

TRANSMISSION

Automatic Transmission - Aisin TL-80SN (MGG) - CTS Sedan

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Automatic Transmission Fluid Filter Bolt	10	89 lb in
Automatic Transmission Fluid Passage Cover Bolt	6	53 lb in
Automatic Transmission Vent Retainer	6	53 lb in
Front Propeller Shaft Flange Nut	137	101 lb ft
Manual Shift Dentent Spring Bolt	11	97 lb in
Park/Neutral Position Switch Nut	7	62 lb in
Park/Neutral Position Switch Bolt	13	115 lb in
Shift Cable Bracket	22	16 lb ft
Torque Converter Bolt with LFX	63	46 lb ft
Torque Converter Bolt with LF3	100	74 lb ft
Transmission Converter Cover Bolt	12	106 lb in
Transmission Control Fasteners	9	80 lb in
Transmission Fluid Drain Plug	20	15 lb ft
Transmission Mount Nut	22	16 lb ft
Transmission Oil Temperature Sensor Retaining Bolt	11	97 lb in
Transmission to Engine Fasteners	58	43 lb ft
Transmission to Engine Fasteners - Lower	50	37 lb ft
Transmission Range Selector Cable Lever Nut	30	22 lb ft
Valve Body Bolt	11	97 lb in
Valve Body Cover Bolt	7	62 lb in
Valve Body Wire Harness Bolt	6	53 lb in

TRANSMISSION GENERAL SPECIFICATIONS

Transmission General Specifications

Name	TL-80
RPO Codes	MGG
Production Location	-
Transmission Drive	Rear Wheel Drive
1st Gear Ratio	4.596
2nd Gear Ratio	2.724

3rd Gear Ratio	1.863
4th Gear Ratio	1.464
5th Gear Ratio	1.231
6th Gear Ratio	1.000
7th Gear Ratio	0.824
8th Gear Ratio	0.685
Reverse	4.056
Torque Converter Size - Diameter of Torque Converter Turbine	-
Pressure Taps	Line Pressure
Transmission Fluid Type	NWS-9638
Transmission Type: 80	8 Forward Gears
Transmission Type: TL	Longitude Mount
Transmission Type: SN	Product Series
Position Quadrant	P, R, N, D, M
Case Material	Die Cast Aluminum
Transmission Net Weight (Approximate)	94.7 kg (209 lb)
Maximum Trailer Towing Capacity	Refer to applicable owner's manual

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material	GM Part Number	
		United States	Canada
Automatic Transmission Fluid	ATF-WS	88863400	88863401

FLUID CAPACITY SPECIFICATIONS

Fluid Capacity Specifications

Application	Specification	
	Metric	English
Complete TL80-SN Transmission System Fill - Approximate	10.6 - 11.3 liters	11.2 - 11.9 quarts
Fluid Filter Change - LFX (3.6L) Engine Application	4.7 - 5.2 liters	5.0 - 5.5 quarts
Fluid Filter Change - LF3 (3.6L Twin Turbo) Engine Application	5.2 - 5.7 liters	5.5 - 6.0 quarts
Valve Body Replacement - LFX (3.6L) Engine Application	7.0 - 7.6 liters	7.4 - 8.0 quarts
Valve Body Replacement - LF3 (3.6L Twin Turbo) Engine Application	7.6 - 8.0 liters	8.0 - 8.5 quarts

RANGE REFERENCE

Range Reference Table

Range	Park	Reverse	Reverse (Inhibit Operate)	Neutral	Drive							
					1st	2nd	3rd	4th	5th	6th	7th	8th
C1	-	-	-	-	Applied	Applied	Applied	Applied	Applied	-	-	-
C2	-	-	-	-	-	-	-	-	Applied	Applied	Applied	Applied
C3	-	Applied	-	-	-	-	Applied	-	-	-	Applied	-
C4	-	-	Applied	-	-	-	-	Applied	-	Applied	-	-
B1	-	-	-	-	-	Applied	-	-	-	-	-	Applied
B2	-	Applied	Applied	-	-	-	-	-	-	-	-	-
OWC	-	-	-	-	Holding	-	-	-	-	-	-	-
TCC Lock-up operation exists: 2nd - 8th Gears												

SHIFT SOLENOID VALVE STATE AND GEAR RATIO

Shift Solenoid Valve State and Gear Ratio

Gear	SL1 N/C	SL2 N/C	SL3 N/C	SL4 N/C	SL5 N/C	SR N/O	SL N/C	SLU N/C	Gear Ratio
Park	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	-
Reverse	OFF	OFF	ON	OFF	OFF	ON	ON	OFF	4.056
Reverse (Inhibit Operate)	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	4.056
Neutral	ON	OFF	OFF	OFF	OFF	ON	OFF	OFF	-
1st	ON	OFF	OFF	OFF	OFF	ON	*ON*	*ON*	4.596
2nd	ON	OFF	OFF	OFF	ON	ON	*ON*	*ON*	2.724
3rd	ON	OFF	ON	OFF	OFF	ON	*ON*	*ON*	1.863
4th	ON	OFF	OFF	ON	OFF	ON	*ON*	*ON*	1.464
5th	ON	ON	OFF	OFF	OFF	ON	*ON*	*ON*	1.231
6th	OFF	ON	OFF	ON	OFF	ON	*ON*	*ON*	1.000
7th	OFF	ON	ON	OFF	OFF	ON	*ON*	*ON*	0.824
8th	OFF	ON	OFF	OFF	ON	ON	*ON*	*ON*	0.685
ON = (N/O: Close , N/C: Open)									
OFF = (N/O: Open , N/C: Close)									
ON = ON: Lock-up ON / OFF: Lock-up OFF									

SCHEMATIC WIRING DIAGRAMS

AUTOMATIC TRANSMISSION CONTROLS WIRING SCHEMATICS

Power, Ground, Serial Data and MIL

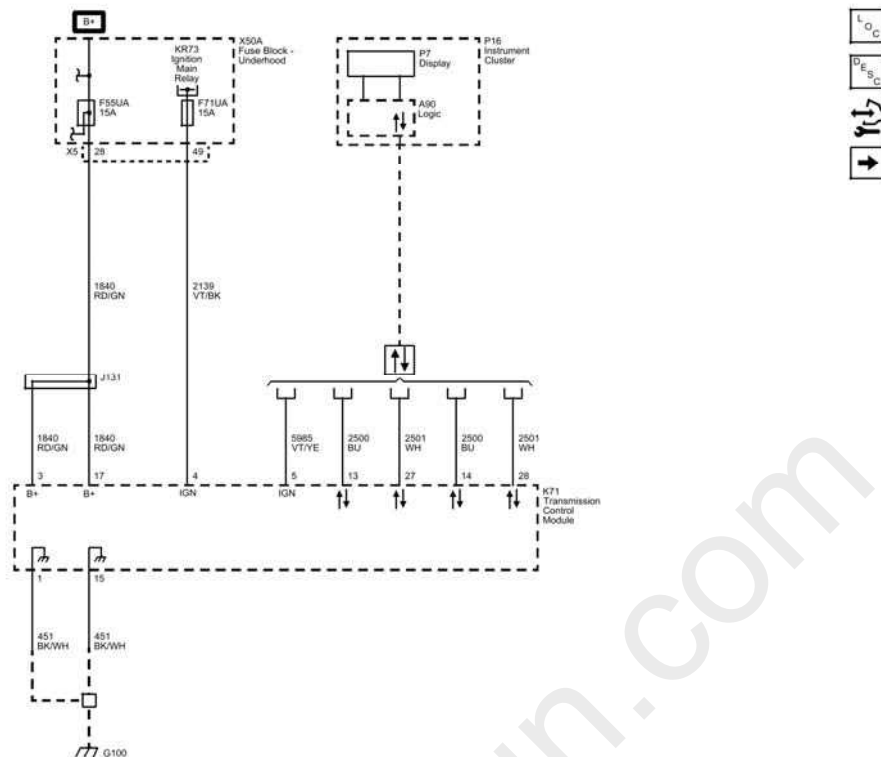


Fig. 1: Power, Ground, Serial Data and MIL
 Courtesy of GENERAL MOTORS COMPANY

Speed and Temperature Sensors, Pressure and Shift Controls

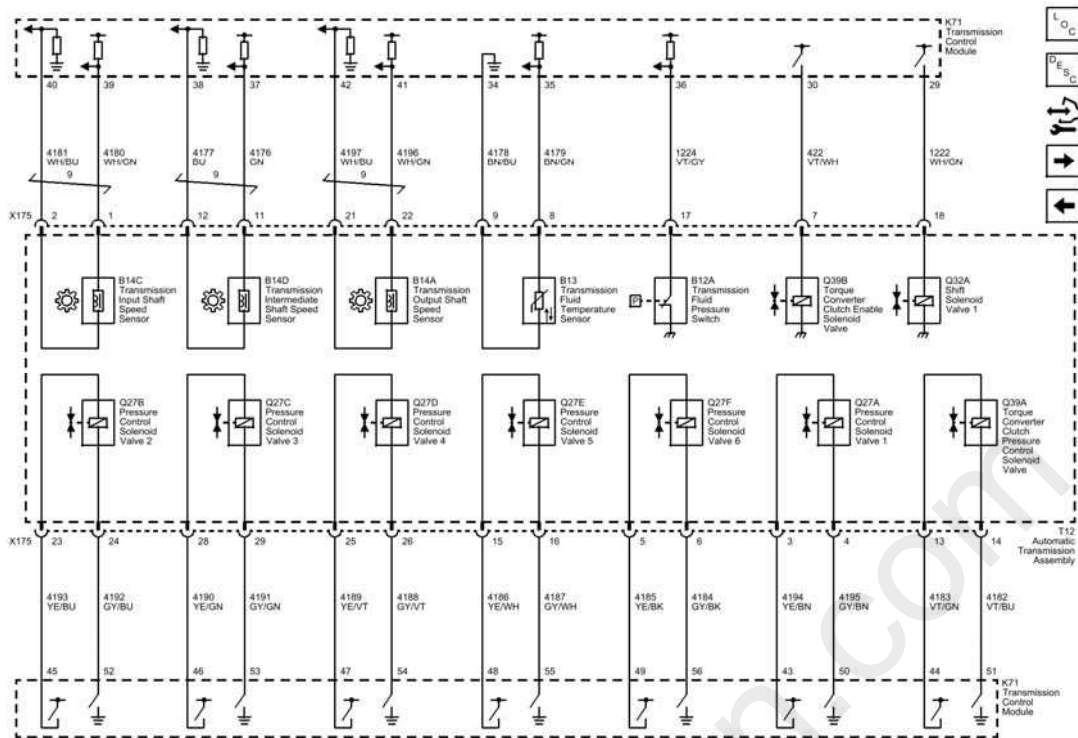
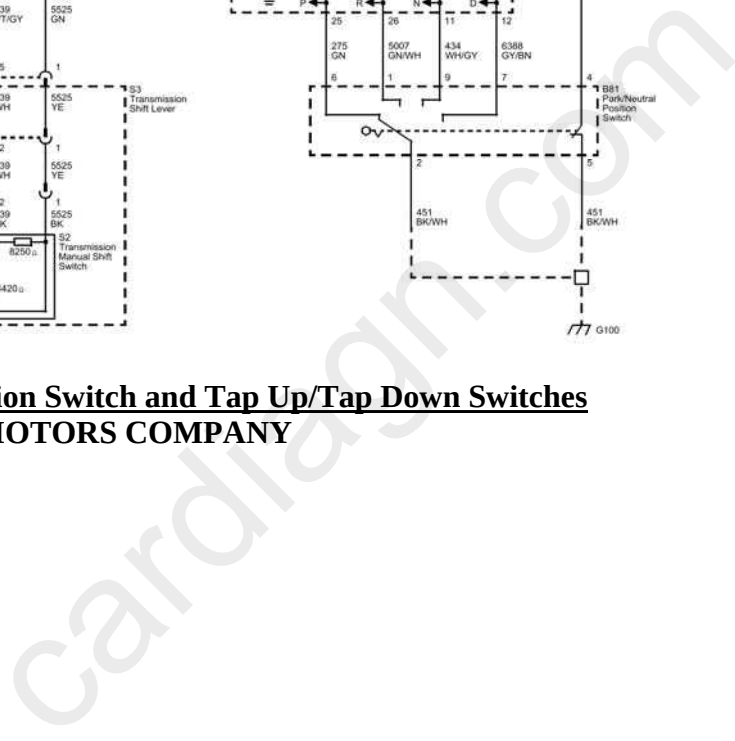


Fig. 2: Speed and Temperature Sensors, Pressure and Shift Controls
Courtesy of GENERAL MOTORS COMPANY

Park/Neutral Position Switch and Tap Up/Tap Down Switches



Shift Lever Position Indicator

Shift Lever Position Indicator

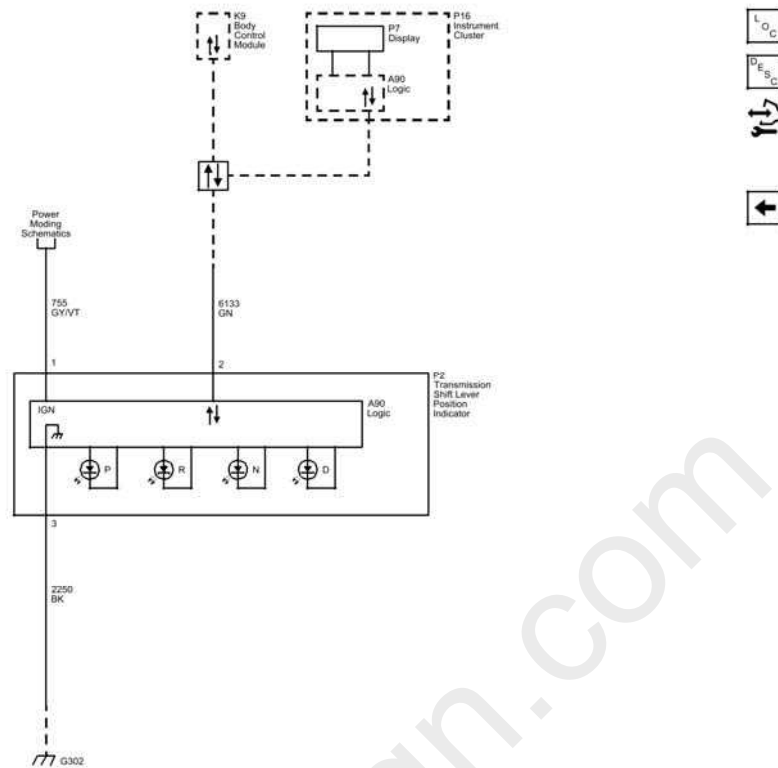


Fig. 4: Shift Lever Position Indicator
 Courtesy of GENERAL MOTORS COMPANY

COMPONENT LOCATOR

DISASSEMBLED VIEWS

Case and Associated Parts

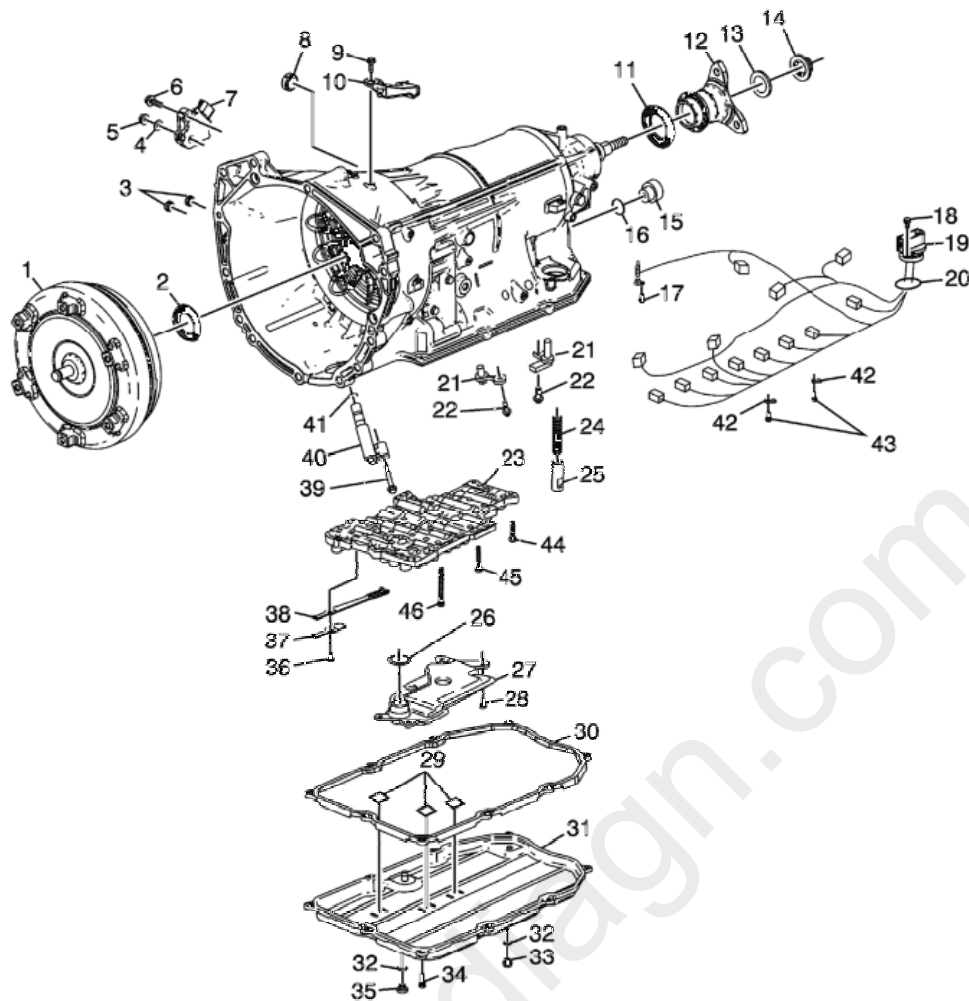


Fig. 5: Case and Associated Parts
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Torque Converter
2	Torque Converter Fluid Seal
3	Transmission Cooler Pipe Fitting Seal
4	Park/Neutral Position Switch Washer
5	Park/Neutral Position Switch Nut
6	Park/Neutral Position Switch Bolt
7	Park/Neutral Position Switch
8	Manual Shift Shaft Seal
9	Automatic Transmission Vent Retainer
10	Automatic Transmission Vent
11	Propeller Shaft Transmission Flange Fluid Seal
12	Propeller Shaft Transmission Flange
13	Propeller Shaft Transmission Flange Fluid Seal

14	Front Propeller Shaft Flange Nut
15	Automatic Transmission Case Plug
16	Automatic Transmission Case O-ring Seal
17	Transmission Oil Temperature Sensor Retaining Bolt
18	Automatic Transmission Fluid Passage Cover Bolt
19	Automatic Transmission Wiring Harness
20	Automatic Transmission Wiring Harness Connector O-ring Seal
21	Automatic Transmission Output Speed Sensor
22	Automatic Transmission Output Speed Sensor Bolt (Qty: 2)
23	Control Valve Body Assembly
24	Transmission Fluid Cooler Ball Check Valve Spring
25	Automatic Transmission Fluid Cooler Line Ball Check Valve
26	Automatic Transmission Fluid Filter (O-ring) Seal
27	Automatic Transmission Fluid Filter
28	Automatic Transmission Fluid Filter Bolt (Qty: 4)
29	Transmission Chip Collector Magnet
30	Automatic Transmission Fluid Pan Gasket
31	Control Valve Body Cover
32	Transmission Fluid Drain Plug Washer
33	Automatic Transmission Fluid Drain Plug
34	Valve Body Cover Bolt (Qty: 9)
35	Transmission Fluid Drain Plug
36	Manual Shaft Detent Spring Bolt
37	Manual Detent Spring Cover
38	Manual Shaft Detent Spring
39	Automatic Transmission Input Speed Sensor Bolt
40	Automatic Transmission Input Speed Sensor
41	Automatic Transmission Input Speed Sensor (O-ring) Seal
42	Automatic Transmission Wiring Harness Clip
43	Valve Body Wire Harness Bolt
44	Valve Body Bolt M6 x 1.0 x 21 mm (Qty: 2)
45	Valve Body Bolt M6 x 1.0 x 31 mm (Qty: 12)
46	Valve Body Bolt M6 x 1.0 x 64 mm (Qty: 3)

Transmission Plug Locations

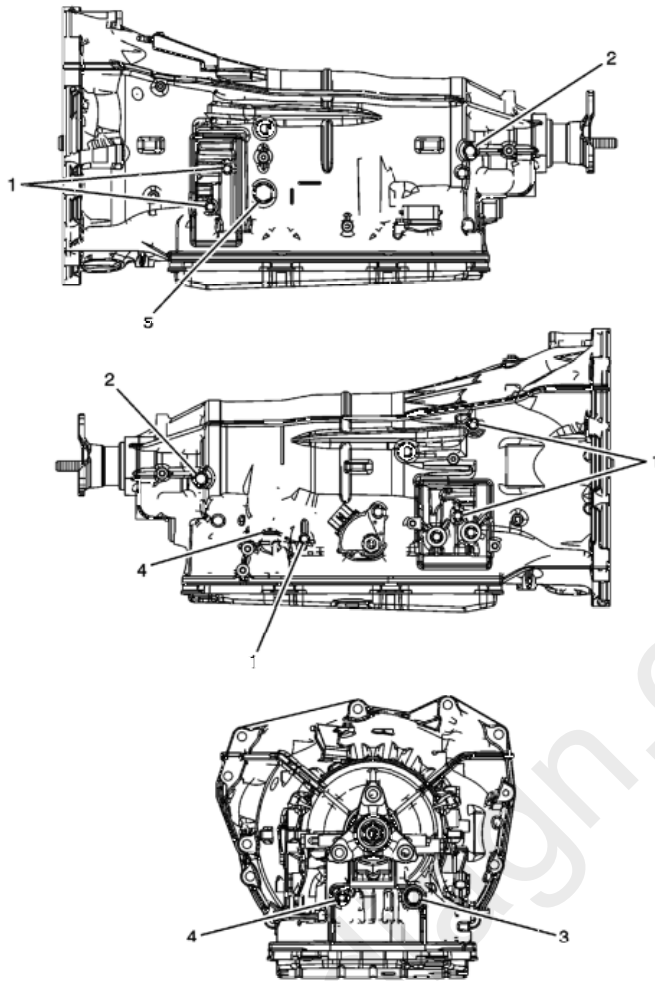


Fig. 6: Transmission Plug Locations
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Automatic Transmission Fluid Pressure Test Hole Plug
2	Automatic Transmission Case Hole Plug
3	Automatic Transmission Case Plug
4	Park Pawl Shaft Hole Plug
5	Transmission Fluid Filler Hole Plug

Transmission Wiring Harness

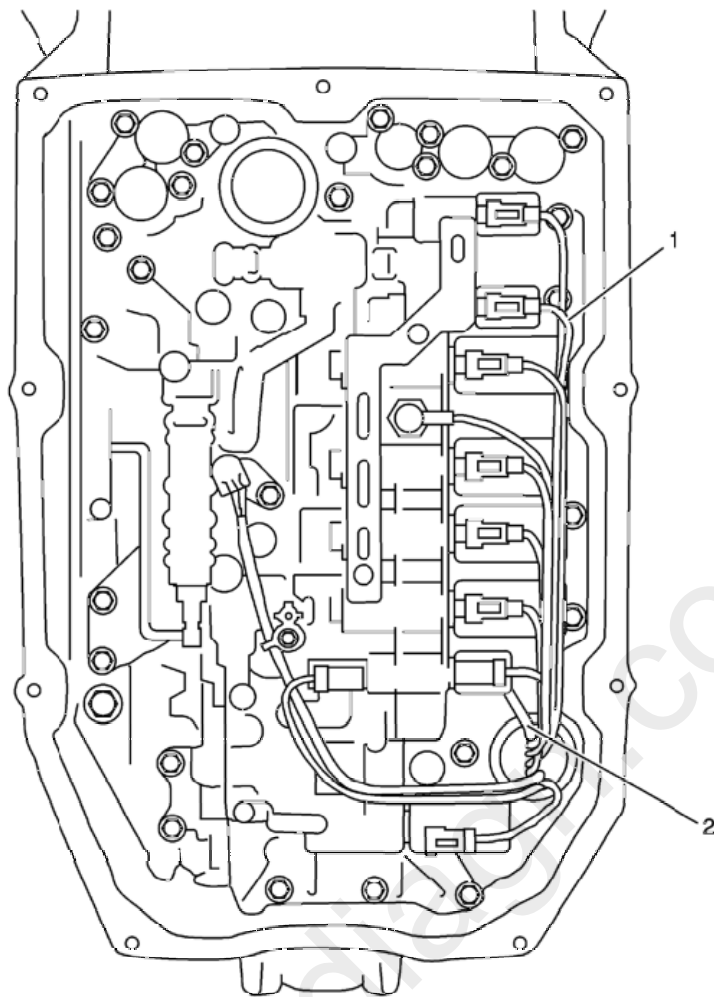


Fig. 7: Transmission Wiring Harness
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Automatic Transmission Wiring Harness
2	Automatic Transmission Output Speed Sensor Wire

Valve Body Bolts (Bolt Size)

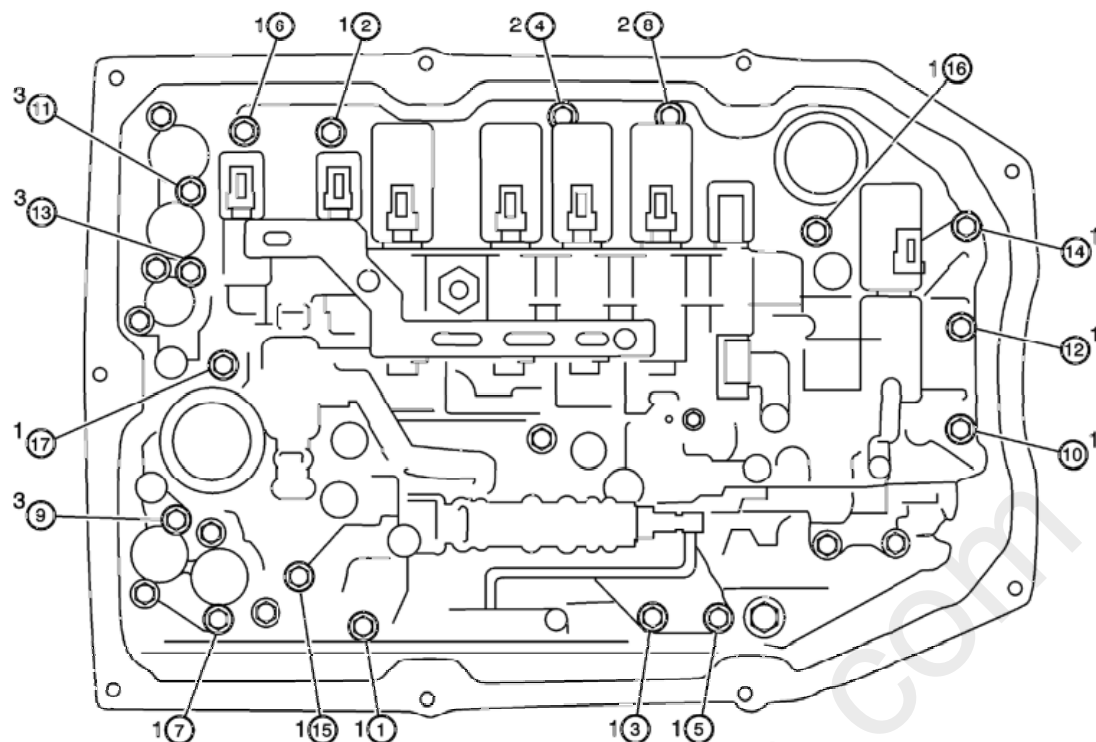


Fig. 8: Valve Body Bolts (Bolt Size)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	M6 X 1.0 X 31mm
2	M6 X 1.0 X 21mm
3	M6 X 1.0 X 64mm

DIAGNOSTIC INFORMATION AND PROCEDURES

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** - Overflow Check
 - **Fluid Pressure High or Low**
 - **Automatic Transmission Fluid Leaks**
 - **Fluid Leak Diagnosis**
- Noise and Vibration Diagnosis
 - **Hum or Rattle Noise at Idle**
 - **Vibration While Driving**
 - **Flex Plate/Torque Converter Vibration Test**
 - **Noise and Vibration Analysis**
- Range Performance Diagnosis
 - **No Park or Drive**
 - **No Drive in All Ranges**
 - **No Reverse Gear**
- Shift Quality Feel Diagnosis
 - **Harsh Garage Shift**
 - **Harsh, Soft, Delayed or Slipping First or Reverse Gear**
 - **Harsh Park or Neutral to Drive Engagement**
 - **Harsh Park or Neutral to Reverse Engagement**
 - **Harsh Upshift**
 - **Harsh Shift on Coastdown**
 - **Harsh Downshift**
- Shift Pattern
 - **No First and Reverse Gears**
 - **No Second and Eighth Gear**
 - **No First, Second, Third, Fourth, and Fifth Gear**
 - **No Forward and Reverse**
 - **Slips in Drive or No Drive**
 - **Slips in Reverse**
 - **No 1-2 Upshift**
 - **No 2-3 Upshift**

- No 3-4 Upshift
- No 4-5 Upshift
- No 5-6 Upshift
- No 6-7 Upshift
- No 7-8 Upshift
- No Downshift
- Torque Converter Diagnosis
 - Torque Converter Diagnosis
 - No Torque Converter Clutch Apply
 - No Torque Converter Clutch Release
- Symptom Not Found or No Symptom Detected
 - Transmission Fluid Level and Condition Check
 - Road Test
 - Line Pressure Check

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>DTC P0601-P0604, P0606, or P16F3</u>	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 P16F3 Control Module Redundant Performance
<u>DTC P0705 or P0706</u>	DTC P0705 Transmission Range Switch Circuit DTC P0706 Transmission Range Switch Performance
<u>DTC P0711-P0713</u>	DTC P0711 Transmission Fluid Temperature Sensor Performance DTC P0712 Transmission Fluid Temperature Sensor Circuit Low Voltage DTC P0713 Transmission Fluid Temperature Sensor Circuit High Voltage
<u>DTC P0717, P07BF, or P07C0</u>	DTC P0717 Input Speed Sensor Circuit No Signal DTC P07BF Input Speed Sensor Circuit Low Voltage DTC P07C0 Input Speed Sensor Circuit High Voltage
<u>DTC P0722, P077C, or P077D</u>	DTC P0722 Output Speed Sensor Circuit No Signal DTC P077C Output Speed Sensor Circuit Low Voltage DTC P077D Output Speed Sensor Circuit High Voltage
<u>DTC P0729-P0735, P076F, or P07D9</u>	DTC P0729 6th Gear Ratio Incorrect DTC P0730 Incorrect Gear Ratio DTC P0731 1st Gear Ratio Incorrect DTC P0732 2nd Gear Ratio Incorrect DTC P0733 3rd Gear Ratio Incorrect DTC P0734 4th Gear Ratio Incorrect DTC P0735 5th Gear Ratio Incorrect

	DTC P076F 7th Gear Ratio Incorrect DTC P07D9 8th Gear Ratio Incorrect
<u>DTC P0741 or P0742</u>	DTC P0741 Torque Converter Clutch (TCC) System Stuck Off DTC P0742 Torque Converter Clutch (TCC) System Stuck On
<u>DTC P0748, P0962, or P0963</u>	DTC P0748 Pressure Control Solenoid Valve 1 Control Circuit DTC P0962 Pressure Control Solenoid Valve 1 Control Circuit Low Voltage DTC P0963 Pressure Control Solenoid Valve 1 Control Circuit High Voltage
<u>DTC P0776 or P0777</u>	DTC P0776 Pressure Control Solenoid Valve 2 - Stuck Off DTC P0777 Pressure Control Solenoid Valve 2 - Stuck On
<u>DTC P0778, P0966, or P0967</u>	DTC P0778 Pressure Control Solenoid Valve 2 Control Circuit DTC P0966 Pressure Control Solenoid Valve 2 Control Circuit Low Voltage DTC P0967 Pressure Control Solenoid Valve 2 Control Circuit High Voltage
<u>DTC P0798, P0970, or P0971</u>	DTC P0798 Pressure Control Solenoid Valve 3 Control Circuit DTC P0970 Pressure Control Solenoid Valve 3 Control Circuit Low Voltage DTC P0971 Pressure Control Solenoid Valve 3 Control Circuit High Voltage
<u>DTC P07A2</u>	DTC P07A2 Transmission Clutch 1 Performance
<u>DTC P0815, P0816, P0826-P0828, or P085F</u>	DTC P0815 Upshift Switch Circuit DTC P0816 Downshift Switch Circuit DTC P0826 Up and Down Shift Switch Circuit DTC P0827 Up and Down Shift Switch Circuit Low Voltage DTC P0828 Up and Down Shift Switch Circuit High Voltage DTC P085F Up and Down Shift Switch Range Performance
<u>DTC P0842 or P0843</u>	DTC P0842 Transmission Fluid Press Switch Circuit Low Voltage DTC P0843 Transmission Fluid Press Switch Circuit High Voltage
<u>DTC P0851</u>	DTC P0851 Park/Neutral Position Switch Circuit Low Voltage
<u>DTC P0973 or P0974</u>	DTC P0973 Shift Solenoid Valve 1 Control Circuit Low Voltage DTC P0974 Shift Solenoid Valve 1 Control Circuit High Voltage
<u>DTC P170A-P170E</u>	DTC P170A Transmission Hydraulic Circuit 2 Max Pressure Not Achieved DTC P170B Transmission Hydraulic Circuit 3 Max Pressure Not Achieved DTC P170C Transmission Hydraulic Circuit 4 Max Pressure Not Achieved DTC P170D Transmission Hydraulic Circuit 5 Max Pressure Not Achieved DTC P170E Transmission Hydraulic Circuit 6 Max Pressure Not Achieved
<u>DTC P175F</u>	DTC P175F Acceleration Sensor Signal Message Counter Incorrect
<u>DTC P1761</u>	DTC P1761 Up and Down Shift Switch Signal Message Counter Incorrect
<u>DTC P176A, P176C, or P176D</u>	DTC P176A Intermediate Speed Sensor Circuit No Signal DTC P176C Intermediate Speed Sensor Circuit Low Voltage DTC P176D Intermediate Speed Sensor Circuit High Voltage
<u>DTC P2716, P2720, or P2721</u>	DTC P2716 Pressure Control Solenoid Valve 4 Control Circuit DTC P2720 Pressure Control Solenoid Valve 4 Control Circuit Low Voltage DTC P2721 Pressure Control Solenoid Valve 4 Control Circuit High Voltage
<u>DTC P2719</u>	DTC P2719 Pressure Control Solenoid Valve 4 Performance
<u>DTC P2725, P2729, or P2730</u>	DTC P2725 Pressure Control Solenoid Valve 5 Control Circuit DTC P2729 Pressure Control Solenoid Valve 5 Control Circuit Low Voltage DTC P2730 Pressure Control Solenoid Valve 5 Control Circuit High Voltage
<u>DTC P2734, P2738, or</u>	DTC P2734 Pressure Control Solenoid Valve 6 Control Circuit

<u>P2739</u>	DTC P2738 Pressure Control Solenoid Valve 6 Control Circuit Low Voltage DTC P2739 Pressure Control Solenoid Valve 6 Control Circuit High Voltage
<u>DTC P2761, P2763, or P2764</u>	DTC P2761 Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit DTC P2763 Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit High Voltage DTC P2764 Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit Low Voltage
<u>DTC P2769 or P2770</u>	DTC P2769 Torque Converter Clutch (TCC) Enable Solenoid Valve Control Circuit Low Voltage DTC P2770 Torque Converter Clutch (TCC) Enable Solenoid Valve Control Circuit High Voltage

DTC P0601-P0604, P0606, OR P16F3: CONTROL MODULE PROCESSOR/MEMORY

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

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 P16F3

Control Module Redundant Performance

Circuit/System Description

DTCs P0601, P0603, P0604 and P0606 indicate an internal fault to the transmission control module (TCM). DTC P0602 indicates that the TCM is not programmed. DTC P16F3 could indicate either an internal circuit fault or a separate external circuit fault to the TCM.

