFF/ON

Diagnostic Instructions

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

DTC Descriptor

DTC P0746

Transmission Control Solenoid Valve 1 Stuck Off

DTC P0747

Transmission Control Solenoid Valve 1 Stuck On

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition

Component	DTC	Condition
Q77A Transmission Control Solenoid Valve 1	P0746, P0747	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
• 1-2-3-4-5-6 Clutch Regulator Valve • Valve Spring • Valve Body Bore	P0746, P0747	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
• 1-2-3-4-5-6 Clutch Boost Valve • Valve Spring • Valve Spring	P0746, P0747	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
1-2-3-4-5-6 Clutch Assembly - Oil Feed Circuit	P0746, P0747	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Gasket • O-Ring • Seal
1-2-3-4-5-6 Clutch Assembly	P0746, P0747	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Clutch Piston • Clutch Housing • Gasket • O-Ring • Seal • Binding, sticking or stuck component: Clutch Plates • Damaged or worn component: • Clutch Plates • Clutch Piston • Clutch Housing

Circuit/System Description

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

DTC P0746, P0747 sets only when there is a hydraulic/mechanical problem.

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

- Park - Engine Running (Hydraulic Circuits Without ETRS) Park - Engine Running (Hydraulic Circuits With ETRS) Park - Engine Running (Mechanical Powerflow)
- Reverse (Hydraulic Circuits Without ETRS) Reverse (Hydraulic Circuits With ETRS) Reverse (Mechanical Powerflow)
- Neutral - Engine Running (Hydraulic Circuits Without ETRS) Neutral - Engine Running (Hydraulic Circuits With ETRS) Neutral - Engine Running (Mechanical Powerflow)
- Drive Range, First Gear (Hydraulic Circuits Without ETRS) Drive Range, First Gear (Hydraulic Circuits With ETRS) Drive Range, First Gear (Mechanical Powerflow)
- Drive Range, Second Gear (Hydraulic Circuits Without ETRS) Drive Range, Second Gear (Hydraulic Circuits With ETRS) Drive Range, Second Gear (Mechanical Powerflow)
- Drive Range, Third Gear (Hydraulic Circuits Without ETRS) Drive Range, Third Gear (Hydraulic Circuits With ETRS) Drive Range, Third Gear (Mechanical Powerflow)
- Drive Range, Fourth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fourth Gear (Hydraulic Circuits With ETRS) Drive Range, Fourth Gear (Mechanical Powerflow)
- Drive Range, Fifth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fifth Gear (Hydraulic Circuits With ETRS) Drive Range, Fifth Gear (Mechanical Powerflow)
- Drive Range, Sixth Gear (Hydraulic Circuits Without ETRS) Drive Range, Sixth Gear (Hydraulic Circuits With ETRS) Drive Range, Sixth Gear (Mechanical Powerflow)
- Drive Range, Seventh Gear (Hydraulic Circuits Without ETRS) Drive Range, Seventh Gear (Hydraulic Circuits With ETRS) Drive Range, Seventh Gear (Mechanical Powerflow)
- Drive Range, Eighth Gear (Hydraulic Circuits Without ETRS) Drive Range, Eighth Gear (Hydraulic Circuits With ETRS) Drive Range, Eighth Gear (Mechanical Powerflow)
- Drive Range, Ninth Gear (Hydraulic Circuits Without ETRS) Drive Range, Ninth Gear (Hydraulic Circuits With ETRS) Drive Range, Ninth Gear (Mechanical Powerflow)

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Engine Speed = 400 RPM
- High Side Driver 1, 2 = On
- Ignition/Vehicle = On

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

Conditions for Setting the DTC

P0746

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

P0747

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

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A

- 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 Values Learn = Freeze current adapt values

- {P0746} Transmission gear allowed = Reverse or Gear 7
- {P0747} Engine Torque = Less than a predefined threshold
- {P0747} Transmission gear allowed = Reverse or Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A

Diagnostic Aids

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

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to [Transmission Fluid Level and Condition Check](#)
 - **If a condition exists**
Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. Ignition - On/Vehicle - In Service Mode
3. Clear DTCs
4. Road test the vehicle. - Refer to [Road Test](#)
5. Verify DTC P0716, P0717, P0721, P0722, P0723, P0746, P0747, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P0746, P0747 is set**
Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are 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 P0716, P0717, P0721, P0722, P0723, P0746, P0747, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is not set.

- **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- If DTC P0746, P0747 is set

Refer to Diagnostic Fault Information

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

7. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing Disassemble](#) - 1-2-3-4-5-6 Clutch Assembly
- Refer to [Clutch Plate Diagnosis](#)
- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#), [Control Valve Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#), [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0776 OR P0777: TRANSMISSION CONTROL SOLENOID VALVE 2 STUCK OFF/ON

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: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Q77B Transmission Control Solenoid Valve 2	P0776, P0777	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
• 2-9 Clutch Regulator Valve • Valve Spring • Valve Body Bore	P0776, P0777	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring

Component	DTC	Condition
2-9 Clutch Assembly - Oil Feed Circuit	P0776, P0777	- Blocked or restricted component: Fluid/oil passage - Leaking component: - Gasket - O-Ring - Seal
2-9 Clutch Assembly	P0776, P0777	- Blocked or restricted component: Fluid/oil passage - Leaking component: - Clutch Piston - Clutch Housing - Gasket - O-Ring - Seal - Binding, sticking or stuck component: Clutch Plates - Damaged or worn component: - Clutch Plates - Clutch Piston - Clutch Housing

Circuit/System Description

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

DTC P0776, P0777 sets only when there is a hydraulic/mechanical problem.

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

- [Park - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Park - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Park - Engine Running \(Mechanical Powerflow\)](#)
- [Reverse \(Hydraulic Circuits Without ETRS\)](#) [Reverse \(Hydraulic Circuits With ETRS\)](#) [Reverse \(Mechanical Powerflow\)](#)
- [Neutral - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Neutral - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Neutral - Engine Running \(Mechanical Powerflow\)](#)
- [Drive Range, First Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, First Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, First Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Second Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Second Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Second Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Third Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Third Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Third Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fourth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Fourth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Fourth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fifth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Fifth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Fifth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Sixth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Sixth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Sixth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Seventh Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Seventh Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Seventh Gear \(Mechanical Powerflow\)](#)

- [Drive Range, Eighth Gear \(Hydraulic Circuits Without ETRS\), Drive Range, Eighth Gear \(Hydraulic Circuits With ETRS\), Drive Range, Eighth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Ninth Gear \(Hydraulic Circuits Without ETRS\), Drive Range, Ninth Gear \(Hydraulic Circuits With ETRS\), Drive Range, Ninth Gear \(Mechanical Powerflow\)](#)

Conditions for Running the DTC

- Battery Voltage = 11 to 32 V
- High Side Driver 2 = On
- Ignition = On
- Power Mode Status = Accessory or Ignition

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

Conditions for Setting the DTC

P0776

Clutch 2-9 = Not applied

P0777

Clutch 2-9 = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- 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 Values Learn = Freeze current adapt values
- {P0776} Transmission gear allowed = Reverse or Gear 5
- {P0777} Transmission gear allowed = Gear 2 or Gear 9

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

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

Reference Information

Component View Reference

[Transmission Solenoid Information](#)

DTC Type Reference

[Powertrain Diagnostic Trouble Code \(DTC\) Type Definitions](#)

Scan Tool Reference

[Control Module References](#)

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 DTC P0716, P0717, P0721, P0722, P0723, P0776, P0777, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is not set.

- **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **If DTC P0776 or P0777 is set**

Refer to Diagnostic Fault Information

- **Go to next step: If none of the DTCs are 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 P0716, P0717, P0721, P0722, P0723, P0776, P0777, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is not set.

- **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **If DTC P0776 or P0777 is set**

Refer to Diagnostic Fault Information

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

7. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [2-9 and 4 Clutch Piston Housing Disassemble](#) - 2-9 Clutch Assembly
- Refer to [Clutch Plate Diagnosis](#)
- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0796 OR P0797: TRANSMISSION CONTROL SOLENOID VALVE 3 STUCK OFF/ON

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: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Q77C Transmission Control Solenoid Valve 3	P0796, P0797	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
• 3-8 Clutch Regulator Valve • Valve Spring • Valve Body Bore	P0796, P0797	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
3-8 Clutch Assembly - Oil Feed Circuit	P0796, P0797	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Gasket • O-Ring • Seal

Component	DTC	Condition
3-8 Clutch Assembly	P0796, P0797	- Blocked or restricted component: Fluid/oil passage - Leaking component: - Clutch Piston - Clutch Housing - Gasket - O-Ring - Seal - Binding, sticking or stuck component: Clutch Plates - Damaged or worn component: - Clutch Plates - Clutch Piston - Clutch Housing

Circuit/System Description

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

DTC P0796, P0797 sets only when there is a hydraulic/mechanical problem.

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

- [Park - Engine Running \(Hydraulic Circuits Without ETRS\)](#), [Park - Engine Running \(Hydraulic Circuits With ETRS\)](#), [Park - Engine Running \(Mechanical Powerflow\)](#)
- [Reverse \(Hydraulic Circuits Without ETRS\)](#), [Reverse \(Hydraulic Circuits With ETRS\)](#), [Reverse \(Mechanical Powerflow\)](#)
- [Neutral - Engine Running \(Hydraulic Circuits Without ETRS\)](#), [Neutral - Engine Running \(Hydraulic Circuits With ETRS\)](#), [Neutral - Engine Running \(Mechanical Powerflow\)](#)
- [Drive Range, First Gear \(Hydraulic Circuits Without ETRS\)](#), [Drive Range, First Gear \(Hydraulic Circuits With ETRS\)](#), [Drive Range, First Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Second Gear \(Hydraulic Circuits Without ETRS\)](#), [Drive Range, Second Gear \(Hydraulic Circuits With ETRS\)](#), [Drive Range, Second Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Third Gear \(Hydraulic Circuits Without ETRS\)](#), [Drive Range, Third Gear \(Hydraulic Circuits With ETRS\)](#), [Drive Range, Third Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fourth Gear \(Hydraulic Circuits Without ETRS\)](#), [Drive Range, Fourth Gear \(Hydraulic Circuits With ETRS\)](#), [Drive Range, Fourth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fifth Gear \(Hydraulic Circuits Without ETRS\)](#), [Drive Range, Fifth Gear \(Hydraulic Circuits With ETRS\)](#), [Drive Range, Fifth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Sixth Gear \(Hydraulic Circuits Without ETRS\)](#), [Drive Range, Sixth Gear \(Hydraulic Circuits With ETRS\)](#), [Drive Range, Sixth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Seventh Gear \(Hydraulic Circuits Without ETRS\)](#), [Drive Range, Seventh Gear \(Hydraulic Circuits With ETRS\)](#), [Drive Range, Seventh Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Eighth Gear \(Hydraulic Circuits Without ETRS\)](#), [Drive Range, Eighth Gear \(Hydraulic Circuits With ETRS\)](#), [Drive Range, Eighth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Ninth Gear \(Hydraulic Circuits Without ETRS\)](#), [Drive Range, Ninth Gear \(Hydraulic Circuits With ETRS\)](#), [Drive Range, Ninth Gear \(Mechanical Powerflow\)](#)

Conditions for Running the DTC

- Battery Voltage = 11 to 32 V
- High Side Driver 2 = On

- Ignition = On
- Power Mode Status = Accessory or Ignition

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

Conditions for Setting the DTC

P0796

Clutch 3-8 = Not applied

P0797

Clutch 3-8 = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- 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 Values Learn = Freeze current adapt values
- {P0796} Transmission gear allowed = Reverse or Gear 5
- {P0797} Transmission gear allowed = Reverse or Gear 3 or Gear 8

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

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

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

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

- **If a condition exists**

Repair or replace as necessary.

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

2. Ignition - On/Vehicle - In Service Mode

3. Clear DTCs

4. Road test the vehicle. Refer to: [Road Test](#)

5. Verify DTC P0716, P0717, P0721, P0722, P0723, P0796, P0797, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is not set.

- If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- If DTC P0796 or P0797 is set

Refer to Diagnostic Fault Information

- Go to next step: If none of the DTCs are 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 P0716, P0717, P0721, P0722, P0723, P0796, P0797, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is not set.

- If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- If DTC P0796 or P0797 is set

Refer to Diagnostic Fault Information

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

7. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Clutch Plate Diagnosis](#)
- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Replacement](#)
- Perform the necessary programming and setup procedure: [Solenoid Valve Characterization Reprogramming](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0815, P0816 OR P0826: UP AND DOWN SHIFT SWITCH CIRCUITS

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	P0815, P0816, P0826	-	-	-
Ground	-	-	-	-

Typical Scan Tool Data**K9 Body Control Module Up and Down Shift Switch**

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition - On/Vehicle - In Service Mode Parameter Normal Range: ON			
Signal	ON	OFF	ON
Ground	-	-	-

Typical Scan Tool Data**K71 Transmission Control Module Up and Down Shift Switch**

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition - On/Vehicle - In Service Mode Parameter Normal Range: • Inactive • In Transition • Upshift • Downshift			
Signal	Invalid	None	None
Ground	-	None	-

Circuit/System Description

For an overview of the component/system, refer to [Manual Mode Description and Operation](#)

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.

Component	Description
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs. The control module receives information from a variety of sensors, switches and serial data information from other control modules. This information is used to control a combination of solenoid valves to obtain the correct line pressure, gear ratio and torque converter clutch operation.
S2 Transmission Manual Shift Switch	The switch S2 has an internal resistor ladder network. A specific resistance is generated dependent on the position of the switch. S2 is part of the component: Transmission Control Lever Knob

The switches 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 switch 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

- DTC P0815, P0816, P0826, P1761 = Not set
- Engine Speed = 400 to 7, 500 RPM
- Greater than 1 s since last transmission shift operation.
- Ignition Voltage = Greater than 9 V

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

P0826

- DTC P1761 = Not set
- Engine Speed = 400 to 7, 500 RPM
- Ignition Voltage = Greater than 9 V

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

Conditions for Setting the DTC

P0815

Condition 1

- Up and Down Shift Switch = Upshift
- Transmission Range = Park or Neutral or Reverse

The above conditions must occur for greater than 1 s.

Condition 2

- Up and Down Shift Switch = Upshift
- Transmission Range = Forward Gear

The above condition(s) must occur for greater than 2 min.

P0816

Condition 1

- Up and Down Shift Switch = Downshift
- Transmission Range = Park or Neutral or Reverse

The above conditions must occur for greater than 1 s.

Condition 2

- Up and Down Shift Switch = Downshift
- Transmission Range = Forward Gear

The above condition(s) must occur for greater than 2 min.

P0826

Up and Down Shift Switch = Invalid

The above condition(s) must occur for greater than 1 min.

Actions Taken When the DTC Sets

DTC P0815, P0816, P0826 = Type C

Manual Shift Control = Disabled

Conditions for Clearing the DTC

DTC P0815, P0816, P0826 = Type C

Diagnostic Aids

A high resistance or short to voltage in the signal circuit will not set a DTC.

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H)).

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

WARNING: Refer to [Parking Brake and Drive Wheels Warning](#) .

1. Ignition - On/Vehicle - In Service Mode

2. Operate the component: S3 Transmission Shift Lever - L

Verify the scan tool parameter: Driver Shift Control Mode Switch @ Body Control Module = Active or On

- **If not the specified state**

Refer to Circuit/System Testing

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

3. Press and hold the switch: S2 Transmission Manual Shift Switch - Upshift

Verify the scan tool parameter: Driver Shift Control Mode Switch = Up or Upshift

- **If not the specified state**

Refer to Circuit/System Testing

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

4. Press and hold the switch: S2 Transmission Manual Shift Switch - Downshift

Verify the scan tool parameter: Driver Shift Control Mode Switch = Down or Downshift

- **If not the specified state**

Refer to Circuit/System Testing

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

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

Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing

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

6. All OK.

Circuit/System Testing

NOTE: Circuit/System Verification must be performed before proceeding with 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. Remove the component: Transmission Control Lever Knob

3. Disconnect the electrical connector: S2 Transmission Manual Shift Switch

4. Test for less than 10 Ω between the test points: Low Reference circuit terminal 12 @ Component harness & Ground

- **If 10 Ω or greater**

1. Disconnect the appropriate ground connection:

2. Test for less than 2 Ω between the test points: Low Reference circuit terminal 12 @ Component harness & The other end of the circuit

- If 2 Ω or greater - Repair the open/high resistance in the circuit.

- If less than 2 Ω - Repair the open/high resistance in the ground connection.

- **Go to next step: If less than 10 Ω**

5. Ignition - On/Vehicle - In Service Mode

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

or Off

- **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 11 @ Component harness & 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**

7. Connect a 3 A fused jumper wire between the test points: Signal circuit terminal 11 @ Component harness & Ground circuit terminal 12

8. Verify the scan tool parameter: Driver Shift Control Mode Switch = Error or 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 11 @ Component harness & Ground

- If 1 V or greater - Repair the short to voltage on the circuit.
- If less than 1 V

5. Ignition/Vehicle - Off

6. Test for less than 2 Ω between the test points: Signal circuit terminal 11 @ Component harness & The other end of the circuit

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K9 Body Control Module

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

9. Test or replace the component: Transmission Control Lever Knob

Component Testing

1. Ignition/Vehicle - Off

2. Remove the component: Transmission Control Lever Knob

3. Disconnect the electrical connector: S2 Transmission Manual Shift Switch

4. Test for 5, 900 to 6, 400 Ω between the test points: Signal terminal 11 & Ground circuit terminal 12

- **If not between 5, 900 and 6, 400 Ω**

Replace the component: Transmission Control Lever Knob

- **Go to next step: If between 5, 900 and 6, 400 Ω**

5. Press and hold the switch: S2 Transmission Manual Shift Switch - Downshift

6. Test for 1, 900 to 2, 100 k Ω between the test points: Signal terminal 11 & Ground circuit terminal 12

- **If not between 1, 900 to 2, 100 k Ω**

Replace the component: Transmission Control Lever Knob

- **Go to next step: If between 1, 900 to 2, 100 k Ω**

7. Press and hold the switch: S2 Transmission Manual Shift Switch - Upshift

8. Test for 600 to 660 Ω between the test points: Signal terminal 11 & Ground circuit terminal 12

- **If not between 600 and 660 Ω**

Replace the component: Transmission Control Lever Knob

- **Go to next step: If not between 600 and 660 Ω**

9. 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: Transmission Control Lever Knob

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

10. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Transmission Control Lever Knob Replacement](#)
- For the system learn/reset procedure, refer to [Transmission Service Fast Learn Procedure](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P08CA OR P08CB: TRANSMISSION CONTROL SOLENOID VALVE 11 CONTROL CIRCUIT LOW/HIGH VOLTAGE

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 P08CA

Transmission Control Solenoid Valve 11 Control Circuit Low Voltage

DTC P08CB

Transmission Control Solenoid Valve 11 Control Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 28	P2670	P2670	P2671	-
Control - Terminal 10	P282F	P282F	P08CB	-

Typical Scan Tool Data

Transmission Control Solenoid Valve 11 Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine idling. Parameter Normal Range: OK or Not Run			
Control - Terminal 28	Malfunction	Malfunction	-
Control - Terminal 10	Malfunction	Malfunction	-

Transmission Control Solenoid Valve 11 Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine idling. Parameter Normal Range: OK or Not Run			
Control - Terminal 28	-	-	Malfunction
Control - Terminal 10	-	-	Malfunction

Circuit/System Description

For an overview of the component/system, refer to [Electronic Component Description](#)

Circuit	Description
Control - Terminal 28	Supplied by a control module.
Control - Terminal 10	The output circuit is switched to ground to activate the component.

Component	Description
Q77L Transmission Control Solenoid Valve 11	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

- Battery Voltage = 8 to 32 V
- Power Mode Status = Accessory or Run/Crank
- Run/Crank Voltage = Greater than 5 V

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

Conditions for Setting the DTC

P08CA

Control circuit = Short to Ground - For less than 1 s

P08CB

Control circuit = Short to Voltage - For less than 1 s

Actions Taken When the DTC Sets

DTC P08CA, P08CB = Type C

Actions Taken When the DTC Sets = None

Conditions for Clearing the DTC

DTC P08CA, P08CB = Type C

Reference Information

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\).](#)

- [COMPONENT CONNECTOR END VIEWS - INDEX](#)
- [INLINE HARNESS CONNECTOR END VIEWS - INDEX](#)

[Transmission Solenoid Information](#)

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

[Powertrain Diagnostic Trouble Code \(DTC\) Type Definitions](#)

[Control Module References](#)

[Circuit/System Verification](#)

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

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **Go to next step: If none of the DTCs are set**
3. Engine Running
4. Verify the scan tool parameter:
 - Transmission Control Solenoid Valve 11 Control Circuit Low Voltage Test Status = OK or Not Run
 - Transmission Control Solenoid Valve 11 Control Circuit High Voltage Test Status = OK or Not Run
 - **If not the specified state**

Refer to Circuit/System Testing
 - **Go to next step: If the specified state**
5. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. Verify the DTC does not set.
 - **If the DTC sets**

Refer to Circuit/System Testing
 - **Go to next step: If the DTC is not set**
6. All OK.