Conditions for Running the DTC

- DTC P0601, P0602, P0603, P0604, P0606 or P16F3 is not set.
- The ignition voltage is greater than 9 V.

Conditions for Setting the DTC

P0601

The TCM has detected a memory checksum malfunction.

P0602

The TCM is not programmed.

P0603

The TCM has detected a long term memory malfunction, during power up.

P0604

The TCM has detected a random access memory malfunction.

P0606

The TCM has detected a main processor malfunction.

P16F3

- The TCM has detected a redundant memory performance malfunction.
- The TCM has detected an intermittent or corruptive input speed sensor signal.

Action Taken When the DTC Sets

- P0601, P0602, P0603, P0604, P0606 and P16F3 are Type A DTCs.
- The transmission shifts to 3rd gear.
- Reverse gear is also allowed.

Conditions for Clearing the DTC

P0601, P0602, P0603, P0604, P0606 and P16F3 are Type A DTCs.

Diagnostic Aids

Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Ignition OFF for one minute. Ignition ON.
2. Verify with a scan tool that DTC P0602 is not set.
 - **If DTC P0602 is set**

Program the K71 Transmission Control Module.

- **If DTC P0602 is not set**
3. Verify with a scan tool that DTCs P0601, P0603, P0604, or P0606 is not set.
 - **If DTC P0601, P0603, P0604, or P0606 is set**

Replace and program the new K71 Transmission Control Module.

- **If DTC P0601, P0603, P0604, or P0606 is not set**

4. Verify with a scan tool that DTC P16F3 is not set.

- **If DTC P16F3 is set**

1. Ignition OFF. Disconnect the X175 Transmission Harness Connector at the T12 Automatic Transmission Assembly.
2. Verify the X175 Transmission Harness Connector terminals are clean, tight and fully seated.
 - If the connector or terminals are not OK, repair or replace as necessary.
 - If the connector and terminals are OK, replace and program the new K71 Transmission Control Module.

- **If DTC P16F3 is not set**

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

- **If any of the DTCs set**

Replace and program the new K71 Transmission Control Module.

- **If none of the DTCs set**

6. All OK.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)** following all transmission related repairs.
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P0705 OR P0706: TRANSMISSION RANGE SWITCH

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P0705

Transmission Range Switch Circuit

DTC P0706

Transmission Range Switch Performance

Diagnostic Fault Information

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	P0705	P0705	P0705	P0706
Ground	-	P0705	-	P0706

Typical Scan Tool Data

Transmission Range Switch P/R/N/D

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON, in Park position Parameter Normal Range: High or Low			
Park/Neutral Switch Signal	Low	High	High
Signal Ground	-	High	-

Transmission Range Switch P/R/N/D

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON, in Reverse position Parameter Normal Range: High or Low			
Reverse Switch Signal	Low	High	High
Signal Ground	-	High	-

Transmission Range Switch P/R/N/D

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON, in Neutral position Parameter Normal Range: High or Low			
Neutral Safety Switch Signal	Low	High	High
Ground	-	High	-

Transmission Range Switch P/R/N/D

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON, in Drive position Parameter Normal Range: High or Low			
Drive Switch Signal	Low	High	High
Signal Ground	-	High	-

Circuit/System Description

NOTE: The transmission range switch is part of the B81 Park/Neutral Position Switch Assembly.

The transmission range switch indicates to the transmission control module (TCM) which gear position the vehicle operator has selected. The 4 positions are Park, Reverse, Neutral and Drive. Each position has its own individual 12 V signal circuit, switch and ground circuit. All four ground circuits are connected together at a common chassis ground. The TCM supplies and monitors each 12 V signal circuit for a voltage drop. When a range is selected the switch closes and the circuit changes from high to low. Depending on which switch closes, this action signals the TCM as to which gear the vehicle operator has selected and applies the correct clutches. The transmission range switch parameter will display High with the switch open, Low with the switch closed or Invalid when stuck between 2 positions.

Conditions for Running the DTC

P0705

- DTC U0100 or U0073 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.

P0706

- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.

Conditions for Setting the DTC

P0705

All four Transmission range switch circuits are at battery voltage.

P0706

Two or more transmission range switch circuits are less than 2 V.

Action Taken When the DTC Sets

- P0705 and P0706 are Type A DTCs.
- The TCM freezes transmission adaptive functions.
- The TCM forces TCC OFF.
- The TCM inhibits manual shifting of forward gears.
- The TCM inhibits reverse gear and all forward gears.

Conditions for Clearing the DTC

P0705 and P0706 are Type A DTCs.

Diagnostic Aids

Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Verify the Transmission Range Selector Lever Cable is adjusted correctly. Refer to **Range Selector Lever Cable Adjustment**.
 - **If the range selector cable adjustment is not OK**

Adjust, repair or replace as necessary.
 - **If the range selector cable adjustment is OK**
2. Ignition ON.
3. Verify the scan tool Transmission Range Switch P/R/N/D parameter displays Low/High/High/High when the gear shift lever is placed in Park position.
 - **If Low/High/High/High is not displayed**

Refer to Circuit/System Testing.

- **If Low/High/High/High is displayed**

4. Verify the scan tool Transmission Range Switch P/R/N/D parameter displays High/Low/High/High when the gear shift lever is placed in Reverse position.

- **If High/Low/High/High is not displayed**

Refer to Circuit/System Testing.

- **If High/Low/High/High is displayed**

5. Verify the scan tool Transmission Range Switch P/R/N/D parameter displays High/High/Low/High when the gear shift lever is placed in Neutral position.

- **If High/High/Low/High is not displayed**

Refer to Circuit/System Testing.

- **If High/High/Low/High is displayed**

6. Verify the scan tool Transmission Range Switch P/R/N/D parameter displays High/High/High/Low when the gear shift lever is placed in Drive position.

- **If High/High/High/Low is not displayed**

Refer to Circuit/System Testing.

- **If High/High/High/Low is displayed**

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

8. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

9. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B81 Park/Neutral Position Switch. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 5 ohms between the ground circuit terminal 2 and ground.
 - **If 5 ohms or greater**
 1. Ignition OFF.
 2. Test for less than 2 ohms in the ground circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.

- If less than 2 ohms, repair the open/high resistance in the ground connection.
- **If less than 5 ohms**
- 3. Ignition ON, place the gear shift lever in Park position.
- 4. Verify the scan tool Transmission Range Switch P/R/N/D parameter is High, for Park position.
 - **If not High**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 2. Test for infinite resistance between the Park signal circuit terminal 6 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K71 Transmission Control Module.
 - **If High**
- 5. Install a 3 A fused jumper wire between the Park signal circuit terminal 6 and the ground circuit terminal 2.
- 6. Verify the scan tool Transmission Range Switch P/R/N/D parameter is Low, for Park position.
 - **If not Low**
 1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the K71 Transmission Control Module, Ignition ON.
 2. Test for less than 1 V between the Park signal circuit terminal 6 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V.
 3. Test for less than 2 ohms in the signal circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.
 - **If Low**
- 7. Ignition ON, place the range shift lever in Reverse position.
- 8. Verify the scan tool Transmission Range Switch P/R/N/D parameter is High, for Reverse position.
 - **If not High**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 2. Test for infinite resistance between the Reverse signal circuit terminal 1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K71 Transmission Control Module.
 - **If High**
- 9. Install a 3 A fused jumper wire between the Reverse signal circuit terminal 1 and the ground circuit terminal 2.
- 10. Verify the scan tool Transmission Range Switch P/R/N/D parameter is Low, for Reverse position.
 - **If not Low**
 1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the K71 Transmission Control Module, Ignition ON.
 2. Test for less than 1 V between the Reverse signal circuit terminal 1 and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V.
- 3. Test for less than 2 ohms in the Reverse signal circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.
- **If Low**
- 11. Ignition ON, place the range shift lever in Neutral position.
- 12. Verify the scan tool Transmission Range Switch P/R/N/D parameter is High, for Neutral Position.
 - **If not High**
 - 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 - 2. Test for infinite resistance between the Neutral signal circuit terminal 9 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K71 Transmission Control Module.
 - **If High**
- 13. Install a 3 A fused jumper wire between the Neutral signal circuit terminal 9 and the ground circuit terminal.2
- 14. Verify the scan tool Transmission Range Switch P/R/N/D parameter is Low, for Neutral position.
 - **If not Low**
 - 1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the K71 Transmission Control Module, Ignition ON.
 - 2. Test for less than 1 V between the Neutral signal circuit terminal 9 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V.
 - 3. Test for less than 2 ohms in the Neutral signal circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.
 - **If Low**
- 15. Ignition ON, place the range shift lever in Drive position.
- 16. Verify the scan tool Transmission Range Switch P/R/N/D parameter is High, for Drive position.
 - **If not High**
 - 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 - 2. Test for infinite resistance between the Drive signal circuit terminal 7 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K71 Transmission Control Module.
 - **If High**
- 17. Install a 3 A fused jumper wire between the Drive signal circuit terminal 7 and the ground circuit terminal 2.
- 18. Verify the scan tool Transmission Range Switch P/R/N/D parameter is Low, for Drive Position

- **If not Low**

1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the K71 Transmission Control Module, Ignition ON.
2. Test for less than 1 V between the Drive signal circuit terminal 7 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V.
3. Test for less than 2 ohms in the Drive signal circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.

- **If Low**

19. Test or replace the B81 Park/Neutral Position Switch.

Component Testing

1. Perform the Circuit/System Verification first.
2. Place the range shift lever in Park position.
3. Ignition OFF, disconnect the harness connector at the B81 Park/Neutral Position Switch.
4. Test for less than 2 ohms between the Park signal circuit terminal 6 and the ground circuit terminal 2.

- **If 2 ohms or greater**

Replace the B81 Park/Neutral Position Switch.

- **If less than 2 ohms**

5. Place the range shift lever in Reverse position.
6. Test for infinite resistance between the Park signal circuit terminal 6 and the ground circuit terminal 2.

- **If less than infinite resistance**

Replace the B81 Park/Neutral Position Switch.

- **If infinite resistance**

7. Test for less than 2 ohms between the Reverse signal circuit terminal 1 and the ground circuit terminal 2.

- **If 2 ohms or greater**

Replace the B81 Park/Neutral Position Switch.

- **If less than 2 ohms**

8. Place the range shift lever in Neutral position.
9. Test for infinite resistance between the Reverse signal circuit terminal 1 and the ground circuit terminal 2.

- **If less than infinite resistance**

Replace the B81 Park/Neutral Position Switch.

- **If infinite resistance**

10. Test for less than 2 ohms between the Neutral signal circuit terminal 9 and the ground circuit terminal 2.

- **If 2 ohms or greater**

Replace the B81 Park/Neutral Position Switch.

- **If less than 2 ohms**

11. Place the range shift lever in Drive position.

12. Test for infinite resistance between the Neutral signal circuit terminal 9 and the ground circuit terminal 2.

- **If less than infinite resistance**

Replace the B81 Park/Neutral Position Switch.

- **If infinite resistance**

13. Test for less than 2 ohms between the Drive signal circuit terminal 7 and the ground circuit terminal 2.

- **If 2 ohms or greater**

Replace the B81 Park/Neutral Position Switch.

- **If less than 2 ohms**

14. Place the range shift lever in Park position.

15. Test for infinite resistance between the Drive signal circuit terminal 7 and the ground circuit terminal 2.

- **If less than infinite resistance**

Replace the B81 Park/Neutral Position Switch.

- **If infinite resistance**

16. All OK.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)** following all transmission related repairs.
- **Park/Neutral Position Switch Replacement**
- **Range Selector Lever Cable Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P0711-P0713: TRANSMISSION FLUID TEMPERATURE SENSOR

Diagnostic Instructions

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

- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P0711

Transmission Fluid Temperature Sensor Performance

DTC P0712

Transmission Fluid Temperature Sensor Circuit Low Voltage

DTC P0713

Transmission Fluid Temperature Sensor Circuit High Voltage

Diagnostic Fault Information

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal +	P0712	P0713	P0713	P0711
Signal -	P0712	P0713	P0713	P0711

Typical Scan Tool Data

Transmission Fluid Temperature Sensor

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine Running			
Parameter Normal Range: -74 to +174°C (-101 to +345°F)			
Signal +	174°C (345°F)	-74 (-101°F)	-74 (-101°F)
Signal -	174°C (345°F)	-74 (-101°F)	-74 (-101°F)

Circuit/System Description

The transmission fluid temperature sensor is a 2 wire negative temperature coefficient thermistor. The transmission control module (TCM) supplies a 12 V signal circuit and a low reference circuit to the transmission fluid temperature sensor. The transmission fluid temperature sensor measures the temperature of the oil in the transmission fluid oil pan. As the temperature of the fluid increases, the resistance of the sensor decreases, varying the voltage on the signal circuit. The transmission fluid temperature sensor is part of the transmission internal wire harness assembly and has no serviceable parts.

Conditions for Running the DTC

P0711, P0712 or P0713

- DTC U0100 or U0073 is not set.
- Ignition Voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32 V.
- Engine speed is greater than 400 RPM and is valid.

Conditions for Setting the DTC

P0711 - Condition 1

- Gear shift lever is in the Drive position.
- Vehicle speed is greater than 40 km/h (24.85 MPH).
- Automatic transmission fluid temperature does not change.
- The above conditions occur for 10 min or more.

P0711 - Condition 2

- Ignition is OFF for 8 hours.
- Vehicle speed is over 24 km/h (14.91 MPH) for 400 s.
- Automatic transmission fluid temperature does not change.
- The above conditions happen once.

P0712

- Ignition is ON.
- Automatic transmission fluid is 200°C (392°F) or more.
- Above conditions continues for 10 s or more.
- Above conditions occur 6 times.

P0713

- Gear shift lever is in the Drive position.
- Vehicle has been driven for 1 min or more.
- Automatic transmission fluid is -55°C (-67°F) or less.
- Above conditions continue for 1 s or more.
- Above conditions occurs 12 consecutive times.

Action Taken When the DTC Sets

- P0711, P0712 and P0713 are Type B DTCs.
- The TCM freezes transmission adaptive functions.
- The TCM forces TCC OFF.

Conditions for Clearing the DTC

P0711, P0712 and P0713 are Type B DTCs.

Diagnostic Aids

Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Verify the transmission fluid level and condition is correct. Refer to **Transmission Fluid Level and Condition Check**.
 - **If the transmission fluid level and condition is not correct**

Repair as necessary.
 - **If the transmission fluid level and condition is correct**
2. Engine idling at operating temperature.

3. Verify the scan tool B13 Transmission Fluid Temperature parameter is between -74 to +174°C (-101 to +345°F).

- **If not between -74 to +174°C (-101 to +345°F)**

Refer to Circuit/System Testing.

- **If between -74 to +174°C (-101 to +345°F)**

4. Verify the scan tool B13 Transmission Fluid Temperature parameter increases greater than 2°C (35°F) after operating the vehicle at 64 km/h (40 mph) for 10 min.

- **If the temperature does not increase greater than 2°C (35°F)**

Refer to Circuit/System Testing.

- **If the temperature does increase greater than 2°C (35°F)**

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

6. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

7. All OK.

Circuit/System Testing

1. Ignition OFF, and all vehicle systems OFF, disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 ohms between the low reference circuit terminal 9 on the X175 vehicle harness connector and ground.
 - **If 10 ohms or greater**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 2. Test for less than 2 ohms in the low reference circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.
 - **If less than 10 ohms**
3. Ignition ON.
4. Verify 11.6-12.4 V between the 12 V signal circuit terminal 8 on the X175 vehicle harness side connector and ground.
 - **If not between 11.6-12.4 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 2. Test for infinite resistance between the 12 V signal circuit terminal 8 on the X175 vehicle harness

side connector and ground.

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

3. Test for less than 1 ohms in the 12 V signal circuit, end to end.

- If 1 ohms or greater, repair the open/high resistance in the circuit.
- If less than 1 ohms, replace the K71 Transmission Control Module.

○ **If between 11.6-12.4 V**

5. Replace the internal transmission wire harness assembly.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)** following all transmission related repairs.
- **Automatic Transmission Wiring Harness Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

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

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

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

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

Signal +	P07BF	P07C0	P07C0	P0717
Signal -	P07BF	P07C0	-	P0717

Typical Scan Tool Data

Transmission ISS

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine running Parameter Normal Range: 0-7,500 RPM			
Signal +	0 RPM	0 RPM	-
Signal -	0 RPM	0 RPM	-

Circuit/System Description

The input speed sensor assembly is a two wire hall-effect type sensor. The transmission control module (TCM) supplies a 12 V signal circuit and a low reference circuit to the input speed sensor. The input speed sensor produces a square wave signal by toggling the 12 V signal circuit low and high based on the leading and trailing edges on the splines that are cast on the transmission input shaft. As the rotational speed of the input shaft increases, the frequency of the input speed sensor signal increases. The TCM uses the input speed sensor signal along with the intermediate and output speed sensor signals to, determine transmission line pressure, shift patterns, torque converter clutch slip speed and the correct gear ratio.

Conditions for Running the DTC

P0717

- DTC U0100 or U0073 is not set.
- Ignition Voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.

P07BF or P07C0

- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32 V.

Conditions for Setting the DTC

P0717

- Gear shift lever is in Drive position.
- Vehicle speed is 20 km/h (12.42 MPH) or more.
- The TCM has received 26 pulses from the output speed sensor signal.
- The TCM has not received any input speed sensor signals.

P07BF or P07C0

- Ignition is ON.
- The TCM has not received input speed sensor signals.
- Above conditions are met for 0.1 s or more.
- Above conditions occur 10 times consecutively.

Action Taken When the DTC Sets

- P0717, P07BF and P07C0 are Type A DTCs.
- The transmission shifts to 3rd, 4th or 6th gear depending on vehicle speed.
- Reverse gear is allowed.

Conditions for Clearing the DTC

P0717, P07BF and P07C0 are Type A DTCs.

Diagnostic Aids

Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Engine Running, range selector lever in park position.
2. Verify the scan tool Transmission ISS parameter varies with engine RPM and does not drop out.
 - **If the B14C Transmission ISS does not vary with engine speed or drops out**

Refer to Circuit/System Testing.

- **If the B14C Transmission ISS does vary with engine speed and does not drop out**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
4. Verify the DTC does not set.
 - **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**
5. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the X175 harness connector at the T12 Automatic Transmission Assembly case. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 ohms between the low reference circuit terminal 2 on the X175 vehicle harness side connector and ground.
 - **If 10 ohms or greater**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 2. Test for less than 2 ohms in the low reference circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.
 - **If less than 10 ohms**
3. Test for less than 1 V between the 12 V signal circuit terminal 1 on the X175 vehicle harness connector and ground.
 - **If greater than 1 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
 2. Test for less than 1 V between the 12 V signal circuit terminal 1 on the X175 vehicle harness

connector and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K71 Transmission Control Module.

- **If less than 1 V**

4. Ignition ON.

5. Verify 11.6-12.4 V between the 12 V signal circuit terminal 1 on the X175 vehicle harness connector and ground.

- **If not between 11.6-12.4 V**

1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.

2. Test for infinite resistance between the 12 V signal circuit terminal 1 on the X175 vehicle harness connector.

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

3. Test for less than 1 ohms in the 12 V signal circuit, end to end.

- If 1 ohms or greater, repair the open/high resistance in the circuit.
- If less than 1 ohms, replace the K71 Transmission Control Module.

- **If between 11.6-12.4 V**

6. Ignition OFF.

7. Remove the oil pan from the T12 Automatic Transmission Assembly.

8. Disconnect the wire harness connector at B14C Transmission Input Speed Sensor.

9. Verify and inspect the internal transmission wire harness circuits for the B14C Transmission Input Shaft Speed Sensor for opens, high resistance, short to ground or short to B+.

- **If the internal wire harness is not OK**

Replace the internal transmission wire harness.

- **If the internal wire harness is OK**

10. Replace the B14C Transmission Input Speed Sensor.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)** following all transmission related repairs.
- **Input Speed Sensor Replacement**
- **Automatic Transmission Wiring Harness Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P0722, P077C, OR P077D: OUTPUT SPEED SENSOR CIRCUIT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P0722

Output Speed Sensor Circuit No Signal

DTC P077C

Output Speed Sensor Circuit Low Voltage

DTC P077D

Output Speed Sensor Circuit High Voltage

Diagnostic Fault Information

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal +	P077C	P077D	P077D	P0722
Signal -	P077C	P077D	-	P0722

Typical Scan Tool Data

Output Speed Sensor

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Vehicle speed above 21 kph (13 MPH) Parameter Normal Range: 0 - 7,500 RPM			
Signal +	0 RPM	0 RPM	-
Signal -	0 RPM	0 RPM	-

Circuit/System Description

The output speed sensor assembly is a two wire hall-effect type sensor. The transmission control module (TCM) supplies a 12 V signal circuit and a low reference circuit to the output speed sensor. The output speed sensor produces a square wave signal by toggling the 12 V signal circuit low and high based on the leading and trailing edges of the splines that are on the outside diameter of the rear planetary ring gear drum. As the rotational speed of the rear planetary ring gear drum increases, the frequency of the output speed sensor signal increases. The TCM uses the output speed sensor signal along with the input and intermediate speed sensor signals to determine transmission line pressure, shift patterns, torque converter clutch slip speed and the correct gear ratio.

Conditions for Running the DTC

P0722

- DTC U0100 or U0073 is not set.
- Ignition Voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.

P077C or P077D

- Ignition Voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.

Conditions for Setting the DTC

P0722

- Gear shift lever is in Drive position.
- Vehicle speed is 20 km/h (12.42 MPH) or more.
- The TCM has received 13 pulses from the input speed sensor signal.
- The TCM has not received any output speed sensor signals.

P077C or P077D

- Ignition is ON.
- The TCM has not received Output Speed Sensor signals.
- Above conditions are met for 0.1 s or more.
- Above conditions occur 10 times consecutively.

Action Taken When the DTC Sets

- P0722, P077C and P077D are Type A DTCs.
- The transmission shifts to 3rd, 4th or 6th gear depending on vehicle speed.
- Reverse gear is allowed.

Conditions for Clearing the DTC

P0722, P077C and P077D are Type A DTCs.

Diagnostic Aids

Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Perform the **Road Test**.
2. Verify the scan tool Transmission OSS parameter varies with an increase with vehicle speed and does not drop out.
 - **If the Transmission OSS does not vary with vehicle speed or drops out**

Refer to Circuit/System Testing.

- **If the Transmission OSS does vary with vehicle speed and does not drop out**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
 4. Verify the DTC does not set.
 - **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**
5. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the X175 harness connector at the T12 Automatic Transmission Assembly case. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 ohms between the low reference circuit terminal 21 on the X175 vehicle harness connector and ground.
 - **If 10 ohms or greater**
 1. Ignition OFF, disconnect the wire harness connector at the K71 Transmission Control Module.
 2. Test for less than 2 ohms in the low reference circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.
 - **If less than 10 ohms**
3. Test for less than 1 V between the 12 V signal circuit terminal 21 on the X175 vehicle harness connector and ground.
 - **If greater than 1 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
 2. Test for less than 1 V between the 12 V signal circuit terminal 22 on the X175 vehicle harness connector and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.
 - **If less than 1 V**
4. Ignition ON.
5. Verify 11.6-12.4 V between the 12 V signal circuit terminal 22 on the X175 vehicle harness connector and ground at the T12 Automatic Transmission Assembly case.
 - **If not between 11.6-12.4 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 2. Test for infinite resistance between the 12 V signal circuit terminal 22 on the X175 vehicle harness connector and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 1 ohms in the 12 V signal circuit, end to end.
 - If 1 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 1 ohms, replace the K71 Transmission Control Module.
 - **If between 11.6-12.4 V**
6. Ignition OFF.
7. Remove the oil pan from the T12 Automatic Transmission Assembly.
8. Disconnect the wire harness connector at B14A Transmission Output Speed Sensor.
9. Verify and inspect the internal transmission wire harness circuits for the B14A Transmission Output Shaft Speed Sensor for opens, high resistance, short to ground or short to B+.

- **If the internal wire harness is not OK**

Replace the internal transmission wire harness.

- **If the internal wire harness is OK**

10. Replace the B14A Transmission Output Speed Sensor.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)** following all transmission related repairs.
- **Output Speed Sensor Replacement (Intermediate), Output Speed Sensor Replacement (Primary)**
- **Automatic Transmission Wiring Harness Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P0729-P0735, P076F, OR P07D9: GEAR RATIO INCORRECT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P0729

6th Gear Ratio Incorrect

DTC P0730

Incorrect Gear Ratio

DTC P0731

1st Gear Ratio Incorrect

DTC P0732

2nd Gear Ratio Incorrect

DTC P0733

3rd Gear Ratio Incorrect

DTC P0734

4th Gear Ratio Incorrect

DTC P0735

5th Gear Ratio Incorrect

DTC P076F

7th Gear Ratio Incorrect

DTC P07D9

8th Gear Ratio Incorrect

Circuit/System Description

The transmission control module (TCM) uses the information it receives along with the serial data information from other control modules to calculate the correct gear ratio. The TCM compares the calculated gear ratio to the commanded gear ratio gear. The calculated gear ratio and the commanded gear ratio must match.

Conditions for Running the DTC

P0729 - Condition 1 - 6th gear

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is in Drive range.
- Transmission is in 6th gear.
- Output Speed Sensor is 500 RPM or greater.

P0729 - Condition 2 - 6th gear stuck

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is in Drive range.

- Transmission is in 6th gear.
- Output Speed Sensor is 60 RPM or greater.
- Engine torque has achieved at least 50 (36.87 lb ft).

P0730 - Condition 1 - 1st gear with engine braking

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is in Drive range.
- Transmission is in 1st (engine braking) gear.
- Output Speed Sensor is 500 RPM or greater.
- Engine torque is less than 0 (0 lb ft).

P0730 - Condition 2 - 1st gear with engine braking stuck

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is in Drive range.
- Transmission is in 1st (engine braking) gear.
- Input speed sensor is 6000 RPM or less.
- Output Speed Sensor is 60 RPM or greater.
- Engine torque has achieved at least 50 (36.87 lb ft).

P0731 - 1st gear stuck

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is in Drive range.
- Transmission is in 1st gear.

- Input speed sensor is 6000 RPM or less.
- Output Speed Sensor is 60 RPM or greater.
- Engine torque is 80 (59 lb ft) or greater.

P0732 - Condition 1 - 2nd gear

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is Drive range.
- Transmission is in 2nd gear.
- Output speed sensor is 500 RPM or greater.

P0732 - Condition 2 - 2nd gear stuck

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is Drive range.
- Transmission is in 2nd gear.
- Output speed sensor is 60 RPM or greater.
- Engine torque has achieved at least 50 (36.87 lb ft).

P0733 - Condition 1 - 3rd gear

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is Drive range.
- Transmission is in 3rd gear.
- Output speed sensor is 500 RPM or greater.

P0733 - Condition 2 - 3rd gear stuck

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is Drive range.
- Transmission is in 3rd gear.
- Output speed sensor is 60 RPM or greater.
- Engine torque has achieved at least 50 (36.87 lb ft).

P0734 - Condition 1 - 4th gear

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is Drive range.
- Transmission is in 4th gear.
- Output speed sensor is 500 RPM or greater.

P0734 - Condition 2 - 4th gear stuck

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Transmission is in 4th gear.
- Output speed sensor is 60 RPM or greater.
- Engine torque is 50 (36.87 lb ft) or greater.

P0735 - Condition 1 - 5th gear

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.

- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is Drive range.
- Transmission is in 5th gear.
- Output speed sensor is 500 RPM or greater.

P0735 - Condition 2 - 5th gear stuck

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is Drive range.
- Transmission is in 5th gear.
- Output speed sensor is 60 RPM or greater.
- Engine torque has achieved at least 50 (36.87 lb ft).

P076F - 7th gear

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is Drive range.
- Transmission is in 7th gear.
- Output speed sensor is 500 RPM or greater.

P07D9 - Condition 1 - 8th gear

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is Drive range.
- Transmission is in 8th gear.
- Output speed sensor is 60 RPM or greater.

P07D9 - Condition 2 - 8th gear stuck

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is Drive range.
- Transmission is in 8th gear.
- Output speed sensor is 60 RPM or greater.
- Engine torque has achieved at least 50 (36.87 lb ft).

Conditions for Setting the DTC

P0729 - Condition 1

- TCM has not detected 6th gear ratio.
- DTC sets when 12 counts are accumulated.

P0729 - Condition 2

- TCM has detected 7th gear ratio.
- DTC sets when 5 counts are accumulated.

P0730 - Condition 1

- TCM has not detected the 1st gear ratio.
- DTC sets when 12 counts are accumulated.

P0730 - Condition 2

- TCM has detected either 2nd, 3rd, 4th, or 7th gear ratio.
- DTC sets when 5 counts are accumulated.

P0731

- TCM has detected either 2nd, 3rd, 4th, or 5th gear ratio.
- DTC sets when 5 counts are accumulated.

P0732 - Condition 1

- TCM has not detected the 2nd gear ratio.
- DTC sets when 12 counts are accumulated.

P0732 - Condition 2

- TCM has detected either 3rd, 4th, or 8th gear ratio.
- DTC sets when 5 counts are accumulated.

P0733 - Condition 1

- TCM has not detected the 3rd gear ratio.
- DTC sets when 12 counts are accumulated.

P0733 - Condition 2

- TCM has detected 7th gear ratio.
- DTC sets when 5 counts are accumulated.

P0734 - Condition 1

- TCM has not detected 4th gear ratio.
- DTC sets when 12 counts are accumulated.

P0734 - Condition 2

- TCM has detected 3rd or 6th gear ratio.
- DTC sets when 5 counts are accumulated.

P0735 - Condition 1

- TCM has not detected the 5th gear ratio.
- DTC sets when 12 counts are accumulated.

P0735 - Condition 2

- TCM has detected 6th, 7th, or 8th gear ratio.
- DTC sets when 5 counts are accumulated.

P076F

- TCM has not detected the 7th gear ratio.
- DTC sets when 12 counts are accumulated.

P07D9 - Condition 1

- TCM has not detected 8th gear ratio.
- DTC sets when 12 counts are accumulated.

P07D9 - Condition 2

- TCM has detected 6th or 7th gear ratio.
- DTC sets when 5 counts are accumulated.

Action Taken When the DTC Sets

DTC P0729, P0731, P0732 P0733, P0734, P0735, P076F and P07D9

- P0729, P0731, P0732, P0733, P0734, P0735, P076F and P07D9 are Type A DTCs.
- The transmission shifts to 3rd, 4th or 6th gear depending on vehicle speed.
- Reverse gear is allowed.

DTC P0730

- P0730 is a Type C DTC.
- Transmission self-learning function is inhibited.

Conditions for Clearing the DTC

- P0729, P0731, P0732, P0733, P0734, P0735, P076F and P07D9 are Type A DTCs.
- P0730 is a Type C DTC.

Diagnostic Aids

Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Verify there are no other DTCs are set.

- **If other DTCs are set**

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

- **If no other DTCs are set**

2. Verify the transmission fluid level and condition are correct. Refer to **Transmission Fluid Level and Condition Check**.

- **If the transmission fluid level and condition is not correct**

Correct the fluid level or condition as necessary.

- **If the transmission fluid level and condition is correct**

3. Verify the transmission range selector lever cable is adjusted properly. Refer to **Range Selector Lever Cable Adjustment**.

- **If the transmission range selector cable is not adjusted properly**

Adjust the range selector cable.

- **If the transmission range selector cable is adjusted properly**

4. Perform the **Road Test**.

5. Verify the transmission shifts correctly and no incorrect gear ratio DTCs are set.

- **If the transmission does not shift correctly or DTCs are set**

Refer to Circuit/System Testing.

- **If the transmission does shift correctly and no 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 observe from the Freeze Frame/Failure Records data.

7. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

8. All OK.

Circuit/System Testing

1. Replace the transmission control valve body assembly.
2. Clear the DTCs from the K71 Transmission Control Module.
3. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
4. Perform the **Road Test**.
5. Verify the transmission shifts correctly and no incorrect gear ratio DTCs are set.
 - **If transmission shifts correctly and no incorrect gear ratio DTCs are set**

All OK.

- **If the transmission does not shift correctly or incorrect gear ratio DTCs are set**

6. Replace the T12 Automatic Transmission Assembly.
7. Clear the DTCs from the K71 Transmission Control Module.
8. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
9. Perform the **Road Test**.
10. Verify the transmission shifts correctly and no incorrect gear ratio DTCs are set.
 - **If the transmission shifts correctly and no incorrect gear ratio DTCs are set**

All OK.

- **If the transmission does not shift correctly or incorrect gear ratio DTCs are set**

11. Replace the K71 Transmission Control Module.
12. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
13. Perform the **Road Test**.
14. Verify the transmission shifts correctly and no incorrect gear ratio DTCs are set.
 - **If the transmission does shift correctly and no incorrect gear ratio DTCs are set**
15. All OK.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Control Valve Body Replacement**
- **Transmission Replacement**

- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P0741 OR P0742: TORQUE CONVERTER CLUTCH (TCC) SYSTEM STUCK

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P0741

Torque Converter Clutch (TCC) System Stuck Off

DTC P0742

Torque Converter Clutch (TCC) System Stuck On

Circuit/System Description

The torque converter clutch (TCC) pressure control solenoid is part of the control solenoid valve assembly which has no serviceable parts. The transmission control module (TCM) uses the information it receives along with the serial data information from other control modules to calculate when to apply/release the TCC. The TCM calculates torque converter slip speed based on engine speed and transmission input shaft speed.

Conditions for Running the DTC

P0741

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is in drive range.
- Input speed sensor signal is valid.
- Output speed sensor is valid.

P0742

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535,

P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.

- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is in drive range.
- Input speed sensor signal is valid.
- Output speed sensor is valid.
- Automatic transmission fluid temperature is 20°C (68°F) or greater.

Conditions for Setting the DTC

P0741

- TCM is commanding torque converter clutch ON.
- The difference between engine RPM and input speed sensor is 100 RPM or greater for 2 s.
- Above conditions occur 6 times consecutively.

P0742

- TCM is commanding torque converter clutch ON.
- The difference between engine RPM and input speed sensor is 30 RPM or less for 2 s.
- Above conditions occur 8 times consecutively.

Actions Taken When the DTC Sets

P0741

- P0741 is a Type B DTC.
- The TCM freezes transmission adaptive functions.
- The TCM inhibits TCC.

P0742

- P0742 is a Type C DTC.
- The TCM freezes transmission adaptive functions.

Conditions for Clearing the DTC

- P0741 is a Type B DTC.
- P0742 is a Type C DTC.

Diagnostic Aids

Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Verify there are no other DTCs set except, DTC P0741 or P0742.

- If a DTC is set

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

- If a DTC is not set

2. Verify the transmission fluid level and condition is correct. Refer to Transmission Fluid Level and Condition Check.

- If the transmission fluid level and condition is not correct

Correct the fluid level or condition as necessary.

- If the transmission fluid level and condition is correct

3. Verify the transmission range selector lever cable is adjusted properly. Refer to **Range Selector Lever Cable Adjustment**.

- **If the transmission range selector cable is not adjusted properly**

Adjust the range selector cable.

- **If the transmission range selector cable is adjusted properly**

4. Perform the **Road Test**.
5. Verify the transmission shifts correctly and no incorrect gear ratio DTCs are set.
 - **If the transmission does not shift correctly or DTCs are set**

Refer to Circuit/System Testing.

- **If the transmission does shift correctly and no 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 observe from the Freeze Frame/Failure Records data.
7. Verify the DTC does not set.
 - **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

8. All OK.

Circuit/System Testing

1. Replace the transmission control valve body assembly.
2. Clear the DTCs from the K71 Transmission Control Module.
3. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
4. Perform the **Road Test**.
5. Verify the transmission shifts correctly, the TCC applies/releases and no DTCs are set.
 - **If the transmission shifts correctly, the TCC applies/releases and no DTCs are set**

All OK.

- **If the transmission does not shift correctly, the TCC does not apply/release or DTCs are set**

6. Replace the Torque Converter Assembly.
7. Clear the DTCs from the K71 Transmission Control Module.
8. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
9. Perform the **Road Test**.
10. Verify the transmission shifts correctly, the TCC applies/releases and no DTCs are set.
 - **If the transmission shifts correctly, the TCC applies/releases and no DTCs are set**

All OK.

- If the transmission does not shift correctly, the TCC does not apply/release or DTCs are set

11. Replace the K71 Transmission Control Module.
12. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
13. Perform the **Road Test**.
14. Verify the transmission shifts correctly and no incorrect gear ratio DTCs are set.
 - If the transmission does shift correctly, the TCC applies/release and no DTCs are set

All OK.

- If the transmission does not shift correctly, the TCC does not apply/release or DTCs are set

15. Replace the T12 Automatic Transmission Assembly.
16. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
17. Perform the **Road Test**.
18. Verify the transmission shifts correctly and no incorrect gear ratio DTCs are set.
 - If the transmission does shift correctly, the TCC applies/release and no DTCs are set
19. All OK.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Control Valve Body Replacement**
- **Torque Converter Assembly Replacement**
- **Transmission Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P0748, P0962, OR P0963: PRESSURE CONTROL SOLENOID VALVE 1 CONTROL CIRCUIT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P0748

Pressure Control Solenoid Valve 1 Control Circuit

DTC P0962

Pressure Control Solenoid Valve 1 Control Circuit Low Voltage

DTC P0963

Pressure Control Solenoid Valve 1 Control Circuit High Voltage

Diagnostic Fault Information

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control +	P0748	P0748, P0962	P0963	-
Control -	P0748	P0748, P0962	-	-

Typical Scan Tool Data

Pressure Control Solenoid Valve 1 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 +	Malfunction	-	-
Control -	Malfunction	Malfunction	-

Pressure Control Solenoid Valve 1 Control Circuit Open Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON Parameter Normal Range: OK or Not Run			
Control +	-	Malfunction	-
Control -	-	Malfunction	-

Pressure Control Solenoid Valve 1 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 +	-	Malfunction	Malfunction
Control -	-	-	Malfunction

Circuit/System Description

The pressure control solenoid valve 1 is part of the valve body assembly which has no serviceable parts. The pressure control solenoid valve 1 controls the transmission fluid line pressure. The pressure control solenoid valve 1 is supplied 12 V by the transmission control module (TCM) through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset. To control amperage

through the solenoid, the output control circuit is pulsed width modulated from a low side driver in the TCM.

Conditions for Running the DTC

P0748

- P0962 or P0963 is not set.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.
- Battery voltage is greater than 11 V for 500 ms.

P0962

- P0963 is not set.
- Ignition switch is ON.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.

P0963

- P0962 is not set.
- Ignition switch is ON.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.

Conditions for Setting the DTC

P0748

The TCM has detected the feedback current for the pressure control solenoid valve 1 has exceeded the commanded current, for more than 2 s.

P0962

The TCM has detected a short to ground or an open/high resistance on the pressure control solenoid valve 1. This condition must occur 5 consecutive times, lasting 100 ms or more.

P0963

The TCM has detected a short to voltage on the pressure control solenoid valve 1 circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

Action Taken When the DTC Sets

- P0748, P0962 and P0963 are Type A DTCs.

- The transmission shifts to 3rd, 4th or 6th gear depending on vehicle speed.
- Reverse gear is allowed.

Conditions for Clearing the DTC

P0748, P0962 and P0963 are Type A DTCs.

Diagnostic Aids

- Material particles or slivers of metallic debris may become deposited on the solenoid terminals or electrical connector. Inspect and clean as necessary.
- Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Ignition ON.

2. Verify the scan tool parameters listed below do not display Malfunction.
 - Pressure Control Solenoid Valve 1 Control Circuit Low Voltage Test Status
 - Pressure Control Solenoid Valve 1 Control Circuit Open Test Status
 - Pressure Control Solenoid Valve 1 Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**

Refer to Circuit/System Testing.

- **If Malfunction is not displayed**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
 4. Verify the DTC does not set.
 - **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**
5. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 minutes for all vehicle systems to power down. Ignition ON.
2. Test for 2.4-2.8 V between the control + circuit terminal 3 and ground.
 - **If less than 2.4 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 2. Test for infinite resistance between the control + circuit terminal 3 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 3. Test for less than 2 ohms in the control + circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.
 - **If greater than 2.8 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
 2. Test for less than 1 V between the control + circuit terminal 3 and ground.
 - If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.
 - **If between 2.4-2.8 V**
3. Test for less than 1 V between the control - circuit terminal 4 and ground.
 - **If greater than 1 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition

ON.

2. Test for less than 1 V between the control - circuit terminal 4 and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K71 Transmission Control Module.

- **If less than 1 V**

4. Ignition OFF.
5. Connect a jumper wire between the control + terminal 3 and control - terminal 4 on the X175 transmission harness connector.
6. Disconnect the harness connector at the K71 Transmission Control Module.
7. Test for less than 2 ohms between the control + terminal 43 and control - terminal 50 at the K71 Transmission Control Module harness connector.

- **If 2 ohms or greater**

Repair the open/high resistance in the control + circuit or the control - circuit.

- **If less than 2 ohms**

8. Test for infinite resistance between the control + circuit terminal 43 and ground.

- **If less than infinite resistance**

Repair the short to ground in either the control + circuit or the control - circuit.

- **If infinite resistance**

9. Test the Q27A Pressure Control Solenoid Valve 1.

Component Testing

1. Ignition OFF, remove the oil pan from the T12 Automatic Transmission Assembly.
2. Disconnect the wire harness at the Q27A Pressure Control Solenoid Valve 1
3. Test for 5.0-5.6 ohms between the 2 terminals on the Q27A Pressure Control Solenoid Valve 1.

- **If not between 5.0-5.6 ohms**

Replace the control valve body assembly.

- **If between 5.0-5.6 ohms**

4. Test for infinite resistance between each terminal on the Q27A Pressure Control Solenoid Valve 1 and ground.

- **If not infinite resistance**

Replace the control valve body assembly.

- **If infinite resistance**

5. Test the internal transmission wire harness control + circuit and control - circuit of the Q27A Pressure Control Solenoid Valve 1 for an open/high resistance, short to ground or short to voltage.

- **If control + and control - circuits are not OK**

Replace the internal transmission wire harness assembly.

- **If control + and control - circuits are OK**

6. Replace the K71 Transmission Control Module.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Automatic Transmission Wiring Harness Replacement**
- **Control Valve Body Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P0776 OR P0777: PRESSURE CONTROL SOLENOID VALVE 2 - STUCK

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P0776

Pressure Control Solenoid Valve 2 - Stuck Off

DTC P0777

Pressure Control Solenoid Valve 2 - Stuck On

Circuit/System Description

The pressure control solenoid valve 2 is part of the control solenoid valve assembly which has no serviceable parts. The transmission control module uses the information it receives along with the serial data information from other control modules to calculate the correct gear ratio. If the pressure control solenoid valve 2 is stuck ON or OFF, the transmission will have an incorrect gear ratio.

Conditions for Running the DTC

P0776

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0712, P0713, P0717, P0722, P0748, P0729, P0731, P0732, P0733, P0734, P0735, P076F, P07D9, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Range selector position switch indicates Drive range for 1 s.
- Transmission is in 1st, 2nd, 3rd, 4th or 5th gear.
- Output speed sensor signal is 500 RPM or less.
- Input speed sensor signal is valid.
- Automatic transmission fluid temperature is 0°C (32°F) or greater.
- Transmission torque converter control is commanded OFF.

P0777

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0712, P0713, P0717, P0722, P0748, P0729, P0731, P0732, P0733, P0734, P0735, P076F, P07D9, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Range selector position switch indicates Drive range for 8 s.
- Automatic transmission fluid temperature is 10°C (50°F) or greater.
- Input speed sensor signal is valid.
- Engine torque is 80 (59 lb ft) or greater.

Conditions for Setting the DTC

P0776

- The difference between engine RPM and the input speed sensor signal is 150 RPM or less.
- Above conditions must occur 2 times.

P0777

- The transmission is in 5th, 7th, or 8th gear.
- The automatic transmission fluid pressure switch is closed.
- The difference between the actual gear ratio RPM and the expected gear ratio RPM is less than 4 percent.
- The above conditions must be met for 1 s and occur 4 times consecutively.

Action Taken When the DTC Sets

- P0776 or P0777 are Type A DTCs.
- The transmission shifts to 3rd, 4th or 6th gear depending on vehicle speed.
- Reverse gear is allowed.

Conditions for Clearing the DTC

P0776 or P0777 are Type A DTCs.

Diagnostic Aids

Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN

Description and Operation

Electronic Component Description

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Verify there are no other DTCs are set.
 - If other DTCs are set

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

- **If no other DTCs are set**
- 2. Verify the transmission fluid level and condition is correct. Refer to **Transmission Fluid Level and Condition Check**.
 - **If the transmission fluid level and condition is not correct**

Correct the fluid level or condition as necessary.
 - **If the transmission fluid level and condition is correct**
- 3. Verify the transmission range selector lever cable is adjusted properly. Refer to **Range Selector Lever Cable Adjustment**.
 - **If the transmission range selector lever cable is not adjusted properly**

Adjust the range selector lever cable.
 - **If the transmission range selector lever cable is adjusted properly**
- 4. Perform the **Road Test**.
- 5. Verify the transmission shifts correctly and no incorrect gear ratio DTCs are set.
 - **If the transmission does not shift correctly or DTCs are set**

Refer to Circuit/System Testing.
 - **If the transmission does shift correctly or 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 observe from the Freeze Frame/Failure Records data.
- 7. Verify the DTC does not set.
 - **If the DTC sets**

Refer to Circuit/System Testing.
 - **If the DTC does not set**
- 8. All OK.

Circuit/System Testing

- 1. Replace the transmission control valve body assembly.
- 2. Clear the DTCs from the K71 Transmission Control Module.
- 3. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
- 4. Perform the **Road Test**.
- 5. Verify the transmission shifts correctly and no incorrect gear ratio DTCs are set.
 - **If transmission shifts correctly and no incorrect gear ratio DTCs are set**

All OK.

- **If the transmission does not shift correctly or incorrect gear ratio DTCs are set**
- 6. Replace the K71 Transmission Control Module.
- 7. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
- 8. Perform the **Road Test**.
- 9. Verify the transmission shifts correctly and no incorrect gear ratio DTCs are set.
 - **If transmission shifts correctly and no incorrect gear ratio DTCs are set**

All OK.

- **If transmission does not shift correctly or incorrect gear ratio DTCs are set**
- 10. Replace the T12 Automatic Transmission Assembly.
- 11. Clear the DTCs from the K71 Transmission Control Module.
- 12. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
- 13. Perform the **Road Test**.
- 14. Verify the transmission shifts correctly and no incorrect gear ratio DTCs are set.
 - **If transmission shifts correctly and no incorrect gear ratio DTCs are set**
- 15. All OK.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Transmission Control Module Replacement**
- **Transmission Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P0778, P0966, OR P0967: PRESSURE CONTROL SOLENOID VALVE 2 CONTROL CIRCUIT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P0778

Pressure Control Solenoid Valve 2 Control Circuit

DTC P0966

Pressure Control Solenoid Valve 2 Control Circuit Low Voltage

DTC P0967

Pressure Control Solenoid Valve 2 Control Circuit High Voltage

Diagnostic Fault Information

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control +	P0966	P0778, P0966	P0967	-
Control -	P0966	P0778, P0966	-	-

Typical Scan Tool Data

Pressure Control Solenoid Valve 2 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 +	Malfunction	-	-
Control -	Malfunction	Malfunction	-

Pressure Control Solenoid Valve 2 Control Circuit Open Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON			
Parameter Normal Range: OK or Not Run			
Control +	-	Malfunction	-
Control -	-	Malfunction	-

Pressure Control Solenoid Valve 2 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 +	-	Malfunction	Malfunction
Control -	-	-	-

Circuit/System Description

The pressure control solenoid valve 2 is part of the valve body assembly which has no serviceable parts. The pressure control solenoid valve 2 controls the pressurized transmission fluid to Clutch 1. The pressure control solenoid valve 2 is supplied 12 V by the transmission control module (TCM) through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset. To control amperage through the solenoid, the output control circuit is pulsed width modulated from a low side driver in the TCM.

Conditions for Running the DTC

P0778

- P0966 or P0967 is not set.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.
- Battery voltage is greater than 11 V for 500 ms.

P0966

- P0967 is not set.
- Ignition switch is ON.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32 V.

P0967

- P0966 is not set.
- Ignition switch is ON.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.

Conditions for Setting the DTC

P0778

The TCM has detected the feedback current for the pressure control solenoid valve 2 has exceeded the commanded current, for more than 2 s.

P0966

The TCM has detected a short to ground or an open/high resistance on the pressure control solenoid valve 2 circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

P0967

The TCM has detected a short to voltage on the pressure control solenoid valve 2 circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

Actions Taken When the DTC Sets

- P0778, P0966 and P0967 are Type A DTCs.
- The transmission shifts to 3rd, 4th or 6th gear depending on vehicle speed.
- Reverse gear is allowed.

Conditions for Clearing the DTC

P0778, P0966 and P0967 are Type A DTCs.

Diagnostic Aids

- Material particles or slivers of metallic debris may become deposited on the solenoid terminals or electrical connector. Inspect and clean as necessary.
- Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool parameters listed below do not display Malfunction.
 - Pressure Control Solenoid Valve 2 Control Circuit Low Voltage Test Status
 - Pressure Control Solenoid Valve 2 Control Circuit Open Test Status

- Pressure Control Solenoid Valve 2 Control Circuit High Voltage Test Status
- **If Malfunction is displayed**

Refer to Circuit/System Testing.

- **If Malfunction is not displayed**

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

Refer to Circuit/System Testing.

- **If the DTC does not set**

5. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 minutes for all vehicle systems to power down. Ignition ON.
2. Test for 2.4-2.8 V between the control + circuit terminal 23 and ground.
 - **If less than 2.4 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 2. Test for infinite resistance between the control + circuit terminal 23 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 3. Test for less than 2 ohms in the control + circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.
 - **If greater than 2.8 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
 2. Test for less than 1 V between the control + circuit terminal 23 and ground.
 - If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.
 - **If between 2.4-2.8 V**
3. Test for less than 1 V between the control - circuit terminal 24 and ground.
 - **If greater than 1 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
 2. Test for less than 1 V between the control - circuit terminal 24 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.

- If less than 1 V, replace the K71 Transmission Control Module.

- **If less than 1 V**

4. Ignition OFF.
5. Connect a jumper wire between the control + terminal 23 and control - terminal 24 on the X175 transmission harness connector.
6. Disconnect the harness connector at the K71 Transmission Control Module.
7. Test for less than 2 ohms between the control + terminal 45 and control - terminal 52 at the K71 Transmission Control Module harness connector.

- **If 2 ohms or greater**

Repair the open/high resistance in the control + circuit or the control - circuit.

- **If less than 2 ohms**

8. Test for infinite resistance between the control + circuit terminal 45 and ground.

- **If less than infinite resistance**

Repair the short to ground in either the control + circuit or the control - circuit.

- **If infinite resistance**

9. Test the Q27A Pressure Control Solenoid Valve 2.

Component Testing

1. Ignition OFF, remove the oil pan from the T12 Automatic Transmission Assembly.
2. Disconnect the wire harness at the Q27B Pressure Control Solenoid Valve 2.
3. Test for 5.0-5.6 ohms between the 2 terminals on the Q27B Pressure Control Solenoid Valve 2.

- **If not between 5.0-5.6 ohms**

Replace the control valve body assembly.

- **If between 5.0-5.6 ohms**

4. Test for infinite resistance between each terminal on the Q27B Pressure Control Solenoid Valve 2 and ground.

- **If not infinite resistance**

Replace the control valve body assembly.

- **If infinite resistance**

5. Test the internal transmission wire harness control + circuit and control - circuit of the Q27B Pressure Control Solenoid Valve 2 for an open/high resistance, short to ground or short to voltage.

- **If control + and control - circuits are not OK**

Replace the internal transmission wire harness assembly.

- If control + and control - circuits are OK

6. Replace the K71 Transmission Control Module.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Control Valve Body Replacement**
- **Automatic Transmission Wiring Harness Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P0798, P0970, OR P0971: PRESSURE CONTROL SOLENOID VALVE 3 CONTROL CIRCUIT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P0798

Pressure Control Solenoid Valve 3 Control Circuit

DTC P0970

Pressure Control Solenoid Valve 3 Control Circuit Low Voltage

DTC P0971

Pressure Control Solenoid Valve 3 Control Circuit High Voltage

Diagnostic Fault Information

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control +	P0970	P0798, P0970	P0971	-
Control -	P0970	P0798, P0970	-	-

Typical Scan Tool Data

Pressure Control Solenoid Valve 3 Control Circuit Low Voltage Test Status

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Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON			
Parameter Normal Range: OK or Not Run			
Control +	Malfunction	-	-
Control -	Malfunction	Malfunction	-

Pressure Control Solenoid Valve 3 Control Circuit Open Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON			
Parameter Normal Range: OK or Not Run			
Control +	-	Malfunction	-
Control -	-	Malfunction	-

Pressure Control Solenoid Valve 3 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 +	-	Malfunction	Malfunction
Control -	-	-	-

Circuit/System Description

The pressure control solenoid valve 3 is part of the valve body assembly which has no serviceable parts. The pressure control solenoid valve 3 controls the pressurized transmission fluid to Clutch 2. The pressure control solenoid valve 3 is supplied 12 V by the transmission control module (TCM) through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset. To control amperage through the solenoid, the output control circuit is pulsed width modulated from a low side driver in the TCM.

Conditions for Running the DTC

P0798

- P0970 or P0971 is not set.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.
- Battery voltage is greater than 11 V for 500 ms.

P0970

- DTC P0971 is not set.
- Ignition switch is ON.
- Ignition voltage is 9 V or greater.

- Battery voltage is between 10.2-32.0 V.

P0971

- P0970 is not set.
- Ignition switch is ON.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.

Conditions for Setting the DTC

P0798

The TCM has detected the feedback current for the pressure control solenoid valve 3 has exceeded the commanded current, for more than 2 s.

P0970

The TCM has detected a short to ground or an open/high resistance on the pressure control solenoid valve 3 circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

P0971

The TCM has detected a short to voltage on the pressure control solenoid valve 3 circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

Actions Taken When the DTC Sets

- P0798, P0970 and P0971 are Type A DTCs.
- The transmission shifts to 3rd, 4th or 6th gear depending on vehicle speed.
- Reverse gear is allowed.

Conditions for Clearing the DTC

P0798, P0970 and P0971 are Type A DTCs.

Diagnostic Aids

- Material particles or slivers of metallic debris may become deposited on the solenoid terminals or electrical connector. Inspect and clean as necessary.
- Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool parameters listed below do not display Malfunction.
 - Pressure Control Solenoid Valve 3 Control Circuit Low Voltage Test Status
 - Pressure Control Solenoid Valve 3 Control Circuit Open Test Status
 - Pressure Control Solenoid Valve 3 Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**

Refer to Circuit/System Testing.

- **If Malfunction is not displayed**

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

Refer to Circuit/System Testing.

- **If the DTC does not set**

5. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 minutes for all vehicle systems to power down. Ignition ON.
2. Test for 11.6-12.4 V between the control + circuit terminal 28 and ground.
 - **If less than 11.6 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 2. Test for infinite resistance between the control + circuit terminal 28 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 3. Test for less than 2 ohms in the control + circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.
 - **If greater than 12.4 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
 2. Test for less than 1 V between the control + circuit terminal 28 and ground.
 - If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.
 - **If between 11.6-12.4 V**
3. Test for less than 1 V between the control - circuit terminal 29 and ground
 - **If greater than 1 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
 2. Test for less than 1 V between the control - circuit terminal 29 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.
 - **If less than 1 V**
4. Ignition OFF.
5. Connect a jumper wire between the control + terminal 28 and control - terminal 29 on the X175 transmission harness connector.
6. Disconnect the harness connector at the K71 Transmission Control Module.
7. Test for less than 2 ohms between the control + terminal 46 and control - terminal 53 at the K71 Transmission Control Module harness connector.
 - **If 2 ohms or greater**

Repair the open/high resistance in the control + circuit or the control - circuit.

- **If less than 2 ohms**

8. Test for infinite resistance between the control + circuit terminal 46 and ground.

- **If less than infinite resistance**

Repair the short to ground in either the control + circuit or the control - circuit.

- **If infinite resistance**

9. Test the Q27C Pressure Control Solenoid Valve 3.

Component Testing

1. Ignition OFF, remove the oil pan from the T12 Automatic Transmission Assembly.

2. Disconnect the wire harness at the Q27C Pressure Control Solenoid Valve 3.

3. Test for 5.0-5.6 ohms between the 2 terminals on the Q27C Pressure Control Solenoid Valve 3.

- **If not between 5.0-5.6 ohms**

Replace the control valve body assembly.

- **If between 5.0-5.6 ohms**

4. Test for infinite resistance between each terminal on the Q27C Pressure Control Solenoid Valve 3 and ground.

- **If not infinite resistance**

Replace the control valve body assembly.

- **If infinite resistance**

5. Test the internal transmission wire harness control + circuit and control - circuit of the Q27C Pressure Control Solenoid Valve 3 for an open/high resistance, short to ground or short to voltage.

- **If control + and control - circuits are not OK**

Replace the internal transmission wire harness assembly.

- **If control + and control - circuits are OK**

6. Replace the K71 Transmission Control Module.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Control Valve Body Replacement**
- **Automatic Transmission Wiring Harness Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P07A2: TRANSMISSION CLUTCH 1 PERFORMANCE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P07A2

Transmission Clutch 1 Performance

Circuit/System Description

The setting of this DTC indicates a performance concern with Clutch 1 housing assembly, valve body or the fluid pressure circuit to the Clutch 1 housing assembly. With a loss of pressurized fluid to the Clutch 1 housing assembly, a neutral condition or NO drive in forward gears will result.

Conditions for Running the DTC

- The automatic transmission fluid temperature is 0°C (32°F) or greater.
- The transmission gear range selector is in Drive range.
- The output speed sensor signal is 500 RPM or less.
- The transmission is in 1st, 2nd, 3rd, 4th or 6th gear.

Conditions for Setting the DTC

- The difference between engine RPM and the transmission input speed sensor signal RPM is less than 150 RPM.
- Above conditions must occur 2 times consecutively.

Action Taken When the DTC Sets

- P07A2 is a Type C DTC.
- No drive in forward gears.
- Learn procedure inoperative.

Conditions for Clearing the DTC

P07A2 is a Type C DTC.

Diagnostic Aids

Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Verify there are no other DTCs are set.

- If other DTCs are set

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

- If no other DTCs are set

2. Verify the transmission fluid level and condition are correct. Refer to Transmission Fluid Level and Condition Check.

- If the transmission fluid level and condition is not correct

Correct the fluid level or condition as necessary.

- If the transmission fluid level and condition is correct

3. Verify the transmission range selector lever cable is adjusted properly. Refer to **Range Selector Lever Cable Adjustment**.

- **If the transmission range selector lever cable is not adjusted properly**

Adjust the range selector lever cable.

- **If the transmission range selector lever cable is adjusted properly**

4. Perform the **Road Test**.
5. Verify the transmission shifts correctly and no incorrect gear ratio DTCs are set.
 - **If the transmission does not shift correctly or DTCs are set**

Refer to Circuit/System Testing.

- **If the transmission does shift correctly and no 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 observe from the Freeze Frame/Failure Records data.
7. Verify the DTC does not set.
 - **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

8. All OK.

Circuit/System Testing

1. Replace the transmission control valve body assembly.
2. Clear the DTCs from the K71 Transmission Control Module.
3. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
4. Perform the **Road Test**.
5. Verify the transmission shifts correctly and no DTCs are set.
 - **If transmission shifts correctly and no DTCs are set**

All OK.

- **If the transmission does not shift correctly or DTCs are set**

6. Replace the T12 Automatic Transmission Assembly.
7. Clear the DTCs from the K71 Transmission Control Module.
8. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
9. Perform the **Road Test**.
10. Verify the transmission shifts correctly and no DTCs are set.
 - **If transmission shifts correctly and no DTCs are set**

11. All OK.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Control Valve Body Replacement**
- **Transmission Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P0815, P0816, P0826-P0828, OR P085F: UP AND DOWN SHIFT SWITCH CIRCUIT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

NOTE: DTCs P0815, P0816 and P0826 are for the Transmission Manual Shift Switches - Right and Left, located on the steering wheel.

DTC P0815

Upshift Switch Circuit

DTC P0816

Downshift Switch Circuit

DTC P0826

Up and Down Shift Switch Circuit

NOTE: DTCs P0827, P0828 and P085F are for the Transmission Manual Shift Switch located on top of the Transmission Shift Lever.

DTC P0827

Up and Down Shift Switch Circuit Low Voltage

DTC P0828

Up and Down Shift Switch Circuit High Voltage

DTC P085F

Up and Down Shift Switch Range Performance

Diagnostic Fault Information

Transmission Manual Shift Switches - Right and Left

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	P0815, P0826	P0826	P0826	P0826
Ground	-	-	-	-

Transmission Manual Shift Switch

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P0827	P085F	-	-
Signal	P0827	P0827	P0828	P085F

Typical Scan Tool Data

Up and Down Shift Switch

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine Running, In Drive Range, Manual Mode selected Parameter Normal Range: Up Shift / Down Shift			
Signal	Down Shift	Up Shift	Up Shift
Ground	-	Up Shift	-

Driver Shift Control Mode

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine Running, In Drive Range Parameter Normal Range: Inactive/Active			
Ignition	Inactive	Inactive	-
Signal	Active	Inactive	Inactive/Active

Circuit/System Description

Transmission Manual Shift Switch Circuit

The transmission manual shift switch circuit consists of a fused 12 V circuit from the ignition main relay, a transmission manual shift switch located on top of the transmission shift lever and a signal circuit to the transmission control module (TCM). The transmission manual shift switch consists of 2 voltage dropping resistors in parallel. For manual mode operation the engine must be running and the transmission shift lever in drive position. The TCM is constantly monitoring the signal circuit for a change in voltage. Pressing the

transmission manual shift switch button will command the TCM into manual mode operation. The letter M of the PRNDM section on the instrument cluster will also illuminate to indicate the transmission is in manual mode operation. To exit manual mode, press the transmission manual shift switch button again.

Transmission Manual Shift Switch - Right and Left Circuits

The transmission manual shift switches consist of 2 separate switches mounted on the forward facing side of the steering wheel. The upshift (+) switch is located on the right side and the downshift (-) switch is located on the left side of the steering wheel. The 2 switches consist of voltage dropping resistors that are in series-parallel to each other. A 12 V signal circuit is provided by the body control module (BCM). Both the right and left switches are connected to a common chassis ground. The BCM is constantly monitoring the signal circuit for a change in voltage. When either the upshift or downshift switch is momentarily depressed, the voltage will change on the signal circuit. Depending on which switch is depressed, this will indicate either an upshift or downshift to the BCM. This signal is then sent out on the serial data line to the engine control module (ECM) and TCM to perform the desired upshift or downshift.

Conditions for Running the DTC

P0815, P0816, P0826, P0827, P0828 or P085F

- DTC U0100, U0730, P0815, P0816, P0826, P0827, P0828 or P085F is not set.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.

Conditions for Setting the DTC

P0815 - Condition 1

The BCM detects a stuck ON, transmission manual shift switch - right for 1 s in park or neutral position.

P0815 - Condition 2

The BCM detects a stuck ON, transmission manual shift switch - right for 10 min. in any forward gear.

P0816 - Condition 1

The BCM detects a stuck ON, transmission manual shift switch - left for 1 s in park or neutral position.

P0816 - Condition 2

The BCM detects a stuck ON, transmission manual shift switch - left for 10 min. in any forward gear.

P0826

The BCM detects an invalid voltage signal on the Transmission Manual Shift Switch circuit.

P0827

- Incorrect low voltage signal from the Manual Shift Switch to the TCM.
- The above condition continues for 1 s or more and occurs 30 times consecutively.

P0828

- Incorrect high voltage signal from the manual shift switch to the TCM.
- The above condition continues for 1 s or more and occurs 30 times consecutively.

P085F - Condition 1

- Incorrect low voltage signal from the manual shift switch to the TCM.
- The above condition continues for 1 s or more and occurs 30 times consecutively.

P085F - Condition 2

- Manual mode shift switch signal to the TCM is active all the time.
- The above condition continues for 4 s or more in park, reverse and neutral.

Action Taken When the DTC Sets

- P0815, P0816, P0826, P0827, P0828 and P085F are Type C DTCs.
- The TCM disables manual mode operation.
- The TCM disables up shift and down Sshift operation.

Conditions for Clearing the DTC

P0815, P0816, P0826, P0827, P0828 and P085F are Type C DTCs.

Diagnostic Aids

Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Ignition ON, place the S3 Transmission Shift Lever in Drive range.
2. Verify with a scan tool, the Driver Shift Control Mode parameter changes between Inactive and Active with each press of the S2 Transmission Manual Shift Switch on top of the S3 Transmission Shift Lever.
 - **If the parameter does not change states**

Refer to Circuit/System Testing.

- **If the parameter does change states**
3. Verify with a scan tool, the Driver Shift Control Mode parameter displays Active.
 4. Verify with a scan tool, the Up and Down Shift Switch parameter displays Upshift when pushing rearward on the S2R Transmission Manual Shift Switch - Right.
 - **If the parameter does not display Upshift**

Refer to Circuit/System Testing.

- **If the parameter does display Upshift**
5. Verify with a scan tool, the Up and Down Shift Switch parameter displays Down Shift when pushing rearward on the S2L Transmission Manual Shift Switch - Left.
 - **If the parameter does not display Down Shift**

Refer to Circuit/System Testing.

- **If the parameter does display Down Shift**
6. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.

7. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

8. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF. Disconnect the harness connector at the S3 Transmission Shift Lever. It may take up to 2 min. for all vehicle systems to power down.

2. Test for less than 5 ohms between the low reference circuit terminal 1 and ground.

- **If greater than 5 ohms**

1. Ignition OFF. Disconnect the harness connector at the K71 Transmission Control Module.

2. Test for less than 2 ohms in the low reference circuit end to end.

- If 2 ohms or greater, repair the open/high resistance in the circuit.

- If less than 2 ohms, replace the K71 Transmission Control Module.

- **If less than 5 ohms**

3. Ignition ON.

4. Verify a test lamp illuminates between the ignition voltage circuit terminal 5 and ground.

- **If the test lamp does not illuminate**

1. Ignition ON.

2. Verify with a test lamp that both test points of the circuit protection fuse for the S2 Transmission Manual Shift Switch illuminates.

- If only one test point of the fuse illuminates, repair the short to ground in the ignition voltage circuit to the S2 Transmission Manual Shift Switch.

- If both test points of the fuse illuminates, repair the open/high resistance in the ignition voltage circuit to the S2 Transmission Manual Shift Switch.

- If both test points of the fuse do not illuminate, refer to **DTC P0685-P0687, P0689, P0690, or P1682**.

- **If the test lamp illuminates**

5. Ignition OFF. Connect the harness connector at the S3 Transmission Shift Lever. Ignition ON.

6. Verify with a scan tool the T12 Automatic Transmission Assembly is in drive range. Ignition OFF.

7. Disconnect the harness connector at the S3 Transmission Shift Lever.

8. Test for 8100-8400 ohms between terminal 1 and terminal 5 on the S3 Transmission Shift Lever.

- **If not within the specified range**

Replace the S3 Transmission Shift Lever.

- **If within the specified range**

9. Test for 3400-4500 ohms between terminal 1 and terminal 5 on the S3 Transmission Shift Lever while pressing and holding down the S2 Transmission Manual Shift Switch.

- **If not within the specified range**

Replace the S3 Transmission Shift Lever.

- **If within the specified range**

10. Ignition OFF. Disconnect the harness connector at the S2R Transmission Manual Shift Switch - Right.

11. Test for less than 5 ohms between the ground circuit terminal 2 and ground.

- **If greater than 5 ohms**

1. Ignition OFF.

2. Test for less than 2 ohms in the ground circuit end to end.

- If 2 ohms or greater, repair the open/high resistance in the circuit.

- If less than 2 ohms, repair the open/high resistance in the ground connection.

- **If less than 5 ohms**

12. Ignition ON.

13. Test for 11.6-12.4 V between the signal circuit terminal 1 and ground.

- **If not between 11.6-12.4 V**

1. Ignition OFF. Disconnect the X3 connector at the K9 Body Control Module.

2. Test for infinite resistance between the signal circuit and ground.

- If less than infinite resistance, repair the short to ground in the signal circuit.

3. Test for less than 2 ohms in the signal circuit end to end.

- If greater than 2 ohms, repair the open/high resistance in the circuit.