[Circuit/System Testing](#)

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: X175 @ T12 Automatic Transmission Assembly
3. Connect a test lamp between the test points: Control circuit terminal 28 & Ground

4. Ignition - On/Vehicle - In Service Mode

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 28 @ Component harness & Ground

- If less than infinite resistance - Repair the short to ground on the circuit.
- If infinite resistance

4. Test for less than 2 Ω between the test points: Control circuit terminal 28 @ Component harness & Terminal 49 @ Control module harness

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - 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 28 @ 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. Remove - Test Lamp

7. Ignition/Vehicle - Off

8. Disconnect the electrical connector: @ K71 Transmission Control Module

9. Test for less than 2 Ω between the test points: Control circuit terminal 10 @ Component harness & Terminal 22 @ Control module harness

- **If 2 Ω or greater - Repair the open/high resistance in the circuit.**
- **Go to next step: If less than 2 Ω**

10. Test for infinite resistance between the test points: Control circuit terminal 10 & Ground

- **If less than infinite resistance - Repair the short to ground on the circuit.**
- **Go to next step: If infinite resistance**

11. Ignition - On/Vehicle - In Service Mode

12. Test for less than 1 V between the test points: Control circuit terminal 10 & Ground

- **If 1 V or greater - Repair the short to voltage on the circuit.**
- **Go to next step: If less than 1 V**

13. Ignition/Vehicle - Off

14. Remove the component: Transmission Cover

15. Connect the electrical connector: X175 @ T12 Automatic Transmission Assembly

16. Disconnect the electrical connector: Q77L Transmission Control Solenoid Valve 11

17. Ignition - On/Vehicle - In Service Mode

18. Test for less than 1 V between the test points:

- Control circuit terminal 49 & Ground
- Control circuit terminal 22 & Ground
- **If 1 V or greater Replace the component: Automatic Transmission Wiring Harness**
- **Go to next step: If less than 1 V** If less than 1 V

19. Ignition/Vehicle - Off

20. Test for infinite resistance between the test points:

- Control circuit terminal 49 & Ground
- Control circuit terminal 22 & Ground
- **If less than infinite resistance - Replace the component:** Automatic Transmission Wiring Harness
- **Go to next step: If infinite resistance**

21. Connect a jumper wire between the test points: Control circuit terminal 1 & Control circuit terminal 2

22. Test for less than 4 Ω between the test points: Control circuit terminal 49 & Control circuit terminal 33

- **If 4 Ω or greater - Replace the component:** Automatic Transmission Wiring Harness
- **Go to next step: If less than 4 Ω**

NOTE: The component's temperature should be 19 to 21 $^{\circ}\text{C}$ (66 to 70 $^{\circ}\text{F}$) while testing.

23. Test for 19.0 to 19.9 Ω between the test points: Control terminal 1 & Control terminal 2

- **If not between 19.0 and 19.9 Ω**

Replace the component: Q77L Transmission Control Solenoid Valve 11

- **Go to next step: If between 19.0 and 19.9 Ω**

24. 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: Q77L Transmission Control Solenoid Valve 11

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

25. Replace the component: K71 Transmission Control Module

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Automatic Transmission Wiring Harness Replacement](#)
- Perform the necessary programming and setup procedure: [Solenoid Valve Characterization Reprogramming](#)
- Perform the scan tool learn/reset function: [Transmission Service Fast Learn Procedure](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P0960, P0962, P0963, P0964, P0966, P0967, P0968, P0970, P0971, P2670, P2671, P2718, P2720, P2721, P2812, P2814, P2815, P281B, P281D OR P281E: TRANSMISSION CONTROL SOLENOID VALVE 1, 2, 3, 4, 7, 8 CONTROL CIRCUIT/ACTUATOR HIGH CONTROL CIRCUIT GROUP 2 VOLTAGE

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 Voltage

DTC P0963

Transmission Control Solenoid Valve 1 Control Circuit High Voltage

DTC P0964

Transmission Control Solenoid Valve 2 Control Circuit Open

DTC P0966

Transmission Control Solenoid Valve 2 Control Circuit Low Voltage

DTC P0967

Transmission Control Solenoid Valve 2 Control Circuit High Voltage

DTC P0968

Transmission Control Solenoid Valve 3 Control Circuit Open

DTC P0970

Transmission Control Solenoid Valve 3 Control Circuit Low Voltage

DTC P0971

Transmission Control Solenoid Valve 3 Control Circuit High Voltage

DTC P2670

Actuator High Control Circuit Group 2 Low Voltage

DTC P2671

Actuator High Control Circuit Group 2 High Voltage

DTC P2718

Transmission Control Solenoid Valve 4 Control Circuit Open

DTC P2720

Transmission Control Solenoid Valve 4 Control Circuit Low Voltage

DTC P2721

Transmission Control Solenoid Valve 4 Control Circuit High Voltage

DTC P2812

Transmission Control Solenoid Valve 7 Control Circuit Open

DTC P2814

Transmission Control Solenoid Valve 7 Control Circuit Low Voltage

DTC P2815

Transmission Control Solenoid Valve 7 Control Circuit High Voltage

DTC P281B

DTC P281D

Transmission Control Solenoid Valve 8 Control Circuit Low Voltage

DTC P281E

Transmission Control Solenoid Valve 8 Control Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 2	P281D	P281B	P281E	-
Control - Terminal 3	P0966	P0964	P0967	-
Control - Terminal 4	P2720	P2718	P2721	-
Control - Terminal 18	P2814	P2812	P2815	-
Control - Terminal 19	P0962	P0960	P0963	-
Control - Terminal 20	P0970	P0968	P0971	-
Control - Terminal 49	1	P2670	P2671	-
1. Lost Communication with Transmission Control Module				

Typical Scan Tool Data**High Side Driver 2 Circuit High Voltage Test Status**

Circuit	Short to Ground	Open	Short to Voltage
Operation Conditions: Engine = Running Parameter Normal Range: OK or Not Run			
Control - Terminal 49	Not Run or OK	Not Run or OK	Malfunction

High Side Driver 2 Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: OK or Not Run			
Control - Terminal 49	Malfunction	Malfunction	Not Run or OK

High Side Driver 2 Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: Not Run or OK			
Control - Terminal 49	Malfunction	Malfunction	Not Run or OK

Transmission Control Solenoid Valve 1-4, 7, 8 Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: Not Run or OK			
Control - Terminal 2-4, 18-20	Not Run or OK	Not Run or OK	Malfunction

Transmission Control Solenoid Valve 1-4, 7, 8 Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: OK or Not Run			
Control - Terminal 2-4, 18-20	Malfunction	Malfunction	Not Run or OK

Transmission Control Solenoid Valve 1-4, 7, 8 Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Running Parameter Normal Range: OK or Not Run			
Control - Terminal 2-4, 18-20	Malfunction	Malfunction	Not Run or OK

Circuit/System Description

For an overview of the component/system, refer to [Electronic Component Description](#)

Circuit	Description
Control - Terminal 2-4, 18-20	The output circuit is switched to ground to activate the component. The output is PWM controlled.
Control - Terminal 49	The output circuit is switched to 12 V to activate the component.

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

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Ignition = On
- Ignition Voltage = 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
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled

- Powertrain braking = Disabled
- Tap Up & Tap Down = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Disabled
- {P0960, P0963} Transmission gear allowed = Reverse or Gear 1-6
- {P0962} Transmission gear allowed = Reverse or Gear 7, 8, 9
- {P0964, P0967} Transmission gear allowed = Reverse or Gear 1, 3-8
- {P0966} Transmission gear allowed = Gear 2, 9
- {P0968, P0971} Transmission gear allowed = Reverse
- {P0970} Transmission gear allowed = Gear 1-9
- {P2670} Transmission gear allowed = Park
- {P2718, P2721} Transmission gear allowed = Gear 1-3, 5-9
- {P2720} Transmission gear allowed = Park
- {P2812, P2815} Transmission gear allowed =
 - Park - If less than 5 km/h (3 MPH)
 - Neutral - If greater than 5 km/h (3 MPH)
- {P2814} Transmission gear allowed = Park

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H)).

Connector End View Reference

- [COMPONENT CONNECTOR END VIEWS - INDEX](#)
- [INLINE HARNESS CONNECTOR END VIEWS - INDEX](#)

Component View Reference

Transmission Solenoid Information

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Ignition On - Engine Running
2. Verify the scan tool parameter:
 - High Side Driver 2 Circuit Open Test Status = Not Run or OK
 - High Side Driver 2 Circuit Low Voltage Test Status = Not Run or OK

- High Side Driver 2 Circuit High Voltage Test Status = Not Run or OK
- Transmission Control Solenoid Valve 1-4, 7, 8 Control Circuit Open Test Status = Not Run or OK
- Transmission Control Solenoid Valve 1-4, 7, 8 Control Circuit Low Voltage Test Status = Not Run or OK
- Transmission Control Solenoid Valve 1-4, 7, 8 Control Circuit High Voltage Test Status = Not Run or OK
- **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: T12 Automatic Transmission Assembly
3. Connect a test lamp between the test points: Control circuit terminal 28 & Ground
4. Ignition - On/Vehicle - In Service Mode
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. Connect the electrical connector: T12 Automatic Transmission Assembly
2. Ignition/Vehicle - Off
3. Disconnect the electrical connector:
 - K71 Transmission Control Module
 - T12 Automatic Transmission Assembly
4. Test for infinite resistance between the test points: Control circuit terminal 28 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
5. Test for less than 2 Ω between the test points: Control circuit terminal 28 @ Component harness & Terminal 49 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module

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

1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
2. Ignition/Vehicle - Off
3. Disconnect the electrical connector:
 - K71 Transmission Control Module
 - T12 Automatic Transmission Assembly
4. Ignition - On/Vehicle - In Service Mode

5. Test for less than 1 V between the test points: Control circuit terminal 28 @ 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. Connect the electrical connector: T12 Automatic Transmission Assembly

7. Ignition/Vehicle - Off

8. Disconnect the electrical connector:

- K71 Transmission Control Module
- T12 Automatic Transmission Assembly

9. Test for less than 2 Ω between the test points:

- {P0960, P0962, P0963} Control circuit terminal 26 @ Component harness & Terminal 19 @ Control module harness
- {P0964, P0966, P0967} Control circuit terminal 27 @ Component harness & Terminal 3 @ Control module harness
- {P0968, P0970, P0971} Control circuit terminal 12 @ Component harness & Terminal 20 @ Control module harness
- {P2718, P2720, P2721} Control circuit terminal 25 @ Component harness & Terminal 4 @ Control module harness
- {P2812, P2814, P2815} Control circuit terminal 24 @ Component harness & Terminal 18 @ Control module harness
- {P281B, P281D, P281E} Control circuit terminal 14 @ Component harness & Terminal 2 @ Control module harness
- **If 2 Ω or greater**

Repair the open/high resistance in the circuit.

• **Go to next step: If less than 2 Ω**

10. Test for infinite resistance between the test points:

- {P0960, P0962, P0963} Control circuit terminal 26 @ Component harness & Ground
- {P0964, P0966, P0967} Control circuit terminal 27 @ Component harness & Ground
- {P0968, P0970, P0971} Control circuit terminal 12 @ Component harness & Ground
- {P2718, P2720, P2721} Control circuit terminal 25 @ Component harness & Ground
- {P2812, P2814, P2815} Control circuit terminal 24 @ Component harness & Ground
- {P281B, P281D, P281E} Control circuit terminal 14 @ Component harness & Ground
- **If less than infinite resistance**

Repair the short to ground on the circuit.

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

11. Ignition - On/Vehicle - In Service Mode

12. Test for less than 1 V between the test points:

- {P0960, P0962, P0963} Control circuit terminal 26 @ Component harness & Ground
- {P0964, P0966, P0967} Control circuit terminal 27 @ Component harness & Ground
- {P0968, P0970, P0971} Control circuit terminal 12 @ Component harness & Ground
- {P2718, P2720, P2721} Control circuit terminal 25 @ Component harness & Ground
- {P2812, P2814, P2815} Control circuit terminal 24 @ Component harness & Ground
- {P281B, P281D, P281E} Control circuit terminal 14 @ 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**

13. Connect the electrical connector: T12 Automatic Transmission Assembly

14. Ignition/Vehicle - Off

15. Disconnect the electrical connector: T12 Automatic Transmission Assembly

16. Remove the component: Transmission Cover

17. Connect the electrical connector: T12 Automatic Transmission Assembly

18. Disconnect the electrical connector: Q77 Transmission Control Solenoid Valve

19. Test for less than 2 Ω between the test points: Control circuit terminal 49 &

- {P0960, P0962, P0963} Terminal 1 @ Q77A Transmission Control Solenoid Valve 1
- {P0964, P0966, P0967} Terminal 1 @ Q77B Transmission Control Solenoid Valve 2
- {P0968, P0970, P0971} Terminal 1 @ Q77C Transmission Control Solenoid Valve 3
- {P2718, P2720, P2721} Terminal 1 @ Q77D Transmission Control Solenoid Valve 4
- {P2812, P2814, P2815} Terminal 1 @ Q77G Transmission Control Solenoid Valve 7
- {P281B, P281D, P281E} Terminal 1 @ Q77H Transmission Control Solenoid Valve 8
- **If 2 Ω or greater**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If less than 2 Ω**

20. Test for infinite resistance between the test points: Control circuit terminal 49 & Ground

- **If less than infinite resistance**

Replace the component: Automatic Transmission Wiring Harness

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

21. Test for less than 2 Ω between the test points:

- {P0960, P0962, P0963} Terminal 2 @ Q77A Transmission Control Solenoid Valve 1 - Electrical Connector & Control circuit terminal 19
- {P0964, P0966, P0967} Terminal 2 @ Q77B Transmission Control Solenoid Valve 2 - Electrical Connector & Control circuit terminal 3
- {P0968, P0970, P0971} Terminal 2 @ Q77C Transmission Control Solenoid Valve 3 - Electrical Connector & Control circuit terminal 20
- {P2718, P2720, P2721} Terminal 2 @ Q77D Transmission Control Solenoid Valve 4 - Electrical Connector & Control circuit terminal 4
- {P2812, P2814, P2815} Terminal 2 @ Q77G Transmission Control Solenoid Valve 7 - Electrical Connector & Control circuit terminal 18
- {P281B, P281D, P281E} Terminal 2 @ Q77H Transmission Control Solenoid Valve 8 - Electrical Connector & Control circuit terminal 2
- **If 2 Ω or greater**

Replace the component: Automatic Transmission Wiring Harness

- **Go to next step: If less than 2 Ω**

22. Test for infinite resistance between the test points: Ground &

- {P0960, P0962, P0963} Terminal 2 @ Q77A Transmission Control Solenoid Valve 1 - Electrical Connector
- {P0964, P0966, P0967} Terminal 2 @ Q77B Transmission Control Solenoid Valve 2 - Electrical Connector
- {P0968, P0970, P0971} Terminal 2 @ Q77C Transmission Control Solenoid Valve 3 - Electrical Connector
- {P2718, P2720, P2721} Terminal 2 @ Q77D Transmission Control Solenoid Valve 4 - Electrical Connector
- {P2812, P2814, P2815} Terminal 2 @ Q77G Transmission Control Solenoid Valve 7 - Electrical Connector

- {P281B, P281D, P281E} Terminal 2 @ Q77H Transmission Control Solenoid Valve 8 - Electrical Connector

- **If less than infinite resistance**

Replace the component: Automatic Transmission Wiring Harness

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

23. Test for infinite resistance between the test points: Control circuit terminal 49 &

- {P0960, P0962, P0963} Control circuit terminal 19
- {P0964, P0966, P0967} Control circuit terminal 3
- {P0968, P0970, P0971} Control circuit terminal 20
- {P2718, P2720, P2721} Control circuit terminal 4
- {P2812, P2814, P2815} Control circuit terminal 18
- {P281B, P281D, P281E} Control circuit terminal 2
- **If less than infinite resistance**

Replace the component: Automatic Transmission Wiring Harness

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

24. Test or replace the component: Q77 Transmission Control Solenoid Valve

Component Testing

1. Test the resistance between the test points: Terminal 1 @ Q77 Transmission Control Solenoid Valve & Terminal 2 @ Q77 Transmission Control Solenoid Valve

Verify the value is within the range listed in the table: [Transmission Solenoid Information](#)

- **If not in the specified range**

Replace the component: Q77 Transmission Control Solenoid Valve

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

2. Test for infinite resistance between the test points: Terminal 1 @ Q77 Transmission Control Solenoid Valve & Ground

- **If less than infinite resistance**

Replace the component: Q77 Transmission Control Solenoid Valve

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

3. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Automatic Transmission Wiring Harness Replacement](#)
- Refer to [Control Valve Body Cover Removal](#)
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC P171A, P171B, P171C: TRANSMISSION ACCUMULATOR SOLENOID VALVE CONTROL CIRCUIT

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 P171A

Transmission Accumulator Solenoid Valve Control Circuit

DTC P171B

Transmission Accumulator Solenoid Valve Control Circuit Low Voltage

DTC P171C

Transmission Accumulator Solenoid Valve Control Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 1 @ B280 Automatic Transmission Accumulator Solenoid Valve	P171B	P171B, P171C	P171C	P171A
Control - Terminal 2 @ B280 Automatic Transmission Accumulator Solenoid Valve	P171B	P171B	P171C	P171A

Typical Scan Tool Data

Transmission Accumulator Solenoid Valve Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Idling Parameter Normal Range: Not Run or OK			
Control - Terminal 1 @ B280 Automatic Transmission Accumulator Solenoid Valve	Malfunction	Not Run or OK	Not Run or OK
Control - Terminal 2 @ B280 Automatic Transmission Accumulator Solenoid Valve	Malfunction	Not Run or OK	Not Run or OK

Transmission Accumulator Solenoid Valve Control Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Idling Parameter Normal Range: Not Run or OK			
Control - Terminal 1 @ B280 Automatic Transmission Accumulator Solenoid Valve	Not Run or OK	Malfunction	Not Run or OK
Control - Terminal 2 @ B280 Automatic Transmission Accumulator Solenoid Valve	Not Run or OK	Malfunction	Not Run or OK

Transmission Accumulator Solenoid Valve Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine = Idling Parameter Normal Range: Not Run or OK			

Circuit	Short to Ground	Open	Short to Voltage
Control - Terminal 1 @ B280 Automatic Transmission Accumulator Solenoid Valve	Not Run or OK	Not Run or OK	Malfunction
Control - Terminal 2 @ B280 Automatic Transmission Accumulator Solenoid Valve	Not Run or OK	Not Run or OK	Malfunction

Circuit/System Description

For an overview of the component/system, refer to: [Electronic Component Description](#)

Circuit	Description
Control - Terminal 1 @ B280 Automatic Transmission Accumulator Solenoid Valve	The output circuit is switched to 12 V to activate the component.
Control - Terminal 2 @ B280 Automatic Transmission Accumulator Solenoid Valve	The output circuit is switched to ground to activate the component.

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

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Ignition = On
- Ignition Voltage = 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

P171A

Control circuit = Open/High Resistance - For greater than 1 s

P171B

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

P171C

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

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

- Autostart/Autostop = Disabled
- {P171B} Transmission Adaptive Values Learn = Freeze current adapt values

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H))

Connector End View Reference

- **COMPONENT CONNECTOR END VIEWS - INDEX**
- **INLINE HARNESS CONNECTOR END VIEWS - INDEX**

Component View Reference

Transmission Solenoid Information

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. 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, P2727, P2729, P2730, P2736, P2738, P2739, P2826, P2827, P282F or P2830**

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

3. Clear DTCs
4. Perform the scan tool control function: Transmission Accumulator Solenoid Valve - On and Off

Verify the scan tool parameter:

- Transmission Accumulator Solenoid Valve Control Circuit Open Test Status = Not Run or OK
- Transmission Accumulator Solenoid Valve Control Circuit Low Voltage Test Status = Not Run or OK
- Transmission Accumulator Solenoid Valve Control Circuit High Voltage Test Status = Not Run or OK
- **If not the specified state**

Refer to Circuit/System Testing

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

5. Perform the scan tool control function: Transmission Accumulator Solenoid Valve - On and Off

Verify a click can be heard or felt at the component when it is turned On and Off:

- **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**

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

1. Ignition/Vehicle - Off

2. Disconnect the electrical connector: B280 Automatic Transmission Accumulator Solenoid Valve

3. Connect a test lamp between the test points: Control circuit terminal 1 & Ground

4. Ignition - On/Vehicle - In Service Mode

5. Perform the scan tool control function: High Side Driver 1 - 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 1 @ Component harness & Ground

- If less than infinite resistance - Repair the short to ground on the circuit.
- If infinite resistance

4. Test for less than 2 Ω between the test points: Control circuit terminal 1 @ Component harness & Terminal 33 @ Control module harness

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - 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**

6. Remove - Test Lamp

7. Ignition/Vehicle - Off

8. Disconnect the electrical connector: K71 Transmission Control Module
9. Test for less than 2 Ω between the test points: Control circuit terminal 2 @ Component harness & Terminal 24 @ Control module harness
- **If 2 Ω or greater**
Repair the open/high resistance in the circuit.
 - **Go to next step: If less than 2 Ω**
10. Test for infinite resistance between the test points: Control circuit terminal 2 & Ground
- **If less than infinite resistance**
Repair the short to ground on the circuit.
 - **Go to next step: If infinite resistance**
11. Ignition - On/Vehicle - In Service Mode
12. Test for less than 1 V between the test points: Control circuit terminal 2 & Ground
- **If 1 V or greater**
Repair the short to voltage on the circuit.
 - **Go to next step: If less than 1 V**
13. Ignition/Vehicle - Off

NOTE: The component's temperature should be 19 to 21 $\text{^\circ C}$ (66 to 70 $\text{^\circ F}$) while testing.

14. Test for 17 to 19 Ω between the test points: Control terminal 1 & Control terminal 2
- **If not between 17 and 19 Ω**
Replace the component: B280 Automatic Transmission Accumulator Solenoid Valve
 - **Go to next step: If between 17 and 19 Ω**
15. 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**
16. Replace the component: K71 Transmission Control Module

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Auxiliary Fluid Accumulator Removal](#)
- Refer to [Auxiliary Fluid Accumulator Installation](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P171D: TRANSMISSION ACCUMULATOR SYSTEM PERFORMANCE

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 Accumulator System Performance

Diagnostic Fault Information

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 • 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 \(Hydraulic Circuits Without ETRS\)](#), [Park - Engine Running \(Hydraulic Circuits With ETRS\)](#), [Park - Engine Running \(Mechanical Powerflow\)](#).

Conditions for Running the DTC

- Ignition = On
- Ignition Voltage = Greater than 9 V
- Transmission Fluid Temperature = 0 to 110 Å, Å°C (32 to 230 Å, Å°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](#)

Control Module References

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](#)

- Refer to [Auxiliary Fluid Accumulator Installation](#)
- Refer to [Auxiliary Fluid Accumulator Removal](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P175E: TRANSMISSION CONTROL SYSTEM - SHIFT LIMITING ACTIVE

Diagnostic Instructions

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

DTC Descriptor

DTC P175E

Transmission Control System - Shift Limiting Active

Circuit/System Description

DTC P175E is an informational DTC.

Conditions for Running the DTC

- Battery Voltage = Greater than 9 V
- Ignition = On
- Ignition Voltage = 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 Transmission Output Shaft Speed Sensor
- B14C Transmission Input Shaft Speed Sensor
- B14D Transmission Intermediate Shaft Speed Sensor
- B26 Crankshaft Position Sensor
- B303 Transmission Range Sensor
- B74 Manifold Absolute Pressure Sensor
- B75 Mass Air Flow 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 system/component:

- B107 Accelerator Pedal Position Sensor
- B14A Transmission Output Shaft Speed Sensor
- B14C Transmission Input Shaft Speed Sensor
- B14D Transmission Intermediate Shaft Speed Sensor
- B26 Crankshaft Position Sensor
- B303 Transmission Range Sensor
- B74 Manifold Absolute Pressure Sensor
- B75 Mass Air Flow 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: ACCELERATION SENSOR SIGNAL MESSAGE COUNTER INCORRECT

Diagnostic Instructions

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

DTC Descriptor

DTC P175F

Acceleration Sensor Signal Message Counter Incorrect

Circuit/System Description

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

Conditions for Running the DTC

- DTC U0121 = Not set
- Ignition = On
- Serial Data = Enabled

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 3 s

Conditions for Setting the DTC

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

- K17 Electronic Brake Control Module
- K71 Transmission Control Module

The above condition(s) must occur 5 times.

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type C

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 system/component: Serial Data

- **If other DTCs are set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **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.

Verify the DTC does not set.

- If the DTC sets - Replace the component: K71 Transmission Control Module
- If the DTC is not set

4. 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: UP AND DOWN SHIFT SWITCH SIGNAL MESSAGE COUNTER INCORRECT

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 = On
- Ignition Voltage = 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.

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 system/component: 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
- 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, P176C, P176D, P178F, P17C4 OR P17D3: INTERMEDIATE SPEED SENSOR CIRCUIT/INTERMEDIATE SPEED SENSOR DIRECTION

Diagnostic Instructions

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

DTC Descriptor

DTC P176B

Intermediate Speed Sensor Circuit Performance

DTC P176C

Intermediate Speed Sensor Circuit Low Voltage

DTC P176D

Intermediate Speed Sensor Circuit High Voltage

DTC P17D3

Intermediate Speed Sensor 1 Direction Signal Invalid

DTC P178F

Intermediate Speed Sensor Direction Not Plausible - Forward

DTC P17C4

Intermediate Speed Sensor Direction Not Plausible - Reverse

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P07BF, P17FB, P17F6, P176C, P187E	P07BF, P17FB, P17F6, P176C, P187E	-	P176B, P176C, P176D, P178F, P17C4
Signal	P176C	P176C	P176D*	P176B, P176C, P176D, P178F, P17C4

* Internal control module damage may occur if the circuit is shorted to B+.

Typical Scan Tool Data

Transmission 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: 0 to 7, 500 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
5 V Reference	Regulated voltage supplied by the control module.
Signal	The sensor produces a frequency modulated signal.

Component	Description
B14C Transmission Input 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. When the strength changes, the sensor changes the amount of current it consumes. This results in a square wave signal of the current, while the voltage stays constant. The control module detects the frequency in which the current 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 56 teeth, magnetic segments, or indentations. - The reluctor ring is part of the component: 3-8 and 5-7-R clutch hub assembly

The sensor is an input to the control module K71. The input signal is used to determine the rotational speed of the component: 3-8 and 5-7-R clutch hub assembly

Conditions for Running the DTC

P176B

- Battery Voltage = Greater than 9 V
- Engine = Running
- Run/Crank Ignition 1 Voltage = Greater than 9 V
- Transmission Input Speed = Greater than 172 RPM
- Transmission Output Speed = Greater than 89 RPM

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

P176C, P176D, P17D3

- Battery Voltage = Greater than 9 V
- Power Mode Status = Run
- Run/Crank Ignition 1 Voltage = Greater than 9 V

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

P178F, P17C4

- Battery Voltage = Greater than 9 V
- Engine Speed = Greater than 500 RPM
- Run/Crank Ignition 1 Voltage = Greater than 9 V

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

Conditions for Setting the DTC

P176B

Transmission Intermediate Speed Sensor & Output Speed Sensor = Greater than 20 RPM - For greater than 1 s

P176C

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

P176D

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

P17D3

Shifting from Gear 1 & Reverse Gear = Greater than 25 RPM - For 3.5 s

P178F

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

P17C4

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

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A

- Autostart/Autostop = Disabled
- Default shift pattern = Enabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Freeze current adapt values
- Transmission gear allowed = Reverse & Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A

Diagnostic Aids

The following components are combined into one housing:

- B14C Transmission Input Shaft Speed Sensor
- B14D Transmission Intermediate Shaft Speed Sensor

Each sensor is triggered by a separate reluctor ring inside the transmission.

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\)](#)

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: 9 V Reference 1 Circuit Status = OK
 - **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 - Idling
5. Transmission in Drive
6. Verify the scan tool parameter: Transmission 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: @ B14D Transmission Intermediate Shaft Speed Sensor
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 2 & Ground

- **If less than 8.3 V**

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: K71 Transmission Control Module
3. Test for infinite resistance between the test points: 9 V Reference circuit terminal 2 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
4. Test for less than 2 Ω between the test points: 9 V Reference circuit terminal 2 @ Component harness & Terminal 8 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - 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 2 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component: K71 Transmission Control Module

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

5. Ignition/Vehicle - Off
6. Install the special tool: **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 300 Hz
 - Set the duty cycle to 50%
 - Black lead @ Ground
 - Red lead @ Signal circuit terminal 1
7. Ignition - On/Vehicle - In Service Mode
8. Verify the scan tool parameter: Transmission Input Speed 313 to 323 RPM

- **If not between 313 and 323 RPM**

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

6. Test for infinite resistance between the test points: Signal circuit terminal 1 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
7. Test for less than 2 Ω between the test points: Signal circuit terminal 1 @ Component harness & Terminal 13 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module
- **Go to next step: If between 313 and 323 RPM**
9. Test or replace the component: B14C Transmission Input Shaft Speed Sensor & B14D Transmission Intermediate Shaft Speed Sensor

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Automatic Transmission Input Speed Sensor Replacement](#) - B14E Transmission Input/Intermediate Shaft Speed Sensor
- For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC P17F5-P17F7, P17FA-P17FC OR P17FF: TRANSMISSION PARK VALVE POSITION SWITCH/SENSOR 1-2 CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

DTC P17F5

Transmission Park Valve Position Switch 1 Circuit

DTC P17F6

Transmission Park Valve Position Sensor 1 Circuit Low Voltage

DTC P17F7

Transmission Park Valve Position Sensor 1 Circuit High Voltage

DTC P17FA

Transmission Park Valve Position Switch 2 Circuit

DTC P17FB

Transmission Park Valve Position Sensor 2 Circuit Low Voltage

DTC P17FC

Transmission Park Valve Position Sensor 2 Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P17F6, P17FB	P17F6, P17FB	-	-

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

Typical Scan Tool Data

Transmission Park Valve Position Sensor 1/Transmission Park Valve Position Sensor 2

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

Circuit/System Description

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

Component	Description
B316 Transmission Park Valve Position Switch	The switch contains 2 hall-effect sensors and additional electronics. It detects the strength of the magnetic field caused by a magnet that is mounted to the park release lever. When the strength changes, the sensors change the amount of current they consume.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs.

Conditions for Running the DTC

Ignition Voltage = 9 to 32 V

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

Conditions for Setting the DTC

P17F5

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

P17F6

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

P17F7

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

P17FA

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

P17FB

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

P17FC

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

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

Autostart/Autostop = Disabled

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H))

Connector End View Reference

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. Transmission Range - Park

Verify the scan tool parameter:

- {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor 1 = 0.6 to 1.0 V
- {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = 0.6 to 1.0 V
- **If not between 0.6 and 1.0 V**

Refer to Circuit/System Testing

- **Go to next step: If between 0.6 and 1.0 V**

3. Transmission Range - Reverse Gear

Verify the scan tool parameter:

- {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor 1 = 1.7 to 2.1 V
- {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = 1.7 to 2.1 V
- **If not between 1.7 and 2.1 V**

Refer to Circuit/System Testing

- **Go to next step: If between 1.7 and 2.1 V**

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

Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing

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

5. All OK.

Circuit/System Testing

1. Ignition/Vehicle - Off

2. Disconnect the electrical connector:

- B14E Transmission Input/Intermediate Shaft Speed Sensor
- X1 @ T12 Automatic Transmission Assembly

3. Ignition - On/Vehicle - In Service Mode

4. Test for 8.6 to 9.2 V between the test points: 9 V Reference circuit terminal 1 X1 @ T12 Automatic Transmission Assembly (harness side) & Ground

- **If less than 8.6 V**

1. Disconnect the electrical connector: K71 Transmission Control Module

2. Test for infinite resistance between the test points: 9 V Reference circuit terminal 1 X1 @ T12 Automatic Transmission Assembly (harness side) & Ground

- If less than infinite resistance - Repair the short to ground on the circuit.
- If infinite resistance

3. Test for less than 2 Ω between the test points: 9 V Reference circuit terminal 1 X1 @ T12 Automatic Transmission Assembly (harness side) & Terminal 7 @ Control module harness

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K71 Transmission Control Module

- **If greater than 9.2 V**

1. Ignition/Vehicle - Off

2. Disconnect the electrical connector: K71 Transmission Control Module

3. Ignition - On/Vehicle - In Service Mode

4. Test for less than 1 V between the test points: 9 V Reference circuit terminal 1 X1 @ T12 Automatic Transmission Assembly (harness side) & Ground

- If 1 V or greater - Repair the short to voltage on the circuit.
- If less than 1 V - Replace the component: K71 Transmission Control Module

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

5. Verify the scan tool parameter:

- {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor 1 = Less than 0.4 V
- {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = Less than 0.4 V

- **If 0.4 V or greater**

1. Ignition/Vehicle - Off

2. Disconnect the electrical connector: K71 Transmission Control Module

3. Ignition - On/Vehicle - In Service Mode

4. Test for less than 0.4 V between the test points:

- {P17F5, P17F6, P17F7} Signal circuit terminal 17 @ T12 Automatic Transmission Assembly (harness side) & Ground
- {P17FA, P17FB, P17FC} Signal circuit terminal 16 @ T12 Automatic Transmission Assembly (harness side) & Ground
- If 0.4 V or greater - Repair the short to voltage on the circuit.
- If less than 0.4 V - Replace the component: K71 Transmission Control Module

- **Go to next step: If less than 0.4 V**

6. Connect a 3 A fused jumper wire between the test points:

- {P17F5, P17F6, P17F7} Signal circuit terminal 17 X1 & 9 V Reference circuit terminal 1 X1
- {P17FA, P17FB, P17FC} Signal circuit terminal 16 X1 & 9 V Reference circuit terminal 1 X1

7. Verify the scan tool parameter:

- {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor 1 = Greater than 4.8 V
- {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = Greater than 4.8 V
- **If less than 4.8 V**

1. Ignition/Vehicle - Off & Remove - Jumper wire(s)

2. Disconnect the electrical connector: K71 Transmission Control Module

3. Test for infinite resistance between the test points:

- {P17F5, P17F6, P17F7} Signal circuit terminal 17 X1 @ Component harness & Ground
- {P17FA, P17FB, P17FC} Signal circuit terminal 16 X1 @ Component harness & Ground
- If less than infinite resistance - Repair the short to ground on the circuit.
- If infinite resistance

4. Test for less than 2 Ω between the test points:

- {P17F5, P17F6, P17F7} Signal circuit terminal 17 X1 @ Component harness & Terminal 59 @ Control module harness
- {P17FA, P17FB, P17FC} Signal circuit terminal 16 X1 @ Component harness & Terminal 61 @ Control module harness
- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K71 Transmission Control Module

• **Go to next step: If greater than 4.8 V**

8. Ignition/Vehicle - Off & Remove - Jumper wire(s)

9. Remove the component: Control Valve Body Cover

10. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly

11. Disconnect the electrical connector: B316 Transmission Park Valve Position Switch

12. Ignition - On/Vehicle - In Service Mode

13. Verify the scan tool parameter:

- {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor 1 = Less than 0.4 V
- {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = Less than 0.4 V
- **If 0.4 V or greater**

Replace the component: Automatic Transmission Wiring Harness

14. Test for 8.6 to 9.2 V between the test points: 9 V Reference circuit terminal 1 & Ground

- **If not between 8.6 and 9.2 V**

Replace the component: Automatic Transmission Wiring Harness

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

15. Connect a 3 A fused jumper wire between the test points:

- {P17F5, P17F6, P17F7} Signal circuit terminal 2 @ B316 Transmission Park Valve Position Switch (harness side) & Terminal 1
- {P17FA, P17FB, P17FC} Signal circuit terminal 3 @ Component harness & Terminal 1

16. Verify the scan tool parameter:

- {P17F5, P17F6, P17F7} Transmission Park Valve Position Sensor 1 = Greater than 4.8 V
- {P17FA, P17FB, P17FC} Transmission Park Valve Position Sensor 2 = Greater than 4.8 V
- **If less than 4.8 V**

Replace the component: Automatic Transmission Wiring Harness

- Go to next step: If 4.8 V or greater

17. Test or replace the component: B316 Transmission Park Valve Position Switch

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Control Valve Body Assembly Installation \(without ETRS\)](#), [Control Valve Body Assembly Installation \(with ETRS\)](#), / [Control Valve Body Assembly Removal \(without ETRS\)](#), [Control Valve Body Assembly Removal \(with ETRS\)](#) - B316 Transmission Park Valve Position Switch
- Refer to [Control Valve Body Cover Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P187D, P18E7 OR P18E8: TRANSMISSION PARK VALVE STUCK ON/TRANSMISSION PARK VALVE POSITION SENSOR 1-2 PERFORMANCE

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 P187D

Transmission Park Valve Stuck On

DTC P18E7

Transmission Park Valve Position Sensor 1 Performance

DTC P18E8

Transmission Park Valve Position Sensor 2 Performance

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Control Valve Body • Mode 2 Electronic Transmission Range Selector Valve • Electronic Transmission Range Selector Mode Enable Valve/Spring	P187D, P18E7, P18E8	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
Control Solenoid Valve Body • Mode 1 Electronic Transmission Range Selector Valve	P187D, P18E7, P18E8	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring

Circuit/System Description

DTC P187D, P18E7, P18E8 sets only when there is a hydraulic/mechanical problem.

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

- Park - Engine Running (Hydraulic Circuits Without ETRS), Park - Engine Running (Hydraulic Circuits With ETRS), Park - Engine Running (Mechanical Powerflow).
- Reverse (Hydraulic Circuits Without ETRS), Reverse (Hydraulic Circuits With ETRS), Reverse (Mechanical Powerflow).
- Neutral - Engine Running (Hydraulic Circuits Without ETRS), Neutral - Engine Running (Hydraulic Circuits With ETRS), Neutral - Engine Running (Mechanical Powerflow).
- Drive Range, First Gear (Hydraulic Circuits Without ETRS), Drive Range, First Gear (Hydraulic Circuits With ETRS), Drive Range, First Gear (Mechanical Powerflow).
- Drive Range, Second Gear (Hydraulic Circuits Without ETRS), Drive Range, Second Gear (Hydraulic Circuits With ETRS), Drive Range, Second Gear (Mechanical Powerflow).
- Drive Range, Third Gear (Hydraulic Circuits Without ETRS), Drive Range, Third Gear (Hydraulic Circuits With ETRS), Drive Range, Third Gear (Mechanical Powerflow).
- Drive Range, Fourth Gear (Hydraulic Circuits Without ETRS), Drive Range, Fourth Gear (Hydraulic Circuits With ETRS), Drive Range, Fourth Gear (Mechanical Powerflow).
- Drive Range, Fifth Gear (Hydraulic Circuits Without ETRS), Drive Range, Fifth Gear (Hydraulic Circuits With ETRS), Drive Range, Fifth Gear (Mechanical Powerflow).
- Drive Range, Sixth Gear (Hydraulic Circuits Without ETRS), Drive Range, Sixth Gear (Hydraulic Circuits With ETRS), Drive Range, Sixth Gear (Mechanical Powerflow).
- Drive Range, Seventh Gear (Hydraulic Circuits Without ETRS), Drive Range, Seventh Gear (Hydraulic Circuits With ETRS), Drive Range, Seventh Gear (Mechanical Powerflow).
- Drive Range, Eighth Gear (Hydraulic Circuits Without ETRS), Drive Range, Eighth Gear (Hydraulic Circuits With ETRS), Drive Range, Eighth Gear (Mechanical Powerflow).
- Drive Range, Ninth Gear (Hydraulic Circuits Without ETRS), Drive Range, Ninth Gear (Hydraulic Circuits With ETRS), Drive Range, Ninth Gear (Mechanical Powerflow).
- Fluid Passages (Hydraulic Circuits Without ETRS), Fluid Passages (Hydraulic Circuits With ETRS).

Conditions for Running the DTC

Ignition Voltage = Greater than 9 V

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

Conditions for Setting the DTC

Transmission Range Command = Park & Transmission Range Control Valve 1 Position
Switch/Transmission Range Control Valve 2 Position Switch = Low - 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

Diagnostic Aids

Wiring harness routing is critical. - Starter Ground Cable/Starter Positive Cable - Electromagnetic Interference

Reference Information

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

DTC Type Reference

[Powertrain Diagnostic Trouble Code \(DTC\) Type Definitions](#)

Scan Tool Reference

[Control Module References](#)

[Circuit/System Verification](#)

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to [Transmission Fluid Level and Condition Check](#)

- **If a condition exists**

Repair or replace as necessary.

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

2. Ignition - On/Vehicle - In Service Mode

3. Clear 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 DTC P187D, P18E7, P18E8, P27EB, P27ED, P27EE, P27EF, P27F1, P27F2 is not set.

- **If DTC P27EB, P27ED, P27EE, P27EF, P27F1, P27F2 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **If DTC P187D, P18E7, P18E8 is set**

Refer to Diagnostic Fault Information

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

5. All OK.

[Repair Instructions](#)

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#), [Control Valve Body Cleaning and Inspection \(with ETRS\)](#).
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#), [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#).
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P187E, P18AA, P18AB, P18AC, P18AD, P18AE, P27EC OR P27F0: TRANSMISSION PARK VALVE STUCK OFF/TRANSMISSION RANGE CONTROL VALVE 1-2 POSITION SWITCH/TRANSMISSION RANGE CONTROL ENABLE VALVE STUCK OFF

[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 P187E

Transmission Park Valve Stuck Off

DTC P18AA

Transmission Range Control Valve 1 Position Switch Circuit Stuck On

DTC P18AB

Transmission Range Control Valve 1 Position Switch Circuit Stuck Off

DTC P18AC

Transmission Range Control Valve 2 Position Switch Circuit Stuck On

DTC P18AD

Transmission Range Control Valve 2 Position Switch Circuit Stuck Off

DTC P18AE

Transmission Range Control Enable Valve Stuck Off

DTC P27EC

Transmission Range Control Valve 1 Position Switch Performance

DTC P27F0

Transmission Range Control Valve 2 Position Switch Performance

Diagnostic Fault Information**NOTE:** The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
B280 Automatic Transmission Accumulator Solenoid Valve	P18AA - During an autostop event	Leaking
Q77D Transmission Control Solenoid Valve 4	P187E, P18AA, P18AB, P18AC, P18AD, P18AE, P27EC, P27F0	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve

Component	DTC	Condition
Control Valve Body - Mode 1 Electronic Transmission Range Selector Valve - Electronic Transmission Range Selector Mode Enable Valve/Spring - Control Valve Body Spacer Plate - Feed Limit Valve/Spring - Clutch Selector Valve/Spring	P187E, P18AA, P18AB, P18AC, P18AD, P18AE, P27EC, P27F0	- Binding, sticking or stuck component: Valve - Debris on the component. - Damaged component: - Valve or Bore - Scored - Spring
Control Solenoid Valve Body Mode 2 Electronic Transmission Range Selector Valve	P187E, P18AA, P18AB, P18AC, P18AD, P18AE, P27EC, P27F0	- Binding, sticking or stuck component: Valve - Debris on the component. - Damaged component: - Valve or Bore - Scored - Spring
Automatic Transmission Fluid Pump Body - Automatic Transmission Fluid Pump - Pressure Regulator Valve	P18AB & P18AD	- Damaged component: Automatic Transmission Fluid Pump - Binding, sticking or stuck component: Valve - Debris on the component. - Damaged component: - Valve or Bore - Scored - Spring

Circuit/System Description

DTC P187E, P18AA, P18AB, P18AC, P18AD, P18AE, P27EC, P27F0 sets only when there is a hydraulic/mechanical problem.