- If less than 2 ohms, replace the K9 Body Control Module.

- **If between 11.6-12.4 V**

14. Test for infinite resistance between terminal 1 and terminal 2 on the S2R Transmission Manual Shift Switch - Right.

- **If not infinite resistance**

Replace the S2R Transmission Manual Shift Switch - Right.

- **If infinite resistance**

15. Test for 600-680 ohms between terminal 1 and terminal 2 on the S2R Transmission Manual Shift Switch - Right while depressing the switch.

- **If not within the specified range**

Replace the S2R Transmission Manual Shift Switch - Right.

- **If within the specified range**

16. Test for 600-680 ohms between terminal 1 and terminal 3 on the S2R Transmission Manual Shift Switch - Right.

- **If not within the specified range**

Replace the S2R Transmission Manual Shift Switch - Right.

- **If within the specified range**

17. Ignition OFF.

18. Disconnect the harness connector at the S2L Transmission Manual Shift Switch - Left.

19. Test for less than 2 ohms between terminal 2 on the S2L Transmission Manual Shift Switch - Left harness connector and terminal 3 on the S2R Transmission Manual Shift Switch - Right harness connector.

- **If greater than 2 ohms**

Repair the open/high resistance in the signal circuit between the S2L Transmission Manual Shift Switch - Left and the S2R Transmission Manual Shift Switch - Right.

- **If less than 2 ohms**

20. Test for less than 5 ohms between the ground circuit terminal 1 and ground.

- **If greater than 5 ohms**

1. Ignition OFF.

2. Test for less than 2 ohms in the ground circuit end to end.

- If 2 ohms or greater, repair the open/high resistance in the circuit.

- If less than 2 ohms, repair the open/high resistance in the ground connection.

- **If less than 5 ohms**

21. Test for 5400-5800 ohms between terminal 1 and terminal 2 on the S2L Transmission Manual Shift Switch - Left.

- **If not within the specified range**

Replace the S2L Transmission Manual Shift Switch - Left.

- **If within the specified range**

22. Test for 1200-1500 ohms between terminal 1 and terminal 2 on the S2L Transmission Manual Shift Switch - Left with the switch depressed.

- **If not within the specified range**

Replace the S2L Transmission Manual Shift Switch - Left.

- **If within the specified range**

Replace the K9 Body Control Module.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Transmission Control Replacement**
- **Transmission Control Lever Knob Replacement**
- **Manual Shift Auxiliary Position Switch Replacement - Steering Wheel**
- **Control Module References** for transmission control module, body control module replacement, programming and setup.

DTC P0842 OR P0843: TRANSMISSION FLUID PRESS SWITCH CIRCUIT VOLTAGE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P0842

Transmission Fluid Press Switch Circuit Low Voltage

DTC P0843

Transmission Fluid Press Switch Circuit High Voltage

Diagnostic Fault Information

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Switch Signal 1	P0842	P0843	P0843	-
Ground	-	P0843	-	-

Typical Scan Tool Data

Transmission Fluid Pressure Switch

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine Running in Park Parameter Normal Range: High			
Switch Signal 1	Low	High	High
Ground	-	High	-

Circuit/System Description

The transmission fluid pressure switch is part of the transmission valve body which has no serviceable parts.

The transmission fluid pressure switch is a normally open switch. A 12 V signal circuit is provided by the transmission control module (TCM) to the transmission fluid pressure switch. The ground circuit is provided through the transmission fluid pressure switch housing to the transmission case. The transmission fluid pressure switch detects the fluid pressure when the pressure control solenoid valve 2 is commanded ON.

Conditions for Running the DTC

P0842

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0712, P0713, P0717, P0722, P0748, P0729, P0731, P0732, P0733, P0734, P0735, P076F, P07D9, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Range selector position switch indicates Drive range.

P0843

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0712, P0713, P0717, P0722, P0748, P0729, P0731, P0732, P0733, P0734, P0735, P076F, P07D9, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Range selector position switch indicates park, reverse or neutral range.

Conditions for Setting the DTC

P0842

The transmission fluid pressure sensor status indicates ON.

P0843

- Transmission fluid pressure switch status indicates OFF.
- Difference between actual gear ratio and commanded gear ratio is less than 4 percent.
- Transmission is in 1st, 2nd, 3rd, 4th, or 5th gear.
- Engine speed is greater than 500 RPM for 1 s.
- Engine torque is 80 (59 lb ft).
- Transmission input speed is 6000 RPM or less.
- Transmission output speed is 60 RPM or greater.

Action Taken When the DTC Sets

P0842 and P0843 are Type B DTCs.

Conditions for Clearing the DTC

P0842 and P0843 are Type B DTCs.

Diagnostic Aids

Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Engine running and transmission in park position.
2. Verify the scan tool transmission fluid pressure switch parameter displays HIGH.

- **If the parameter does not display HIGH**

Refer to Circuit/System Testing.

- **If the parameter displays HIGH**

3. Verify the scan tool transmission fluid pressure switch parameter changes from HIGH to LOW, when placing the gear shift lever in drive position.

- **If the parameter does not display LOW**

Refer to Circuit/System Testing.

- **If the parameter does display LOW**

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

5. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

6. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the X175 harness connector at the T12 Automatic Transmission Assembly Case. It may take up to 2 min for all vehicle systems to power down.

2. Ignition ON.

3. Verify the scan tool B12A Transmission Fluid Pressure Switch parameter is HIGH.

- **If not HIGH**

1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.

2. Test for infinite resistance between the signal circuit terminal 17 and ground.

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

- If infinite resistance, replace the K71 Transmission Control Module.

- **If HIGH**

4. Install a 3 A fused jumper wire between the transmission fluid pressure switch signal circuit terminal 17 and ground at the T12 Automatic Transmission Assembly case.

5. Verify the scan tool B12A Transmission Fluid Pressure Switch parameter is LOW.

- **If not LOW**

1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the K71 Transmission Control Module, Ignition ON.

2. Test for less than 1 V between the signal circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.

- If less than 1 V
- 3. Test for less than 2 ohms in the signal circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.

- **If LOW**

6. Ignition OFF, connect the X175 harness connector at the T12 Automatic Transmission Case.
7. Remove the T12 Automatic Transmission Assembly oil pan.
8. Disconnect the wire harness connector at B12A Transmission Fluid Pressure Switch.
9. Verify and inspect the internal transmission wire harness circuits for the B12A Transmission Fluid Pressure Switch for opens, high resistance, and short to ground or short to B+.

- **If the internal wire harness is not OK**

Replace the internal transmission wire harness.

- **If the internal wire harness is OK**

10. Replace the transmission control valve body assembly.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Automatic Transmission Wiring Harness Replacement**
- **Control Valve Body Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P0851: PARK/NEUTRAL POSITION SWITCH CIRCUIT LOW VOLTAGE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P0851

Park/Neutral Position Switch Circuit Low Voltage

Diagnostic Fault Information

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Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	P0851			
Ground				

Typical Scan Tool Data

Park/Neutral Position Switch - Park/Neutral or In Gear

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON			
Parameter Normal Range: Park/Neutral or In Gear			
Signal	Park/Neutral	In Gear	
Ground			

Circuit/System Description

The park/neutral position switch indicates to the engine control module (ECM) if the vehicle is in park/neutral or in a drive gear range. With the ignition ON, the ECM provides 12 V on the park/neutral signal circuit to the park/neutral position switch, mounted on the exterior of the transmission case. A separate ground wire from the park/neutral position switch to chassis ground completes the circuit. When the gear shift lever in park or neutral, the switch closes and drops the voltage on the signal circuit to 0 V. In this state the engine will start and run. In reverse or drive range the park/neutral position switch opens, 12 V is then present on the signal circuit which will inhibit engine starting.

Conditions for Running the DTC

- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.

Conditions for Setting the DTC

The ECM detects the park/neutral switch input signal is 12 V, or in gear when the transmission is in actually in park or neutral position.

Action Taken When the DTC Sets

P0851 is a Type A DTC.

Conditions for Clearing the DTC

P0851 is a Type A DTC.

Diagnostic Aids

Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Verify the transmission range selector lever cable is adjusted correctly. Refer to **Range Selector Lever Cable Adjustment**.
 - **If the range selector cable adjustment is not OK**

Adjust, repair or replace as necessary.
 - **If the range selector cable adjustment is OK**
2. Ignition ON.
3. Verify the scan tool Park/Neutral Position Switch parameter displays Park/Neutral when the range shift lever is placed in park and neutral position.
 - **If the parameter does not display Park/Neutral**

Refer to Circuit/System Testing.
 - **If the parameter does display Park/Neutral**

4. Verify the scan tool Park/Neutral Position Switch parameter displays In Gear when the range shift lever is placed in Reverse or Drive position.

- **If the parameter does not display In Gear**

Refer to Circuit/System Testing.

- **If the parameter does display In Gear**

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

6. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

7. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B81 Park/Neutral Position Switch. It may take up to 2 min for all vehicle systems to power down.

2. Test for less than 5 ohms between the ground circuit terminal 5 and ground.

- **if 5 ohms or greater**

1. Ignition OFF.

2. Test for less than 2 ohms in the ground circuit end to end.

- If 2 ohms or greater, repair the open/high resistance in the circuit.

- If less than 2 ohms, repair the open/high resistance in the ground connection.

- **If less than 5 ohms**

3. Ignition ON, place the gear shift lever in Park position.

4. Verify the scan tool Park/Neutral Position Switch parameter displays In Gear.

- **If In Gear is not displayed**

1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module.

2. Test for infinite resistance between the signal circuit terminal 4 and ground.

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

- If infinite resistance, replace the K20 Engine Control Module.

- **If In Gear is displayed**

5. Install a 3 A fused jumper wire between the Park/Neutral signal circuit terminal 4 and the ground circuit terminal 5, on the B81 Park/Neutral Position Switch wire harness.

6. Verify the scan tool B81 Park/Neutral Position Switch parameter displays Park/Neutral.

- **If Park/Neutral is not displayed**

1. Ignition OFF, remove the jumper wire, disconnect the harness connector at the K20 Engine Control

Module, ignition ON.

2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
3. Test for less than 2 ohms in the signal circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K20 Engine Control Module.
 - **If Park/Neutral is displayed**

7. Test or replace the B81 Park/Neutral Position Switch.

Component Testing

1. Perform the Circuit/System Verification first.
2. Place the range shift lever in Park position.
3. Ignition OFF, disconnect the wire harness connector at the B81 Park/Neutral Position Switch.
4. Test for less than 2 ohms between the signal circuit terminal 4 and the ground circuit terminal 5, on the B81 Park/Neutral Position Switch.
 - **If 2 ohms or greater**

Replace the B81 Park/Neutral Position Switch.

- **If less than 2 ohms**
5. Place the range shift lever in reverse position.
6. Test for infinite resistance between the signal circuit terminal 4 and the ground circuit terminal 5, on the B81 Park/Neutral Position Switch.
 - **If less than infinite resistance**

Replace the B81 Park/Neutral Position Switch.

- **If infinite resistance**
7. Place the range shift lever in neutral position.
8. Test for less than 2 ohms between the signal circuit terminal 4 and the ground circuit terminal 5, on the B81 Park/Neutral Position Switch.
 - **If 2 ohms or greater**

Replace the B81 Park/Neutral Position Switch.

- **If less than 2 ohms**
9. Place the range shift lever in drive position.
10. Test for infinite resistance between the signal circuit terminal 4 and the ground circuit terminal 5, on the B81 Park/Neutral Position Switch.
 - **If less than infinite resistance**

Replace the B81 Park/Neutral Position Switch.

- If infinite resistance

11. All OK.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Park/Neutral Position Switch Replacement**
- **Range Selector Lever Cable Replacement**
- **Control Module References** for transmission control module replacement, programming and setup.

DTC P0973 OR P0974: SHIFT SOLENOID VALVE 1 CONTROL CIRCUIT VOLTAGE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P0973

Shift Solenoid Valve 1 Control Circuit Low Voltage

DTC P0974

Shift Solenoid Valve 1 Control Circuit High Voltage

Diagnostic Fault Information

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control +	P0973	P0974	P0974	-

Typical Scan Tool Data

Scan Tool Parameter Name

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON, in Drive range			
Parameter Normal Range: OK or Not Run			

Control +	Malfunction	Malfunction	Malfunction
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Circuit/System Description

The shift solenoid valve 1 is part of the valve body assembly which has no serviceable parts. The shift solenoid valve 1 controls the pressurized transmission fluid to supply relay valve 1 and supply relay valve 2. The shift solenoid valve 1 is supplied 12 V by the transmission control module (TCM) through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset. To complete the circuit, ground is provided by the housing of the shift solenoid valve 1.

Conditions for Running the DTC

P0973

- P0973 or P0974 is not set.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.
- Shift solenoid valve 1 is command ON.

P0974

- P0973 or P0974 is not set.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32 V.
- Shift solenoid valve 1 is command OFF.

Conditions for Setting the DTC

P0973

The TCM has detected a short to ground on the shift solenoid valve 1 circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

P0974

The TCM has detected an open or a short to B+ on the shift solenoid valve 1 circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

Actions Taken When the DTC Sets

P0973

- P0973 is a Type B DTC.
- The TCM commands 3rd gear.

- Reverse gear is allowed.

P0974

- P0974 is a Type A DTC.
- The TCM commands 3rd gear.
- Reverse gear is allowed.

Conditions for Clearing the DTC

- P0973 is a Type B DTC.
- P0974 is a Type A DTC.

Diagnostic Aids

- Material particles or slivers of metallic debris may become deposited on the solenoid terminals or electrical connector. Inspect and clean as necessary.
- Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool parameters listed below do not display Malfunction.
 - Shift Solenoid Valve 1 Control Circuit Low Voltage Test Status
 - Shift Solenoid Valve 1 Control Circuit Open Test Status
 - Shift Solenoid Valve 1 Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**

Refer to Circuit/System Testing.

- **If Malfunction is not displayed**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
 4. Verify the DTC does not set.
 - **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**
5. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 minutes for all vehicle systems to power down. Ignition ON.
2. Test for 11.6-12.4 V between the control + circuit terminal 18 and ground.
 - **If less than 11.6 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 2. Test for infinite resistance between the control + circuit terminal 18 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 3. Test for less than 2 ohms in the control + circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.
 - **If greater than 12.4 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
 2. Test for less than 1 V between the control + circuit terminal 18 and ground.

- If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.
 - **If between 11.6-12.4 V**
3. Test the Q32A Shift Solenoid Valve 1.

Component Testing

1. Ignition OFF, remove the oil pan from the T12 Automatic Transmission Assembly.
2. Disconnect the wire harness at the Q32A Shift Solenoid Valve 1
3. Test for 5.0-5.6 ohms between the terminal on the Q32A Shift Solenoid Valve 1 and ground.
 - **If not between 5.0-5.6 ohms**

Replace the control valve body assembly.

- **If between 5.0-5.6 ohms**
4. Test the internal transmission wire harness control + circuit of the Q32A Shift Solenoid Valve 1 for an open/high resistance, short to ground or short to voltage.
 - **If control + circuit is not OK**

Replace the internal transmission wire harness assembly.

- **If control + circuit is OK**
5. Replace the K71 Transmission Control Module.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Automatic Transmission Wiring Harness Replacement**
- **Control Valve Body Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P170A-P170E: TRANSMISSION HYDRAULIC CIRCUIT MAX PRESSURE NOT ACHIEVED

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P170A

Transmission Hydraulic Circuit 2 Max Pressure Not Achieved

DTC P170B

Transmission Hydraulic Circuit 3 Max Pressure Not Achieved

DTC P170C

Transmission Hydraulic Circuit 4 Max Pressure Not Achieved

DTC P170D

Transmission Hydraulic Circuit 5 Max Pressure Not Achieved

DTC P170E

Transmission Hydraulic Circuit 6 Max Pressure Not Achieved

Circuit/System Description

These DTCs indicate that the respective pressure control solenoids did not achieved maximum fluid pressure when the transmission experienced an abnormal upshift/downshift or a tie-up occurred during shifts.

Conditions for Running the DTC

P170A, P170B, P170C, P170D and P170E

- DTC U0100, U0730, P0563, P0592, P0601, P0602, P0604, P0717, P0722, P0748, P077C, P077D, P07BF, P07C0, P0778, P0798, P0962, P0963, P0966, P0967, P0970, P0971, P0973, P0974, P2535, P2716, P2720, P2721, P2725, P2729, P2730, P2734, P2735, P2738, P2739, P2761, P2763, or P2764 is not set.
- Ignition voltage is greater than 9 V for 10 ms.
- Battery voltage is between 10.2-32.0 V.
- Engine speed is greater than 400 RPM and is valid.
- Gear shift lever is in drive range.
- Input speed sensor signal is valid.
- Output speed sensor 300 RPM or greater and valid.
- Automatic transmission fluid is -100°C (-148°F) or greater.

Conditions for Setting the DTC

P170A, P170B, P170C, P170D and P170E

- The transmission control module (TCM) has detected either a soft, harsh, delayed or tie-up during

upshifts or downshifts.

- The above conditions must occur 5 times for each DTC to set.

Action Taken When the DTC Sets

- P170A, P170B, P170C, P170D and P170E are Type A DTCs.
- The transmission shifts to 3rd, 4th or 6th gear depending on vehicle speed.
- Reverse gear is allowed.

Conditions for Clearing the DTC

P170A, P170B, P170C, P170D and P170E are Type A DTCs.

Diagnostic Aids

- Material particles or slivers of metallic debris may become deposited on the solenoid terminals or electrical connector. Inspect and clean as necessary.
- Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Verify there are no other DTCs are set.

- **If other DTCs are set**

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

- **If no other DTCs are set**

2. Verify the transmission fluid level and condition are correct. Refer to **Transmission Fluid Level and Condition Check**.

- **If the transmission fluid level and condition is not correct**

Correct the fluid level or condition as necessary.

- **If the transmission fluid level and condition is correct**

3. Verify the transmission range selector lever cable is adjusted properly. Refer to **Range Selector Lever Cable Adjustment**.

- **If the transmission range selector lever cable is not adjusted properly**

Adjust the shift cable.

- **If the transmission range selector lever cable is adjusted properly**

4. Perform the **Road Test**.

5. Verify the transmission shifts correctly and no DTCs are set.

- **If the transmission does not shift correctly or DTCs are set**

Refer to Circuit/System Testing.

- **If the transmission does shift correctly and no 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 observe from the Freeze Frame/Failure Records data.

7. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

8. All OK.

Circuit/System Testing

1. Replace the transmission control valve body assembly.

2. Clear the DTCs from the K71 Transmission Control Module.
3. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
4. Perform the **Road Test**.
5. Verify the transmission shifts correctly and no DTCs are set.
 - **If transmission shifts correctly and no DTCs are set**

All OK.

- **If the transmission does not shift correctly or DTCs are set**
6. Replace the T12 Automatic Transmission Assembly.
 7. Clear the DTCs from the K71 Transmission Control Module.
 8. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
 9. Perform the **Road Test**.
 10. Verify the transmission shifts correctly and no DTCs are set.
 - **If transmission shifts correctly and no DTCs are set**

All OK.

- **If the transmission does not shift correctly or DTCs are set**
11. Replace the K71 Transmission Control Module.
 12. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
 13. Perform the **Road Test**.
 14. Verify the transmission shifts correctly and no DTCs are set.
 - **If the transmission does shift correctly and no DTCs are set**
 15. All OK.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Control Valve Body Replacement**
- **Transmission Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P175F: ACCELERATION SENSOR SIGNAL MESSAGE COUNTER INCORRECT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.

- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P175F

Acceleration Sensor Signal Message Counter Incorrect

Circuit/System Description

The multi-axis acceleration sensor sends the amount or rate of acceleration to the electronic brake control module (EBCM). To improve vehicle performance and transmission shift feel, the EBCM is constantly sending the transmission control module (TCM) serial data messages with information regarding the rate of vehicle acceleration. The TCM sets this code when it detects a discrepancy in the structure of the message, causing the signal message integrity to be questioned.

Conditions for Running the DTC

- The engine speed is between 400-7,500 RPM for 5 s.
- No other CAN errors are present.

Conditions for Setting the DTC

The TCM detects an error in the rolling count value that does not match with the rolling count value sent by the EBCM.

Action Taken When the DTC Sets

- P175F is a Type C DTC.
- The TCM inhibits TAP Up/Down shift operation.
- Corning control is inhibited.

Conditions for Clearing the DTC

P175F is a Type C DTC.

Reference Information

Description and Operation

Electronic Component Description

DTC Type Reference

Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Circuit/System Verification

NOTE:

- DTC P175F is an informational DTC.
- Diagnose all other K71 Transmission Control Module and K17 Electronic Brake Control Module DTCs prior to DTC P175F.

1. Verify with a scan tool, there are no other K71 Transmission Control Module or K17 Electronic Brake Control Module DTCs set.

- If a DTC is set

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

- If a DTC is not set

2. Complete the diagnosis by looking for a CAN fault. Refer to Scan Tool Does Not Communicate with High Speed GMLAN Device .

- If a CAN circuit fault is found

Repair as necessary.

- If a CAN circuit fault is not found

3. All OK.

Repair Instructions

Perform the Diagnostic Repair Verification after completing the repair.

- Perform the Automatic Transmission 8-Speed Learn Procedure (MGG), following all transmission related repairs.
- Control Module References for Transmission Control Module replacement, programming and setup.

DTC P1761: UP AND DOWN SHIFT SWITCH SIGNAL MESSAGE COUNTER INCORRECT**Diagnostic Instructions**

- Perform the Diagnostic System Check - Vehicle prior to using this diagnostic procedure.
- Review Strategy Based Diagnosis for an overview of the diagnostic approach.
- Diagnostic Procedure Instructions provides an overview of each diagnostic category.

DTC Descriptor**DTC P1761**

Up and Down Shift Switch Signal Message Counter Incorrect

Circuit/System Description

The transmission manual mode function, allows the driver to select the desired range of gears for current

driving conditions. The manual mode shift system is activated when the gear selector is in the drive position and the button on top of the shifter is pressed. The manual mode system is deactivated in all other range positions. When manual mode is selected, a signal is sent to the body control module (BCM) and the also to the transmission control module (TCM). Each time a signal is sent, an internal counter in the BCM and TCM increments. Both counters must have the same value. This code sets when the rolling count value of the TCM does not match the same rolling count value sent from the BCM.

Conditions for Running the DTC

The engine run time is greater than 5 s.

Conditions for Setting the DTC

The TCM detects an error in the rolling count value that does not match the BCM count value.

Action Taken When the DTC Sets

- P1761 is a Type C DTC.
- The TCM inhibits manual shifting of forward gears.

Conditions for Clearing the DTC

P1761 is a Type C DTC.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - SEDAN

Description and Operation

Electronic Component Description

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

NOTE:

- **DTC P1761 is an informational DTC.**
- **Diagnose all other K9 Body Control Module DTCs prior to DTC P1761.**

1. Verify there are no other K9 Body Control Module or communication DTCs set.
 - **If a DTC is set**

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

- **If a DTC is not set**
2. Complete the diagnosis by looking for a CAN fault. Refer to **Scan Tool Does Not Communicate with High Speed GMLAN Device** .
 - **If a CAN circuit fault is found**

Repair as necessary.
 - **If a CAN circuit fault is not found**
 3. All OK.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P176A, P176C, OR P176D: INTERMEDIATE SPEED SENSOR CIRCUIT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P176A

Intermediate Speed Sensor Circuit No Signal

DTC P176C

Intermediate Speed Sensor Circuit Low Voltage

DTC P176D

Intermediate Speed Sensor Circuit High Voltage

Diagnostic Fault Information

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal +	P176C	P176D	P176D	P176A
Signal -	P176C	P176D	P176D	P176A

Typical Scan Tool Data

Transmission Intermediate Speed Sensor

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Engine running, Transmission in Park, foot off brake pedal. Parameter Normal Range: 0 - 7,500 RPM			
Signal +	0 RPM	0 RPM	-
Signal -	0 RPM	0 RPM	-

Circuit/System Description

The intermediate speed sensor assembly is a two wire hall-effect type sensor. The transmission control module (TCM) supplies a 12 V signal circuit and a low reference circuit to the intermediate speed sensor. The intermediate speed sensor produces a square wave signal by toggling the 12 V signal circuit low and high based on the leading and trailing edges of the trigger splines that are on the outside diameter of the C3 Clutch Drum. As the rotational speed of the C3 Clutch Drum increases, the frequency of the intermediate speed sensor signal increases. The TCM uses the intermediate speed sensor signal along with the input and output speed sensor signals to determine transmission line pressure, shift patterns, torque converter clutch slip speed and the correct gear ratio.

Conditions for Running the DTC

P176A

- In 3rd, 4th 5th and 6th gear the vehicle speed 40 km/h (25 MPH) or greater.
- In 7th gear the vehicle speed is 60 km/h (37 MPH) or greater.

P176C or P176D

- The ignition is ON.
- No intermediate speed sensor signals are received by the TCM.

Conditions for Setting the DTC

P176A

The above conditions must occur for 1 s and occurs 10 times consecutively.

P176C or P176D

The above conditions must occur for 0.1 s and occurs 10 times consecutively.

Action Taken When the DTC Sets

P176A, P176C and P176D are Type D DTCs.

Conditions for Clearing the DTC

P176A, P176C and P176D are Type D DTCs.

Diagnostic Aids

Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Engine running, range selector in Park position .
2. Verify the scan tool Transmission Intermediate Speed Sensor parameter varies with engine RPM and does not drop out.
 - **If the B14D Transmission Intermediate Speed Sensor does not vary with vehicle speed or drops out**

Refer to Circuit/System Testing.

- **If the B14D Transmission Intermediate Speed Sensor does vary with vehicle speed and does not drop out**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
 4. Verify the DTC does not set.
 - **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**
5. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the X175 harness connector at the T12 Automatic Transmission Assembly case. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 ohms between the low reference circuit terminal 12 on the X175 vehicle harness side connector and ground.
 - **If 10 ohms or greater**
 1. Ignition OFF, disconnect the wire harness connector at the K71 Transmission Control Module.
 2. Test for less than 2 ohms in the low reference circuit end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.
 - **If less than 10 ohms**
3. Test for less than 1 V between the 12 V signal circuit terminal 11 on the X175 vehicle harness side connector and ground at the T12 Automatic Transmission Assembly case.
 - **If greater than 1 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
 2. Test for less than 1 V between the 12 V signal circuit terminal 11 on the X175 vehicle harness connector and ground at the T12 Automatic Transmission Assembly case.

- If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.
 - **If less than 1 V**
4. Ignition ON.
 5. Verify 11.6-12.4 V between the 12 V signal circuit terminal 11 on the X175 vehicle harness connector and ground at the T12 Automatic Transmission Assembly case.
 - **If not between 11.6-12.4 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 2. Test for infinite resistance between the 12 V signal circuit terminal 11 on the X175 vehicle harness side connector and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 1 ohms in the 12 V signal circuit, end to end.
 - If 1 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 1 ohms, replace the K71 Transmission Control Module.
 - **If between 11.6-12.4 V**
 6. Ignition OFF.
 7. Remove the T12 Automatic Transmission Assembly oil pan.
 8. Disconnect the wire harness connector at B14D Transmission Intermediate Shaft Speed Sensor.
 9. Verify and inspect the internal transmission wire harness circuits for the B14D Transmission Intermediate Shaft Speed Sensor for opens, high resistance, short to ground or short to B+.
 - **If the internal wire harness is not OK**

Replace the internal transmission wire harness.
 - **If the internal wire harness is OK**
 10. Replace the B14D Transmission Intermediate Shaft Speed Sensor.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)** following all transmission related repairs.
- **Control Module References** for Transmission Control Module replacement, programming and setup.
- **Automatic Transmission Wiring Harness Replacement**

DTC P2716, P2720, OR P2721: PRESSURE CONTROL SOLENOID VALVE 4 CONTROL CIRCUIT

Diagnostic Instructions

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

- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P2716

Pressure Control Solenoid Valve 4 Control Circuit

DTC P2720

Pressure Control Solenoid Valve 4 Control Circuit Low Voltage

DTC P2721

Pressure Control Solenoid Valve 4 Control Circuit High Voltage

Diagnostic Fault Information

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P2720	P2716, P2720	P2721	-
Output Control	P2720	P2716, P2720	-	-

Typical Scan Tool Data

Pressure Control Solenoid Valve 4 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 +	Malfunction	-	-
Control -	Malfunction	Malfunction	-

Pressure Control Solenoid Valve 4 Control Circuit Open Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON			
Parameter Normal Range: OK or Not Run			
Control +		Malfunction	-
Control -		Malfunction	-

Pressure Control Solenoid Valve 4 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 +	-	Malfunction	Malfunction
Control -	-	-	-

Circuit/System Description

The pressure control solenoid valve 4 is part of the valve body assembly which has no serviceable parts. The pressure control solenoid valve 4 controls the pressurized transmission fluid to Clutch 3. The pressure control solenoid valve 4 is supplied 12 V by the transmission control module (TCM) through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset. To control amperage through the solenoid, the output control circuit is pulsed width modulated from a low side driver in the TCM.

Conditions for Running the DTC

P2716

- P2720 or P2721 is not set.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.
- Battery voltage is greater than 11 V for 500 ms.

P2720

- P2721 is not set.
- Ignition switch is ON.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.

P2721

- P2720 is not set.
- Ignition switch is ON.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.

Conditions for Setting the DTC

P2716

The TCM has detected the feedback current for the pressure control solenoid valve 4 has exceeded the commanded current, for more than 2 s.

P2720

The TCM has detected a short to ground or an open/high resistance on the pressure control solenoid valve 4 circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

P2721

The TCM has detected a short to voltage on the pressure control solenoid valve 4 circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

Action Taken When the DTC Sets

- P2716, P2720 and P2721 are Type A DTCs.
- The transmission shifts to 3rd, 4th or 6th gear depending on vehicle speed.
- Reverse gear is allowed.

Conditions for Clearing the DTC

P2716, P2720 and P2721 are Type A DTCs.

Diagnostic Aids

- Material particles or slivers of metallic debris may become deposited on the solenoid terminals or electrical connector. Inspect and clean as necessary.
- Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool parameters listed below do not display Malfunction.
 - Pressure Control Solenoid Valve 4 Control Circuit Low Voltage Test Status
 - Pressure Control Solenoid Valve 4 Control Circuit Open Test Status
 - Pressure Control Solenoid Valve 4 Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**

Refer to Circuit/System Testing.
 - **If Malfunction is not displayed**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
4. Verify the DTC does not set.
 - **If the DTC sets**

Refer to Circuit/System Testing.
 - **If the DTC does not set**
5. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 minutes for all vehicle systems to power down. Ignition ON.
2. Test for 2.4-2.8 V between the control + circuit terminal 25 and ground.
 - **If less than 2.4 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 2. Test for infinite resistance between the control + circuit terminal 25 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 3. Test for less than 2 ohms in the control + circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.
 - **If greater than 2.8 V**

1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
2. Test for less than 1 V between the control + circuit terminal 25 and ground.
 - If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.
 - **If between 2.4-2.8 V**
3. Test for less than 1 V between the control - circuit terminal 26 and ground.
 - **If greater than 1 V**
 - 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
 - 2. Test for less than 1 V between the control - circuit terminal 26 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.
 - **If less than 1 V**
4. Ignition OFF.
5. Connect a jumper wire between the control + terminal 25 and control - terminal 26 on the X175 transmission harness connector.
6. Disconnect the harness connector at the K71 Transmission Control Module.
7. Test for less than 2 ohms between the control + terminal 47 and control - terminal 54 at the K71 Transmission Control Module harness connector.
 - **If 2 ohms or greater**

Repair the open/high resistance in the control + circuit or the control - circuit.
 - **If less than 2 ohms**
8. Test for infinite resistance between the control + circuit terminal 47 and ground.
 - **If less than infinite resistance**

Repair the short to ground in either the control + circuit or the control - circuit.
 - **If infinite resistance**
9. Test the Q27D Pressure Control Solenoid Valve 4.

Component Testing

1. Ignition OFF, remove the oil pan from the T12 Automatic Transmission Assembly.
2. Disconnect the wire harness at the Q27D Pressure Control Solenoid Valve 4
3. Test for 5.0-5.6 ohms between the 2 terminals on the Q27D Pressure Control Solenoid Valve 4.
 - **If not between 5.0-5.6 ohms**

Replace the control valve body assembly.

- **If between 5.0-5.6 ohms**
- 4. Test for infinite resistance between each terminal on the Q27D Pressure Control Solenoid Valve 4 and ground.
 - **If not infinite resistance**

Replace the control valve body assembly.
 - **If infinite resistance**
- 5. Test the internal transmission wire harness control + circuit and control - circuit of the Q27D Pressure Control Solenoid Valve 4 for an open/high resistance, short to ground or short to voltage.
 - **If control + and control - circuits are not OK**

Replace the internal transmission wire harness assembly.
 - **If control + and control - circuits are OK**
- 6. Replace the K71 Transmission Control Module.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Automatic Transmission Wiring Harness Replacement**
- **Control Valve Body Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P2719: PRESSURE CONTROL SOLENOID VALVE 4 PERFORMANCE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptor

DTC P2719

Pressure Control Solenoid Valve 4 Performance

Circuit/System Description

The setting of this DTC indicates a performance concern with Clutch 3 housing assembly, Clutch Brake 2 housing assembly, valve body or the fluid pressure circuit to the Clutch 3 or Clutch Brake 2 housing assembly.

With a loss of pressurized fluid to the Clutch 3 or Clutch Brake 2 housing assembly, a neutral condition or NO drive in Reverse gear will result.

Conditions for Running the DTC

- The automatic transmission fluid temperature is 0°C (32°F) or greater.
- The transmission is in Reverse range.
- The transmission output speed sensor signal is 500 RPM or less.

Conditions for Setting the DTC

- The difference between engine RPM and the input speed sensor RPM is less than 150 RPM.
- The above condition must occur 3 times.

Action Taken When the DTC Sets

- P2719 is a Type C DTC.
- The TCM freezes transmission adaptive functions.
- Neutral condition or no drive in Reverse range.

Conditions for Clearing the DTC

P2719 is a Type C DTC.

Diagnostic Aids

Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Verify there are no other DTCs are set.
 - **If other DTCs are set**
 Refer to **Diagnostic Trouble Code (DTC) List - Vehicle** .
 - **If no other DTCs are set**
2. Verify the transmission fluid level and condition is correct. Refer to **Transmission Fluid Level and Condition Check**.
 - **If the transmission fluid level and condition is not correct**
 Correct the fluid level or condition as necessary.
 - **If the transmission fluid level and condition is correct**
3. Verify the transmission range selector lever cable is adjusted properly. Refer to **Range Selector Lever Cable Adjustment**.
 - **If the transmission range selector lever cable is not adjusted properly**
 Adjust the range selector lever cable.
 - **If the transmission range selector lever cable is adjusted properly**
4. Perform the **Road Test**.
5. Verify the transmission shifts correctly and no incorrect gear ratio DTCs are set.
 - **If the transmission does not shift correctly or DTCs are set**
 Refer to Circuit/System Testing.
 - **If the transmission does shift correctly and no 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 observe from the Freeze Frame/Failure Records data.
7. Verify the DTC does not set.