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

- [Park - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Park - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Park - Engine Running \(Mechanical Powerflow\)](#)
- [Reverse \(Hydraulic Circuits Without ETRS\)](#) [Reverse \(Hydraulic Circuits With ETRS\)](#) [Reverse \(Mechanical Powerflow\)](#)
- [Neutral - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Neutral - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Neutral - Engine Running \(Mechanical Powerflow\)](#)
- [Drive Range, First Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, First Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, First Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Second Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Second Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Second Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Third Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Third Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Third Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fourth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Fourth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Fourth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fifth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Fifth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Fifth Gear \(Mechanical Powerflow\)](#)

- [Drive Range, Sixth Gear \(Hydraulic Circuits Without ETRS\)](#), [Drive Range, Sixth Gear \(Hydraulic Circuits With ETRS\)](#), [Drive Range, Sixth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Seventh Gear \(Hydraulic Circuits Without ETRS\)](#), [Drive Range, Seventh Gear \(Hydraulic Circuits With ETRS\)](#), [Drive Range, Seventh Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Eighth Gear \(Hydraulic Circuits Without ETRS\)](#), [Drive Range, Eighth Gear \(Hydraulic Circuits With ETRS\)](#), [Drive Range, Eighth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Ninth Gear \(Hydraulic Circuits Without ETRS\)](#), [Drive Range, Ninth Gear \(Hydraulic Circuits With ETRS\)](#), [Drive Range, Ninth Gear \(Mechanical Powerflow\)](#)
- [Fluid Passages \(Hydraulic Circuits Without ETRS\)](#), [Fluid Passages \(Hydraulic Circuits With ETRS\)](#)

Conditions for Running the DTC

Ignition Voltage = Greater than 9 V

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

Conditions for Setting the DTC

Transmission Range Command = Park & Transmission Range Control Valve 1 Position

Switch/Transmission Range Control Valve 2 Position Switch = Low - 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

Diagnostic Aids

If fluid pressure is less than 345 kPa (50 PSI), DTC P18AB & P18AD may set.

Reference Information

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

DTC Type Reference

[Powertrain Diagnostic Trouble Code \(DTC\) Type Definitions](#)

Scan Tool Reference

[Control Module References](#)

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - 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. DTCs related to the following system/component = Not Set
 - B315A Transmission Range Control Valve 1 Position Switch

- B315B Transmission Range Control Valve 2 Position Switch
- B316 Transmission Park Valve Position Switch
- **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. Ignition - On/Vehicle - In Service Mode

4. Clear DTCs

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 DTC P187E, P18AA, P18AB, P18AC, P18AD, P18AE, P27EC, P27F0, P27EB, P27ED, P27EE, P27EF, P27F1, P27F2 is not set.

- **If DTC P27EB, P27ED, P27EE, P27EF, P27F1, P27F2 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **If DTC P187E, P18AA, P18AB, P18AC, P18AD, P18AE, P27EC, P27F0 is set**

Refer to Diagnostic Fault Information

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

6. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#). [Control Valve Body Cleaning and Inspection \(with ETRS\)](#).
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#). [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#).
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P18A2 OR P18A4: TRANSMISSION PARK INHIBIT ACTUATOR CONTROL CIRCUIT LOW/HIGH VOLTAGE

Diagnostic Instructions

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

DTC Descriptor

DTC P18A2

Transmission Park Inhibit Actuator Control Circuit Low Voltage

DTC P18A4

Transmission Park Inhibit Actuator Control Circuit High Voltage

Diagnostic Fault Information

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

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control - Terminal 22	P18A2	P18A2	P18A4	-
Control - Terminal 49	P2670	P2671	P2671	-

Typical Scan Tool Data

Transmission Park Valve Lock Solenoid Actuator Control Circuit High Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On Parameter Normal Range: OK or Not Run			
Control - Terminal 22	-	-	Malfunction
Control - Terminal 49	-	-	-

Transmission Park Valve Lock Solenoid Actuator Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On Parameter Normal Range: OK or Not Run			
Control - Terminal 22	Malfunction	Malfunction	-
Control - Terminal 49	Malfunction	Malfunction	-

Transmission Park Valve Lock Solenoid Actuator Control Circuit Open Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On Parameter Normal Range: OK or Not Run			
Control - Terminal 22	Malfunction	Malfunction	-
Control - Terminal 49	-	Malfunction	-

Circuit/System Description

Circuit	Description
Control - Terminal 28	The output circuit is switched to 12 V to activate the component.
Control - Terminal 10	The output circuit is switched to ground to activate the component.

Component	Description
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs.
M123 Transmission Park Valve Lock Solenoid Actuator	A linear solenoid actuator is an electro-mechanical device that converts electrical power into a mechanical pushing or pulling force or motion.

When the M123 Transmission Park Valve Lock Solenoid Actuator/Transmission Control Solenoid Valve 11 is energized, it prevent the transmission from going into park, by holding the Park Release Servo Piston in the extended position.

Conditions for Running the DTC

Ignition Voltage = 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

P18A2

The control module detects a short to ground or The control module detects an open circuit. - For greater than 1 s

P18A4

The control module detects a short to voltage. - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled
- Manual Shift Control = Disabled

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

[Automatic Transmission Controls Wiring Schematics \(9T45 \(M3U\) or 9T50 \(M3D M3H\)\).](#)

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 P2670, P2671 is not set.
 - If the DTC is set

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

3. Perform the scan tool control function: Transmission Control Solenoid Valve 11 - On and Off

Verify the scan tool parameter:

- Transmission Control Solenoid Valve 11 Control Circuit High Voltage Test Status = OK or Not Run
- Transmission Control Solenoid Valve 11 Control Circuit Low Voltage Test Status = OK or Not Run
- Transmission Control Solenoid Valve 11 Control Circuit Open Test Status = OK or Not Run
- **If not the specified state**

Refer to Circuit/System Testing

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

Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing

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

5. All OK.

Circuit/System Testing

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
3. Connect a test lamp between the test points: Control circuit terminal 28 & Ground
4. Ignition - On/Vehicle - In Service Mode
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. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
2. Ignition/Vehicle - Off & Remove - Test lamp
3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
4. Disconnect the electrical connector: K71 Transmission Control Module
5. Test for infinite resistance between the test points: Control circuit terminal 28 @ Component harness & Ground

- If less than infinite resistance - Repair the short to ground on the circuit.
- If infinite resistance

6. Test for less than 2 Ω between the test points: Control circuit terminal 28 @ Component harness & Terminal 49 @ Control module harness
- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K71 Transmission Control Module

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

1. Remove - Test Lamp
2. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
3. Ignition/Vehicle - Off
4. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
5. Disconnect the electrical connector: K71 Transmission Control Module
6. Ignition - On/Vehicle - In Service Mode
7. Test for less than 1 V between the test points: Control circuit terminal 28 @ Component harness & Ground

- If 1 V or greater - Repair the short to ground 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. Remove - Test Lamp
7. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
8. Ignition/Vehicle - Off
9. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
10. Disconnect the electrical connector: K71 Transmission Control Module

11. Test for less than 2 Ω between the test points: Control circuit terminal 10 @ Component harness & Control circuit terminal 22 @ Control module harness
- If 2 Ω or greater
- Repair the open/high resistance in the circuit.
- If less than 2 Ω
12. Test for infinite resistance between the test points: Control circuit terminal 10 @ Component harness & Ground
- **If less than infinite resistance**
- Repair short to ground on the circuit.
- **Go to next step: If infinite resistance**
13. Ignition - On/Vehicle - In Service Mode
14. Test for less than 1 V between the test points: Control circuit terminal 10 & Ground
- **If 1 V or greater**
- Repair the short to voltage on the circuit.
- If less than 1 V
15. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
16. Ignition/Vehicle - Off
17. Connect the electrical connector: K71 Transmission Control Module
18. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
19. Remove the component: Control Valve Body Cover
20. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
21. Disconnect the electrical connector: M123 Transmission Park Valve Lock Solenoid Actuator
22. Connect a test lamp between the test points: Control circuit terminal 1 @ Component harness & Ground
23. Ignition - On/Vehicle - In Service Mode
24. Perform the scan tool control function: High Side Driver 2 - On and Off

Verify the test lamp turns On and Off.

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

Replace the component: Automatic Transmission Wiring Harness

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

25. Connect a test lamp between the test points: Control circuit terminal 1 @ Component harness & Control circuit terminal 2 @ Component harness
26. Perform the scan tool control function: Transmission Control Solenoid Valve 11 - 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**

27. Test or replace the component: M123 Transmission Park Valve Lock Solenoid Actuator

Component Testing

Static Test

1. Ignition/Vehicle - Off
2. Remove the component: Control Valve Body Cover

3. Disconnect the electrical connector: M123 Transmission Park Valve Lock Solenoid Actuator

4. Test for 15 to 25 Ω between the test points: Control terminal 1 & Control terminal 2

- **If not between 15 to 25 Ω**

Replace the component: M123 Transmission Park Valve Lock Solenoid Actuator

- **Go to next step: If between 15 to 25 Ω**

5. Test for infinite resistance between the test points: Each terminal of the component & The component's housing

- **If less than infinite resistance**

Replace the component: M123 Transmission Park Valve Lock Solenoid Actuator

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

6. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Control Valve Body Assembly Removal \(without ETRS\)](#), [Control Valve Body Assembly Removal \(with ETRS\)](#) - M123 Transmission Park Valve Lock Solenoid Actuator
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P18A8: TRANSMISSION PARK CONTROL SOLENOID ACTUATOR STUCK OFF

Diagnostic Instructions

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

DTC Descriptor

DTC P18A8

Transmission Park Control Solenoid Actuator Stuck Off

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Q77D Transmission Control Solenoid Valve 4	P18A8	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
M123 Transmission Park Valve Lock Solenoid Actuator	P18A8	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring

Component	DTC	Condition
Control Valve Body • Mode 2 Electronic Transmission Range Selector Valve • Electronic Transmission Range Selector Mode Enable Valve/Spring • Control Valve Body Spacer Plate • Feed Limit Valve/Spring • Clutch Selector Valve/Spring	P18A8	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
Control Solenoid Valve Body • Mode 1 Electronic Transmission Range Selector Valve	P18A8	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring

Circuit/System Description

DTC P18A8 sets only when there is a hydraulic/mechanical problem.

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

- Park - Engine Running (Hydraulic Circuits Without ETRS) Park - Engine Running (Hydraulic Circuits With ETRS) Park - Engine Running (Mechanical Powerflow)
- Reverse (Hydraulic Circuits Without ETRS) Reverse (Hydraulic Circuits With ETRS) Reverse (Mechanical Powerflow)
- Neutral - Engine Running (Hydraulic Circuits Without ETRS) Neutral - Engine Running (Hydraulic Circuits With ETRS) Neutral - Engine Running (Mechanical Powerflow)
- Drive Range, First Gear (Hydraulic Circuits Without ETRS) Drive Range, First Gear (Hydraulic Circuits With ETRS) Drive Range, First Gear (Mechanical Powerflow)
- Drive Range, Second Gear (Hydraulic Circuits Without ETRS) Drive Range, Second Gear (Hydraulic Circuits With ETRS) Drive Range, Second Gear (Mechanical Powerflow)
- Drive Range, Third Gear (Hydraulic Circuits Without ETRS) Drive Range, Third Gear (Hydraulic Circuits With ETRS) Drive Range, Third Gear (Mechanical Powerflow)
- Drive Range, Fourth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fourth Gear (Hydraulic Circuits With ETRS) Drive Range, Fourth Gear (Mechanical Powerflow)
- Drive Range, Fifth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fifth Gear (Hydraulic Circuits With ETRS) Drive Range, Fifth Gear (Mechanical Powerflow)
- Drive Range, Sixth Gear (Hydraulic Circuits Without ETRS) Drive Range, Sixth Gear (Hydraulic Circuits With ETRS) Drive Range, Sixth Gear (Mechanical Powerflow)
- Drive Range, Seventh Gear (Hydraulic Circuits Without ETRS) Drive Range, Seventh Gear (Hydraulic Circuits With ETRS) Drive Range, Seventh Gear (Mechanical Powerflow)
- Drive Range, Eighth Gear (Hydraulic Circuits Without ETRS) Drive Range, Eighth Gear (Hydraulic Circuits With ETRS) Drive Range, Eighth Gear (Mechanical Powerflow)
- Drive Range, Ninth Gear (Hydraulic Circuits Without ETRS) Drive Range, Ninth Gear (Hydraulic Circuits With ETRS) Drive Range, Ninth Gear (Mechanical Powerflow)
- Fluid Passages (Hydraulic Circuits Without ETRS) Fluid Passages (Hydraulic Circuits With ETRS)

Conditions for Running the DTC

Ignition Voltage = Greater than 9 V

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

Conditions for Setting the DTC

Transmission Range Command Actual - Transmission Range Control Valve 1 Position Switch/Transmission Range Control Valve 2 Position Switch = Low

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

Electrical Information Reference

- [Circuit Testing](#)
- [Connector Repairs](#)
- [Testing for Intermittent Conditions and Poor Connections](#)
- [Wiring Repairs](#)

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to [Transmission Fluid Level and Condition Check](#)
 - **If a condition exists**
Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. Ignition - On/Vehicle - In Service Mode
3. Clear 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.
5. Verify DTC P18A8, P27EB, P27ED, P27EE, P27EF, P27F1, P27F2 is not set.
 - **If DTC P27EB, P27ED, P27EE, P27EF, P27F1, P27F2 is set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P18A8 is set**
Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are set**
6. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#), [Control Valve Body Cleaning and Inspection \(with ETRS\)](#).
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#), [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#).
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P188B: TRANSMISSION RANGE SIGNAL MESSAGE COUNTER INCORRECT

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 P188B

Transmission Range 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 U0121 = Not set
- Ignition = On
- Serial Data = Enabled

Frequency the DTC runs = Continuously - After the running conditions are met - For greater than 3 s

Conditions for Setting the DTC

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

- K20 Engine Control Module
- K71 Transmission Control Module

The above condition(s) must occur 5 times.

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type C

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 system/component: Serial Data

- **If other DTCs are set**

Refer to: [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- **If no other DTCs are set**

1. Ignition/Vehicle - Off
2. Replace the component: K71 Transmission 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: K20 Engine Control Module
- If the DTC is not set

4. 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 P189C: TRANSMISSION RANGE COMMAND MESSAGE PERFORMANCE

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 P189C

Transmission Range Command Message Performance

Circuit/System Description

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

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

Conditions for Running the DTC

Ignition = On

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

Conditions for Setting the DTC

Commanded state does not match the actual state

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type B DTC

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type B DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H)).

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Component View Reference

Transmission Solenoid Information

Electrical Information Reference

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

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

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

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

Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

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

4. All OK.

Circuit/System Testing

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

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector.
 - K20 Engine Control Module
 - K71 Transmission Control Module
3. Test for less than 1 V between the test points: Serial Data circuit terminal 31 @ K71 Transmission Control Module & The other end of the circuit
 - **If greater than 1 V**
Repair the short to voltage on the circuit.
 - **Go to next step: If less than 1 V**
4. Test for infinite resistance between the test points: Serial Data circuit terminal 31 @ K71 Transmission Control Module & Ground
 - **If less than infinite resistance**
Repair the short to ground on the circuit.
 - **Go to next step: If infinite resistance**
5. Test for less than 10 Ω between the test points: Serial Data circuit terminal 31 @ K71 Transmission Control Module & The other end of the circuit
 - **If greater than 10 Ω**
Repair the open/high resistance in the circuit.
 - **Go to next step: If less than 10 Ω**
6. Replace the component: K71 Transmission Control Module
7. Verify DTC P189C is not set.
 - **If the DTC sets**
Replace the component: K20 Engine Control Module
 - **Go to next step: If the DTC does not set**
8. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- For control module replacement, programming, and setup refer to: [Control Module References](#)

DTC P2714 OR P2715: TRANSMISSION CONTROL SOLENOID VALVE 4 STUCK OFF/ON

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:** The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Q77D Transmission Control Solenoid Valve 4	P2714, P2715	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
• 4th Clutch Regulator Valve • Valve Spring • Valve Body Bore	P2714, P2715	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
4th Clutch Oil Feed Circuit	P2714, P2715	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Gasket • O-Ring • Seal
4th 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

Circuit/System Description

The solenoid actuator controls fluid pressure by moving the clutch 4th regulator valve that controls the fluid pressure to the 4th clutch. DTC P2714, P2715 sets only when there is a hydraulic/mechanical problem.

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

- [Park - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Park - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Park - Engine Running \(Mechanical Powerflow\)](#)
- [Reverse \(Hydraulic Circuits Without ETRS\)](#) [Reverse \(Hydraulic Circuits With ETRS\)](#) [Reverse \(Mechanical Powerflow\)](#)
- [Neutral - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Neutral - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Neutral - Engine Running \(Mechanical Powerflow\)](#)
- [Drive Range, First Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, First Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, First Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Second Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Second Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Second Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Third Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Third Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Third Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fourth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Fourth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Fourth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Fifth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Fifth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Fifth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Sixth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Sixth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Sixth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Seventh Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Seventh Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Seventh Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Eighth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Eighth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Eighth Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Ninth Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Ninth Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Ninth Gear \(Mechanical Powerflow\)](#)

Conditions for Running the DTC

- Battery Voltage = 11 to 32 V
- Engine Speed = Greater than 400 RPM
- High Side Driver 2 = On

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

Conditions for Setting the DTC

P2714

Clutch 4 = Not applied

P2715

Clutch 4 = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A

- Autostart/Autostop = Disabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- TCC Control = Disabled

- Transmission Adaptive Values Learn = Freeze current adapt values
- {P2714} Transmission gear allowed = Reverse or Gear 7
- {P2715} Transmission gear allowed = Reverse or Gear 5

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A

Diagnostic Aids

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

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to [Transmission Fluid Level and Condition Check](#)
 - **If a condition exists**
Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. Ignition - On/Vehicle - In Service Mode
3. Clear DTCs
4. Road test the vehicle. Refer to [Road Test](#)
5. Verify DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2714, P2715 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P2714, P2715 is set**
Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are 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 P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2714, P2715 is not set.

- **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- If DTC P2714, P2715 is set

Refer to Diagnostic Fault Information

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

7. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [2-9 and 4 Clutch Piston Housing Disassemble](#)
- Refer to [Clutch Plate Diagnosis](#)
- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#), [Control Valve Body Cleaning and Inspection \(with ETRS\)](#).
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#), [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#).
- Refer to [Control Valve Solenoid Body Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P2723 OR P2724: TRANSMISSION CONTROL SOLENOID VALVE 5 STUCK OFF/ON

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: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Q77E Transmission Control Solenoid Valve 5	P2723, P2724	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
• 5-7-Reverse Clutch Boost Valve • Valve Spring • Valve Body Bore	P2723, P2724	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring

Component	DTC	Condition
• 5-7-R Clutch Regulator Valve • Valve Spring • Valve Body Bore	P2723, P2724	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
5-7-R Clutch Assembly Oil Feed Circuit	P2723, P2724	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Gasket • O-Ring • Seal
5-7-R Clutch Assembly	P2723, P2724	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Clutch Piston • Clutch Housing • Gasket • O-Ring • Seal • Binding, sticking or stuck component: Clutch Plates • Damaged or worn component: • Clutch Plates • Clutch Piston • Clutch Housing

Circuit/System Description

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

DTC P2723, P2724 sets only when there is a hydraulic/mechanical problem.