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

8. All OK.

Circuit/System Testing

1. Replace the Transmission Control Valve Body Assembly.
2. Clear the DTCs from the K71 Transmission Control Module.
3. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
4. Perform the **Road Test**.
5. Verify the transmission shifts correctly and no DTCs are set.
 - **If the transmission shifts correctly and no DTCs are set**

All OK.

- **If the transmission does not shift correctly or DTCs are set**

6. Replace the T12 Automatic Transmission Assembly.
7. Clear the DTCs from the K71 Transmission Control Module.
8. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
9. Perform the **Road Test**.
10. Verify the transmission shifts correctly and no DTCs are set.
 - **If the transmission shifts correctly and no DTCs are set**

All OK.

- **If the transmission does not shift correctly or DTCs are set**

11. Replace the K71 Transmission Control Module Assembly.
12. Clear the DTCs from the K71 Transmission Control Module.
13. Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**.
14. Perform the **Road Test**.
15. Verify the transmission shifts correctly and no DTCs are set.
 - **If the transmission shifts correctly and no DTCs are set**
16. All OK.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission

related repairs.

- **Control Valve Body Replacement**
- **Transmission Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P2725, P2729, OR P2730: PRESSURE CONTROL SOLENOID VALVE 5 CONTROL CIRCUIT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P2725

Pressure Control Solenoid Valve 5 Control Circuit

DTC P2729

Pressure Control Solenoid Valve 5 Control Circuit Low Voltage

DTC P2730

Pressure Control Solenoid Valve 5 Control Circuit High Voltage

Diagnostic Fault Information

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+/Ignition	P2729	P2725, P2729	P2730	-
Output Control	P2729	P2725, P2729	-	-

Typical Scan Tool Data

Pressure Control Solenoid Valve 5 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 +	Malfunction	-	-
Control -	Malfunction	Malfunction	-

Pressure Control Solenoid Valve 5 Control Circuit Open Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
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Operating Conditions: Ignition ON

Parameter Normal Range: OK or Not Run

Control +	-	Malfunction	-
Control -	-	Malfunction	-

Pressure Control Solenoid Valve 5 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 +	-	Malfunction	Malfunction
Control -	-	-	-

Circuit/System Description

The pressure control solenoid valve 5 is part of the valve body assembly which has no serviceable parts. The pressure control solenoid valve 5 controls the pressurized transmission fluid to Clutch 4. The pressure control solenoid valve 5 is supplied 12 V by the transmission control module (TCM) through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset. To control amperage through the solenoid, the output control circuit is pulsed width modulated from a low side driver in the TCM.

Conditions for Running the DTC

P2725

- P2729 or P2730 is not set.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.
- Battery voltage is greater than 11 V for 500 ms.

P2729

- P2730 is not set.
- Ignition switch is ON.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.

P2730

- P2729 is not set.
- Ignition switch is ON.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.

Conditions for Setting the DTC

P2725

The TCM has detected the feedback current for the pressure control solenoid valve 5 has exceeded the commanded current, for more than 2 s.

P2729

The TCM has detected a short to ground or an open/high resistance on the pressure control solenoid valve 5 circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

P2730

The TCM has detected a short to voltage on the pressure control solenoid valve 5 circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

Action Taken When the DTC Sets

- P2725, P2729 and P2730 are Type A DTCs.
- The transmission shifts to 3rd, 4th or 6th gear depending on vehicle speed.
- Reverse gear is allowed.

Conditions for Clearing the DTC

P2725, P2729 and P2730 are Type A DTCs.

Diagnostic Aids

- Material particles or slivers of metallic debris may become deposited on the solenoid terminals or electrical connector. Inspect and clean as necessary.
- Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool parameters listed below do not display Malfunction.
 - Pressure Control Solenoid Valve 5 Control Circuit Low Voltage Test Status
 - Pressure Control Solenoid Valve 5 Control Circuit Open Test Status
 - Pressure Control Solenoid Valve 5 Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**

Refer to Circuit/System Testing.
 - **If Malfunction is not displayed**
3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observe from the Freeze Frame/Failure Records data.
4. Verify the DTC does not set.
 - **If the DTC sets**

Refer to Circuit/System Testing.
 - **If the DTC does not set**
5. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 minutes for all vehicle systems to power down. Ignition ON.
2. Test for 11.6-12.4 V between the control + circuit terminal 15 and ground.
 - **If less than 11.6 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.

2. Test for infinite resistance between the control + circuit terminal 15 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
3. Test for less than 2 ohms in the control + circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.
 - **If greater than 12.4 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
 2. Test for less than 1 V between the control + circuit terminal 15 and ground.
 - If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.
 - **If between 11.6-12.4 V**
3. Test for less than 1 V between the control - circuit terminal 16 and ground
 - **If greater than 1 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
 2. Test for less than 1 V between the control - circuit terminal 16 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.
 - **If less than 1 V**
4. Ignition OFF.
5. Connect a jumper wire between the control + terminal 15 and control - terminal 16 on the X175 transmission harness connector.
6. Disconnect the harness connector at the K71 Transmission Control Module.
7. Test for less than 2 ohms between the control + terminal 48 and control - terminal 55 at the K71 Transmission Control Module harness connector.
 - **If 2 ohms or greater**

Repair the open/high resistance in the control + circuit or the control - circuit.

 - **If less than 2 ohms**
8. Test for infinite resistance between the control + circuit terminal 48 and ground.
 - **If less than infinite resistance**

Repair the short to ground in either the control + circuit or the control - circuit.

 - **If infinite resistance**
9. Test the Q27E Pressure Control Solenoid Valve 5.

Component Testing

1. Ignition OFF, remove the oil pan from the T12 Automatic Transmission Assembly.
2. Disconnect the wire harness at the Q27E Pressure Control Solenoid Valve 5.
3. Test for 5.0-5.6 ohms between the 2 terminals on the Q27E Pressure Control Solenoid Valve 5.
 - **If not between 5.0-5.6 ohms**

Replace the control valve body assembly.
 - **If between 5.0-5.6 ohms**
4. Test for infinite resistance between each terminal on the Q27E Pressure Control Solenoid Valve 5 and ground.
 - **If not infinite resistance**

Replace the control valve body assembly.
 - **If infinite resistance**
5. Test the internal transmission wire harness control + circuit and control - circuit of the Q27E Pressure Control Solenoid Valve 5 for an open/high resistance, short to ground or short to voltage.
 - **If control + and control - circuits are not OK**

Replace the internal transmission wire harness assembly.
 - **If control + and control - circuits are OK**
6. Replace the K71 Transmission Control Module.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Automatic Transmission Wiring Harness Replacement**
- **Control Valve Body Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P2734, P2738, OR P2739: PRESSURE CONTROL SOLENOID VALVE 6 CONTROL CIRCUIT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P2734

Pressure Control Solenoid Valve 6 Control Circuit

DTC P2738

Pressure Control Solenoid Valve 6 Control Circuit Low Voltage

DTC P2739

Pressure Control Solenoid Valve 6 Control Circuit High Voltage

Diagnostic Fault Information

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+/Ignition	P2738	P2734, P2738	Malfunction	-
Output Control	P2738	P2734, P2738	-	-

Typical Scan Tool Data

Pressure Control Solenoid Valve 6 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 +	Malfunction	-	-
Control -	Malfunction	Malfunction	-

Pressure Control Solenoid Valve 6 Control Circuit Open Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Ignition ON Parameter Normal Range: OK or Not Run			
Control +	-	Malfunction	-
Control -	-	Malfunction	-

Pressure Control Solenoid Valve 6 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 +	-	Malfunction	Malfunction
Control -	-	-	-

Circuit/System Description

The pressure control solenoid valve 6 is part of the valve body assembly which has no serviceable parts. The

pressure control solenoid valve 6 supplies pressurized fluid to the Clutch Brake 1. The pressure control solenoid valve 6 is supplied 12 V by the transmission control module (TCM) through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset. To control amperage through the solenoid, the output control circuit is pulsed width modulated from a low side driver in the TCM.

Conditions for Running the DTC

P2734

- P2738 or P2739 is not set.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.
- Battery voltage is greater than 11 V for 500 ms.

P2738

- P2739 is not set.
- Ignition switch is ON.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.

P2739

- P2738 is not set.
- Ignition switch is ON.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.

Conditions for Setting the DTC

P2734

The TCM has detected the feedback current for the pressure control solenoid valve 6 has exceeded the commanded current, for more than 2 s.

P2738

The TCM has detected a short to ground or an open/high resistance on the pressure control solenoid valve 6 circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

P2739

The TCM has detected a short to voltage on the pressure control solenoid valve 6 circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

Actions Taken When the DTC Sets

- P2734, P2738 and P2739 are Type A DTCs.
- The transmission shifts to 3rd, 4th or 6th gear depending on vehicle speed.
- Reverse gear is allowed.

Conditions for Clearing the DTC

P2734, P2738 and P2739 are Type A DTCs.

Diagnostic Aids

- Material particles or slivers of metallic debris may become deposited on the solenoid terminals or electrical connector. Inspect and clean as necessary.
- Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool parameters listed below do not display Malfunction.
 - Pressure Control Solenoid Valve 6 Control Circuit Low Voltage Test Status
 - Pressure Control Solenoid Valve 6 Control Circuit Open Test Status
 - Pressure Control Solenoid Valve 6 Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**

Refer to Circuit/System Testing.

- **If Malfunction is not displayed**

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

Refer to Circuit/System Testing.

- **If the DTC does not set**

5. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 minutes for all vehicle systems to power down. Ignition ON.
2. Test for 11.6-12.4 V between the control + circuit terminal 5 and ground.
 - **If less than 11.6 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 2. Test for infinite resistance between the control + circuit terminal 5 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 3. Test for less than 2 ohms in the control + circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.
 - **If greater than 12.4 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
 2. Test for less than 1 V between the control + circuit terminal 5 and ground.
 - If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.
 - **If between 11.6-12.4 V**

3. Test for less than 1 V between the control - circuit terminal 6 and ground
 - **If greater than 1 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
 2. Test for less than 1 V between the control - circuit terminal 6 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.
 - **If less than 1 V**
4. Ignition OFF.
5. Connect a jumper wire between the control + terminal 5 and control - terminal 6 on the X175 transmission harness connector.
6. Disconnect the harness connector at the K71 Transmission Control Module.
7. Test for less than 2 ohms between the control + terminal 49 and control - terminal 56 at the K71 Transmission Control Module harness connector.
 - **If 2 ohms or greater**

Repair the open/high resistance in the control + circuit or the control - circuit.
 - **If less than 2 ohms**
8. Test for infinite resistance between the control + circuit terminal 49 and ground.
 - **If less than infinite resistance**

Repair the short to ground in either the control + circuit or the control - circuit.
 - **If infinite resistance**
9. Test the Q27F Pressure Control Solenoid Valve 6.

Component Testing

1. Ignition OFF, remove the oil pan from the T12 Automatic Transmission Assembly.
2. Disconnect the wire harness at the Q27F Pressure Control Solenoid Valve 6.
3. Test for 5.0-5.6 ohms between the 2 terminals on the Q27F Pressure Control Solenoid Valve 6.
 - **If not between 5.0-5.6 ohms**

Replace the control valve body assembly.
 - **If between 5.0-5.6 ohms**
4. Test for infinite resistance between each terminal on the Q27F Pressure Control Solenoid Valve 6 and ground.
 - **If not infinite resistance**

Replace the control valve body assembly.

- **If infinite resistance**

5. Test the internal transmission wire harness control + circuit and control - circuit of the Q27F Pressure Control Solenoid Valve 6 for an open/high resistance, short to ground or short to voltage.

- **If control + and control - circuits are not OK**

Replace the internal transmission wire harness assembly.

- **If control + and control - circuits are OK**

6. Replace the K71 Transmission Control Module.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Automatic Transmission Wiring Harness Replacement**
- **Control Valve Body Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P2761, P2763, OR P2764: TORQUE CONVERTER CLUTCH (TCC) PRESSURE CONTROL SOLENOID CONTROL CIRCUIT

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P2761

Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit

DTC P2763

Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit High Voltage

DTC P2764

Torque Converter Clutch (TCC) Pressure Control Solenoid Control Circuit Low Voltage

Diagnostic Fault Information

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Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control +	P2764	P2761, P2764	P2763	-
Control -	P2764	P2761, P2764	-	-

Typical Scan Tool Data

Torque Converter Clutch 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 +	Malfunction	-	-
Control -	Malfunction	Malfunction	-

Typical Scan Tool Data

Torque Converter Clutch Control Circuit Open Voltage Test Status

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

Typical Scan Tool Data

Torque Converter Clutch 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			
Ignition	-	Malfunction	Malfunction
Output Control	-	-	-

Circuit/System Description

The torque converter clutch (TCC) pressure control solenoid is part of the valve body assembly which has no serviceable parts. The TCC pressure control solenoid supplies pressurized fluid to the TCC enable solenoid valve. The TCC pressure control solenoid is supplied 12 V by the transmission control module (TCM) through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset. To control amperage through the solenoid, the output control circuit is pulsed width modulated from a low side driver in the TCM.

Conditions for Running the DTC

P2761

- P2763 or P2764 is not set.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.
- Battery voltage is greater than 11 V for 500 ms.

P2763

- P2764 is not set.
- Ignition switch is ON.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.

P2764

- P2763 is not set.
- Ignition switch is ON.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.

Conditions for Setting the DTC

P2761

The TCM has detected the feedback current for the TCC pressure control solenoid valve has exceeded the commanded current, for more than 2 s.

P2763

The TCM has detected a short to voltage on the TCC pressure control solenoid valve circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

P2764

The TCM has detected a short to ground or an open/high resistance on the TCC pressure control solenoid valve circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

Action Taken When the DTC Sets

- P2761, P2763 and P2764 are Type A DTCs.
- The transmission shifts to 3rd gear.
- Reverse gear is allowed.

Conditions for Clearing the DTC

P2761, P2763 and P2764 are Type A DTCs.

Diagnostic Aids

- Material particles or slivers of metallic debris may become deposited on the solenoid terminals or electrical connector. Inspect and clean as necessary.
- Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool parameters listed below do not display Malfunction.
 - TCC Pressure Control Solenoid Valve Control Circuit Low Voltage Test Status
 - TCC Pressure Control Solenoid Valve Control Circuit Open Test Status
 - TCC Pressure Control Solenoid Valve Control Circuit High Voltage Test Status

- **If Malfunction is displayed**

Refer to Circuit/System Testing.

- **If Malfunction is not displayed**

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

- **If the DTC sets**

Refer to Circuit/System Testing.

- **If the DTC does not set**

5. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 minutes for all vehicle systems to power down. Ignition ON.
2. Test for 11.6-12.4 V between the control + circuit terminal 13 and ground.

- **If less than 11.6 V**

1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
2. Test for infinite resistance between the control + circuit terminal 13 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
3. Test for less than 2 ohms in the control + circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.

- **If greater than 12.4 V**

1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
2. Test for less than 1 V between the control + circuit terminal 13 and ground.
 - If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.

- **If between 11.6-12.4 V**

3. Test for less than 1 V between the control - circuit terminal 14 and ground

- **If greater than 1 V**

1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
2. Test for less than 1 V between the control - circuit terminal 14 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.

- **If less than 1 V**

4. Ignition OFF.
5. Connect a jumper wire between the control + terminal 13 and control - terminal 14 on the X175 transmission harness connector.
6. Disconnect the harness connector at the K71 Transmission Control Module.
7. Test for less than 2 ohms between the control + terminal 44 and control - terminal 51 at the K71 Transmission Control Module harness connector.

- **If 2 ohms or greater**

Repair the open/high resistance in the control + circuit or the control - circuit.

- **If less than 2 ohms**

8. Test for infinite resistance between the control + circuit terminal 44 and ground.

- **If less than infinite resistance**

Repair the short to ground in either the control + circuit or the control - circuit.

- **If infinite resistance**

9. Test the Q39A torque Converter Clutch Pressure Control Solenoid Valve.

Component Testing

1. Ignition OFF, remove the oil pan from the T12 Automatic Transmission Assembly.
2. Disconnect the wire harness at the Q39A Torque Converter Clutch Pressure Control Solenoid Valve.
3. Test for 5.0-5.6 ohms between the 2 terminals on the Q39A Torque Converter Clutch Pressure Control Solenoid Valve.

- **If not between 5.0-5.6 ohms**

Replace the control valve body assembly.

- **If between 5.0-5.6 ohms**

4. Test for infinite resistance between each terminal on the Q39A Torque Converter Clutch Pressure Control Solenoid Valve and ground.

- **If not infinite resistance**

Replace the control valve body assembly.

- **If infinite resistance**

5. Test the internal transmission wire harness control + circuit and control - circuit of the Q39A Torque Converter Clutch Pressure Control Solenoid Valve for an open/high resistance, short to ground or short to voltage.

- **If control + and control - circuits are not OK**

Replace the internal transmission wire harness assembly.

- **If control + and control - circuits are OK**

6. Replace the K71 Transmission Control Module.

Repair Instructions

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

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs.
- **Automatic Transmission Wiring Harness Replacement**
- **Control Valve Body Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup.

DTC P2769 OR P2770: TORQUE CONVERTER CLUTCH (TCC) ENABLE SOLENOID VALVE CONTROL CIRCUIT LOW VOLTAGE

Diagnostic Instructions

- Perform the **Diagnostic System Check - Vehicle** prior to using this diagnostic procedure.
- Review **Strategy Based Diagnosis** for an overview of the diagnostic approach.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

DTC Descriptors

DTC P2769

Torque Converter Clutch (TCC) Enable Solenoid Valve Control Circuit Low Voltage

DTC P2770

Torque Converter Clutch (TCC) Enable Solenoid Valve Control Circuit High Voltage

Diagnostic Fault Information

Circuits	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Ignition	P2769	P2770	P2770	-

Typical Scan Tool Data

TCC Enable Solenoid Valve Control Circuit Low Voltage Test Status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Vehicle Speed			

Parameter Normal Range: OK or Not Run

Control +	Malfunction	Malfunction	-
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Typical Scan Tool Data

TCC Enable Solenoid Valve Control Circuit High Voltage Test status

Circuit	Short to Ground	Open	Short to Voltage
Operating Conditions: Vehicle Speed Parameter Normal Range: OK or Not Run			
Control +	-	-	Malfunction

Circuit/System Description

The torque converter clutch (TCC) enable solenoid valve is part of the valve body assembly which has no serviceable parts. The TCC enable solenoid valve controls the pressurized transmission fluid to the torque converter clutch. The TCC enable solenoid valve is supplied 12 V by the transmission control module (TCM) through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset. To complete the circuit, ground is provided by the housing of the TCC enable solenoid valve.

Conditions for Running the DTC

P2769

- P2769 or P2770 is not set.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.
- Shift solenoid valve 1 is command ON.

P2770

- P2769 or P2770 is not set.
- Ignition voltage is 9 V or greater.
- Battery voltage is between 10.2-32.0 V.
- Shift solenoid valve 1 is command OFF.

Conditions for Setting the DTC

P2769

The TCM has detected a short to ground on the TCC enable solenoid circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

P2770

The TCM has detected an open or a short to B+ on the TCC enable solenoid circuit. This condition must occur 5 consecutive times, lasting 100 ms or more.

Action Taken When the DTC Sets

- P2769 and P2770 are Type B DTCs.
- The TCM freezes transmission adaptive functions.
- The TCM forces TCC OFF.

Conditions for Clearing the DTC

P2769 and P2770 are Type B DTCs.

Diagnostic Aids

- Material particles or slivers of metallic debris may become deposited on the solenoid terminals or electrical connector. Inspect and clean as necessary.
- Ensure the battery is fully charged and the battery cables are clean and tight.

Reference Information

Schematic Reference

Automatic Transmission Controls Schematics

Connector End View Reference

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

Description and Operation

Electronic Component Description

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 for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the scan tool parameters listed below do not display Malfunction.
 - TCC Enable Solenoid Valve Control Circuit Low Voltage Test Status
 - TCC Enable Solenoid Valve Control Circuit Open Test Status
 - TCC Enable Solenoid Valve Control Circuit High Voltage Test Status
 - **If Malfunction is displayed**

Refer to Circuit/System Testing.

- **If Malfunction is not displayed**

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

Refer to Circuit/System Testing.

- **If the DTC does not set**

5. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF. Disconnect the X175 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 minutes for all vehicle systems to power down. Ignition ON.
2. Test for 11.6-12.4 V between the control + circuit terminal 7 and ground.
 - **If less than 11.6 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module.
 2. Test for infinite resistance between the control + circuit terminal 7 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 3. Test for less than 2 ohms in the control + circuit, end to end.
 - If 2 ohms or greater, repair the open/high resistance in the circuit.
 - If less than 2 ohms, replace the K71 Transmission Control Module.
 - **If greater than 12.4 V**
 1. Ignition OFF, disconnect the harness connector at the K71 Transmission Control Module. Ignition ON.
 2. Test for less than 1 V between the control + circuit terminal 7 and ground.
 - If 1 V or greater, repair the short to voltage in the circuit.
 - If less than 1 V, replace the K71 Transmission Control Module.

- **If between 11.6-12.4 V**

3. Test the Q39B Torque Converter Clutch Enable Solenoid Valve.

Component Testing

1. Ignition OFF, remove the oil pan from the T12 Automatic Transmission Assembly.
2. Disconnect the wire harness at the Q39B Torque Converter Clutch Enable Solenoid Valve.
3. Test for 5.0-5.6 ohms between the terminal on the Q39B Torque Converter Clutch Enable Solenoid Valve and ground.

- **If not between 5.0-5.6 ohms**

Replace the control valve body assembly.

- **If between 5.0-5.6 ohms**

4. Test the internal transmission wire harness control + circuit of the Q39B Torque Converter Clutch Enable Solenoid Valve for an open/high resistance, short to ground or short to voltage.

- **If the control + circuit is not OK**

Replace the internal transmission wire harness assembly.

- **If the control + circuit is OK**

5. Replace the K71 Transmission Control Module.

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- Perform the **Automatic Transmission 8-Speed Learn Procedure (MGG)**, following all transmission related repairs
- **Automatic Transmission Wiring Harness Replacement**
- **Control Valve Body Replacement**
- **Control Module References** for Transmission Control Module replacement, programming and setup

TRANSMISSION FLUID LEVEL AND CONDITION CHECK

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

NOTE: For the LFX application, the fluid level must be set with a warm engine idle speed of 600 RPM. If the A/C clutch engages, the engine idle speed will raise to 680 RPM. When the A/C clutch disengages, engine idle speed will not return to 600 RPM until the vehicle is driven above 20 mph. Drive the vehicle above 20 mph with the A/C clutch disengaged to return the idle to

600 RPM.

1. Start the engine with the A/C turned off.
2. Move the shift lever to all positions from "P" to "D", waiting at least 2 seconds at each position. Repeat this again, and then return it to "P".
3. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** . The vehicle must be level, with the engine running and the shift lever in the PARK range.

NOTE:

- The vehicle must be level with the engine running and the shift lever in the PARK range.
- Use only recommended automatic transmission fluid. Refer to **Adhesives, Fluids, Lubricants, and Sealers**.

4. Wait until the automatic transmission fluid temperature reaches the appropriate temperature for the specific model listed below:

Cold

- 3.6L LFX 36-38°C (96.8-100.4°F)
- 3.6L LF3 43.5-50.5°C (110.3-122.9°F)

Hot

NOTE:

Additional fluid must be added AFTER the level setting plug is installed when following the Hot temperature procedure. Failure to do so will result in an under fill condition and possible transmission damage could occur.

- 3.6L LFX 49°C (120.2°F) (add 400 ml (0.4 qt) after installing the level setting plug)
- 3.6L LF3 79-81°C (174.2-177.8°F) (add 910 ml (0.96 qt) after installing the level setting plug)

NOTE:

Some residual automatic transmission fluid will drain from the level setting hole when the plug is initially removed.

5. Remove the level setting plug. Allow any fluid to drain.
 1. Wait until the fluid first begins to flow as a steady stream and is within the specified temperature range, install the level setting plug.
 2. If no fluid comes out and the temperature is within the specified range, add fluid until fluid drips out as a steady stream, and then install the level setting plug. Use only the recommended automatic transmission fluid. Refer to **Adhesives, Fluids, Lubricants, and Sealers**.

CAUTION: Refer to Fastener Caution .

6. Using a new gasket, install and tighten the level setting plug to 20 (15 lb ft).

Condition of Automatic Transmission Fluid

NOTE:

- Insufficient automatic transmission fluid level will cause the oil pump to draw in air, causing the line pressure to decrease. This causes the clutch to slip, resulting in malfunctions such as a burned clutch.
- Excessive/over filled automatic transmission fluid level will cause the gears in the automatic transmission to agitate the automatic transmission fluid, causing bubbling and malfunctions such as deterioration. If the vehicle is driven under this condition, the automatic transmission fluid level can increase and the automatic transmission fluid may blow out of the transmission breather vent hose.
- If the automatic transmission fluid contains an excessive amount of metal or friction material, internal wear of the automatic transmission is suspected.

1. Check that the automatic transmission fluid is free of foreign matter.

NOTE: If the automatic transmission fluid is cloudy, water contamination is suspected. Inspect the cooling system.

2. Check that the automatic transmission fluid is not discolored.

TRANSMISSION FLUID FILL PROCEDURE

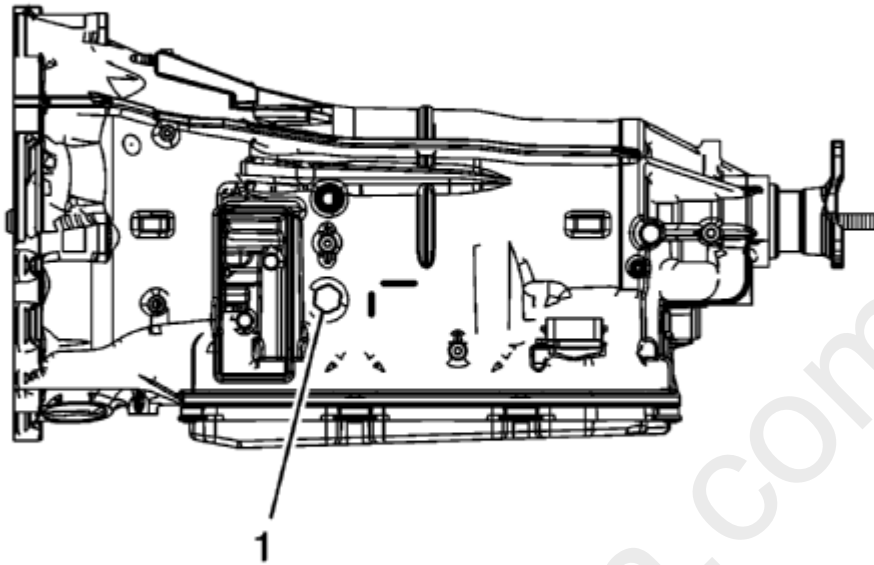


Fig. 9: Transmission Fluid Filler Hole Plug
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Before removing the Transmission Fluid Filler Hole Plug, thoroughly clean around the plug to prevent dirt or contaminants from entering the transmission during plug removal. Use compressed air to dislodge any caked dirt that may be stuck on and around the plug area. Failure to clean around the plug may result in transmission contamination.

1. Clean around the Transmission Fluid Filler Hole Plug (1).
2. Remove the Transmission Fluid Filler Hole Plug (1).

CAUTION: Check the transmission fluid level immediately after adding fluid and before vehicle operation. Do not overfill the transmission. An overfilled transmission may result in foaming or fluid to be expelled out the vent tube when the vehicle is operated. Overfilling will result in possible damage to the transmission.

3. Determine the approximate amount of fluid needed to fill the transmission, based on the repair performed. Refer to **Fluid Capacity Specifications**, . To avoid an under-fill condition, slightly overfill the

transmission, and then allow the extra fluid to drain out through the oil level check plug during the transmission fluid level and condition check procedure. Refer to **Adhesives, Fluids, Lubricants, and Sealers** for the recommended ATF.

CAUTION: Refer to **Component Fastener Tightening Caution** .

NOTE: A suitable hand pump may be utilized as a convenient method to pump the fluid into the bottom pan.

4. Install the Transmission Fluid Filler Hole Plug (1) and tighten to 40 (30 lb ft)..
5. Check the fluid level. Refer to **Transmission Fluid Level and Condition Check**.

LINE PRESSURE CHECK

1. Apply the parking brake and chock the wheels.
2. Secure the vehicle with a chain.
3. Install an SLT current measuring machine.

If the machine is not available, installation is not required.

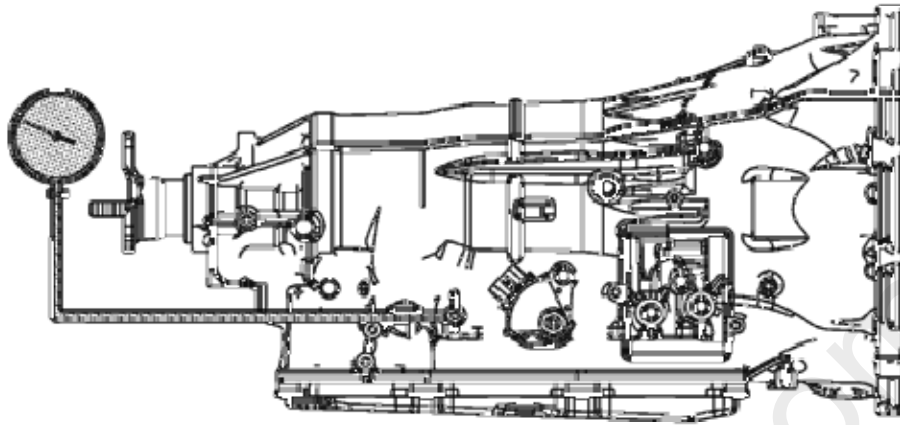


Fig. 10: Locating Test Plug For Installing A Gauge
 Courtesy of GENERAL MOTORS COMPANY

4. Disconnect the test plug indicated in the illustration and install a gauge.
5. Start engine and shift to the "D" or "R" position then check oil pressure at idling engine speed.

Line Pressure

Shift Lever Position	At Engine Idle Speed (kPa)	At Engine Idle Speed (PSI)
D position	450-520	65-75
R position	548-618	79-90

1. Oil pressure, SLT current value should be changed as following graph correspond to shift opening at "D" or "R" position during engine start condition.

Maximum oil pressure is controlled by vehicle condition. So, oil specification value is unable to evaluate by value except under idling engine speed.

NOTE:

- Do not depress the brake pedal. (Oil pressure is detected low if depress brake pedal).
- As this test causes a sudden rise in the ATF temperature, do not

continue the test for more than 5 s.

2. Always keep the foot on the brake pedal.

Starting from idle condition, progressively depress throttle in order to reach 100% throttle after 5 s.

TRANSMISSION ADAPTIVE LEARN

NOTE: If the automatic transmission or the TCM is replaced, or the TCM software is overwritten, be sure to initialize the learned values and perform initial learning.

Warm-up

CAUTION: Do not attempt to increase the fluid temperature by stall testing or damage to the transmission internal components may result.

NOTE: If fluid temperature is not between 65-80°C (149-176°F), initial learning cannot be performed.

Raise the ATF temperature by leaving the engine idling or performing a test drive on city streets. Check the ATF temperature using a special tester and make sure it is between 65-80°C (149-176°F). If the fluid temperature is outside of this range, bring it within the range.

Garage Shift Learning

- With the vehicle stationary, depress the brake pedal and keep the shift lever in the N position for 3 seconds. Then, move the shift lever from the N position to the D position, and keep the shift lever in the D position for 3 s.
- Repeat this procedure 5 times.

Gear Shift Learning

With the shift lever in the D position and the throttle opening amount between 25 and 35%, drive until 4th gear is selected and a vehicle speed of 80 km/h (50 mph) or higher is reached. Then, release the accelerator pedal and let the car coast, and finally bring the vehicle to a stop within 60 s. Repeat this procedure 10 times.

Check Learning Results

Check that shift shock has been reduced compared to before learning.

AUTOMATIC TRANSMISSION 8-SPEED LEARN PROCEDURE (MGG)

The transmission self-learn procedure for the 8-speed automatic transmission is a series of different tests performed to allow the transmission control module (TCM) to learn individual clutch performance characteristics. The TCM uses the learned values for clutch application control during upshifts and downshifts.

The self-learning procedure must be performed when one of the following repairs has been made to the transmission:

- Transmission replacement
- Transmission internal service or repair
- Valve body repair, cleaning or replacement
- Torque converter replacement
- TCM replacement
- TCM software/calibration update
- Any service or repair in response to transmission DTCs being set or shift quality concerns

Failure to perform the self-learn procedure after a repair/replacement may result in poor transmission performance, DTCs being set or customer dissatisfaction.

NOTE: **Ensure the following conditions are met before performing the self-learn procedure:**

- **Perform any adjustments, programming or setup procedures that are required when a component or module is removed or replaced.**
- **Clear the TCM of all DTCs.**
- **Ensure the transmission fluid is at the correct level.**
- **Verify with a scan tool the transmission fluid temperature is at least 65°C (149°F).**

NOTE:

- **Steps 1 and 2 below are garage shift procedures.**
- **Ensure the drive wheels are chocked.**
- **Ensure the parking brake is applied.**
- **Ensure the service brake is applied.**

1. Engine running. Move the shift lever from Neutral (N) to Drive (D) and back to the Neutral (N) position. Between each neutral to drive to neutral position cycle, wait 5 seconds. Perform this procedure 5 times.
2. Engine running. Move the shift lever from Neutral (N) to Reverse (R) and back to the Neutral (N) position. Between each neutral to reverse to neutral position cycle, wait 5 seconds. Perform this procedure 5 times.

NOTE: **Steps 3, 4, 5, and 6 requires the vehicle to be driven on the road. Do not use the manual mode function to perform the following steps.**

3. Engine running, move shift lever into Drive (D) position.
4. Accelerate the vehicle, with the scan tool throttle position parameter between 15-25 percent (light throttle) up to 72 km/h (45 mph) and decelerate to a complete stop. Perform this procedure 5 times.
5. Accelerate the vehicle, with the scan tool throttle position parameter between 45-55 percent (mid-throttle

position) up to 72 km/h (45 mph) and decelerate to a complete stop. Perform this procedure 5 times.

6. Accelerate the vehicle, with the scan tool throttle position parameter over 70 percent (heavy throttle) up to 72 km/h (45 mph) and decelerate to a complete stop. Perform this procedure 5 times.
7. Ignition OFF for 2 minutes.

ROAD TEST

Purpose

The purpose of the road test is to accurately grasp the symptoms of the malfunction and to check completion after repairs are finished.

Conditions

Make sure to perform the road test under the following conditions below:

- The engine has been inspected and adjusted.
- ATF temperature is within the normal driving range 50-80°C (122-176°F).
- The A/C, lights, etc., are off.
- Cruise control is off.