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

- [Park - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Park - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Park - Engine Running \(Mechanical Powerflow\)](#)
- [Reverse \(Hydraulic Circuits Without ETRS\)](#) [Reverse \(Hydraulic Circuits With ETRS\)](#) [Reverse \(Mechanical Powerflow\)](#)
- [Neutral - Engine Running \(Hydraulic Circuits Without ETRS\)](#) [Neutral - Engine Running \(Hydraulic Circuits With ETRS\)](#) [Neutral - Engine Running \(Mechanical Powerflow\)](#)
- [Drive Range, First Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, First Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, First Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Second Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Second Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Second Gear \(Mechanical Powerflow\)](#)
- [Drive Range, Third Gear \(Hydraulic Circuits Without ETRS\)](#) [Drive Range, Third Gear \(Hydraulic Circuits With ETRS\)](#) [Drive Range, Third Gear \(Mechanical Powerflow\)](#)

- Drive Range, Fourth Gear (Hydraulic Circuits Without ETRS), Drive Range, Fourth Gear (Hydraulic Circuits With ETRS), Drive Range, Fourth Gear (Mechanical Powerflow)
- Drive Range, Fifth Gear (Hydraulic Circuits Without ETRS), Drive Range, Fifth Gear (Hydraulic Circuits With ETRS), Drive Range, Fifth Gear (Mechanical Powerflow)
- Drive Range, Sixth Gear (Hydraulic Circuits Without ETRS), Drive Range, Sixth Gear (Hydraulic Circuits With ETRS), Drive Range, Sixth Gear (Mechanical Powerflow)
- Drive Range, Seventh Gear (Hydraulic Circuits Without ETRS), Drive Range, Seventh Gear (Hydraulic Circuits With ETRS), Drive Range, Seventh Gear (Mechanical Powerflow)
- Drive Range, Eighth Gear (Hydraulic Circuits Without ETRS), Drive Range, Eighth Gear (Hydraulic Circuits With ETRS), Drive Range, Eighth Gear (Mechanical Powerflow)
- Drive Range, Ninth Gear (Hydraulic Circuits Without ETRS), Drive Range, Ninth Gear (Hydraulic Circuits With ETRS), Drive Range, Ninth Gear (Mechanical Powerflow)

Conditions for Running the DTC

- Battery Voltage = 11 to 32 V
- Engine = Running
- Engine Speed = Greater than 400 RPM
- High Side Driver 2 = On
- Ignition = On

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

Conditions for Setting the DTC

P2723

Clutch 5-7-R = Not applied

P2724

Clutch 5-7-R = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Freeze current adapt values
- {with EPH} Transmission gear allowed = Reverse or Gear 3, 8
- {without EPH} Transmission gear allowed = Reverse or Gear 4

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

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

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

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

Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. Ignition - On/Vehicle - In Service Mode
3. Clear DTCs
4. Road test the vehicle. Refer to [Road Test](#)
5. Verify DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2723, P2724 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P2723, P2724 is set**

Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are 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 P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2723, P2724 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P2723, P2724 is set**

Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are set**
7. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [5-7-Reverse and 6-7-8-9 Clutch Housing Disassemble](#)
- Refer to [Clutch Plate Diagnosis](#)
- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\) Control Valve Body Cleaning and Inspection \(with ETRS\)](#)

- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#), [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#).
- Refer to [Control Valve Solenoid Body Replacement](#)
- Perform the necessary programming and setup procedure: [Solenoid Valve Characterization Reprogramming](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P2731, P2732, P2733: TRANSMISSION CONTROL SOLENOID VALVE 6 PERFORMANCE/STUCK

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 P2731

Transmission Control Solenoid Valve 6 Performance

DTC P2732

Transmission Control Solenoid Valve 6 Stuck Off

DTC P2733

Transmission Control Solenoid Valve 6 Stuck On

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
Q77F Transmission Control Solenoid Valve 6	P2731, P2732, P2733	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
• Clutch Select Valve • Valve Spring • Valve Body Bore	P2731, P2732, P2733	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
• Selectable One Way Clutch 6-7-8-9 Clutch Regulator Valve • Valve Spring • Valve Body Bore	P2731, P2732, P2733	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring

Component	DTC	Condition
Selectable One Way Clutch 6-7-8-9 Clutch Regulator Valve - Oil Feed Circuit	P2731, P2732, P2733	- Blocked or restricted component: Fluid/oil passage - Leaking component: - Gasket - O-Ring - Seal
2-9 Clutch Assembly	P2731	- 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
1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing	P2731	Stuck
6-7-8-9 Clutch Assembly	P2731, P2732, P2733	- Blocked or restricted component: Fluid/oil passage - Leaking component: - Clutch Piston - Clutch Housing - Gasket - O-Ring - Seal - Binding, sticking or stuck component: Clutch Plates - Damaged or worn component: - Clutch Plates - Clutch Piston - Clutch Housing

Circuit/System Description

The solenoid actuator controls fluid pressure by moving the regulator valve that controls fluid pressure to the following components:

- Clutch Selector Valve
- Selectable One Way Clutch 6-7-8-9 Clutch Regulator Valve
- 6-7-8-9 Clutch Assembly

DTC P2731, P2732, P2733 sets only when there is a hydraulic/mechanical problem.

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

- Park - Engine Running (Hydraulic Circuits Without ETRS) Park - Engine Running (Hydraulic Circuits With ETRS) Park - Engine Running (Mechanical Powerflow)
- Reverse (Hydraulic Circuits Without ETRS) Reverse (Hydraulic Circuits With ETRS) Reverse (Mechanical Powerflow)
- Neutral - Engine Running (Hydraulic Circuits Without ETRS) Neutral - Engine Running (Hydraulic Circuits With ETRS) Neutral - Engine Running (Mechanical Powerflow)
- Drive Range, First Gear (Hydraulic Circuits Without ETRS) Drive Range, First Gear (Hydraulic Circuits With ETRS) Drive Range, First Gear (Mechanical Powerflow)
- Drive Range, Second Gear (Hydraulic Circuits Without ETRS) Drive Range, Second Gear (Hydraulic Circuits With ETRS) Drive Range, Second Gear (Mechanical Powerflow)
- Drive Range, Third Gear (Hydraulic Circuits Without ETRS) Drive Range, Third Gear (Hydraulic Circuits With ETRS) Drive Range, Third Gear (Mechanical Powerflow)
- Drive Range, Fourth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fourth Gear (Hydraulic Circuits With ETRS) Drive Range, Fourth Gear (Mechanical Powerflow)
- Drive Range, Fifth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fifth Gear (Hydraulic Circuits With ETRS) Drive Range, Fifth Gear (Mechanical Powerflow)
- Drive Range, Sixth Gear (Hydraulic Circuits Without ETRS) Drive Range, Sixth Gear (Hydraulic Circuits With ETRS) Drive Range, Sixth Gear (Mechanical Powerflow)
- Drive Range, Seventh Gear (Hydraulic Circuits Without ETRS) Drive Range, Seventh Gear (Hydraulic Circuits With ETRS) Drive Range, Seventh Gear (Mechanical Powerflow)
- Drive Range, Eighth Gear (Hydraulic Circuits Without ETRS) Drive Range, Eighth Gear (Hydraulic Circuits With ETRS) Drive Range, Eighth Gear (Mechanical Powerflow)
- Drive Range, Ninth Gear (Hydraulic Circuits Without ETRS) Drive Range, Ninth Gear (Hydraulic Circuits With ETRS) Drive Range, Ninth Gear (Mechanical Powerflow)

Conditions for Running the DTC

- Battery Voltage = 11 to 32 V
- Engine = Running
- Engine Speed = Greater than 400 RPM
- High Side Driver 2 = On
- Ignition = On

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

Conditions for Setting the DTC

P2731

Selectable One Way Clutch 6-7-8-9 Clutch Regulator Valve = Not released

P2732

Clutch 6-7-8-9 = Not applied

P2733

Clutch 6-7-8-9 = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled
- Default shift pattern = Enabled
- Grade braking = Disabled
- Manual Shift Control = Disabled

- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Freeze current adapt values
- {P2731} Transmission gear allowed = Reverse or Gear 1
- {P2732} Transmission gear allowed = Reverse or Gear 5
- {P2733} Transmission gear allowed = Reverse or Gear 7

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

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

Reference Information

Component View Reference

Transmission Solenoid Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

1. Verify the condition does not exist: Incorrect fluid level or condition - Refer to [Transmission Fluid Level and Condition Check](#)
 - **If a condition exists**
Repair or replace as necessary.
 - **Go to next step: If no condition exists**
2. Ignition - On/Vehicle - In Service Mode
3. Clear DTCs
4. Road test the vehicle. Refer to [Road Test](#)
5. Verify DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2731, P2732, P2733 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**
Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P2731, P2732, P2733 is set**
Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are 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 P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2731, P2732, P2733 is not set.

- If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)

- If DTC P2731, P2732, P2733 is set

Refer to Diagnostic Fault Information

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

7. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [2-9 and 4 Clutch Piston Housing Disassemble](#)
- Refer to [2-9 and 4 Clutch Piston Housing Assemble](#)
- Refer to [2-9 and 4 Clutch Piston Housing Installation](#)
- Refer to [1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing Disassemble](#)
- Refer to [1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing Assemble](#)
- Refer to [1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing Installation](#)
- Refer to [5-7-Reverse and 6-7-8-9 Clutch Housing Disassemble](#)
- Refer to [Clutch Plate Diagnosis](#)
- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#)
- For control module replacement, programming and setup, refer to: [Control Module References](#)

DTC P27A7, P27A8, P27A9, P27AA, P27AB, P27AC, P27AD, P27AE: TRANSMISSION CONTROL SOLENOID VALVE 1-8 CALIBRATION INCORRECT

Diagnostic Instructions

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

DTC Descriptor

DTC P27A7

Transmission Control Solenoid Valve 1 Calibration Incorrect

DTC P27A8

Transmission Control Solenoid Valve 2 Calibration Incorrect

DTC P27A9

Transmission Control Solenoid Valve 3 Calibration Incorrect

DTC P27AA

Transmission Control Solenoid Valve 4 Calibration Incorrect

DTC P27AB

Transmission Control Solenoid Valve 5 Calibration Incorrect

DTC P27AC

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

For an overview of the component/system, refer to [Electronic Component Description](#)

Conditions for Running the DTC

Ignition/Vehicle = On

Conditions for Setting the DTC

Transmission Control Solenoid Valve 1-8 Calibration Data = Not Programmed

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A

- The control module uses default replacement values.

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A

Diagnostic Aids

- DTC P27A7, P27A8, P27A9, P27AA, P27AB, P27AC, P27AD, P27AE is an informational DTC.
- This procedure is required when the following component has been repaired, replaced, removed, or serviced:
 - T12 Automatic Transmission Assembly
 - K71 Transmission Control Module
 - Control Valve Body Assembly
 - Transmission Control Solenoid Valve 1-8

Reference Information

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

Control Module References

Circuit/System Verification

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

Refer to [Solenoid Valve Characterization Reprogramming](#)
 - **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 P27EB, P27ED OR P27EE: TRANSMISSION RANGE CONTROL VALVE 1 POSITION SWITCH CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

DTC P27EB

Transmission Range Control Valve 1 Position Switch Circuit

DTC P27ED

Transmission Range Control Valve 1 Position Switch Circuit Low Voltage

DTC P27EE

Transmission Range Control Valve 1 Position Switch Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P077C, P27ED, P27F1	P077C, P27ED, P27F1	-	-
Signal	P27ED	P27ED	P27EE	-

Typical Scan Tool Data

Transmission Range Control Valve 1 Position Switch

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On Parameter Normal Range: 0.6 to 1.0 V - Default 1.7 to 2.2 V - Active			
9 V Reference	0 V	0 V	0.6 to 1.0 V
Signal	0 V	0 V	4.9 to 5.0 V

Circuit/System Description

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

Component	Description
B315A Transmission Range Control Valve 1 Position Switch	A linear hall effect sensor that changes current flow based on the magnetic field's position relative to the sensor.

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

The B315A Transmission Range Control Valve 1 Position Switch monitors the position of the Mode 1 Electronic Transmission Range Selector Valve

- Default = Low Voltage
- Active = High Voltage

Conditions for Running the DTC

Ignition Voltage = Greater than 9 V

Ignition/Vehicle = On

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

Conditions for Setting the DTC

P27EB

Transmission Range Control Valve 1 Position Switch = 1.3 to 1.5 V - For greater than 1 s

P27ED

Transmission Range Control Valve 1 Position Switch = Less than 0.4 V - For greater than 1 s

P27EE

Transmission Range Control Valve 1 Position Switch = Greater than 2.5 V - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

P27EB

Autostart/Autostop = Disabled

P27ED, P27EE

- Autostart/Autostop = Disabled
- Line Pressure Command = Low

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H)).

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](#)

[Parking Brake and Drive Wheels Warning](#)

1. Ignition - On/Vehicle - In Service Mode
2. Verify the scan tool parameter: Transmission Range Control Valve 1 Position Switch = 0.6 to 1.0 V
 - **If not between 0.6 and 1.0 V**
Refer to Circuit/System Testing
 - **Go to next step: If between 0.6 and 1.0 V**
3. Engine - Running
4. Transmission Range - D
5. Verify the scan tool parameter: Transmission Range Control Valve 1 Position Switch = 1.7 to 2.1 V
 - **If not between 1.7 and 2.1 V**
Refer to Circuit/System Testing
 - **Go to next step: If between 1.7 and 2.1 V**
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](#)

1. Ignition/Vehicle - Off
2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
3. Ignition - On/Vehicle - In Service Mode
4. Test for 8.8 to 9.2 V between the test points: 9 V Reference circuit terminal 7 & Ground
 - **If less than 8.8 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: K71 Transmission Control Module
 5. Test for infinite resistance between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.

- If infinite resistance
6. Test for less than $2\ \Omega$ between the test points: 9 V Reference circuit terminal 7 @ Component harness & Terminal 8 @ Control module harness
 - If $2\ \Omega$ or greater - Repair the open/high resistance in the circuit.
 - If less than $2\ \Omega$ - Replace the component: K71 Transmission Control Module
 - **If greater than 9.2 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: K71 Transmission Control Module
 5. Ignition - On/Vehicle - In Service Mode
 6. Test for less than 1 V between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component: K71 Transmission Control Module
 - **Go to next step: If between 8.8 and 9.2 V**
5. Install the special tool: **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 10 kHz
 - Set the duty cycle to 40%
 - Red lead @ Signal circuit terminal 21 X1 @ T12 Automatic Transmission Assembly
 - Black lead @ Ground
 6. Verify the scan tool parameter: Transmission Range Control Valve 1 Position Switch = 2.0 to 3.7 V
 - **If less than 2.0 V**
 1. Remove - Jumper Wire
 2. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 3. Ignition/Vehicle - Off
 4. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 5. Disconnect the electrical connector: K71 Transmission Control Module
 6. Test for infinite resistance between the test points: Signal circuit terminal 62 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
 7. Test for less than $2\ \Omega$ between the test points: Signal circuit terminal 21 X1 @ Component harness & Terminal 62 @ Control module harness
 - If $2\ \Omega$ or greater - Repair the open/high resistance in the circuit.
 - If less than $2\ \Omega$ - Replace the component: K71 Transmission Control Module
 - **If greater than 2.3 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: K71 Transmission Control Module
 5. Ignition - On/Vehicle - In Service Mode
 6. Test for less than 1 V between the test points: Signal circuit terminal 21 X1 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component: K71 Transmission Control Module
 - **Go to next step: If between 2.0 and 2.3 V**
 7. Remove the transmission cover.

8. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
9. Disconnect the component: B315A Transmission Range Control Valve 1 Position Switch
10. Test for 8.8 to 9.2 V between the test points: 9 V Reference circuit terminal 2 & Ground
 - **If less than 8.8 V**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 3. Test for infinite resistance between the test points: 9 V Reference circuit terminal 2 @ Component harness & Ground
 - If less than infinite resistance - Replace the component: Automatic Transmission Wiring Harness
 - If infinite resistance
 4. Test for less than 2 Ω between the test points: 9 V Reference circuit terminal 2 @ Component harness & Terminal 1 X2 @ Component harness
 - If greater than 2 Ω - Replace the component: Automatic Transmission Wiring Harness
 - If less than 2 Ω - Replace the component: B315A Transmission Range Control Valve 1 Position Switch
 - **If greater than 9.2 V**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 3. Ignition - On/Vehicle - In Service Mode
 4. Test for less than 1 V between the test points: 9 V Reference circuit terminal 2 @ Component harness & Ground
 - If greater than 1 V - Replace the component: Automatic Transmission Wiring Harness
 - If less than 1 V - Replace the component: K71 Transmission Control Module
 - **Go to next step: If between 8.8 and 9.2 V**
11. Install the special tool: **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 10 kHz
 - Set the duty cycle to 40%
 - Red lead @ Signal circuit terminal 1 @ Component harness
 - Black lead @ Ground
12. Verify the scan tool parameter: Transmission Range Control Valve 1 Position Switch = 2.0 to 2.3 V
 - **If less than 2.0 V**
 1. Remove - Jumper Wire
 2. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 3. Ignition/Vehicle - Off
 4. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 5. Disconnect the electrical connector: K71 Transmission Control Module
 6. Test for infinite resistance between the test points: Signal circuit terminal 1 @ Component harness & Ground
 - If less than infinite resistance - Replace the component: Automatic Transmission Wiring Harness
 - If infinite resistance
 7. Test for less than 2 Ω between the test points: Signal circuit terminal 1 @ Component harness & Terminal 8 X2 @ Component harness
 - If greater than 2 Ω - Replace the component: Automatic Transmission Wiring Harness
 - If less than 2 Ω - Replace the component: B315A Transmission Range Control Valve 1 Position Switch
 - **If greater than 2.3 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly

2. Ignition/Vehicle - Off
3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
4. Disconnect the electrical connector: K71 Transmission Control Module
5. Ignition - On/Vehicle - In Service Mode
6. Test for less than 1 V between the test points: Signal circuit terminal 1 @ Component harness & Ground
 - If greater than 1 V - Replace the component: Automatic Transmission Wiring Harness
 - If less than 1 V - Replace the component: B315A Transmission Range Control Valve 1 Position Switch
- **Go to next step: If between 2.0 and 2.3 V**
13. Test or replace the component: B315A Transmission Range Control Valve 1 Position Switch

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Automatic Transmission Wiring Harness Replacement](#)
- Refer to [Control Valve Solenoid Body Replacement](#) - B315A Transmission Range Control Valve 1 Position Switch
- Refer to [Control Valve Body Cover Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P27EF, P27F1 OR P27F2: TRANSMISSION RANGE CONTROL VALVE 2 POSITION SWITCH CIRCUIT

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 P27EF

Transmission Range Control Valve 2 Position Switch Circuit

DTC P27F1

Transmission Range Control Valve 2 Position Switch Circuit Low Voltage

DTC P27F2

Transmission Range Control Valve 2 Position Switch Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
9 V Reference	P077C, P27ED, P27F1	P077C, P27ED, P27F1	-	-
Signal	P27F1	P27F1	P27F2	-

Typical Scan Tool Data

Transmission Range Control Valve 2 Position Switch

Circuit	Short to Ground	Open	Short to Voltage

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition = On Parameter Normal Range: 0.6 to 1.0 V - Default 1.7 to 2.2 V - Active			
9 V Reference	0 V	0 V	0.6 to 1.0 V
Signal	0 V	0 V	4.9 to 5.0 V

Circuit/System Description

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
Transmission Range Control Valve 2 Position Switch	A linear hall effect sensor that changes current flow based on the magnetic field's position relative to the sensor.
K71 Transmission Control Module	The control module contains a microprocessor used to process input data to control outputs.

The B315B Transmission Range Control Valve 2 Position Switch monitors the position of the Mode 1 Electronic Transmission Range Selector Valve

- Default = Low Voltage
- Active = High Voltage

Conditions for Running the DTC

Battery Voltage = Greater than 9 V

Ignition/Vehicle = On

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

Conditions for Setting the DTC

P27EF

Transmission Range Control Valve 2 Position Switch = 1.3 to 1.5 V - For greater than 1 s

P27F1

Transmission Range Control Valve 2 Position Switch = Less than 0.4 V - For greater than 1 s

P27F2

Transmission Range Control Valve 2 Position Switch = Greater than 2.5 V - For greater than 1 s

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled
- Line Pressure Command = Low

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Reference Information

Schematic Reference

Automatic Transmission Controls Wiring Schematics (9T45 (M3U) or 9T50 (M3D M3H)).