Procedure

NOTE:

- When performing a road test on public roads, first check the safety of the road.
- Complete the test in the sequence given. Incomplete testing cannot guarantee an accurate evaluation.

Perform a road test referring to the table below.

Item	Procedure
Shift Function - Drive (D) Position	During normal driving, check that the transmission shifts from 1st to 2nd gear, 2nd to 3rd gear, 3rd to 4th gear, 4th to 5th gear, 5th to 6th gear, 6th to 7th gear and then 7th to 8th gear.
Amount of Shift Shock While Driving	During the normal driving, check for the smooth upshifting.
Kick-Down Function	• Check downshifting by performing kick-down for each gear. • Check the amount of shift shock during kick-down.
Operation of the Engine Brake	Check the operation of the engine brake in 1st gear when in manual mode.
Shifting Point When the Accelerator Pedal Is Fully Depressed	With the shift lever in the drive (D) position, fully depress the accelerator pedal to check if the point at which the transmission upshifts from 1st to 2nd gear matches the specified shift point.
	Check that it is possible to shift into every gear when the shift lever is

Manual Shift Control Function	in the manual mode switch or manual in D, paddle shift.
Lock-Up Control Function	Check that the engine speed does not change dramatically when slightly depressing the accelerator pedal while driving on a flat road at a speed that lock-up is in effect.
Park (P) Position Operation	Stop the vehicle on a slope (of about 5% or 3° or more), move the shift lever to the park (P) position, then release the parking brake and check that the vehicle does not move.
Oil Leak	After a road test, inspect each part and check that there are no oil leaks.

TORQUE CONVERTER DIAGNOSIS

Torque Converter Stator

The torque converter stator roller clutch can have 2 different malfunctions.

- The stator assembly freewheels in both directions.
- The stator assembly remains locked up in both directions.

Poor Acceleration at Low Speed - Stator Roller Clutch Freewheels at All Times

If the stator is freewheeling at all times, the vehicle tends to have poor acceleration from a standstill and at speeds below 48-55 km/h (30-34 mph). At speeds above 48-55 km/h (30-34 mph), the vehicle may act normally.

For poor acceleration at low speeds, you should first determine that the exhaust system is not blocked, and the transmission is in First gear when starting out. If the engine freely accelerates to high RPM in NEUTRAL, you can assume that the engine and the exhaust system are normal. Check for poor performance in DRIVE and REVERSE to help determine if the stator is freewheeling at all times.

Poor Acceleration at High Speed - Stator Roller Clutch is Locked Up at All Times

If the stator is locked up at all times, performance is normal when accelerating from a standstill. Engine RPM and vehicle speed are limited or restricted at speeds above 48-55 km/h (30-34 mph). Visual examination of the converter may reveal a blue color from overheating.

Torque Converter Bearing Noise

NOTE: Do not confuse this noise with pump whine noise, which is usually noticeable in all gear ranges. Pump whine will vary with line pressure.

Torque converter whine is noticed when the vehicle is stopped and the transmission is in DRIVE or REVERSE. This noise will increase as you increase the engine RPM. The noise will stop when the vehicle is moving or when you apply the torque converter clutch, because there is no slip speed across the bearings.

Perform a stall test to verify that the noise is actually coming from the torque converter:

1. Place your foot on the brake.

2. Put the gear selector in DRIVE.

CAUTION: You may damage the transmission if you depress the accelerator for more than 6 seconds.

3. Depress the accelerator to approximately 1 200 RPM for no more than six seconds.

A torque converter noise will increase under this load.

Torque Converter Clutch

The torque converter clutch (TCC) is applied by fluid pressure, which is controlled by a TCC pressure control (PC) solenoid. This solenoid is part of the control solenoid valve assembly, which is located inside the automatic transmission assembly. The solenoid is controlled through a combination of computer controlled switches and sensors. Electronically controlled capacity clutch (ECCC) is controlled slip across the TCC.

Torque Converter Clutch Shudder

The key to diagnosing torque converter clutch (TCC) shudder is to note when it happens and under what conditions. TCC shudder should only occur during the apply, release, or ECCC conditions of the converter clutch. Shudder should never occur after the TCC is fully locked (approximately 0 RPM slip).

If Shudder Occurs During TCC Apply, Release, and ECCC

If the shudder occurs while the TCC is applying, the problem can be within the transmission or the torque converter. Something is causing one of the following conditions to occur:

- The clutch is not engaging completely.
- The clutch is not releasing completely.
- The clutch is releasing and applying rapidly and continuously.

One of the following conditions may be causing the TCC Shudder to occur:

- Leaking turbine shaft/TCC seals
- A restricted release orifice
- A distorted clutch or converter cover due to long flexplate to converter bolts
- Defective friction material on the TCC plate

If Shudder Occurs After TCC has Locked

Engine problems may go unnoticed under light throttle and load, but they become noticeable after the TCC has locked when going up a hill or accelerating.

Refer to **Symptoms - Engine Controls** in order to avoid misdiagnosis of TCC shudder and the unnecessary disassembly of a transmission or the unnecessary replacement of a torque converter.

Torque Converter Vibration Test

NOTE: The Noise and Vibration Analysis procedure should be performed prior to performing this test.

Isolating Vibration

NOTE: Some engine/transmission combinations cannot be balanced in this manner due to restricted access or limited clearances between the torque converter bolts and the engine.

To isolate and correct a flexplate or torque converter vibration:

1. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration.
2. Turn the engine OFF.
3. Raise and suitably support the vehicle. Refer to Lifting and Jacking the Vehicle .
4. Remove the torque converter access cover and the bolts (if equipped).
5. Mark the relationship of the torque converter to the flexplate.
6. Rotate the torque converter to inspect for defects or missing balance weights.
7. Index the converter according to "Indexing Torque Converter" procedure located within this procedure.
8. If the vibration remains, it is most likely caused by the engine.
9. Refer to "Torque Converter Replacement Guide" located within this procedure.

Indexing Torque Converter

To determine and correct a torque converter vibration, the following procedure may have to be performed several times to achieve the best possible torque converter to flexplate balance.

1. Remove the torque converter bolts.
2. Rotate the torque converter one bolt position from the original marked position.

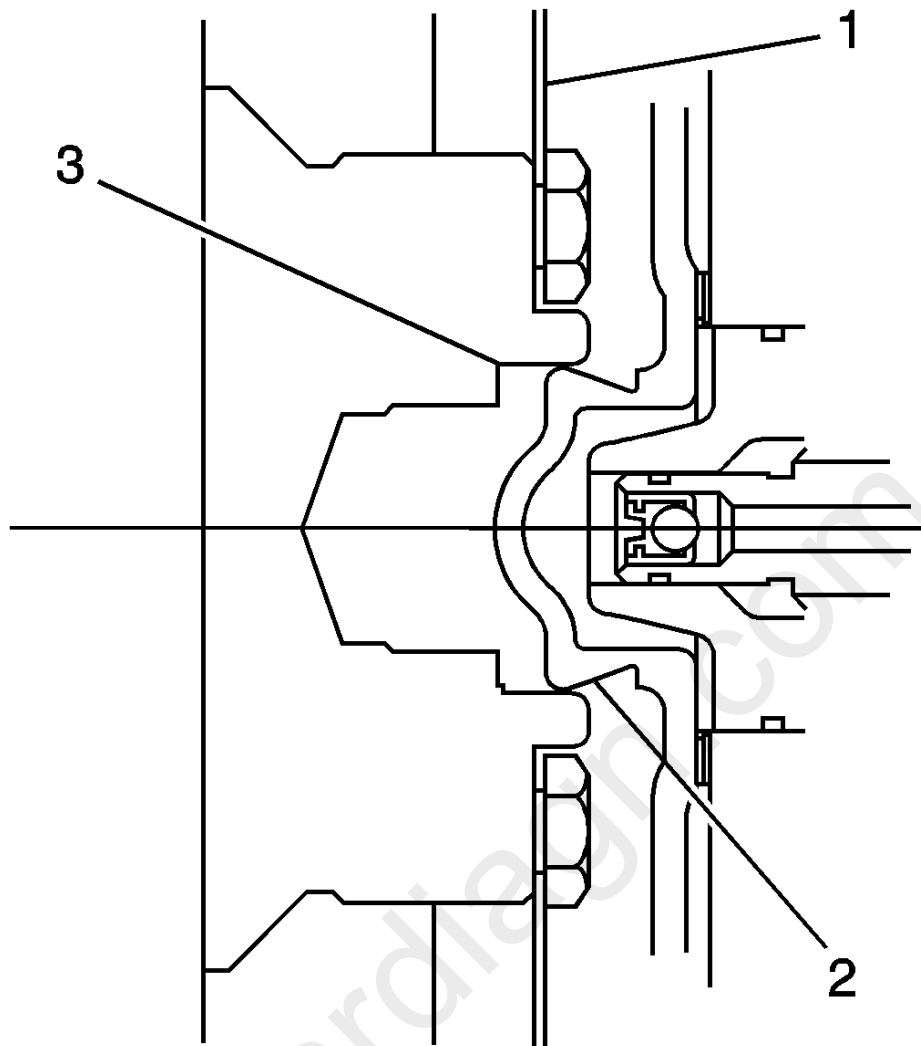


Fig. 11: View Of Torque Converter Hub In Engine Crankshaft
Courtesy of GENERAL MOTORS COMPANY

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 Tightening Specifications.
4. Lower the vehicle.
5. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration.

Repeat this procedure until the best possible balance is obtained.

6. Install the torque converter access cover and bolts (if equipped) and tighten according to **Fastener Tightening Specifications**.

Torque Converter Replacement Guide

Condition	Action
• Transmission Fluid Oxidized/Discolored • Clutch Fiber Material	Do not replace the torque converter. Refer to <u>Transmission Fluid Level and Condition Check</u> .
Transmission Fluid Contaminated with Metal Particles	NOTE: Do not replace the torque converter for clutch system or gearset component damage. Fine metallic debris or clutch plate material that is suspended in the fluid will not cause damage to the internal torque converter components nor any internal transmission components.
Harsh Gear Shifts	Do not replace the torque converter. Refer to <u>Symptoms - Automatic Transmission</u> .
Noise - Whine	• Refer to <u>Symptoms - Automatic Transmission</u> . • Do not replace the torque converter if noise is present in Neutral/Park. Refer to <u>Symptoms - Engine Mechanical</u> .
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 <u>Symptoms - Engine Controls</u> .
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 <u>Symptoms - Engine Controls</u> .
DTC P0741 - TCC Stuck OFF/High Slip - Intermittent Only	Do not replace the torque converter. Refer to <u>DTC P0741 or P0742</u> diagnostic table.
DTC P0741 - TCC Stuck OFF/High Slip	Do not replace the torque converter. Refer to <u>DTC P0741 or P0742</u> diagnostic table.
DTC P0742 - TCC Stuck ON	Do not replace the torque converter. Refer to <u>DTC P0741 or P0742</u> 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.
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 <u>Symptoms - Engine Controls</u> .
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 <u>Symptoms - Engine Controls</u> .
Stripped Converter Bolt Holes	• Replace the torque converter. • Inspect flexplate and refer to <u>Lower Engine Noise, Regardless of Engine Speed</u> .
Torque Converter Pilot Damaged	Replace the torque converter.
Torque Converter Hub surface is damaged - scored, raised/transferred metal	Replace the torque converter.
External Leaks in the weld areas - hub, lug or closure weld	Replace the torque converter.
Broken/Cracked Flexplate	Replace the torque converter.
Torque Converter Discolored/Overheated	Replace the torque converter.

FLEX PLATE/TORQUE CONVERTER VIBRATION TEST

Isolating Vibration

CAUTION: Some engine/transaxle combinations cannot be balanced in this manner due to restricted access or limited clearances between the torque converter bolts and the engine. Ensure that the bolts do not bottom out in the lug nuts or the torque converter cover which could dent and cause internal damage.

To isolate and correct a flywheel or torque converter vibration, separate the torque converter from the flywheel to determine if vibration is in the engine or transmission.

1. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration.
2. Turn the engine OFF.
3. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
4. Remove the transmission converter cover bolts and the cover.
5. Mark the relationship of the converter to the flywheel.
6. Remove the bolts attaching the converter to the flywheel.
7. Slide the torque converter away from the flywheel.
8. Rotate the flywheel and torque converter to inspect for defects or missing balance weights.
9. Lower the vehicle.
10. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration. Refer to **Diagnostic System Check - Vehicle** .
11. Turn the engine OFF.

Indexing Torque Converter

To determine and correct a torque converter vibration, the following procedure may have to be performed several times to achieve the best possible torque converter to flywheel balance.

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Rotate the torque converter one bolt position.

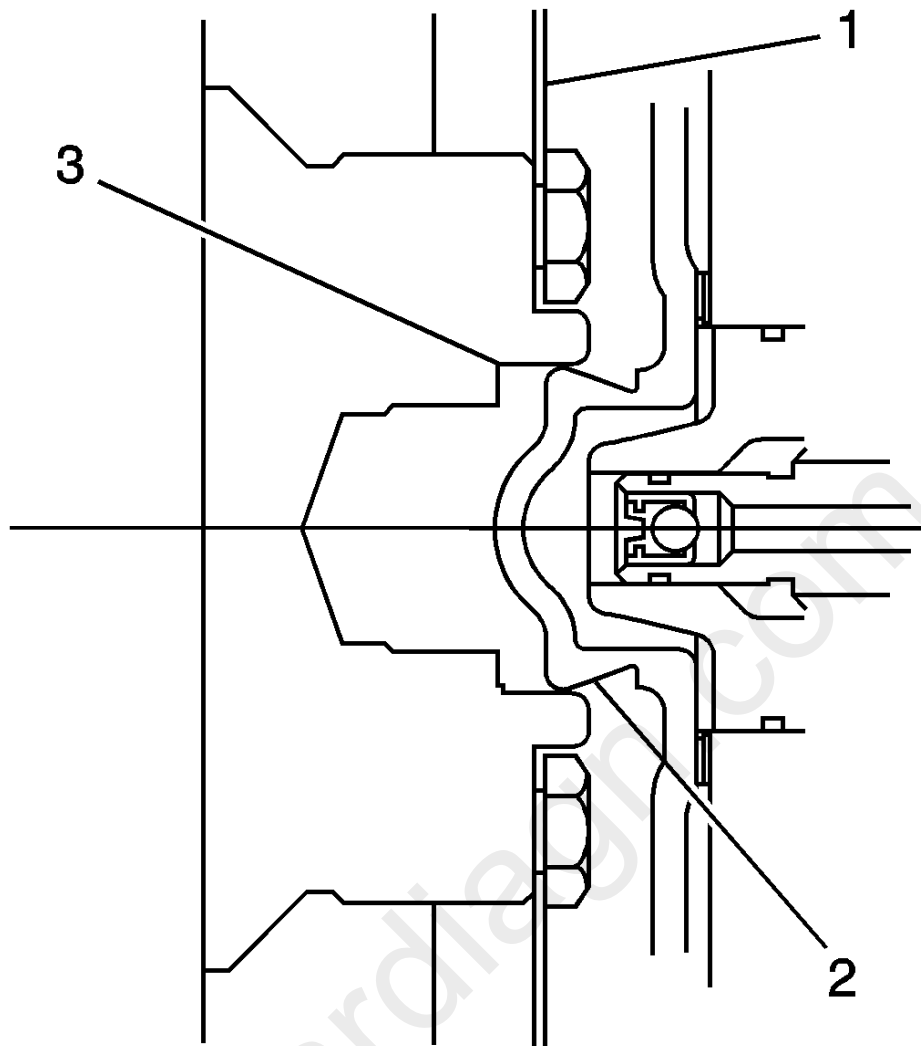


Fig. 12: View Of Torque Converter Hub In Engine Crankshaft
Courtesy of GENERAL MOTORS COMPANY

3. Align the torque converter hub (2) in the engine crankshaft (3) and install the torque converter to flywheel bolts.
4. Lower the vehicle.
5. With the engine at idle speed and the transmission in PARK or NEUTRAL, observe the vibration. Refer to **Noise and Vibration Analysis**.

Repeat this procedure until you obtain the best possible balance.

6. Install the transmission converter cover bolts and the cover.

STALL SPEED TEST

1. Apply the parking brake and chock the wheels.
2. Secure the vehicle with a chain.

3. Install an engine tachometer and start the engine.
4. Fully depress the brake pedal with your left foot, move the shift lever to the D or R position, fully depress the accelerator pedal with your right foot, and quickly check the maximum engine RPM.

SPEC

2646 ± 150 RPM

CAUTION: Do not continuously run the test procedure for longer than 5 seconds because of the extreme increase in the automatic transmission fluid (ATF) temperature. Also, be sure to keep the interval between stall tests to more than 1 minute in order to prevent damage to the automatic transmission internal components.

NOTE: Perform the test at least 3 times and calculate the average.

Test Result Analysis

Test Results	Probable Causes
The values when in the D and the R position are lower than the specification.	• Insufficient engine power • T/C one-way clutch slipping
Only the value when in the D position is higher than the specification.	• Low line pressure, line pressure control solenoid (SLT) failure, primary regulator valve failure • Valve body failure, SL1 hydraulic pressure system • C1 clutch slipping • One-way clutch (F1) failure
Only the value when in the R position is higher than the specification.	• Low line pressure, line pressure control solenoid (SLT) failure, primary regulator valve failure • Valve body failure, SL3 hydraulic pressure system • C3 clutch failure, slipping • B2 brake failure, slipping
The values when in the D and the R position are higher than the specification.	• Low line pressure, line pressure control solenoid (SLT) failure, primary regulator valve failure • Oil pump failure • Oil strainer clogging

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 cause may be from poor engine performance.

- Vibration may also be caused by a small amount of water inside the converter.
- Inspect the tires for the following conditions:
 - Uneven wear
 - Imbalance
 - Mixed sizes
 - Mixed radial and bias ply
- Inspect the suspension components for the following conditions:
 - Alignment wear or damage
 - Loose fasteners
 - Driveline damage or wear
- Inspect the engine and transmission mounts for damage and loose bolts.
- Inspect the transmission case mounting holes for the following conditions:
 - Missing bolts, nuts, and studs
 - Stripped threads
 - Cracks
- Inspect the flywheel for the following conditions:
 - Missing or loose bolts
 - Cracks
 - Imbalance
- Inspect the torque converter for the following conditions:
 - Missing or loose bolts or lugs
 - Missing or loose balance weights
 - Imbalance caused by heat distortion or fluid contamination

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 is between channels.
 - The valve bushing clips are improperly installed.
 - The checkballs are misplaced.
- 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. Replace all of the rubber type seals. The coolant will attack the seal material which will cause leakage.
2. Replace the torque converter.
3. Flush the cooler lines after the transmission cooler has been properly repaired or replaced.

FLUID LEAK DIAGNOSIS

General Method

1. Verify that the leak is transmission fluid.

CAUTION: Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings.

2. Thoroughly clean the suspected leak area using a rag.

NOTE: Do not idle vehicle, this will not actuate transmission systems, and do not drive the vehicle on the freeway as this will splatter oil inhibiting leak diagnosis.

3. Operate the vehicle for 15-20 minutes under city driving conditions until normal operating temperatures are reached.
4. Park the vehicle over clean paper or cardboard.
5. Shut OFF the engine.
6. Look for fluid spots on the paper.
7. Make the necessary repairs.

Powder Method

CAUTION: Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings.

1. Thoroughly clean the suspected leak area using a rag.
2. Apply an aerosol type powder, such as foot powder, to the suspected leak area.

NOTE: Do not idle vehicle, this will not actuate transmission systems, and do not drive the vehicle on the freeway as this will splatter oil inhibiting leak diagnosis.

3. Operate the vehicle for 15-20 minutes under city driving conditions until normal operating temperatures are reached.
4. Shut OFF the engine.
5. Inspect the suspected leak area.
6. Trace the leak path through the powder in order to find the source of the leak.
7. Make the necessary repairs.

Dye and Black Light Method

A fluid dye and black light kit is available from various tool manufacturers.

1. Follow the manufacturer's instructions in order to determine the amount of dye to use.
2. Detect the leak with the black light.
3. Make the necessary repairs.

Find the Cause of the Leak

Pinpoint the leak and trace the leak back to the source. You must determine the cause of the leak in order to repair the leak properly. For example, if you replace a gasket, but the sealing flange is bent, the new gasket will not repair the leak. You must also repair the bent flange. Before you attempt to repair a leak, check for the following conditions, and make repairs as necessary:

Gaskets

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Improperly tightened fasteners
- Dirty or damaged threads
- Warped flanges or sealing surface
- Scratches, burrs, or other damage to the sealing surface
- Damaged or worn gasket
- Cracking or porosity of the component
- Improper sealant used, where applicable
- Incorrect gasket

Seals

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Damaged seal bore
- Damaged or worn seal
- Improper installation
- Cracks in component
- Manual or output shaft surface is scratched, nicked, or damaged
- Loose or worn bearing causing excess seal wear

Possible Points of Fluid Leaks

Transmission Oil Pan

- Incorrectly tightened oil pan bolts
- Improperly installed or damaged oil pan gasket
- Damaged oil pan or mounting face
- Incorrect oil pan gasket

Case Leak

- Damaged vehicle speed sensor seal
- Damaged manual shaft seal

- Loose or damaged oil cooler connector fittings
- Worn or damaged propeller shaft oil seal
- Loose line pressure pipe plug
- Porous casting warped torque converter housing

Leak at the Torque Converter End

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

Leak at the Vent Pipe

- Overfilled system
- Water or coolant in the fluid; The fluid will appear milky
- Transmission case porous
- Incorrect fluid level indicator
- Plugged vent
- Drain-back holes plugged
- Mispositioned oil pump to case gasket, if equipped

Leak Inspection Points

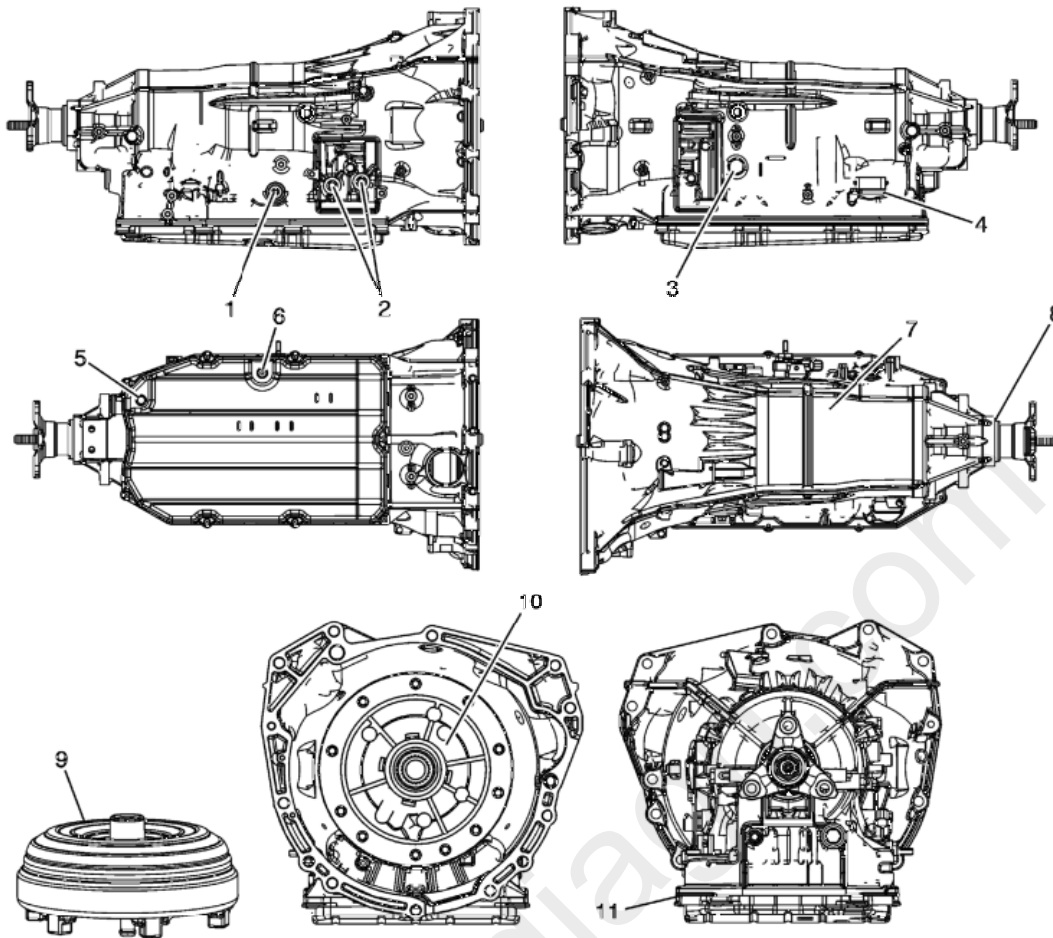


Fig. 13: Leak Inspection Points
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Manual Shift Shaft Seal
2	Transmission Fluid Cooler Pipe Fitting Seals
3	Filler Plug O-ring Seal
4	Automatic Transmission Electrical Connector Passage Sleeve
5	Oil Drain Plug Gasket
6	Oil Overflow Gasket
7	Transmission Case Assembly
8	Rear Oil Seal
9	Torque Converter
10	Oil Pump Seal
11	Oil Pan Gasket

ENGINE STARTS IN GEAR

Engine Starts in Gear

Checks	Causes
Manual Valve	Not engaged to detent lever.
Park/Neutral Position Switch	Not working or incorrectly positioned. Refer to Park/Neutral Position Switch Replacement.

HARSH GARAGE SHIFT

Harsh Garage Shift

Checks	Causes
NOTE: On cold days, approximately 32°F (0°C) or colder, the transmission is designed to shift differently. The transmission uses a warm-up mode shift schedule until the engine reaches normal operating temperature. While the transmission is in warm-up mode, it is normal for transmission upshifts to be delayed or held longer. This feature improves heater performance by giving quicker vehicle warm-ups.	
Engine	Elevated engine RPM - Verify correct engine operating rpm per application.
A/Trans Fluid Pump Cover Assembly (219)	- Inspect for damaged, stuck, sticky pressure regulator valve (233) and springs (234 and 235). - Inspect for damaged, stuck, sticky isolator valve (236) and sleeve (237).
Control Solenoid (w/Body and TCM) Valve Assembly (314)	- Incorrect or inadequate adapt activity - Perform Reset Transmission Adapts procedure. - Incorrect TCM temperature reporting - Monitor TCM temperature using Tech 2. - Line pressure control solenoid incorrect pressure.

NO DRIVE IN ALL RANGES

No Drive in All Ranges

Checks	Causes
A/Trans Fluid Pan Assembly (29)	Verify proper fluid level and condition, inspect transmission assembly for leaks.
Torque Converter (with Fluid Pump) Housing Assembly (2)	Inspect for damaged or scored pump housing (203), cover (219), rotor (217), slide (212), and vanes (216).
Fluid Filter Assembly (26)	- Inspect for damaged or restricted fluid filter assembly (26). - Inspect for damaged fluid filter seal assembly (25) or improper sealing interface, leaks, and fluid aeration.
Automatic Transmission Fluid Pump Seal (5)	Inspect for worn or damaged seal.
A/Trans Cooling/Lubrication System	Inspect transmission oil cooler (radiator) and cooler line seals for restrictions, damage, kinks, or leaks.

Torque Converter Assembly (1)	Inspect for overheating (blued), ballooning, leaks, or other damage.
Control Valve Lower Body Assembly (351)	Inspect for stuck, sticky or damaged clutch select valve (352).
Manual Valve (354)	Inspect the manual valve detent lever assembly (505) and connection to the manual valve (354).
A/Trans Manual Shift Shaft Position Switch Assembly (308)	Inspect the switch assembly (308) and connection to the manual valve (354).
A/Trans Manual Shift Shaft Position Switch Assembly (308)	Inspect PRNDL commands to and from vehicle using Tech 2.
Control Solenoid (w/Body and TCM) Valve Assembly (314)	Inspect PRNDL commands to and from vehicle using Tech 2.
A/Trans Fluid Pump (Transfer) Seal Assembly (19)	Inspect for damage or leaks.
Output Shaft Assembly (499)	Inspect for spline wear or damage.

NO PARK OR DRIVE

No Park or Drive

Checks	Causes
Output Shaft Assembly (70)	Inspect for a broken or damaged output shaft. Inspect for worn splines.
Case Assembly	- Inspect for broken or damaged case. - Inspect for broken or bent park pawl actuator. - Inspect for broken or missing park pawl actuator guide pin or manual shaft pin. - Inspect for broken, loose or misaligned park pawl guide. - Inspect for binding or broken park pawl or actuator assembly.
Manual Shift Detent Lever Assembly (511)	Inspect for broken or disengaged manual valve detent.

NO FIRST AND REVERSE GEARS

No First and Reverse Gears

Checks	Causes
A/Trans Fluid Pan Assembly (29)	Verify proper fluid level and condition, inspect transmission assembly for leaks.
Control Valve Upper Body Assembly (304)	Inspect for sticking, damaged, or worn 1st/rev and 4-5-6 clutch regulator valve (327) and spring (326).
Control Valve Lower Body Assembly (307)	Inspect for sticking, damaged, or worn clutch select valve 3 (352) and spring (353).
Control Valve Lower Body Assembly (307)	Inspect for sticking, damaged, or worn clutch select valve 2 (352) and spring (353).

Control Valve Upper Body Assembly (304)	Inspect for sticking, damaged, or worn #2 ball check valve
Center Support Fluid Passage Seal Assembly (20)	- Inspect for worn, cut, or damaged seals. - Inspect for proper seal (20) size (6L45/50E MYA/MYB) vs (6L80/90E MYC/MYD).

HARSH, SOFT, DELAYED OR SLIPPING FIRST OR REVERSE GEAR

Harsh, Soft, Delayed or Slipping First or Reverse Gear

Checks	Causes
NOTE: On cold days, approximately 32°F (0°C) or colder, the transmission is designed to shift differently. The transmission uses a warm-up mode shift schedule until the engine reaches normal operating temperature. While the transmission is in warm-up mode, it is normal for transmission upshifts to be delayed or held longer. This feature improves heater performance by giving quicker vehicle warm-ups.	
A/Trans Fluid Pan Assembly (29)	Verify proper fluid level and condition, inspect transmission assembly for leaks.
Control Valve Upper Body Assembly (304)	- Inspect for sticking, damaged, or worn 1-R/4-5-6 clutch regulator valve (327) and spring (326). - Inspect for damaged or sticking #2 ball check valve.
Control Valve Lower Body Assembly (307)	Inspect for sticking, damaged, or worn clutch select valve 3 (352) and spring (353).
Control Valve Lower Body Assembly (307)	Inspect for sticking, damaged, or worn clutch select valve 2 (352) and spring (353).
Control Solenoid (w/Body and TCM) Valve Assembly (314)	- Pressure control solenoid 3 commanded/failed HIGH (off) or leaking - Perform solenoid valve assembly function test. Refer to <u>Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test</u>. - Incorrect or inadequate adapt activity - Perform <u>Reset Transmission Adapts</u> procedure.
A/Trans Fluid Pump Cover Assembly (219)	- Inspect for damaged, stuck, sticky pressure regulator valve (233) and spring (234 and 235). - Inspect for damaged, stuck, sticky isolator valve (236) and sleeve (237).
Center Support Fluid Passage Seal Assembly (20).	- Inspect for worn, cut, or damaged seals. - Inspect for proper seal (20) size (6L45/50E MYA/MYB) vs (6L80.90E MYC/MYD).

NO FIRST, SECOND, THIRD, FOURTH, AND FIFTH GEAR

No First, Second, Third, Fourth, and Fifth Gear

Checks	Causes
--------	--------

A/Trans Fluid Pan Assembly (29)	Verify proper fluid level and condition, inspect transmission assembly for leaks.
Control Valve Upper Body Assembly (304)	Inspect for sticking, damaged, or Clutch 1 (C1) regulator valve (337) and spring (326).
Control Solenoid (w/Body and TCM) Valve Assembly (314)	- Inspect for contamination or debris. - Pressure control solenoid 1 (SL1) commanded/failed LOW (off) or leaking - Perform solenoid valve assembly function test. Refer to <u>Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test</u> .
Fluid Filter Assembly (26)	- Inspect for damaged or restricted fluid filter assembly (26). - Inspect for damaged fluid filter seal assembly (25) or improper sealing interface, leaks, and fluid aeration.
Torque Converter (with Fluid Pump) Housing Assembly (2)	Inspect for damaged or scored pump housing (203), cover (219), rotor (217), slide (212) and vanes (216).
A/Trans Fluid Pump (Transfer) Seal Assembly (19)	Inspect for damage or leaks.

NO SECOND AND EIGHTH GEAR

No Second and Eighth Gear

Checks	Causes
A/Trans Fluid Pan Assembly (29)	Verify proper fluid level and condition, inspect transmission assembly for leaks.
Control Valve Upper Body Assembly (304)	Inspect for sticking, damaged, or worn 2-6 clutch regulator valve (334) and spring (326).
Control Solenoid (w/Body and TCM) Valve Assembly (314)	Pressure control solenoid 5 (SL5) commanded/failed LOW (off) or leaking - Perform solenoid valve assembly function test. Refer to <u>Control Solenoid Valve and Transmission Control Module Assembly Solenoid Performance Test</u> .
Center Support Fluid Passage Seal Assembly (20)	- Inspect for worn, cut, or damaged seals. - Inspect for proper seal (20) size (6L45/50E MYA/MYB) vs (6L80/90E MYC/MYD).

NO TORQUE CONVERTER CLUTCH APPLY

No Torque Converter Clutch Apply

Checks	Causes
Torque Converter Assembly (1)	Diagnose torque converter for possible internal damage. Refer to <u>Torque Converter Diagnosis</u> .
Fluid Pump Cover Assembly (219)	- Inspect for worn, damaged, or sticking converter feed limit valve (220) and spring (221). - Inspect for worn, damaged, or sticking TCC control valve (227) and spring (226).

	Inspect for damaged stator shaft.
Control Valve Lower Body Assembly (307)	Inspect for worn, damaged, or sticking torque converter clutch (TCC) regulator apply valve (355). Refer to <u>Control Solenoid Valve and Transmission Control Module Assembly Inspection</u> .
4-5-6 (with Turbine Shaft) Clutch Assembly (56)	- Inspect for damaged turbine shaft. - Inspect for damaged turbine shaft O-ring seal.
Torque Converter (with Fluid Pump) Housing Assembly (2)	Inspect for leaking or damaged torque converter fluid seal assembly (201), torque converter bushing (206), turbine shaft o-ring seal (443) and torque converter (with fluid pump) housing assembly (2).

NO TORQUE CONVERTER CLUTCH RELEASE

No Torque Converter Clutch Release

Checks	Causes
Torque Converter Assembly (1)	Diagnose torque converter for possible internal damage. Refer to <u>Torque Converter Diagnosis</u> .
Fluid Pump Cover Assembly (219)	- Inspect for worn, damaged, or sticking converter feed limit valve (220) and spring (221). - Inspect for worn, damaged, or sticking torque converter clutch (TCC) control valve (227) and spring (226).
Control Valve Lower Body Assembly (307)	Inspect for worn, damaged, or sticking TCC regulator apply valve (355).

NO REVERSE GEAR

No Reverse Gear

Checks	Causes
Engine	- Engine malfunction - Drive plate runout
Chassis	Drive shaft
Electric System	- SR control solenoid (SR) circuit - SL Control Solenoid (SL) Circuit - C3 pressure control solenoid (SL3) circuit - Wire to solenoid Failure
Automatic Transmission Related Parts	Shift cable or NSW misadjusted
ATF	- Lack of ATF, burnt smell of ATF - Water contamination - Wrong ATF
	Oil seal

Automatic Transmission	• Gasket • O-ring • Torque converter • Valve body • Automatic transmission internal parts
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FLUID PRESSURE HIGH OR LOW

Fluid Pressure High or Low

Checks	Causes
Torque Converter Housing with Fluid Pump Assembly (2)	• Inspect for worn, sticking, or damaged pressure regulator valve (233). • Inspect for worn, sticking, or damaged pressure regulator valve outer spring (234). • Inspect for worn, sticking, or damaged pressure regulator valve inner spring (235). • Inspect for worn, sticking, or damaged isolator valve (236) and sleeve (237). • Inspect for worn, sticking, or damaged pressure relief ball valve (225). • Inspect for worn, sticking, or damaged pressure relief ball valve spring (224). • Inspect for damaged or porous pump cover assembly (219). Inspect for pump surfaces not flat. • Inspect for excessive fluid pump rotor (217) clearance or damage. Ensure proper selective rotor is being utilized. • Inspect for damaged fluid pump slide (212). Ensure proper selective slide is being utilized. • Inspect for worn, sticking, or damaged fluid pump slide outer spring (211). • Inspect for worn or damaged fluid pump slide seal (213), seal support (214), pivot pin (215), fluid seal ring (209), and O-ring seal (210). • Inspect for worn or damaged fluid pump vane rings (207) and rotor guide (208).
Control Valve Upper Body Assembly (321)	• Inspect for worn, sticking, or damaged actuator feed limit valve (325) and spring (324). • Inspect for worn, sticking, or damaged clutch boost valve (329) and spring (330).
Control Valve (w/Body and TCM) Valve Assembly	Inspect for leaking or damaged filter plate assembly seals (16). Verify VBS operation in not stuck high or low.

Fluid Filter Assembly (26)

- Inspect for damaged or restricted fluid filter assembly (26).
- Inspect for damaged fluid filter seal assembly (25).

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

NO FORWARD AND REVERSE

No Forward and Reverse

Checks	Causes
Engine	• Engine malfunction • Drive plate runout
Chassis	Drive shaft
Electric System	• Lock-up control solenoid (SLU) circuit • C1 pressure control solenoid (SL1) circuit • C3 pressure control solenoid (SL3) circuit • Wire to solenoid Failure
Automatic Transmission Related Parts	Shift cable or NSW misadjusted
	• Lack of ATF, burnt smell of ATF

ATF	• Water contamination • Wrong ATF
Automatic Transmission	• Oil seal • Gasket • O-ring • Torque converter • Valve body • Automatic transmission internal parts

SLIPS IN DRIVE OR NO DRIVE

Slips in Drive or No Drive

Checks	Causes
Engine	• Engine malfunction • Drive plate runout
Chassis	Drive shaft
Electric System	• Line pressure control solenoid (SLT) circuit • C1 pressure control solenoid (SL1) circuit • C2 pressure control solenoid (SL2) circuit • C3 pressure control solenoid (SL3) circuit • C4 pressure control solenoid (SL4) circuit • B1 pressure control solenoid (SL5) circuit • Wire to solenoid failure • TCM • CAN signal • Engine torque signal
Automatic Transmission Related Parts	Shift cable or NSW misadjustment
ATF	• Lack of ATF, burnt smell of ATF • Water mix, wrong ATF
Automatic Transmission	• Oil Seal • Gasket • O-ring • Torque converter • Valve body • A/T internal parts

SLIPS IN REVERSE

Slips in Reverse

Checks	Causes
Engine	• Engine malfunction • Drive plate runout
Chassis	Drive shaft
Electric System	• Line pressure control solenoid (SLT) circuit • C3 pressure control solenoid (SL3) circuit • Wire to solenoid failure • TCM • CAN signal • Engine torque signal
Automatic Transmission Related Parts	Shift cable or NSW misadjustment
ATF	• Lack of ATF, burnt smell of ATF • Water mix, wrong ATF
Automatic Transmission	• Oil Seal • Gasket • O-ring • Torque converter • Valve body • A/T internal parts

ENGAGEMENT TIME FROM PARK OR NEUTRAL TO DRIVE IS NOT WITHIN SPECIFICATIONS

Time Lag Test

CAUTION: When performing the test in succession, make sure to wait 1 minute between each test in order to prevent damage to the automatic transmission internal components.

NOTE: Perform the test at least 3 times and calculate the average.

1. Apply the parking brake and chock the wheels.
2. Start the engine.
3. Depress the brake pedal and allow the engine to idle. Move the shift lever from the N position to the "D" or "R" position and, using a timer, check how long it takes until a light shift shock is felt.

SPEC:

Shift Lever Position	Time Duration (sec.)

From "N" to "D" position	1.15 or less
From "N" to "R" position	1.20 or less

Test Result Analysis

Test Results	Probable Causes
The time lag from the "N" to "D" position is longer than the specification.	• Valve body failure, SL1 hydraulic pressure system • C1 clutch slipping • One-way clutch (F1) failure • Oil pump failure • Oil strainer clogging
The time lag from the "N" to "R" position is longer than the specification.	• Valve body failure, SL3 hydraulic pressure system • C3 clutch slipping • B2 brake slipping • Oil pump failure • Oil strainer clogging

ENGINE STALLS DURING REVERSE OR DRIVE ENGAGEMENT

Engine Stalls During Reverse or Drive Engagement

Checks	Causes
Engine	Engine malfunction
Electric System	TCM
Automatic Transmission Related Parts	• Oil cooler pipe • Oil cooler pipe misinstalled, damaged
Automatic Transmission	• Torque converter • Valve body • A/T internal parts

NO 1-2 UPSHIFT

No 1-2 Upshift

Checks	Causes
Engine	Engine malfunction
Electric System	• Battery voltage low or high • Throttle position sensor failure • Vehicle speed sensor (SP2) • Turbine revolution sensor (NT) • SR control solenoid circuit • B1 pressure control solenoid (SL5) circuit

	• Wire to solenoid failure • TCM • CAN signal • Accelerator position signal
Automatic Transmission	• Valve body • A/T internal parts

NO 2-3 UPSHIFT

No 2-3 Upshift

Checks	Causes
Engine	Engine malfunction
Electric System	• Battery voltage low or high • Throttle position sensor failure • Vehicle speed sensor (SP2) • Turbine revolution sensor (NT) • SR control solenoid circuit • C3 pressure control solenoid (SL3) circuit • B1 pressure control solenoid (SL5) circuit • Wire to solenoid failure • TCM • CAN signal • Accelerator position signal
Automatic Transmission	• Valve body • A/T internal parts

NO 3-4 UPSHIFT

No 3-4 Upshift

Checks	Causes
Engine	Engine malfunction
Electric System	• Battery voltage low or high • Throttle position sensor failure • Vehicle speed sensor (SP2) • Turbine revolution sensor (NT) • SR control solenoid circuit • C3 pressure control solenoid (SL3) circuit • C4 pressure control solenoid (SL4) circuit

	• Wire to solenoid failure • TCM • CAN signal • Accelerator position signal
Automatic Transmission	• Valve body • A/T internal parts

NO 4-5 UPSHIFT

No 4-5 Upshift

Checks	Causes
Engine	Engine malfunction
Electric System	• Battery voltage low or high • Throttle position sensor failure • Vehicle speed sensor (SP2) • Turbine revolution sensor (NT) • SR control solenoid circuit • C2 pressure control solenoid (SL2) circuit • C4 pressure control solenoid (SL4) circuit • Wire to solenoid failure • TCM • CAN signal • Accelerator position signal
Automatic Transmission	• Valve body • A/T internal parts

NO 5-6 UPSHIFT

No 5-6 Upshift

Checks	Causes
Engine	Engine malfunction
Electric System	• Battery voltage low or high • Throttle position sensor failure • Vehicle speed sensor (SP2) • Turbine revolution sensor (NT) • SR control solenoid circuit • C1 pressure control solenoid (SL1) circuit • C4 pressure control solenoid (SL4) circuit

	• Wire to solenoid failure • TCM • CAN signal • Accelerator position signal
Automatic Transmission	• Valve body • A/T internal parts

NO 6-7 UPSHIFT

No 6-7 Upshift

Checks	Causes
Engine	Engine malfunction
Electric System	• Battery voltage low or high • Throttle position sensor failure • Vehicle speed sensor (SP2) • Turbine revolution sensor (NT) • SR control solenoid circuit • C3 pressure control solenoid (SL3) circuit • C4 pressure control solenoid (SL4) circuit • Wire to solenoid failure • TCM • CAN signal • Accelerator position signal
Automatic Transmission	• Valve body • A/T internal parts

NO 7-8 UPSHIFT

No 7-8 Upshift

Checks	Causes
Engine	Engine malfunction
Electric System	• Battery voltage low or high • Throttle position sensor failure • Vehicle speed sensor (SP2) • Turbine revolution sensor (NT) • SR control solenoid circuit • C3 pressure control solenoid (SL3) circuit • B1 pressure control solenoid (SL5) circuit

	• Wire to solenoid failure • TCM • CAN signal • Accelerator position signal
Automatic Transmission	• Valve body • A/T internal parts

NO DOWNSHIFT

No Downshift

Checks	Causes
Electric System	• Throttle position sensor failure • Vehicle speed sensor (SP2) • SR control solenoid circuit • TCM • Accelerator position signal

TORQUE CONVERTER CLUTCH STUCK ON OR OFF

Torque Converter Clutch Stuck On or Off

Checks	Causes
Electric System	• Battery voltage low or high • Throttle position sensor failure • Vehicle speed sensor (SP2) • Turbine revolution sensor (NT) • Oil temperature sensor for line pressure (OT) • SL control solenoid circuit • Lock-up control solenoid (SLU) circuit • Wire to solenoid failure • TCM • CAN signal • Accelerator position signal
Automatic Transmission	• Torque Converter • Valve body • A/T internal parts

VIBRATION WHILE DRIVING

Vibration While Driving

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Checks	Causes
Engine	• Engine and transmission mounting • Exhaust pipe resonance
Chassis	• Drive shaft • Tire imbalance • Interference with drive train and body • Suspension malfunction
ATF	• Lack of ATF, burnt smell of ATF • Water mix, wrong ATF
Automatic Transmission	A/T internal parts

HUM OR RATTLE NOISE AT IDLE

Hum or Rattle Noise at Idle

Checks	Causes
Engine	• Engine and transmission mounting • Exhaust pipe resonance
Automatic Transmission	A/T internal parts

AUTOMATIC TRANSMISSION FLUID LEAKS

Automatic Transmission Fluid Leaks

Checks	Causes
Breather	• TCM • Lack of ATF, burnt smell of ATF • Water mix, wrong ATF • O-ring • A/T internal parts
Between Engine and Transmission Housing	• Drive plate runout • Oil seal • O-ring • Torque converter • A/T internal parts
Between Transmission Case and Adapter, Extension Housing	• Drive Shaft • Gasket
Manual Shaft Oil Seal	• Oil seal • A/T internal parts
ATF	• Lack of ATF, burnt smell of ATF

	• Water mix, wrong ATF
Oil Cooler Pipe	• Oil cooler pipe • Oil cooler pipe misinstall, damaged • O-ring • A/T internal parts
O-ring (Transmission Wire, Elbow)	• O-ring • A/T internal parts
Adapter, Extension Housing	• Oil seal • A/T internal parts
Transmission Case, Oil Pan	• Gasket • A/T internal parts

HARSH PARK OR NEUTRAL TO DRIVE ENGAGEMENT

Harsh Park or Neutral to Drive Engagement

Checks	Causes
Engine	• Engine malfunction • Drive plate runout • E/G and A/T mounting
Chassis	• Drive shaft • Suspension malfunction
Electric System	• Battery voltage low or high • Vehicle speed sensor (SP2) • Turbine revolution sensor (NT) • Selector position switch (NSW) • Oil temperature sensor for line pressure (OT) • Line pressure control solenoid (SLT) circuit • C1 pressure control solenoid (SL1) circuit • Wire to solenoid failure • TCM • CAN signal • Engine torque signal • Driver torque signal • Engine speed signal
Automatic Transmission Related Parts	Shift cable or NSW misadjustment
ATF	• Lack of ATF, burnt smell of ATF

	• Water mix, wrong ATF
Automatic Transmission	• Oil Seal • Gasket • O-ring • Torque converter • Valve body • A/T internal parts

HARSH PARK OR NEUTRAL TO REVERSE ENGAGEMENT

Harsh Park or Neutral to Reverse Engagement

Checks	Causes
Engine	• Engine malfunction • Drive plate runout • E/G and A/T mounting
Chassis	• Drive shaft • Suspension malfunction
Electric System	• Battery voltage low or high • Vehicle speed sensor (SP2) • Turbine revolution sensor (NT) • Selector position switch (NSW) • Oil temperature sensor for line pressure (OT) • SL control solenoid circuit • Line pressure control solenoid (SLT) circuit • Lock-up control solenoid (SLU) circuit • C3 pressure control solenoid (SL3) circuit • TCM • CAN signal • Engine torque signal • Driver torque signal • Engine speed signal
Automatic Transmission Related Parts	Shift cable or NSW misadjustment
ATF	• Lack of ATF, burnt smell of ATF • Water mix, wrong ATF
	• Oil Seal • Gasket • O-ring

Automatic Transmission	• Torque converter • Valve body • A/T internal parts
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HARSH UPSHIFT

Harsh Upshift

Checks	Causes
Engine	• Engine malfunction • Drive plate runout • E/G & A/T mounting
Chassis	• Drive shaft • Suspension malfunction
Electric System	• Battery voltage low or high • Vehicle speed sensor (SP2) • Turbine revolution sensor (NT) • Oil temperature sensor for line pressure (OT) • SL control solenoid circuit • SR control solenoid circuit • Line pressure control solenoid (SLT) circuit • Lock-up control solenoid (SLU) circuit • C1 pressure control solenoid (SL1) circuit • C2 pressure control solenoid (SL2) circuit • C3 pressure control solenoid (SL3) circuit • C4 pressure control solenoid (SL4) circuit • B1 pressure control solenoid (SL5) circuit • Wire to solenoid failure • TCM • CAN signal • Engine torque signal • Driver torque signal • Engine speed signal
ATF	• Lack of ATF, burnt smell of ATF • Water mix, wrong ATF
Automatic Transmission	• Oil Seal • Gasket • O-ring

- Torque converter
- Valve body
- A/T internal parts

HARSH SHIFT ON COASTDOWN

Harsh Shift on Coastdown

Checks	Causes
Engine	• Engine malfunction • Drive plate runout • E/G & A/T mounting
Chassis	• Drive shaft • Suspension malfunction
Electric System	• Battery voltage low or high • Vehicle speed sensor (SP2) • Turbine revolution sensor (NT) • Oil temperature sensor for line pressure (OT) • SL control solenoid circuit • SR control solenoid circuit • Line pressure control solenoid (SLT) circuit • Lock-up control solenoid (SLU) circuit • C1 pressure control solenoid (SL1) circuit • C2 pressure control solenoid (SL2) circuit • C3 pressure control solenoid (SL3) circuit • C4 pressure control solenoid (SL4) circuit • B1 pressure control solenoid (SL5) circuit • Wire to solenoid failure • TCM • CAN signal • Engine torque signal • Driver torque signal • Engine speed signal
ATF	• Lack of ATF, burnt smell of ATF • Water mix, wrong ATF
Automatic Transmission	• Oil Seal • Gasket • O-ring

- Torque converter
- Valve body
- A/T internal parts

HARSH DOWNSHIFT

Harsh Downshift

Checks	Causes
Engine	• Engine malfunction • Drive plate runout • E/G & A/T mounting
Chassis	• Drive shaft • Suspension malfunction
Electric System	• Battery voltage low or high • Vehicle speed sensor (SP2) • Turbine revolution sensor (NT) • Oil temperature sensor for line pressure (OT) • SL control solenoid circuit • SR control solenoid circuit • Line pressure control solenoid (SLT) circuit • Lock-up control solenoid (SLU) circuit • C1 pressure control solenoid (SL1) circuit • C2 pressure control solenoid (SL2) circuit • C3 pressure control solenoid (SL3) circuit • C4 pressure control solenoid (SL4) circuit • B1 pressure control solenoid (SL5) circuit • Wire to solenoid failure • TCM • CAN signal • Engine torque signal • Driver torque signal • Engine speed signal
ATF	• Lack of ATF, burnt smell of ATF • Water mix, wrong ATF
Automatic Transmission	• Oil Seal • Gasket • O-ring

- Torque converter
- Valve body
- A/T internal parts

REPAIR INSTRUCTIONS - ON VEHICLE

AUTOMATIC TRANSMISSION RANGE SELECTOR LEVER REPLACEMENT

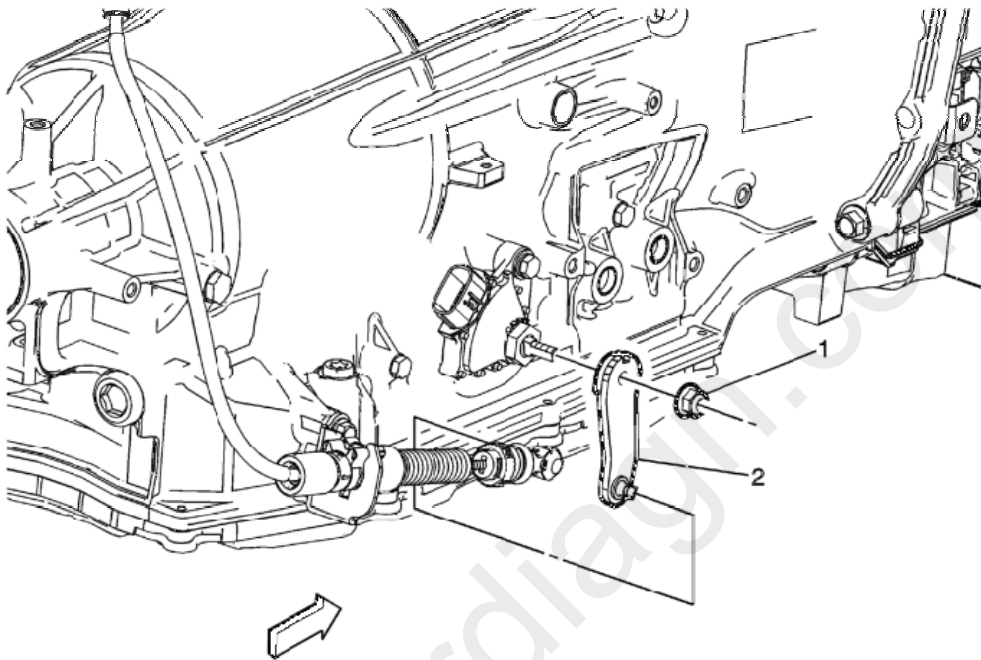


Fig. 14: Automatic Transmission Range Selector Lever
Courtesy of GENERAL MOTORS COMPANY

Automatic Transmission Range Selector Lever Replacement

Callout	Component Name
Preliminary Procedures	
1. Apply the park brake. 2. Shift the transmission into neutral. 3. Raise the vehicle. Refer to <u>Lifting and Jacking the Vehicle</u> . 4. Disconnect the transmission range selector cable from the range selector cable lever ball stud.	
	Transmission Range Selector Cable Lever Nut WARNING: Hold the transmission range selector lever while removing or installing the lever

1	retaining nut. Failure to hold the lever can cause damage to the transmission internal park system components which could allow the vehicle to roll when placed in the park position. CAUTION: Refer to <u>Fastener Caution</u> . Tighten 30 N.m (22 lb ft)
2	Transmission Range Selector Cable Lever

RANGE SELECTOR LEVER CABLE REPLACEMENT

Removal Procedure

1. Set the park brake and chock the wheels.
2. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .

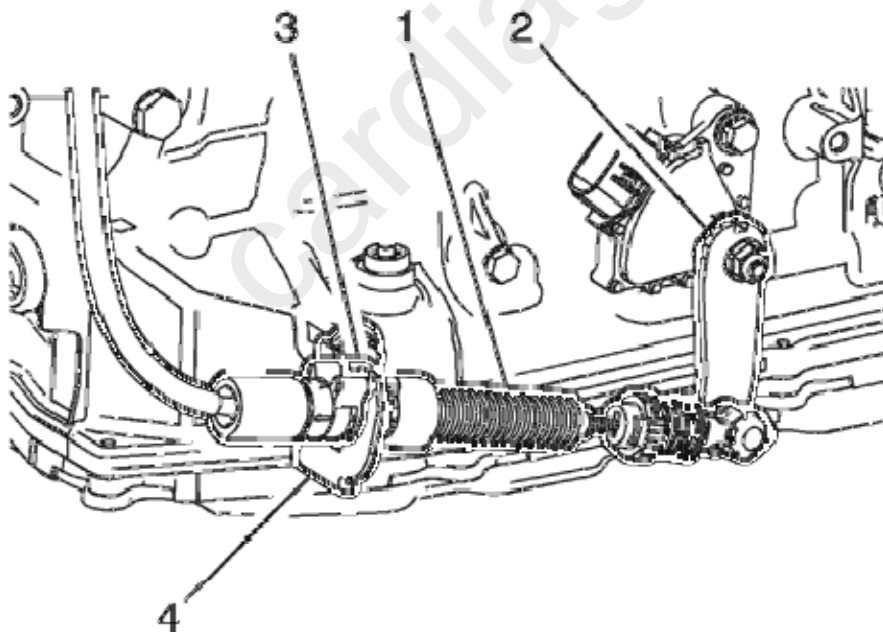


Fig. 15: Transmission Range Selector Lever Cable
Courtesy of GENERAL MOTORS COMPANY

3. Disconnect the transmission range selector lever cable terminal (1) from the transmission manual shift lever pin (2).
4. Slide the retainer (3) forward to release the transmission range selector lever cable from the bracket (4).
5. Lower the vehicle.
6. Remove the front floor console. Refer to **Front Floor Console Replacement** .

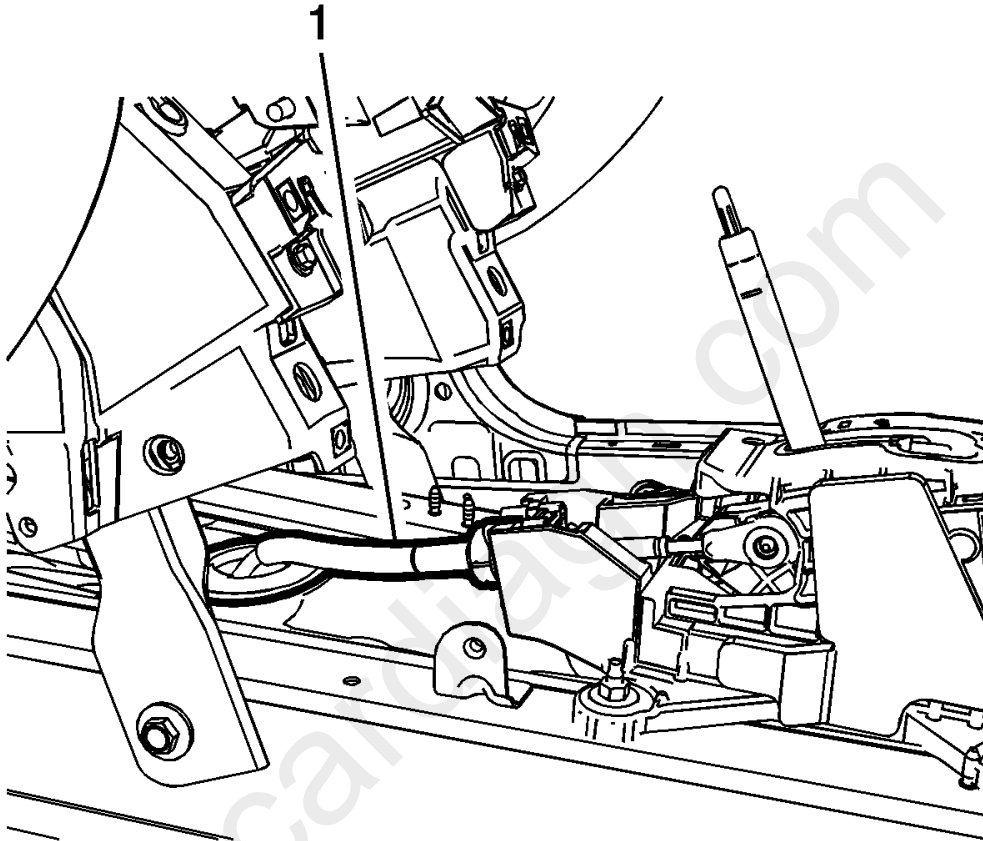


Fig. 16: Cable Assembly

Courtesy of GENERAL MOTORS COMPANY

NOTE: Mark the orientation of the grommet to the floor panel for installation.

7. Remove the grommet and cable assembly (1) from the floor panel.

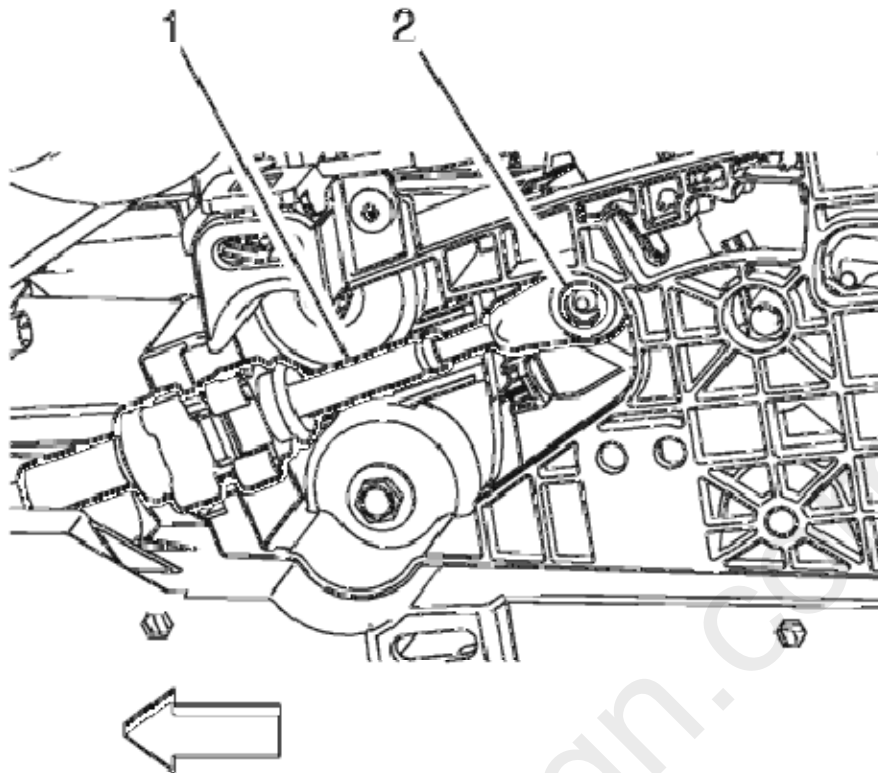


Fig. 17: Transmission Range Selector Lever Cable Retainer
Courtesy of GENERAL MOTORS COMPANY

8. Slide the transmission range selector lever cable retainer rearward (1) and remove the transmission range selector cable from the transmission control base.
9. Disconnect the transmission range selector lever cable terminal (2) from the shift lever pin.
10. Remove the transmission range selector lever cable from the vehicle.

Installation Procedure

1. Position the shift cable in the vehicle.

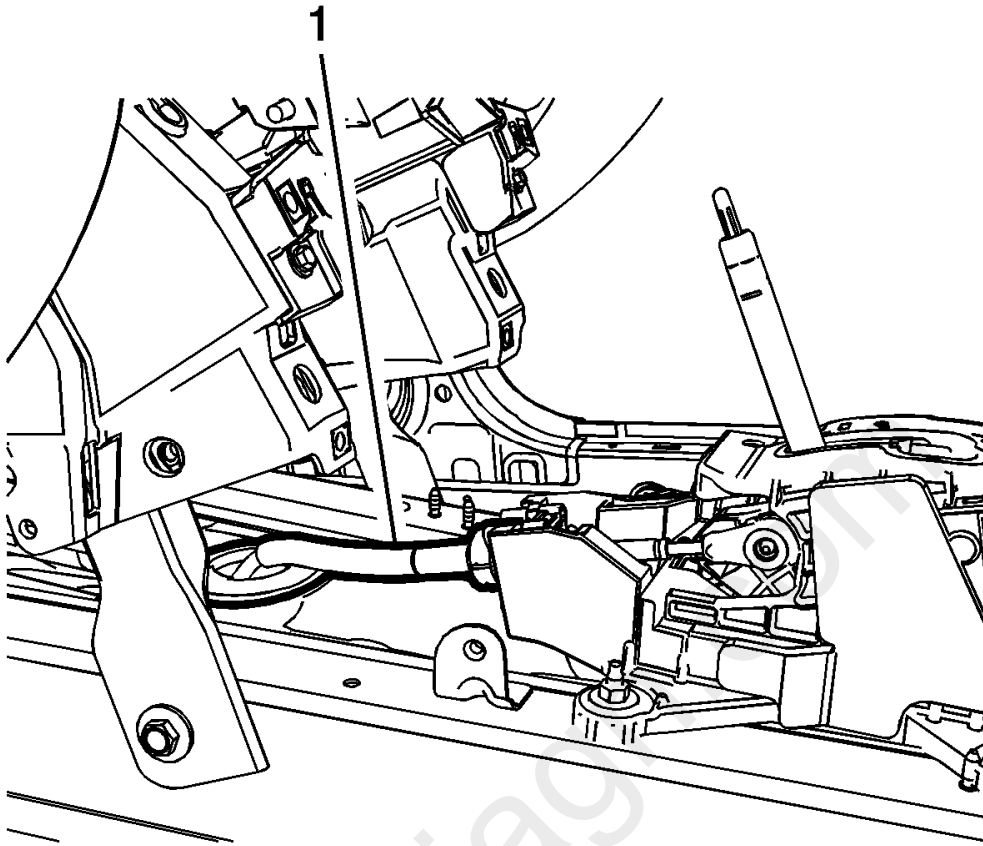


Fig. 18: Cable Assembly
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Ensure the grommet is properly oriented.**

2. Install the grommet and cable assembly (1) into the floor panel with alignment key opening.

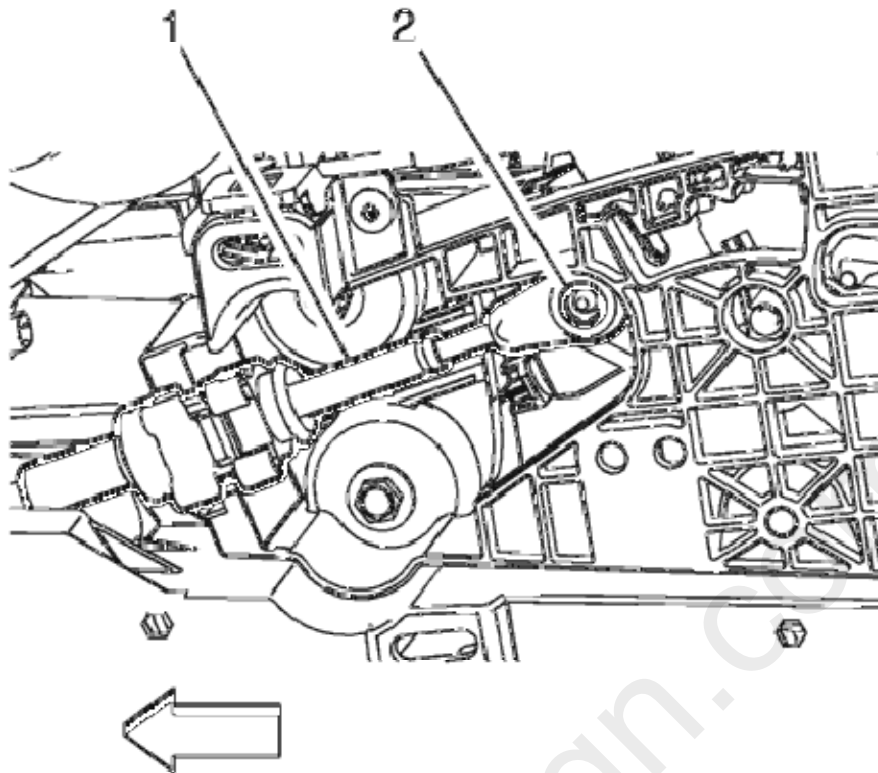


Fig. 19: Transmission Range Selector Lever Cable Retainer
Courtesy of GENERAL MOTORS COMPANY

3. Install the cable to the transmission control, then slide the transmission range selector lever cable retainer (1) forward to lock the transmission range selector cable to the transmission control base.
4. Connect the transmission range selector lever cable terminal (2) to the shift lever pin.
5. Install the front floor console. Refer to **Front Floor Lower Console Replacement** .
6. Raise the vehicle.
7. Position the cable to the transmission.

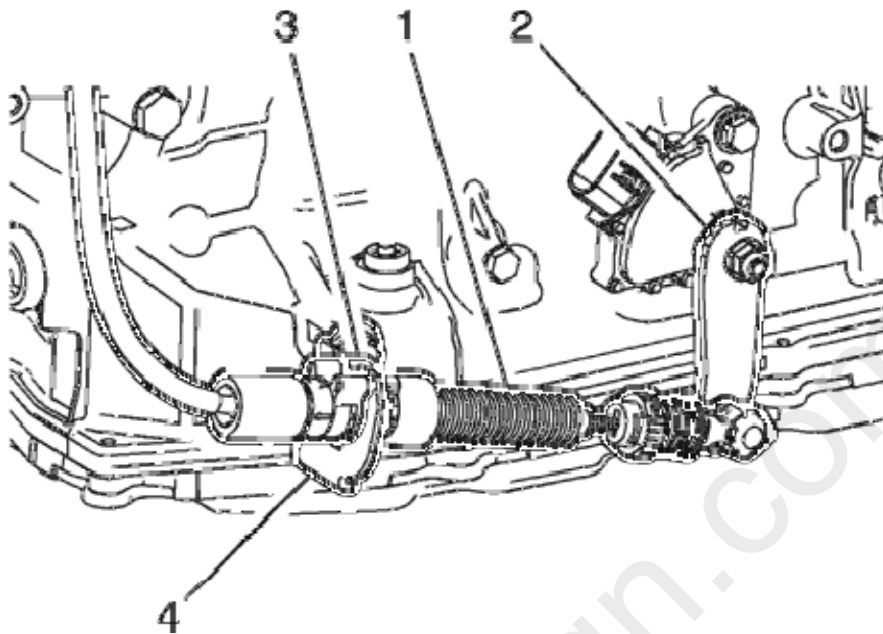


Fig. 20: Transmission Range Selector Lever Cable
Courtesy of GENERAL MOTORS COMPANY

8. Slide the retainer (3) rearward to lock the transmission range selector lever cable to the bracket (4).
9. Connect the transmission range selector lever cable terminal (1) to the transmission manual shift lever pin (2).
10. Adjust the cable. Refer to **Range Selector Lever Cable Adjustment**.