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

Parking Brake and Drive Wheels Warning

1. Ignition - On/Vehicle - In Service Mode
2. Verify the scan tool parameter: Transmission Range Control Valve 2 Position Switch = 0.6 to 1.0 V
 - **If not between 0.6 and 1.0 V**
Refer to Circuit/System Testing
 - **Go to next step: If between 0.6 and 1.0 V**
3. Engine - Running
4. Transmission Range - D
5. Verify the scan tool parameter: Transmission Range Control Valve 2 Position Switch = 1.7 to 2.1 V
 - **If not between 1.7 and 2.1 V**
Refer to Circuit/System Testing
 - **Go to next step: If between 1.7 and 2.1 V**
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

1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
2. Ignition/Vehicle - Off
3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
4. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
5. Ignition - On/Vehicle - In Service Mode
6. Test for 8.8 to 9.2 V between the test points: 9 V Reference circuit terminal 7 & Ground
 - **If less than 8.8 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: K71 Transmission Control Module
 5. Test for infinite resistance between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
 6. Test for less than 2 Ω between the test points: 9 V Reference circuit terminal 7 @ Component harness & Terminal 8 @ Control module harness
 - If 2 Ω or greater - Repair the open/high resistance in the circuit.
 - If less than 2 Ω - Replace the component: K71 Transmission Control Module
 - **If greater than 9.2 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: K71 Transmission Control Module
 5. Ignition - On/Vehicle - In Service Mode
 6. Test for less than 1 V between the test points: 9 V Reference circuit terminal 7 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component: K71 Transmission Control Module
 - **Go to next step: If between 8.8 and 9.2 V**
7. Install the special tool: **EL-38522** Variable Signal Generator
 - Set the voltage to 5 V
 - Set the frequency to 10 kHz
 - Set the duty cycle to 40%
 - Red lead @ Signal circuit terminal 20 X1 @ T12 Automatic Transmission Assembly
 - Black lead @ Ground
8. Verify the scan tool parameter: Transmission Range Control Valve 2 Position Switch = 2.0 to 2.3 V
 - **If less than 2.0 V**
 1. Remove - Jumper Wire
 2. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 3. Ignition/Vehicle - Off
 4. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 5. Disconnect the electrical connector: K71 Transmission Control Module
 6. Test for infinite resistance between the test points: Signal circuit terminal 60 @ Component harness & Ground
 - If less than infinite resistance - Repair the short to ground on the circuit.
 - If infinite resistance
 7. Test for less than 2 Ω between the test points: Signal circuit terminal 20 X1 @ Component harness & Terminal 60 @ Control module harness

- If 2 Ω or greater - Repair the open/high resistance in the circuit.
- If less than 2 Ω - Replace the component: K71 Transmission Control Module
- **If greater than 2.3 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: K71 Transmission Control Module
 5. Ignition - On/Vehicle - In Service Mode
 6. Test for less than 1 V between the test points: Signal circuit terminal 20 X1 @ Component harness & Ground
 - If 1 V or greater - Repair the short to voltage on the circuit.
 - If less than 1 V - Replace the component: K71 Transmission Control Module
- **Go to next step: If between 2.0 and 2.3 V**
- 9. Remove the transmission cover.
- 10. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly X1
- 11. Disconnect the component: B315B Transmission Range Control Valve 2 Position Switch
- 12. Test for 8.8 to 9.2 V between the test points: 9 V Reference circuit terminal 2 & Ground
 - **If less than 8.8 V**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 3. Test for infinite resistance between the test points: 9 V Reference circuit terminal 2 @ Component harness & Ground
 - If less than infinite resistance - Replace the component: Automatic Transmission Wiring Harness
 - If infinite resistance
 4. Test for less than 2 Ω between the test points: 9 V Reference circuit terminal 2 @ Component harness & Terminal 1 X2 @ Component harness
 - If greater than 2 Ω - Replace the component: Automatic Transmission Wiring Harness
 - If less than 2 Ω - Replace the component: B315B Transmission Range Control Valve 2 Position Switch
 - **If greater than 9.2 V**
 1. Ignition/Vehicle - Off
 2. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 3. Ignition - On/Vehicle - In Service Mode
 4. Test for less than 1 V between the test points: 9 V Reference circuit terminal 2 @ Component harness & Ground
 - If greater than 1 V - Replace the component: Automatic Transmission Wiring Harness
 - If less than 1 V - Replace the component: K71 Transmission Control Module
 - **Go to next step: If between 8.8 and 9.2 V**
- 13. Install the special tool: **EL-38522** Variable Signal Generator.
 - Set the voltage to 5 V
 - Set the frequency to 10 kHz
 - Set the duty cycle to 40%
 - Red lead @ Signal circuit terminal 1 @ Component harness
 - Black lead @ Ground
- 14. Verify the scan tool parameter: Transmission Range Control Valve 2 Position Switch = 2.0 to 2.3 V
 - **If less than 2.0 V**
 1. Ignition/Vehicle - Off & Remove - Jumper wire(s)
 2. Disconnect the electrical connector: K71 Transmission Control Module

3. Test for infinite resistance between the test points: Signal circuit terminal 1 @ Component harness & Ground
 - If less than infinite resistance - Replace the component: Automatic Transmission Wiring Harness
 - If infinite resistance
4. Test for less than 2 Ω between the test points: Signal circuit terminal 1 @ Component harness & Terminal 9 X2 @ Component harness
 - If greater than 2 Ω - Replace the component: Automatic Transmission Wiring Harness
 - If less than 2 Ω - Replace the component: B315B Transmission Range Control Valve 2 Position Switch
- **If greater than 2.3 V**
 1. Connect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 2. Ignition/Vehicle - Off
 3. Disconnect the electrical connector: X1 @ T12 Automatic Transmission Assembly
 4. Disconnect the electrical connector: K71 Transmission Control Module
 5. Ignition - On/Vehicle - In Service Mode
 6. Test for less than 1 V between the test points: Signal circuit terminal 1 @ Component harness & Ground
 - If greater than 1 V - Replace the component: Automatic Transmission Wiring Harness
 - If less than 1 V - Replace the component: B315B Transmission Range Control Valve 2 Position Switch
- **Go to next step: If between 2.0 and 2.3 V**
15. Test or replace the component: B315B Transmission Range Control Valve 2 Position Switch

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [Automatic Transmission Wiring Harness Replacement](#)
- Refer to [Control Valve Solenoid Body Replacement](#) - B315B Transmission Range Control Valve 2 Position Switch
- Refer to [Control Valve Body Cover Replacement](#)
- For control module replacement, programming and setup, refer to [Control Module References](#)

DTC P2820 OR P2821: TRANSMISSION CONTROL SOLENOID VALVE 9 STUCK OFF/ON

Diagnostic Instructions

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

DTC Descriptor

DTC P2820

Transmission Control Solenoid Valve 9 Stuck Off

DTC P2821

Transmission Control Solenoid Valve 9 Stuck On

Diagnostic Fault Information

NOTE: The components are listed from the least to the most intrusive to service.

Component	DTC	Condition
-----------	-----	-----------

Component	DTC	Condition
Q77J Transmission Control Solenoid Valve 9	P2820, P2821	• Binding, sticking or stuck component: Solenoid Valve • Damaged or missing component: • Retaining Clip • Solenoid Valve
• Clutch Selector Valve • Valve Spring • Valve Body Bore	P2820, P2821	• Binding, sticking or stuck component: Valve • Debris on the component. • Damaged component: • Valve or Bore - Scored • Spring
Oil Feed Circuit	P2820, P2821	• Blocked or restricted component: Fluid/oil passage • Leaking component: • Gasket • O-Ring • Seal

Circuit/System Description

The solenoid valve controls the oil flow to the appropriate component: Clutch Selector Valve

DTC P2820, P2821 sets only when there is a hydraulic/mechanical problem.

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

- **Electronic Component Description**
- **Park - Engine Running (Hydraulic Circuits Without ETRS) Park - Engine Running (Hydraulic Circuits With ETRS) Park - Engine Running (Mechanical Powerflow)**
- **Reverse (Hydraulic Circuits Without ETRS) Reverse (Hydraulic Circuits With ETRS) Reverse (Mechanical Powerflow)**
- **Neutral - Engine Running (Hydraulic Circuits Without ETRS) Neutral - Engine Running (Hydraulic Circuits With ETRS) Neutral - Engine Running (Mechanical Powerflow)**
- **Drive Range, First Gear (Hydraulic Circuits Without ETRS) Drive Range, First Gear (Hydraulic Circuits With ETRS) Drive Range, First Gear (Mechanical Powerflow)**
- **Drive Range, Second Gear (Hydraulic Circuits Without ETRS) Drive Range, Second Gear (Hydraulic Circuits With ETRS) Drive Range, Second Gear (Mechanical Powerflow)**
- **Drive Range, Third Gear (Hydraulic Circuits Without ETRS) Drive Range, Third Gear (Hydraulic Circuits With ETRS) Drive Range, Third Gear (Mechanical Powerflow)**
- **Drive Range, Fourth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fourth Gear (Hydraulic Circuits With ETRS) Drive Range, Fourth Gear (Mechanical Powerflow)**
- **Drive Range, Fifth Gear (Hydraulic Circuits Without ETRS) Drive Range, Fifth Gear (Hydraulic Circuits With ETRS) Drive Range, Fifth Gear (Mechanical Powerflow)**
- **Drive Range, Sixth Gear (Hydraulic Circuits Without ETRS) Drive Range, Sixth Gear (Hydraulic Circuits With ETRS) Drive Range, Sixth Gear (Mechanical Powerflow)**
- **Drive Range, Seventh Gear (Hydraulic Circuits Without ETRS) Drive Range, Seventh Gear (Hydraulic Circuits With ETRS) Drive Range, Seventh Gear (Mechanical Powerflow)**
- **Drive Range, Eighth Gear (Hydraulic Circuits Without ETRS) Drive Range, Eighth Gear (Hydraulic Circuits With ETRS) Drive Range, Eighth Gear (Mechanical Powerflow)**

- Drive Range, Ninth Gear (Hydraulic Circuits Without ETRS), Drive Range, Ninth Gear (Hydraulic Circuits With ETRS), Drive Range, Ninth Gear (Mechanical Powerflow)

Conditions for Running the DTC

- DTCs related to the following system/component = Not Set
 - B14A Transmission Output Shaft Speed Sensor
 - B14C Transmission Input Shaft Speed Sensor
 - B14D Transmission Intermediate Shaft Speed Sensor
 - B15 Transmission Internal Mode Switch
- Battery Voltage = Greater than 9 V
- Engine Speed = Greater than 400 RPM
- High Side Driver 1 = On
- High Side Driver 2 = On
- Ignition/Vehicle = On
- Transmission Fluid Temperature = -256 to 130 Å, Å°C (-430 to 266 Å, Å°F)
- Transmission OSS = Greater than 34 RPM

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

Conditions for Setting the DTC

P2820

Clutch Selector Valve = Not applied

P2821

Clutch Selector Valve = Not released

Actions Taken When the DTC Sets

DTCs listed in the DTC Descriptor Category = Type A DTC

- Autostart/Autostop = Disabled
- Grade braking = Disabled
- Manual Shift Control = Disabled
- Neutral Idle Mode = Disabled
- Powertrain braking = Disabled
- TCC Control = Disabled
- Transmission Adaptive Values Learn = Freeze current adapt values
- {P2820} 1st Gear = Not Available
- {P2820} Transmission gear allowed = Reverse or Gear 2

Conditions for Clearing the DTC

DTCs listed in the DTC Descriptor Category = Type A DTC

Diagnostic Aids

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

Reference Information

Component View Reference

Transmission Solenoid Information

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 DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2731, P2820, P2821 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P2820 or P2821 is set**

Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are 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 P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3, P2731, P2820, P2821 is not set.
 - **If DTC P0716, P0717, P0721, P0722, P0723, P07BF, P077C, P077D, P07C0, P176B, P176C, P176D, P17D3 is set**

Refer to [Diagnostic Trouble Code \(DTC\) List - Vehicle](#)
 - **If DTC P2820 or P2821 is set**

Refer to Diagnostic Fault Information
 - **Go to next step: If none of the DTCs are set**
7. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair: [Diagnostic Repair Verification](#)

- Refer to [5-7-Reverse and 6-7-8-9 Clutch Housing Disassemble](#)
- Refer to [Clutch Plate Diagnosis](#)
- Refer to [Control Valve Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Cleaning and Inspection \(without ETRS\)](#) [Control Valve Solenoid Body Cleaning and Inspection \(with ETRS\)](#)
- Refer to [Control Valve Solenoid Body Replacement](#)

SOLENOID VALVE CHARACTERIZATION REPROGRAMMING

The solenoids in this transmission require unique performance characteristic data in order to function at maximum efficiency. This data is programmed and stored in the vehicle's transmission control module (TCM). When a transmission assembly, TCM, or solenoids are replaced during service, the performance characteristic data for the solenoids must be retrieved from a web server "cloud" repository and reprogrammed into the TCM.

Reprogramming also ensures that the characteristic data relationship is properly matched between the solenoids, valve body, and transmission.

Solenoid characterization reprogramming is performed using the TIS2Web Service Programming System (SPS).

Solenoid Reprogramming Procedure

Perform solenoid characterization reprogramming after one of the following service procedures:

NOTE: Select "Replace Transmission" at the MCVM Characterization selection screen.

- Replace transmission assembly

NOTE: Select "Replace Valve Body" at the MCVM Characterization selection screen.

- Replace valve body assembly

NOTE: Select "Replace Solenoid" at the MCVM Characterization selection screen.

- Replace solenoid (currently not an available Service Procedure)

NOTE: Select "Refresh Characterization Data" at the MCVM Characterization selection screen.

- Replace TCM

NOTE: Select "Refresh Characterization Data" at the MCVM Characterization selection screen.

- Solenoid characterization may also be performed to "refresh" characterization data.

To perform solenoid characterization after a transmission component replacement:

1. Document the new Transmission Unique Number (TUN) or Part Unique Number (PUN) as required.
 - The TUN location may be found here: [Transmission Identification Information](#) . Since the TUN can be difficult to access when the transmission is installed in the vehicle, ensure you document the 16-digit TUN prior to installing the transmission in the vehicle.
 - The PUN location may be found here: [Control Valve Solenoid Body Identification Information](#) . Before installing the control valve solenoid body onto the transmission, document the 16-digit PUN. If the control valve solenoid body PUN has not been saved for reference, it may be necessary to disassemble the control valve solenoid body from the transmission to clearly read the control valve solenoid body PUN.
2. Log into TIS2Web/SPS.
3. Type the vehicle identification number (VIN).
4. Perform the SPS Transmission Control Module programming event.

- Select "Transmission Control Module - Programming" to update TCM calibrations and Solenoid Characterization data.

OR

- Select "Transmission Control Module - MCVM Operations" to update Solenoid Characterization data only.
5. From the "MCVM (Mechanical Characterization and Virtual Matching) Operation Selection" screen, select the applicable service procedure to be performed. You will be prompted to provide the necessary Transmission Unique Number (TUN) or Part Unique Number (PUN) when replacing a transmission part.

At this point, the system will read the VIN from the engine control module (ECM) using the multiple diagnostic interface (MDI) and then retrieve the applicable genealogy data tree from the cloud. This data tree accesses the original characterization data so that it may be updated with the new component information. The system acquires characterization data for the given TUN/PUN via the cloud and updates the genealogy tree. The TCM is updated with the correct solenoid characterization data, and the cloud is updated with the new genealogy relationship.

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](#) , and [Transmission Component and System Description](#) .

Visual/Physical Inspection

Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to [Testing for Intermittent Conditions and Poor Connections](#) .

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- Fluid Diagnosis
 - [Transmission Fluid Level and Condition Check](#)
 - [Automatic Transmission Fluid Leaks](#)
 - [Fluid Leak Diagnosis](#)
- Noise and Vibration Diagnosis
 - [Whine/Growl Noise](#)
 - [Noise and Vibration Analysis](#)
 - [Torque Converter Diagnosis \(LTG\) Torque Converter Diagnosis \(LYX\)](#)
- Range Performance Diagnosis
 - [No Park](#)
 - [No Drive in All Ranges](#)
 - [No Reverse Gear](#)
 - [Shift Indicator Indicates Wrong Gear Selection](#)
- Shift Quality Feel Diagnosis

- [Harsh Garage Shift](#)
- Torque Converter Diagnosis
 - [Torque Converter Diagnosis \(LTG\)](#)[Torque Converter Diagnosis \(LYX\)](#)
 - [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.

CAUTION: Use Dexron[®] VI transmission fluid only. Failure to use the proper fluid may result in transmission internal damage.

NOTE: Ensure the transmission has enough fluid in it to safely start the vehicle without damaging the transmission. With the vehicle off and the transmission fluid temperature at approximately 20 - 25[°]C (68 - 77[°]F) there must be at least enough fluid to drain out of the fluid level hole. This will ensure that there is enough fluid in the sump to fill the components once the vehicle is started.

Non Dipstick Level Checking Procedure

1. Start the engine.
2. Depress the brake pedal and move the shift lever through each gear range, pausing for about 3 seconds in each range. Then move the shift lever back to PARK (P).
3. Allow the engine to idle 500 - 800 RPM for at least 3 minutes to allow any fluid foaming to dissipate and the fluid level to stabilize. Release the brake pedal.

NOTE: If the TFT reading is not at the required temperature, allow the vehicle to cool, or operate the vehicle until the appropriate TFT is reached. If the fluid temperature is below the specified range, perform the following procedure to raise the fluid temperature to the specification.

Drive the vehicle in second gear until the fluid temperature is at the specified temperature.

4. Keep the engine running and observe the transmission fluid temperature (TFT) using the Driver Information Center or a scan tool.

CAUTION: The transmission fluid level must be checked when the transmission fluid temperature (TFT) is at 85 - 95[°]C (185 - 203[°]F). If the TFT is not at this temperature, operate the vehicle or allow the fluid to cool as required. Setting the fluid level with a TFT outside this temperature will result in either an under or over-filled transmission. TFT 95[°]C under-filled, TFT 85[°]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, fluid foaming, or pump cavitation.

5. Raise the vehicle on a hoist. The vehicle must be level, with the engine running and the shift lever in the PARK range.

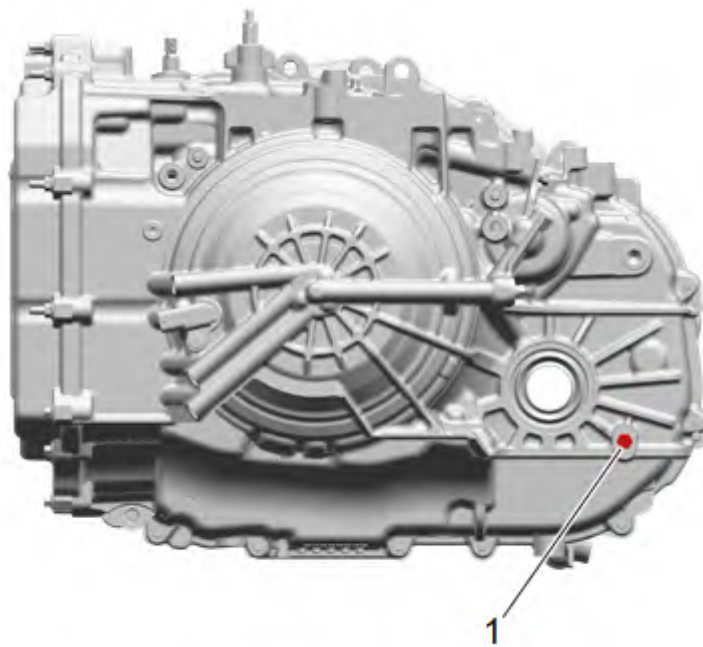


Fig. 1: Oil Level Plug

Courtesy of GENERAL MOTORS COMPANY

6. While the vehicle is idling, remove the oil level set plug. Allow any fluid to drain.

Oil Level Plug (1)

- 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.
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 for excessive metal particles or other debris. A small amount of "friction" material is a "normal" condition. If large pieces and/or metal particles are noted in the fluid, flush the oil cooler and cooler lines and overhaul the transmission. If there are no signs of transmission internal damage noted, replace the fluid, 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](#).
 8. Inspect for external leaks. Refer to [Fluid Leak Diagnosis](#).
 9. If the fluid was changed, reset the transmission oil life monitor if applicable.

Dipstick Level Checking Procedure (If equipped)

1. Park the vehicle on a level surface, apply the parking brake and place the shift lever in PARK (P). Start the engine.
2. Depress the brake pedal and move the shift lever through each gear range, pausing for about 3 seconds in each range. Then move the shift lever back to PARK (P).
3. Allow the engine to idle 500 - 800 RPM for at least 3 minutes to allow any fluid foaming to dissipate and the fluid level to stabilize. Release the brake pedal.
4. Keep the engine running and observe the transmission fluid temperature (TFT) using the Driver Information Center or a scan tool.

CAUTION:

The transmission fluid level must be checked when the transmission fluid temperature (TFT) is at 85 - 95°C (185 - 203°F). If the TFT is not at this temperature, operate the vehicle or allow the fluid to cool as required. Setting the fluid level with a TFT outside this temperature will result in either an under or over-filled transmission. TFT 95°C under-filled, TFT 85°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, fluid foaming, or pump cavitation.

NOTE:

- If the TFT reading is not at the required temperature, allow the vehicle to cool, or operate the vehicle until the appropriate TFT is reached. If the fluid temperature is below the specified range, perform the following procedure to raise the fluid temperature to the specification.
- Check the transmission fluid level when the TFT is at between 85 - 95°C (185 - 203°F). The fluid level rises as fluid temperature increases, so it is important to ensure the transmission fluid temperature is at the specified temperature.

Drive the vehicle in second gear until the fluid temperature is at the specified temperature.

5. The vehicle must be level, with the engine running and the shift lever in the PARK range.
6. Remove the dipstick and wipe it with a clean rag or paper towel.
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 for excessive metal particles or other debris. A small amount of "friction" material is a "normal" condition. If large pieces and/or metal particles are noted in the fluid, flush the oil cooler and cooler lines and overhaul the transmission. If there are no signs of transmission internal damage noted, replace the fluid, 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](#).
8. Install the dipstick. Wait three seconds and then remove it again.

NOTE: Always check the fluid level at least twice. Consistent readings are important to maintaining proper fluid level. If inconsistent readings are noted, inspect the transmission vent cap to ensure it is clean and unclogged.

NOTE: It is not necessary to get the fluid level all the way up to the MAX mark. Anywhere within the crosshatch band is acceptable.

9. Check both sides of the dipstick and read the lower level.
10. Install and remove the dipstick again to verify the reading.

NOTE: Do not add more than one half pint (0.25L) at a time without rechecking the level. Once the oil is on the dipstick bullet, it will not take much more fluid to raise the fluid level into the crosshatch band. Do not overfill. Also, if the fluid level is low, inspect the transmission for leaks. Refer to [Fluid Leak Diagnosis](#).

11. If the fluid level is not within the crosshatch band, and the transmission temperature is at 90°C (194°F), add or drain fluid as necessary to bring the level into the crosshatch band. If the fluid level is low, add only enough fluid to bring the level into the crosshatch band.
12. If the fluid level is in the acceptable range, install the dipstick.
13. If the fluid was changed, reset the transmission oil life monitor if applicable.

Fluid Condition Inspection

- Inspect the fluid color. The fluid should be red in color. The fluid may also turn brown from normal use, and does not always indicate contamination.

NOTE: Fluid that is very dark or black and has a burnt odor usually indicates contamination or overheating.

- If the fluid color is very dark or black and has a burnt odor, inspect the fluid for excessive metal particles or other debris which may indicate transmission damage. Refer to [Road Test](#) to verify transmission operation. Change the transmission fluid if no other conditions are found.
- 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](#).

ROAD TEST

NOTE: The Road Test Procedure should be performed only as part of the Symptom Diagnosis.

Perform the road test in conjunction with the symptom diagnosis. Refer to [Symptoms - Automatic Transmission](#).

The following test provides a method of evaluating the condition of the automatic transmission. The test is structured so that most driving conditions would be achieved. The test is divided into the following parts:

- Electrical Function Check
- Upshift Control and Torque Converter Clutch (TCC) Apply
- Part Throttle Step-In Downshifts
- Manual Downshifts
- Coasting Downshifts
- Manual Gear Range Selection
 - REVERSE
 - Driver Shift Control

NOTE: Complete the test in the sequence given. Incomplete testing cannot guarantee an accurate evaluation.

Before the road test, ensure the following:

- The engine is performing properly.
- Transmission fluid level is correct. Refer to [Transmission Fluid Level and Condition Check](#).
- Tire pressure is correct.

During the road test:

- Perform the test only when traffic conditions permit.
- Operate the vehicle in a controlled, safe manner.
- Observe all traffic regulations.
- View the scan tool data while conducting this test.

Take along qualified help in order to operate the vehicle safely.

- Observe any unusual sounds or smells.
- Ensure the transmission fluid temperature is at least 90°C (194°F).

After the road test, check the following:

- Inspect for proper transmission fluid level. Refer to [Transmission Fluid Level and Condition Check](#).
- Inspect for any diagnostic trouble codes (DTCs) that may have set during the testing. Refer to the applicable DTC.
- Monitor the scan tool data for any abnormal readings or data.
- Inspect for fluid leaks. Refer to [Fluid Leak Diagnosis](#).

Electrical Function Check

Perform this procedure 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.

Refer to [Control Module References](#) for typical data values. Data that is questionable may indicate a concern.

- Engine Speed
- Transmission ISS
- Transmission OSS
- Vehicle Speed
- IMS
- Commanded Gear
- Gear Ratio
- Line PC Sol. Pressure Cmd.
- Brake Switch
- ECT, Engine Data List
- Trans. Fluid Temp.
- TCM Temperature
- Calc. Throttle Position
- Ignition Voltage
- TFP Switch 1
- TFP Switch 3
- TFP Switch 4
- TFP Switch 5
- PC Sol. 2 Pressure Cmd.
- PC Sol. 3 Pressure Cmd.
- PC Sol. 4 Pressure Cmd.
- PC Sol. 5 Pressure Cmd.
- Shift Solenoid 1
- Shift Solenoid 2
- TCC PC Sol. Duty Cycle
- 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:
 1. PARK to REVERSE
 2. REVERSE to NEUTRAL
 3. NEUTRAL to DRIVE
 4. DRIVE to REVERSE
 5. 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 transmission fluid temperature is above 20°C (68°F) 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.
- A default condition caused by certain DTCs that result in maximum line pressure to prevent clutch slippage.
- Incomplete adapting or incorrect adapting - Repeat maneuver multiple times to see if shift quality improves. If it does not, refer to the service procedures for [Harsh Garage Shift](#).

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

- Low idle speed - Compare engine idle speed to desired idle speed.
- Low fluid level
- Cold transmission fluid temperature (TFT) - Use the scan tool to determine TFT.
- Selector linkage - Inspect and adjust as necessary.
- Incomplete adapting or incorrect adapting - Repeat maneuver multiple times to see if delay improves. If it does not, refer to the service procedures for [Harsh Garage Shift](#).

6. Monitor transmission range on the scan tool, transmission data list.

1. Apply the brake pedal and ensure the parking brake is set.
2. Move the gear selector through all ranges.
3. Pause 2 to 3 seconds in each range.
4. Return gear selector to PARK.
5. Verify that all selector positions match the scan tool display.

7. Check throttle position input.

1. Apply the brake pedal and ensure the parking brake is set.
2. Ensure the gear selector is in PARK.
3. Monitor the scan tool Calc. Throttle Position while increasing and decreasing engine speed with the throttle pedal. The scan tool Calc. Throttle Position percentage should increase and decrease with engine speed.

If any of the above checks do not perform properly, record the result for reference after completion of the road test.

Upshift Control and Torque Converter Clutch (TCC) Apply

The TCM calculates the upshift points based primarily on 2 inputs: throttle position and vehicle speed. When the TCM determines that conditions are met for a shift to occur, the TCM commands the shift by varying current to the appropriate PC solenoids to control oncoming and offgoing clutch pressures.

Perform the following steps:

1. Monitor the following scan tool parameters:

- Calc. Throttle Position
- Vehicle Speed
- Engine Speed
- Transmission ISS
- Transmission OSS
- Commanded Gear
- TCC PC Sol. Pressure Cmd.
- TCC Slip Speed

- TFP Switch 1
 - TFP Switch 3
 - TFP Switch 4
 - TFP Switch 5
 - PC Sol. 2 Pressure Cmd.
 - PC Sol. 3 Pressure Cmd.
 - PC Sol. 4 Pressure Cmd.
 - PC Sol. 5 Pressure Cmd.
 - Shift Solenoid 1 and 2
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.
 4. As the transmission upshifts, there should be a noticeable shift feel or engine speed change within 1 to 2 seconds of the commanded gear change. The PC solenoid pressure command should change to "YES" for the oncoming clutch and the PC solenoid pressure command should change to "NO" for the offgoing clutch.
 5. Note any harsh, soft or delayed shifts or slipping. Note any noise or vibration.
 6. The TCC feel may not be noticeable. In many applications the TCC will apply after the 1-2 shift and TCC events will not be easily detected using engine speed.

NOTE: This transmission is equipped with an electronically controlled capacity clutch (ECCC), which allows operation of the clutch without fully locking to the torque converter cover. The clutch maintains a small amount of slippage, approximately 20 RPM, in 2nd, 3rd, 4th, 5th, and 6th gears, depending on the vehicle application. ECCC was developed to reduce the possibility of noise, vibration or chugle caused by TCC apply. Full lockup is available at highway speeds on some applications.

7. Monitor TCC PC solenoid pressure command while driving and check TCC slip speed when the pressure command indicates that the TCC is commanded to apply:

When the TCC applies, slip speed should be controlled to below 100 RPM when the transmission is not shifting and the throttle is held steady. If the TCC slip exceeds this value for more than 6 seconds after the TCC PC Sol. Pressure Command indicates that the TCC is commanded on:

- Check for DTCs.
- Refer to [Torque Converter Diagnosis \(LTG\)](#)[Torque Converter Diagnosis \(LYX\)](#).

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. 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 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 6th gear with the TCC applied.
3. Release the throttle and apply the brakes
4. Verify that the downshifts occur as commanded by monitoring gear ratio, which should change after commanded gear changes.

Manual Gear Range Selection

This application does not utilize manual forward gear ranges.

Reverse

Perform the following test using a 10 - 15 percent throttle position.

1. With the vehicle stopped, move the gear selector to REVERSE.
2. Slowly accelerate the vehicle.
3. Verify that there is no noticeable slip, noise or vibration.

Driver Shift Control (DSC)

Refer to the owner's manual for specific instructions on the type of DSC available in this application. Utilize the DSC to ensure that the transmission responds appropriately to driver's commands. The TCM will upshift automatically when maximum engine speed is achieved and will protect from any downshift which may cause excessive engine RPMs.

TORQUE CONVERTER DIAGNOSIS (LTG)

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:

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

The [Noise and Vibration Analysis](#) procedure should be performed prior to performing this test.

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.

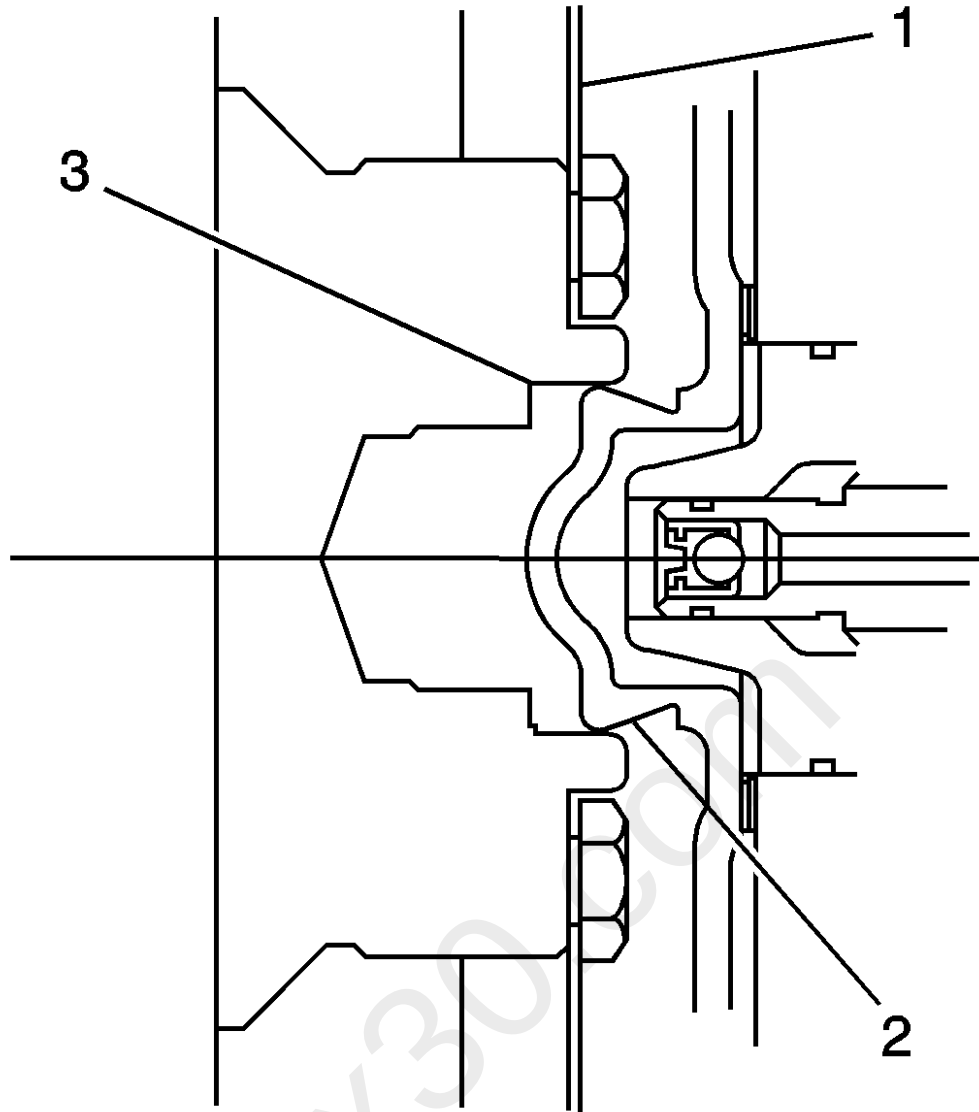


Fig. 2: Aligning Torque Converter Hub In Engine Crankshaft
 Courtesy of GENERAL MOTORS COMPANY

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](#) .

3. Align the torque converter pilot (2) in the engine crankshaft (3). Install the torque converter to flexplate bolts, and tighten according to [Fastener Specifications \(On-Vehicle\)](#) [Fastener Specifications \(Off-Vehicle\)](#) .
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 \(On-Vehicle\)](#) [Fastener Specifications \(Off-Vehicle\)](#) .

Torque Converter Replacement Guide

Condition	Action

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 gasket 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 .
DTC P0741 - TCC Stuck OFF/High Slip - Intermittent Only	Do not replace the torque converter. Refer to DTC P0741, P2817, or P2818 diagnostic table.
DTC P0741 - TCC Stuck OFF/High Slip	Do not replace the torque converter. Refer to DTC P0741, P2817, or P2818 diagnostic table.
DTC P0742 - TCC Stuck ON	Do not replace the torque converter. Refer to DTC P0741, P2817, or P2818 diagnostic table.
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.

Condition	Action
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. • Refer to Torque Converter Stator in this procedure. • Refer to Symptoms - Engine Controls .
Stripped Converter Bolt Holes	• Replace the torque converter. • Inspect flexplate and refer to Lower Engine Noise, Regardless of Engine Speed .
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.

TORQUE CONVERTER DIAGNOSIS (LYX)

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:

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

The [Noise and Vibration Analysis](#) procedure should be performed prior to performing this test.

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.

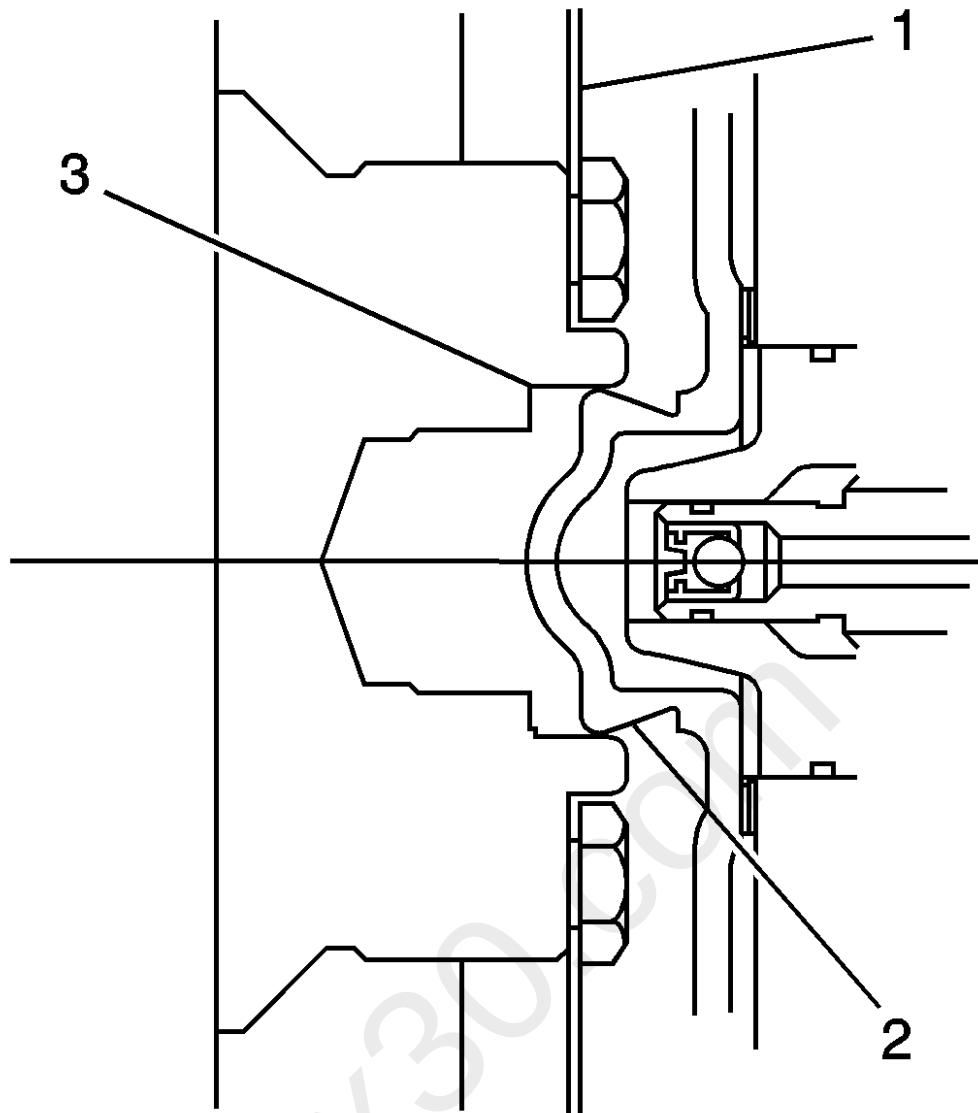


Fig. 3: Aligning Torque Converter Hub In Engine Crankshaft
Courtesy of GENERAL MOTORS COMPANY

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](#) .

3. Align the torque converter pilot (2) in the engine crankshaft (3). Install the torque converter to flexplate bolts, and tighten according to [Fastener Specifications \(On-Vehicle\)](#) [Fastener Specifications \(Off-Vehicle\)](#) .
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 \(On-Vehicle\)](#) [Fastener Specifications \(Off-Vehicle\)](#) .

Torque Converter Replacement Guide

Condition	Action

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 gasket 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 .
DTC P0741 - TCC Stuck OFF/High Slip - Intermittent Only	Do not replace the torque converter. Refer to DTC P0741, P2817, or P2818 diagnostic table.
DTC P0741 - TCC Stuck OFF/High Slip	Do not replace the torque converter. Refer to DTC P0741, P2817, or P2818 diagnostic table.
DTC P0742 - TCC Stuck ON	Do not replace the torque converter. Refer to DTC P0741, P2817, or P2818 diagnostic table.
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.

Condition	Action
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. • Refer to Torque Converter Stator in this procedure. • Refer to Symptoms - Engine Controls .
Stripped Converter Bolt Holes	• Replace the torque converter. • Inspect flexplate and refer to Lower Engine Noise, Regardless of Engine Speed .
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.

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

- 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 in between channels.
 - The valve train retainers are improperly installed.
 - The checkballs are misplaced.
 - Malfunctioning valves.
- The Teflon[®] 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.
8. Inspect the rubber hose portion of the oil cooler lines for damage, if applicable. Refer to [Transmission Fluid Cooler Flow Test and Flushing](#).

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

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 leak tracing 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. Operate the vehicle for 24 km (15 mi) or until normal operating temperatures are reached.
3. Detect the leak with the black light.
4. 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
- Manual shaft or output shaft surface is scratched, nicked, or damaged
- Loose or worn bearing causing excess seal wear

Possible Points of Fluid Leaks

Transmission Valve Body Cover

- Incorrectly tightened bolts
- Improperly installed or damaged gasket/seal
- Damaged mounting face
- Incorrect gasket seal

Case Leak

- Damaged input speed sensor seal
- Damaged manual shaft seal
- Loose or damaged oil cooler lines/seals
- Worn or damaged axle shaft oil seal
- Loose line pressure pipe plug or fluid level pipe plug
- Porous casting
- Warped torque converter housing
- Damaged converter housing to case seal

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 torque converter housing

Leak at the Vent

- Overfilled system
- Water or coolant in the fluid; The fluid will appear milky
- Transmission case porous
- Incorrect fluid level indicator causing an overfilled system
- Plugged vent

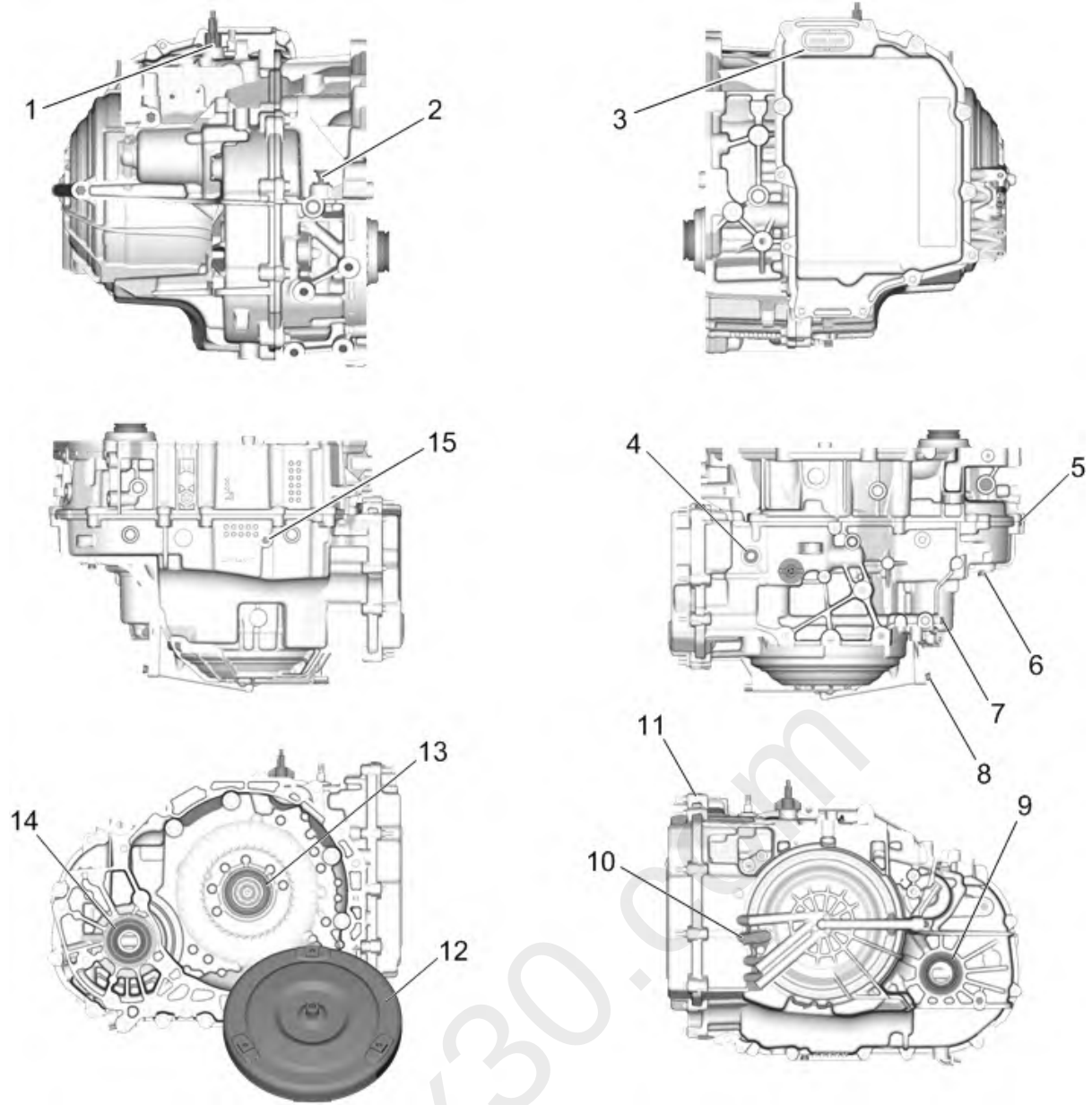


Fig. 4: Fluid Leak Inspection Points
Courtesy of GENERAL MOTORS COMPANY

Leak Inspection Points

1. Transmission Fluid Filler Cap
2. Transmission Fluid Filler Tube Plug
3. Body Side Wiring Harness Opening Seal
4. Manual Shift Shaft Seal
5. Torque Converter Housing Gasket
6. Automatic Transmission Fluid Level Hole Plug
7. Automatic Transmission Fluid Pressure Test Hole Plug
8. Automatic Transmission Case Hole Plug
9. Front Wheel Drive Shaft Oil Seal
10. Automatic Transmission Input Speed Sensor
11. Control Valve Body Gasket
12. Torque Converter Assembly
13. Torque Converter Fluid Seal
14. Front Wheel Drive Shaft Oil Seal
15. Automatic Transmission Fluid Pan Drain Plug

CASE POROSITY REPAIR

Some external leaks are caused by case porosity in non-pressurized areas.

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. Apply the epoxy. A clean, dry soldering acid brush can be used 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 assembling the components.
5. Repeat the fluid leak diagnosis procedures.

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

NOISE AND VIBRATION ANALYSIS

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 vibration may be a result of poor engine performance.

- Vibration may also be caused by a small amount of water inside the converter.
- 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
- If the noise or vibration is noticeable in PARK and NEUTRAL with the engine at idle, but is more noticeable as RPM increases, the vibration may be an engine imbalance or a transmission imbalance. Refer to [Torque Converter Diagnosis \(LTG\)](#) [Torque Converter Diagnosis \(LYX\)](#).

WHINE/GROWL NOISE

Checks	Causes
Front Differential Carrier (238)	• Inspect for worn wheel bearings or axles. • Inspect for worn or damaged Side Gear Thrust Washer or Pinion Gear Thrust Washer • Inspect for loose or worn Side Gear Axle Splines • Inspect for damaged or worn Side Gear • Inspect for worn or damaged Final Drive Inner and Outer Washers • Inspect for loose, damaged or worn Front Differential Carrier Thrust Bearings • Inspect for broken, worn or disengaged Final Drive Pinion Pin Retainer • Inspect for damaged or worn Pinion Gears
Drive Link (233)	• Inspect for worn, loose or damaged links • Inspect for broken, worn or loose Drive Link Lubricant Scoop (60)
Drive Sprocket (234)	• Inspect for improper Drive Sprocket (234) tooth surface finish • Inspect for broken or damaged Drive Sprocket (234) teeth • Inspect for worn or damaged Output Sun Gear Thrust Bearings (230) • Inspect for worn or damaged Output Carrier Transfer Drive Gear Hub Assembly splines (231) • Inspect for loose, worn or damaged Output Carrier Transfer Drive Gear Hub Assembly bushing
Driven Sprocket (241)	• Inspect for worn, binding or damaged Driven Sprocket Bearing Assembly (242) • Inspect for worn or damaged Driven Sprocket Ball Bearing Assembly • Inspect for improper Driven Sprocket (241) tooth surface finish • Inspect for broken or damaged Driven Sprocket (241) teeth

Checks	Causes
Input Carrier Assembly (552)	• Inspect for pitted/spalled Pinion Gear teeth • Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings • Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings • Inspect for loose or broken Hub and Ring Gear • Inspect for loose or broken Output Internal Gear Retainer • Inspect for loose or worn Sun Gear Thrust Bearings (550, 553)
Output Carrier Transfer Drive Gear Hub Assembly (231)	• Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings • Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings • Inspect for loose Hub and Ring Gear
Overdrive and Reaction with Input Internal Gear Carrier	• Inspect for worn or damaged Pinion Gear Thrust Washers and Bushings • Inspect for worn or damaged Pinion Gears, Pins or Needle Bearings • Inspect for loose hub and Ring Gear • Inspect for worn or damaged Overdrive Sun Gear Thrust Bearing (544)
Automatic Transmission Fluid Pump Assembly (201)	• Inspect for proper fluid level • Inspect for leaking Automatic Transmission Fluid Filter Seal (202)
1-2-3-4-5-6 Clutch	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (595 - 599) • Inspect for loose or worn 1-2-3-4-5-6 Clutch Backing Plate Retaining Ring (599)
2-9 Clutch	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (517 - 519) • Inspect for loose or worn 1-2-3-4-5-6 Clutch Piston Housing Return Ring (523)
3-8 Clutch	• Inspect for inadequate Clutch Plate Clearance • Inspect for stripped or sheared Clutch Plate Splines (513 - 514) • Inspect for loose or worn 3-8 Clutch Spring Retaining Ring (511) • Inspect for loose Automatic Transmission Input Shaft Speed Sensor Reluctor Wheel (561) or Retainer (560)

Checks	Causes
4th Clutch	- Inspect for inadequate Clutch Plate Clearance - Inspect for stripped or sheared Clutch Plate Splines (540 - 542)
5-7-Reverse Clutch	- Inspect for inadequate Clutch Plate Clearance - Inspect for stripped or sheared Clutch Plate Splines (578 - 581) - Inspect for loose or worn 5-7-Reverse Clutch Backing Plate Retaining Ring (582)
6-7-8-9 Clutch	- Inspect for inadequate Clutch Plate Clearance - Inspect for stripped or sheared Clutch Plate Splines (574 - 576) - Inspect for loose or worn 6-7-8-9 Clutch Backing Plate Retaining Ring (577)
Automatic Transmission Case (19)	- Inspect for loose or broken Transmission Mount Bolts - Inspect for loose Torque Converter and Differential Housing Bolts (16) - Inspect for loose, worn or damaged differential bushing - Inspect for loose or broken Input Shaft Support Bolts (55) - Inspect for loose or broken Front Differential Carrier Baffle Bolts (62) - Inspect for stripped or sheared splines - Inspect for loose, worn or damaged bushing
Torque Converter Housing (13)	- Inspect for loose or broken Front Differential Ring Gear Retainer (206) - Inspect for loose, worn or damaged differential bushing - Inspect for loose or broken Pinion Gear Shaft Retainer Pin - Inspect for loose or broken Front Differential Carrier Baffle Bolts (204) - Inspect for loose or broken Automatic Transmission Fluid Pump Cover Bolt (200) - Inspect for loose Torque Converter and Differential Housing Bolts (16) - Inspect for loose, worn or damaged bushing
Control Valve Body Cover (3)	Inspect for loose, missing or broken Valve Body Cover Bolts (1)
Torque Converter (14)	- Inspect for improper alignment of Torque Converter to the Crankshaft - Inspect for ballooning of the Torque Converter

Checks	Causes
Front Differential Carrier (238)	• Inspect for worn or damaged Front Differential Carrier (238) • Inspect for worn or damaged Pinion Pins • Inspect for broken, worn or damaged Differential Sun Gear Bearing or Driven Sprocket Bearing • Inspect for worn or damaged Differential Side Gear teeth, Final Drive Pinion Gear teeth or Final Drive Sun Gear teeth • Inspect for worn or damaged Differential Side Gear Thrust Washers or Final Drive Inner and Outer Washers • Inspect for worn or damaged Final Drive Rollers • Inspect for broken or damaged Differential Pinion Gear Shaft Retainer

AUTOMATIC TRANSMISSION FLUID LEAKS

Checks	Causes
Torque Converter (14)	Inspect for damage
Automatic Transmission Case (19)	• Inspect for cracked or broken Case (19) • Inspect for porosity or damage on the sealing surfaces • Inspect for loose Oil Cooler Line Bolts or damaged Oil Cooler Line Seals • Inspect for damaged Manual Shift Shaft Seal (706) • Inspect for damaged or worn Front Wheel Drive Shaft Oil Seal (67) • Inspect for plugged Transmission Fluid Filler Cap (52) • Inspect for loose Automatic Transmission Fluid Pan Drain Plug (66) and Automatic Transmission Fluid Level Plug (65)
Torque Converter and Differential Housing (13)	• Inspect for damaged Torque Converter Housing Assembly (13) • Inspect for porosity or damage on the sealing surfaces • Inspect for damaged Torque Converter Housing Gasket (18) • Inspect for damaged or worn Torque Converter Fluid Seal (210) • Inspect for loose Torque Converter and Differential Housing Bolts (16) • Inspect for loose, missing or damaged Transmission Fluid Filler Tube Plug (15)
Control Valve Body Cover (3)	• Inspect for damaged or warped Valve Body Cover Assembly (3) • Inspect for damaged or improperly installed Valve Body Cover Gasket • Inspect for loose Valve Body Cover Bolts (1, 2) • Inspect for damaged or improperly installed Body Side Wiring Harness Opening Seal (26)

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 cable adjustment. Refer to Range Selector Lever Cable Adjustment
Manual Shift Detent Lever Shaft (705)	- Verify shift lever is properly attached to the manual shaft. - Verify manual shaft is not twisted or damaged.
Manual Shift Detent Lever (709)	Verify proper operation. Refer to Transmission Range Sensor Duty Cycles

NO PARK

Checks	Causes
Front Differential Carrier (238)	- Inspect for damaged or broken Front Differential Assembly (238). - Inspect for damaged or broken Front Differential Side Gear or Pinion Gear. - Inspect for damaged or broken Front Differential Pinion Gear Shaft. - Inspect for damaged or broken Front Differential Pinion Gear Shaft Pin. - Inspect for worn, stripped or sheared Front Differential Side Gear splines. - Inspect for damaged or broken Final Drive Sun, Pinion or Ring Gear. - Inspect for worn, stripped or sheared Final Drive Sun Gear splines.
Output Carrier Assembly (555)	- Inspect for broken Output Carrier Transfer Drive Gear Hub (231). - Inspect for worn, stripped or sheared Output Carrier Transfer Drive Gear Hub (231) splines. - Inspect for damaged or broken park Gear (232). - Inspect for disengaged or broken Drive Sprocket Retainer Ring (235).

Checks	Causes
Drive Link (233)	- Inspect for broken, worn or damaged Drive Link Assembly (233). - Inspect for broken, worn or damaged Drive Sprocket (234). - Inspect for broken, worn or damaged Driven Sprocket Assembly (241). - Inspect for worn, stripped or sheared Driven Sprocket splines. - Inspect for broken Output Carrier Transfer Drive Gear Hub Assembly (231).
Automatic Transmission Case (19)	- Inspect for broken or damaged Case. - Inspect for broken or bent Park Pawl Shaft (714). - Inspect for broken or missing Park Pawl Actuator Guide Pin (704). - Inspect for broken or missing Manual Shift Detent Lever Pin (710). - Inspect for damaged or broken Manual Shift Detent Lever Shaft (705). - Inspect for loose, damaged or broken Manual Shift Detent Lever Spring (20). - Inspect for broken, loose or misaligned Park Pawl Actuator Guide (707). - Inspect for binding, bent or broken Park Pawl (715).

HARSH GARAGE SHIFT

Checks	Causes
Input Carrier Assembly (552)	Inspect for worn or stripped Output Internal Gear Splines.
1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing (590)	- Inspect for damaged or fatigued 1-2-3-4-5-6 Clutch Wave Plate (595). Refer to Clutch Plate Diagnosis. - Inspect for stripped or sheared splines on 1-2-3-4-5-6 Clutch Plate (596). Refer to Clutch Plate Diagnosis. - Inspect for correct fluid level.

NO DRIVE IN ALL RANGES

Checks	Causes

Checks	Causes
Automatic Transmission Case (19)	• Inspect for cracked or broken Case (19). • Inspect for stripped or sheared splines. • Inspect for binding Manual Shift Detent Lever Assembly (709). • Inspect for missing Manual Shift Detent Lever Pin (710). • Inspect for interference or binding Park Pawl Actuator Assembly (708). • Inspect for broken or disengaged 1-2-3-4-5-6 Clutch Piston Housing Return Ring (523). • Inspect for loose or damaged case bushing. • Inspect Automatic Transmission Fluid Pump Shaft Seal (311) for damage.
Torque Converter (14)	• Inspect for stripped or sheared splines on Turbine Shaft. • Inspect for missing Torque Converter to Flywheel bolts.
Torque Converter and Differential Housing (13)	• Inspect for stripped or sheared Front Differential Ring Gear (207) Splines. • Inspect for broken or disengaged Front Differential Rear Gear Retainer (206). • Inspect for loose, missing or broken Torque Converter and Differential Housing bolts (16). • Inspect for loose, missing or broken Automatic Transmission Fluid Pump Cover Bolts (200, 211).
5-7-Reverse and 6-7-8-9 Clutch Housing (530)	• Inspect for damaged or broken Input Sun Gear Thrust Bearing (550, 553). • Inspect for stripped or sheared splines on the Turbine Shaft to the 5-7-Reverse and 6-7-8-9 Clutch Housing (547).
Automatic Transmission Fluid Pump Assembly (201)	• Inspect for fluid leaks/improper fluid level. • Inspect for leaking Fluid Outlet Seal Assembly (24). • Inspect for loose or missing Automatic Transmission Fluid Pump Cover Bolt (312). • Inspect for damaged, restricted or improperly installed Automatic Transmission Fluid Filter (203). • Inspect for damaged or leaking Automatic Transmission Fluid Filter Seal (202). • Inspect for broken or seized Automatic Transmission Fluid Pump (315).

Checks	Causes
Input Carrier Assembly (552)	• Inspect for stripped or sheared castle splines to ring gear. • Inspect for improperly installed carrier pinion gear pins. • Inspect for damaged or broken Pinion Gears. • Inspect for stripped or sheared splines on the Input Sun Gear (551). • Inspect for damaged or broken Output Carrier (555). • Inspect for broken or disengaged Output Internal Gear Retainer Ring. • Inspect for damaged or broken Input Carrier Thrust Bearing (549) and Output Carrier Thrust Bearing (554). • Inspect for damaged or broken Input Sun Gear Thrust Bearing (550, 553).
Overdrive Carrier (546)	• Inspect for stripped or sheared splines.
Output Carrier Assembly (555)	• Inspect for damaged or broken Input Sun Gear Thrust Bearings (550, 553). • Inspect for damaged or broken Pinion Gear teeth. • Inspect for damaged or broken Input Carrier Thrust Bearings (549). • Inspect for broken or damaged Output Internal Gear.
Output Sun Gear Assembly (555)	• Inspect for broken Output Sun Gear Assembly (555) hub or weld.
1-Reverse and 1-2-3-4-5-6 Clutch Piston Housing	Inspect for disengaged or broken 1-2-3-4-5-6 Clutch Backing Plate Retaining Ring (599).
Drive Link (233)	• Inspect for broken, worn or damaged Drive Link Assembly (233). • Inspect for broken, worn or damaged Drive Sprocket (234). • Inspect for broken, worn or damaged Driven Sprocket Assembly (241). • Inspect for broken Drive Gear Hub (231).
Front Differential Carrier (238)	• Inspect for stripped or sheared splines on Differential Side Gear. • Inspect for stripped or sheared splines Final Drive Sun Gear (230). • Inspect for stripped or sheared splines Differential Carrier to PTU (AWD only). • Inspect for stripped broken or disengaged Final Drive Retainer (581). • Inspect for damaged or broken Pinion Gear teeth. • Inspect for damaged or broken Final Drive Rollers (585). • Inspect for broken, worn or damaged Final Drive Inner and Outer Thrust Washers (584).

Checks	Causes
Control Solenoid (w/Body and TCM) Valve Assembly	• Check that the Manual Valve (432) is engaged with Manual Shift Detent Lever Assembly (609). • Inspect the Control Solenoid (w/Body and TCM) Valve Assembly (7) and verify that it is functioning properly.

NO TORQUE CONVERTER CLUTCH APPLY

Checks	Causes
Torque Converter (14)	• Inspect for damaged Torque Converter Clutch Seal (inside converter assembly). • Diagnose Torque Converter Assembly for possible internal damage. Refer to Torque Converter Diagnosis (LTG) Torque Converter Diagnosis (LYX).
Automatic Transmission Fluid Pump Assembly (201)	• Inspect for worn or damaged Torque Converter Fluid Seal Assembly (301). • Inspect for worn, damaged or sticking Torque Converter Clutch Control Valve (333) or Torque Converter Clutch Regulator Apply Valve (337). Refer to: Transmission Fluid Pump Disassemble , and Transmission Fluid Pump Assemble
Torque Converter and Differential Housing (13)	Inspect for leaking or damaged Torque Converter Fluid Seal (210), and Automatic Transmission Fluid Pump Assembly (201).

NO TORQUE CONVERTER CLUTCH RELEASE

Checks	Causes
Torque Converter (14)	Diagnose Torque Converter Assembly for possible internal damage. Refer to Torque Converter Diagnosis (LTG) Torque Converter Diagnosis (LYX) .
Automatic Transmission Fluid Pump Assembly (201)	Inspect for worn, damaged or sticking Torque Converter Clutch Control Valve (333) or Torque Converter Clutch Regulator Apply Valve (337). Refer to: Transmission Fluid Pump Disassemble , and Transmission Fluid Pump Assemble

NO REVERSE GEAR

Checks	Causes
Control Valve Body (23)	• Inspect the 3-8 Clutch Regulator Valve (487) and Control Valve Body Ball Check Valve (453) for debris and stickiness. • Inspect the Clutch Selector Valve (467) and the Actuator Feed Limit Valve (451) for debris and stickiness.
Automatic Transmission Case (19)	• Inspect the Input Shaft Support (54) for missing or damaged Fluid Seal Rings (56).

Checks	Causes
5-7-Reverse and 6-7-8-9 Clutch Housing (516)	• Inspect for damaged, stripped or sheared splines on 5-7-Reverse Clutch Plate (579-580), 5-7-Reverse Clutch Backing Plate (581). • Inspect for stripped or sheared splines on 5-7-Reverse and 6-7-8-9 Clutch Housing (567) to Turbine Shaft (547). • Inspect for damage, improper surface finish, porosity, deformed or unbalanced 3-5 Rev/4-5-6 Housing (516). • Inspect for damaged, worn, loose or seized hub bushing in the 5-7-Reverse and 6-7-8-9 Clutch Housing (567). • Inspect for broken, porous or improper surface finish or plugged oil passages of the 5-7-Reverse and 6-7-8-9 Clutch Housing (567). • Inspect for failure of the 6-7-8-9 and 5-7-Reverse Clutch Housing Thrust Bearing (515). • Inspect for disengaged or broken 5-7-Reverse Clutch Backing Plate Retaining Ring (582). • Inspect for damaged, worn or leaking 3-5 Reverse Clutch Piston Seals (564 - 566). • Inspect for damaged or broken 5-7-Reverse and 6-7-8-9 Clutch Housing (567). • Inspect for warped, damaged, improper surface finish or debonding 3-5 Reverse Clutch Piston (562). • Inspect for broken or fatigued 3-5-Reverse Clutch Piston Retainer Spring (563). • Inspect for disengaged or broken Automatic Transmission Input Shaft Speed Sensor Reluctor Ring Retaining Ring (560). • Inspect for broken Automatic Transmission Input Shaft Speed Sensor Reluctor Wheel (561).