RANGE SELECTOR LEVER CABLE ADJUSTMENT

NOTE: **Adjust the automatic transmission range selector cable while the transmission and the gear selector are in the Park position only. Failure to do so may cause mis-adjustment.**

1. Set the park brake and chock the wheels.
2. Verify the transmission range select lever is in the park position.
3. Verify the transmission manual shift lever is in the park position.

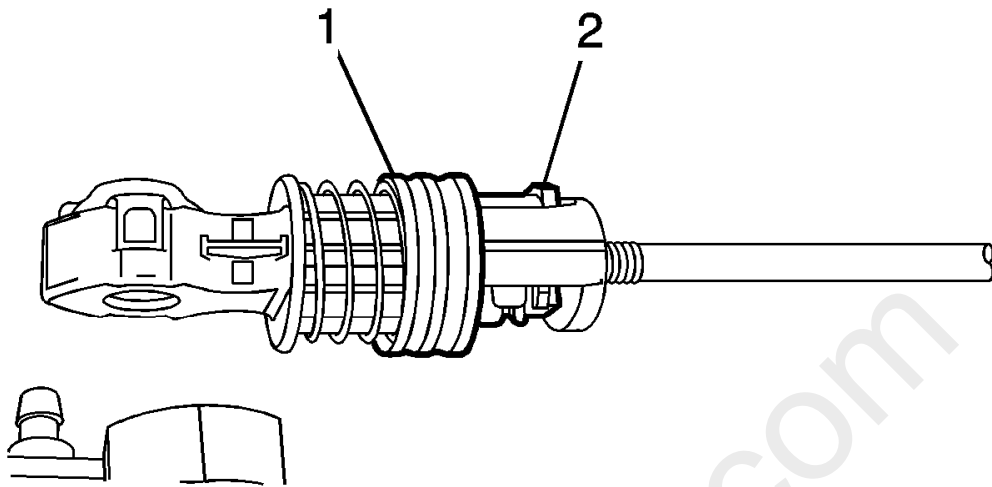


Fig. 21: Retaining Collar And Adjuster Clip
Courtesy of GENERAL MOTORS COMPANY

4. If installing a new cable, skip this step and go to the next step. Pull the retaining collar (1) forward, then release the range select cable adjuster clip (2) by pushing in on the adjuster clip from the backside.
5. Depress the adjuster clip (2) inboard, locking the adjuster clip completely.
6. Ensure that the cable adjuster clip (2) is secured with retaining collar covering the adjuster clip.
7. Check the transmission range select lever in all gear selections for proper operation.

TRANSMISSION CONTROL LEVER KNOB REPLACEMENT

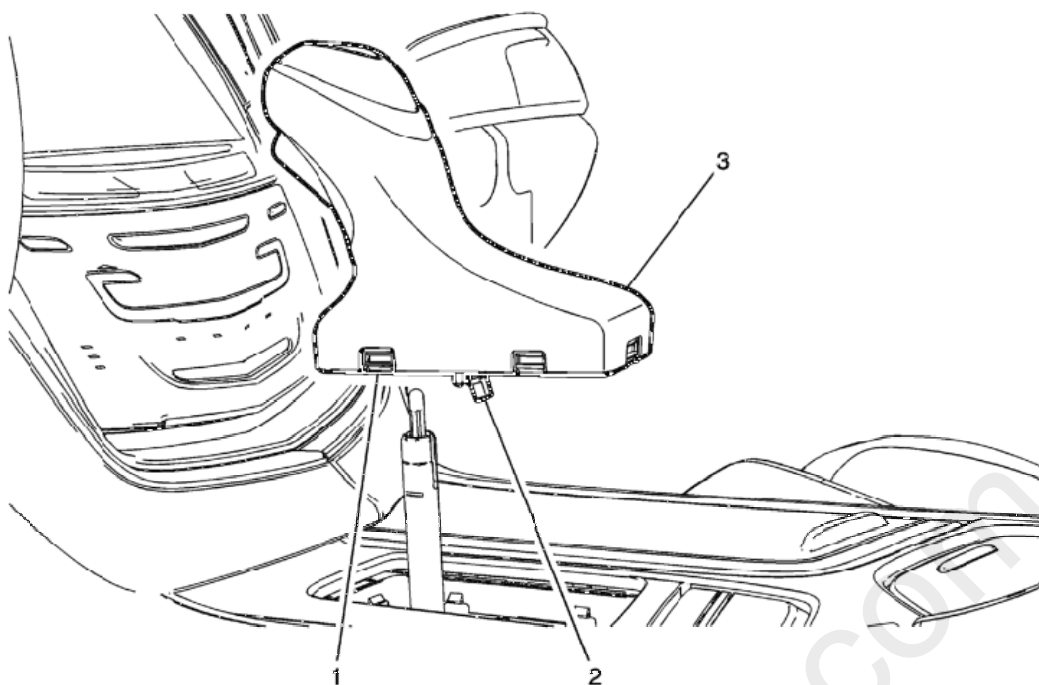


Fig. 22: Transmission Control Lever Knob
 Courtesy of GENERAL MOTORS COMPANY

Transmission Control Lever Knob Replacement

Callout	Component Name
1	Transmission Control Lever Knob Retainer (Qty: 6) Procedure Use a flat-bladed plastic trim tool in order to release the retainer clips securing the control lever boot. NOTE: Place the transmission control in the Neutral position.
2	Electrical Connector
3	Transmission Control Lever Knob NOTE: • The control lever boot and knob are replaced as an assembly. • To remove the knob, pull upward and twist.

TRANSMISSION CONTROL REPLACEMENT

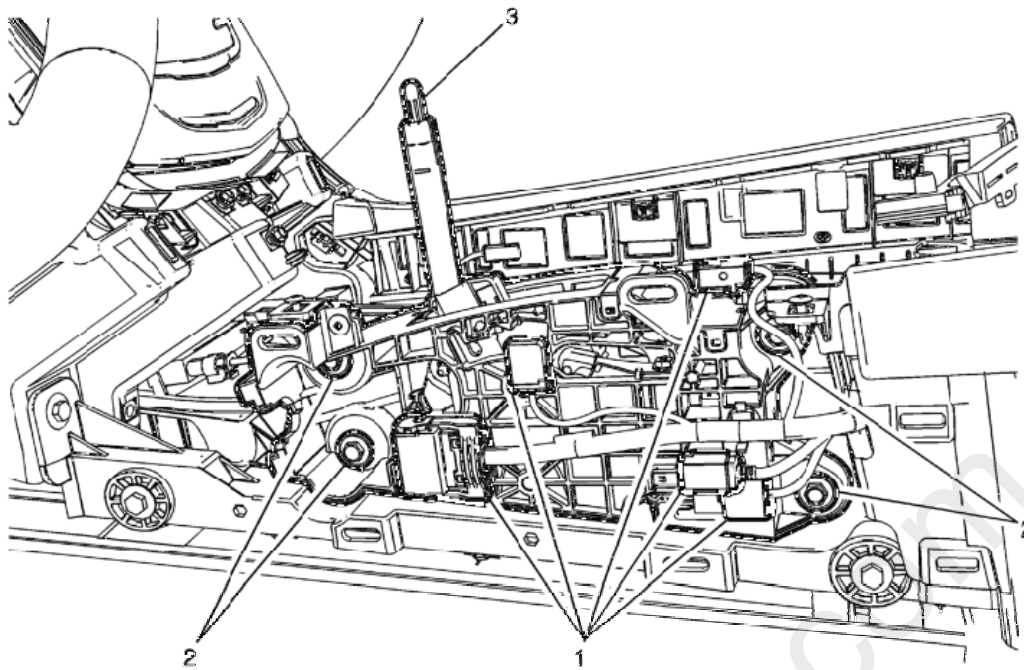


Fig. 23: Transmission Control
 Courtesy of GENERAL MOTORS COMPANY

Transmission Control Replacement

Callout	Component Name
Preliminary Procedures	
1. Remove the front floor console cup holder plate assembly. Refer to <u>Front Floor Console Cup Holder Plate Replacement</u> .	
1	Electrical Connector (Qty: 4)
2	Transmission Control Fasteners (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9 N.m (80 lb in)
3	Transmission Control

PARK/NEUTRAL POSITION SWITCH REPLACEMENT

Special Tools

- J - 45404 Alignment Tool, Neutral Safety

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Apply the parking brake.
2. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
3. Remove the transmission control lever from the manual shaft. Refer to **Automatic Transmission Range Selector Lever Replacement**.
4. Disconnect the electrical connector from the park/neutral position switch.

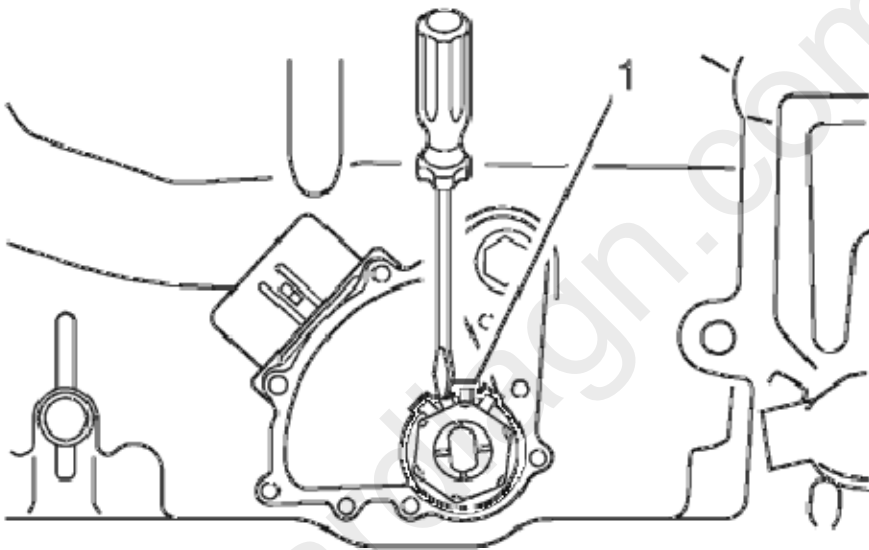


Fig. 24: Tabs On The Lock Washer
Courtesy of GENERAL MOTORS COMPANY

5. Using a flat bladed tool, pry up the 4 tabs on the lock washer (1).

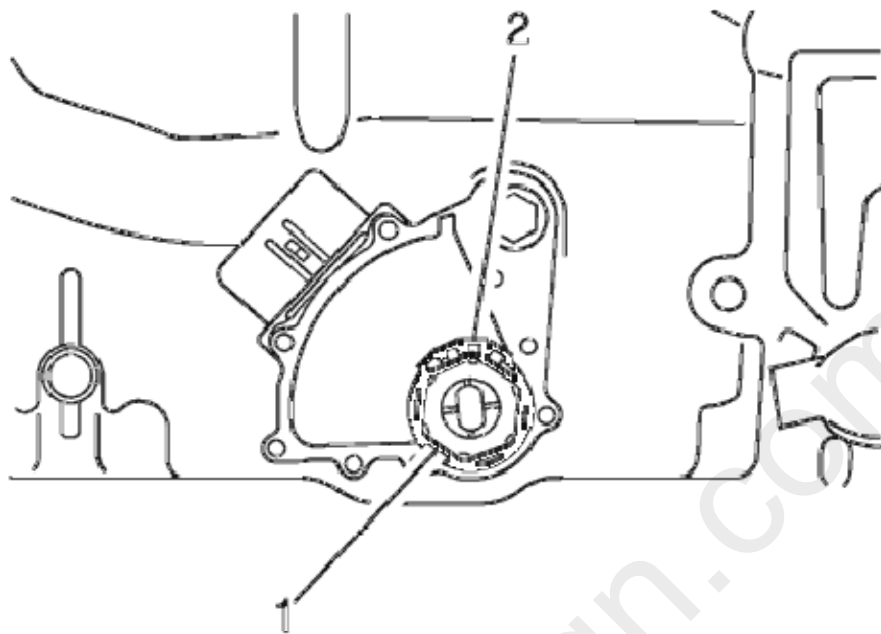


Fig. 25: Park/Neutral Position Switch Nut And Washer
Courtesy of GENERAL MOTORS COMPANY

6. Remove the nut (1) and washer (2) securing the park/neutral position switch to the transmission.

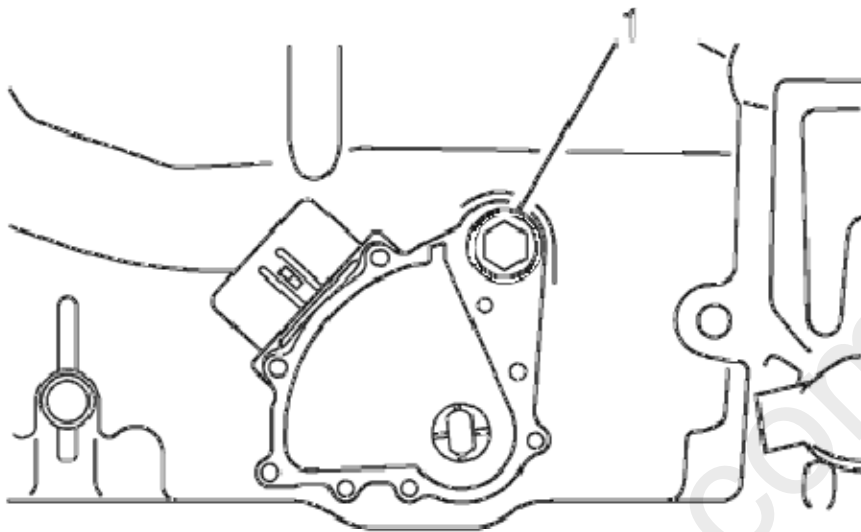


Fig. 26: Park/Neutral Position Switch Bolt
Courtesy of GENERAL MOTORS COMPANY

7. Remove the bolt (1) securing the park/neutral position switch to the transmission.

NOTE: If the switch does not slide off the manual shaft, the outer edge of the manual shift shaft may need to be filed to remove any burrs.

NOTE: Inspect the switch for cracking or damage. Replace the switch as necessary.

8. Remove the park/neutral back up switch from the manual shaft.

Installation Procedure

1. Position the park/neutral back up switch on the manual shaft.

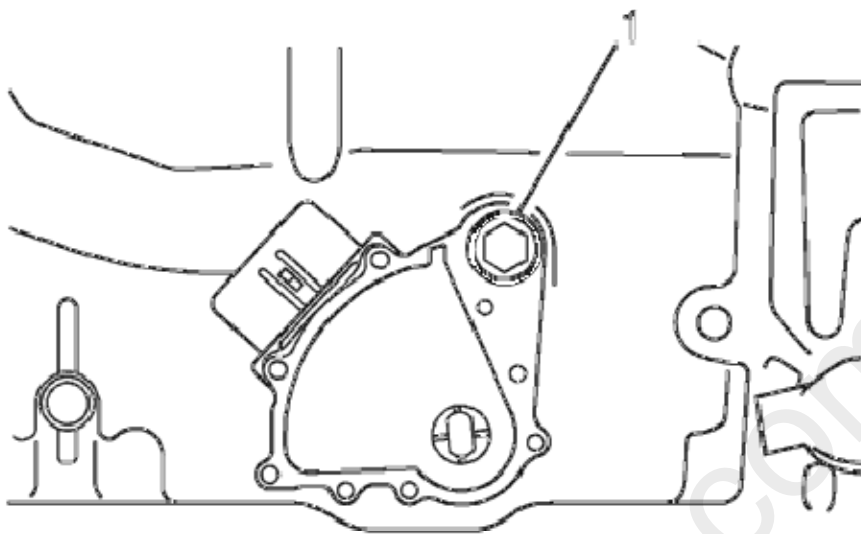


Fig. 27: Park/Neutral Position Switch Bolt
Courtesy of GENERAL MOTORS COMPANY

2. Loosely install the bolt (1) securing the park/neutral position switch to the transmission.

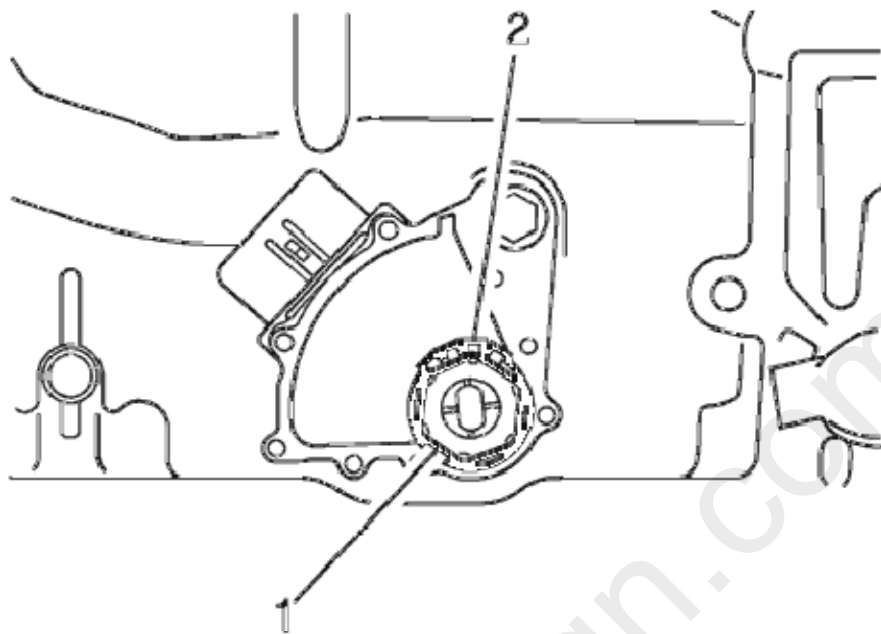


Fig. 28: Park/Neutral Position Switch Nut And Washer
Courtesy of GENERAL MOTORS COMPANY

3. Install a NEW lock washer (2) and loosely install the nut (1) securing the park/neutral position switch to the transmission.
4. Ensure the transmission manual shaft is in the NEUTRAL gear position.

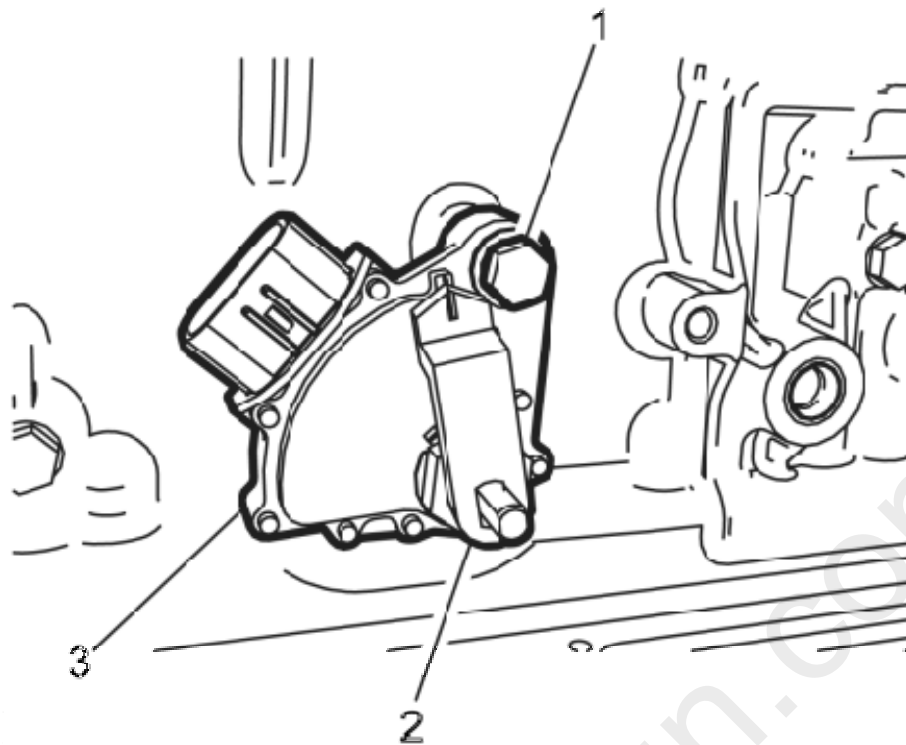


Fig. 29: Park/Neutral Position Switch
Courtesy of GENERAL MOTORS COMPANY

5. Install the J - 45404 Neutral Safety Alignment Tool (2).
6. Align the reference lines.

CAUTION: Refer to Fastener Caution .

7. Tighten the park/neutral position switch retaining bolt (1) to 13 (10 lb ft).
8. Remove the alignment tool.

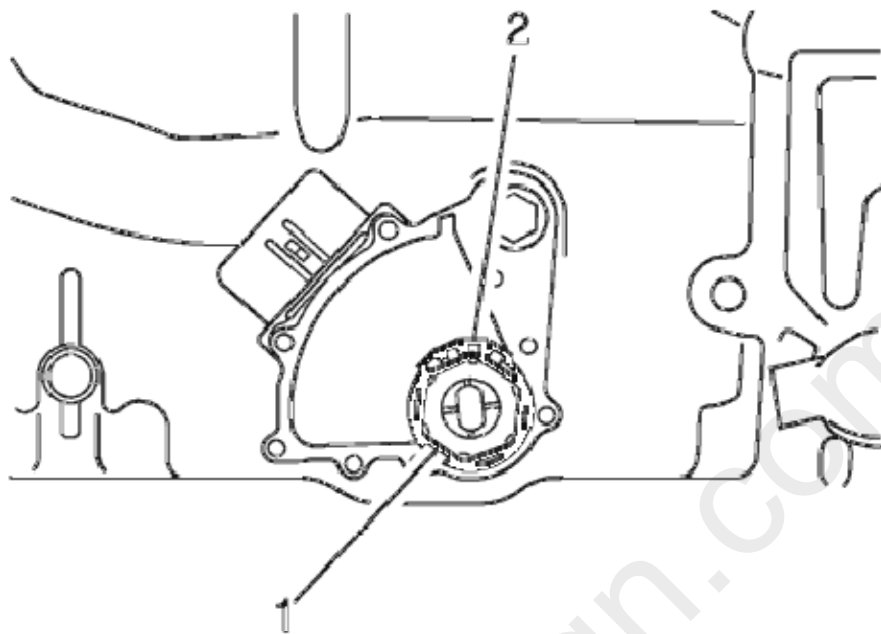


Fig. 30: Park/Neutral Position Switch Nut And Washer
Courtesy of GENERAL MOTORS COMPANY

9. Tighten the nut to 7 (62 lb in).

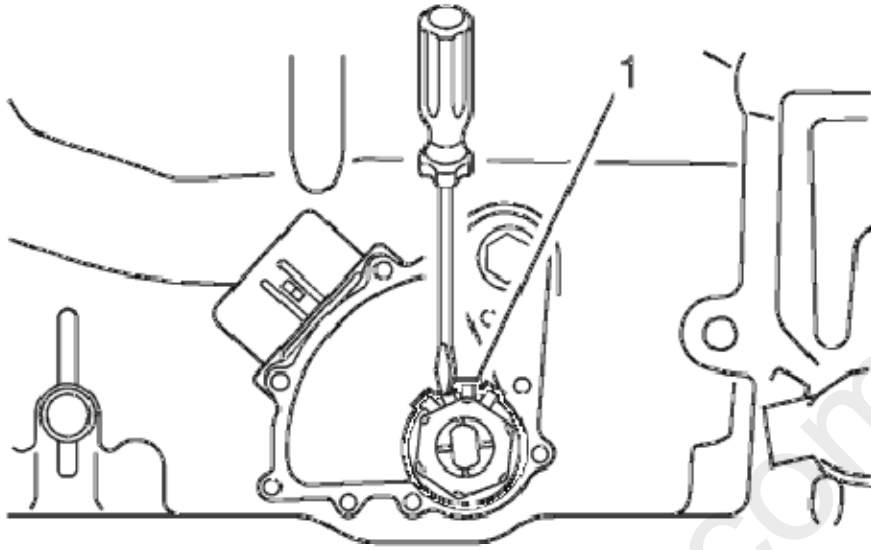


Fig. 31: Tabs On The Lock Washer
Courtesy of GENERAL MOTORS COMPANY

10. Using a flat bladed tool, push down the lock washer (1).
11. Install the transmission control lever to the manual shaft. Refer to **Automatic Transmission Range Selector Lever Replacement**.
12. Connect the electrical connector to the park/neutral position switch.
13. Lower the vehicle.
14. Check the switch for proper operation. The engine must start in the P (PARK) or N (NEUTRAL) positions only. If proper operation of the switch can not be obtained, replace the switch.

AUTOMATIC TRANSMISSION FLUID AND FILTER REPLACEMENT

Removal Procedure

CAUTION: When the transmission is at operating temperatures, take necessary precautions when removing the drain plug, to avoid being burned by draining fluid.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .

2. Place a drain pan under the transmission oil pan.

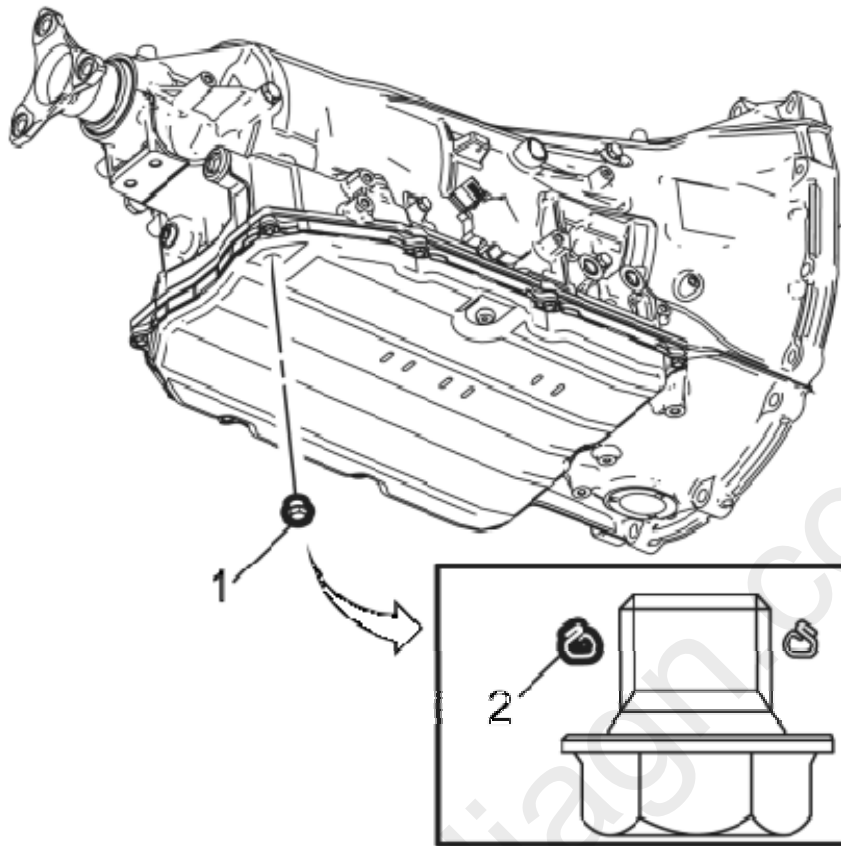


Fig. 32: Automatic Transmission Fluid Pan Drain Plug
Courtesy of GENERAL MOTORS COMPANY

3. Remove the drain plug (1), then remove and Discard the drain plug gasket (2).
4. Remove the oil pan. Refer to **Oil Pan Replacement**.

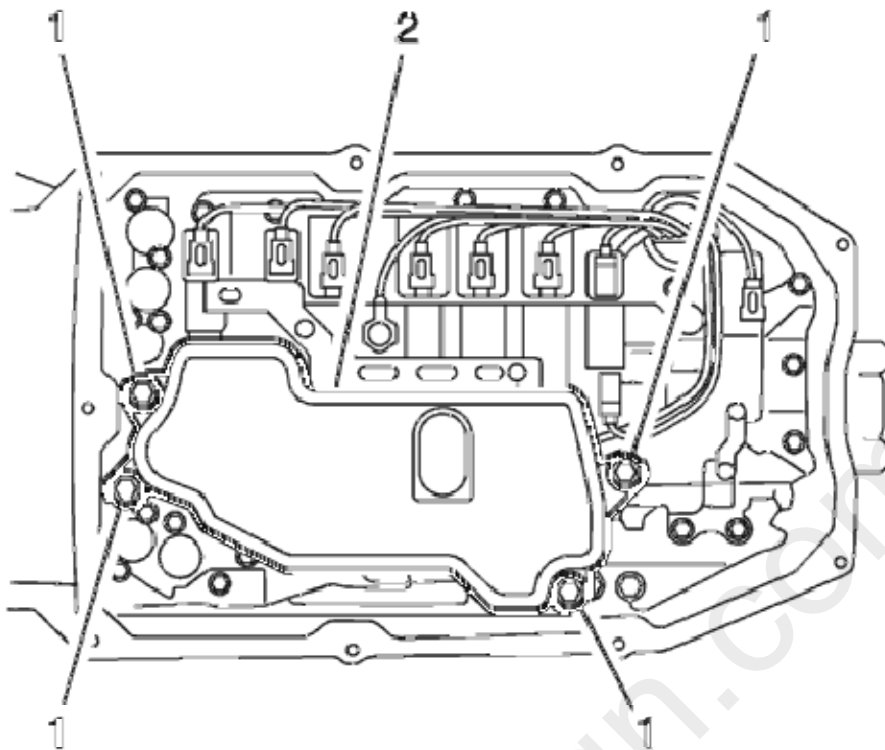


Fig. 33: Automatic Transmission Fluid Filter Retaining Bolts
Courtesy of GENERAL MOTORS COMPANY

5. Remove the four oil filter retaining bolts (1).
6. Grasp firmly while pulling down with a twisting motion in order to remove the filter (2).

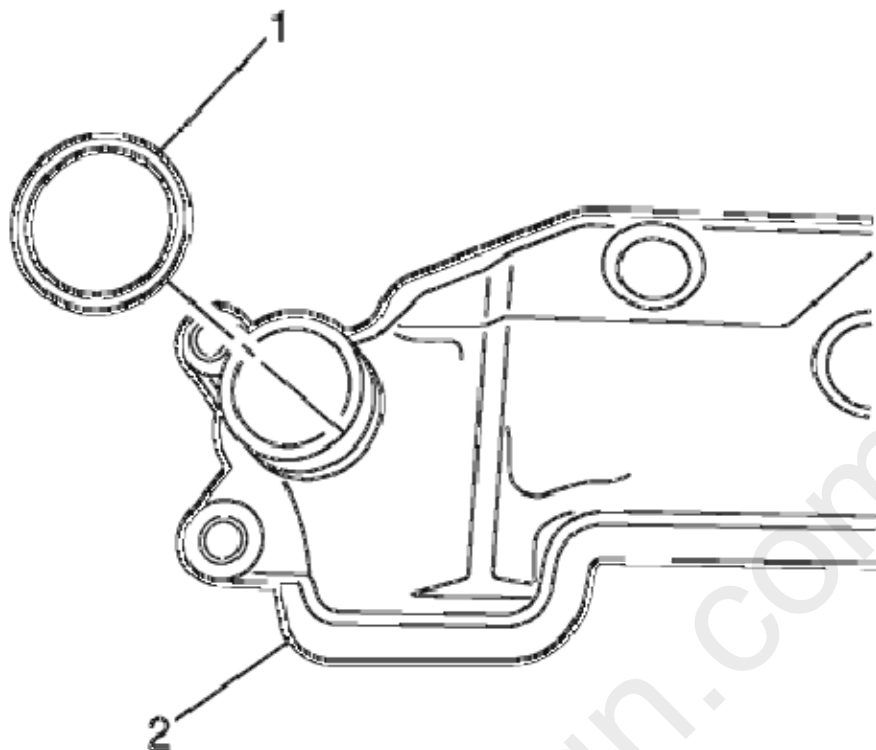


Fig. 34: Automatic Transmission Fluid Filter O-Ring
Courtesy of GENERAL MOTORS COMPANY

7. Remove and Discard the filter seal O-ring (1).
8. Clean the transmission case and the oil pan gasket surfaces.

Installation Procedure

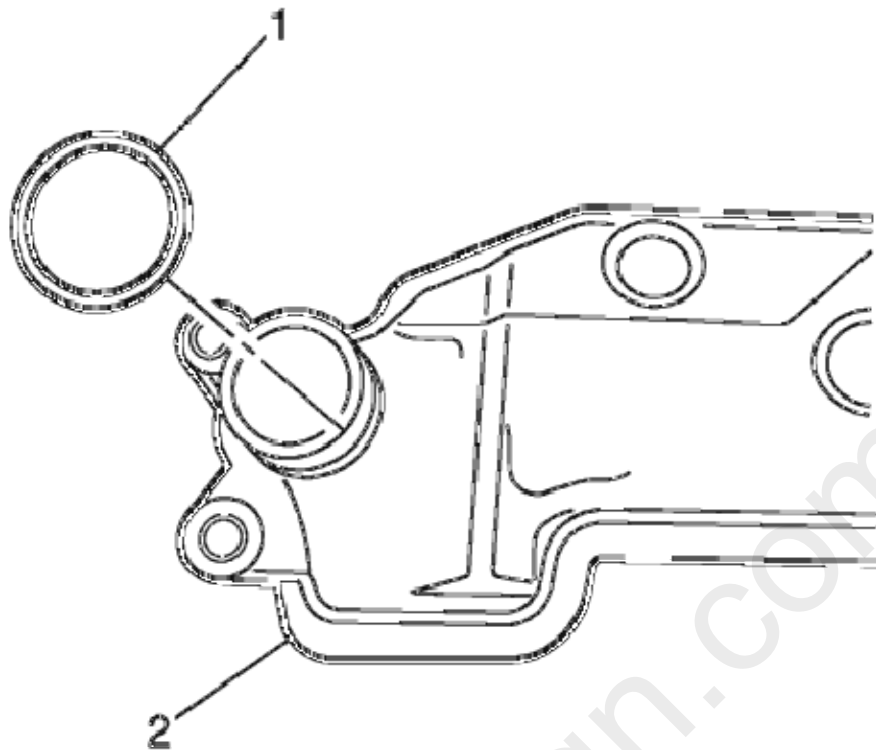


Fig. 35: Automatic Transmission Fluid Filter O-Ring
Courtesy of GENERAL MOTORS COMPANY

1. Coat the New filter seal O-ring (1) with ATF and install to the New oil filter (2).
2. Install the filter assembly into the transmission.

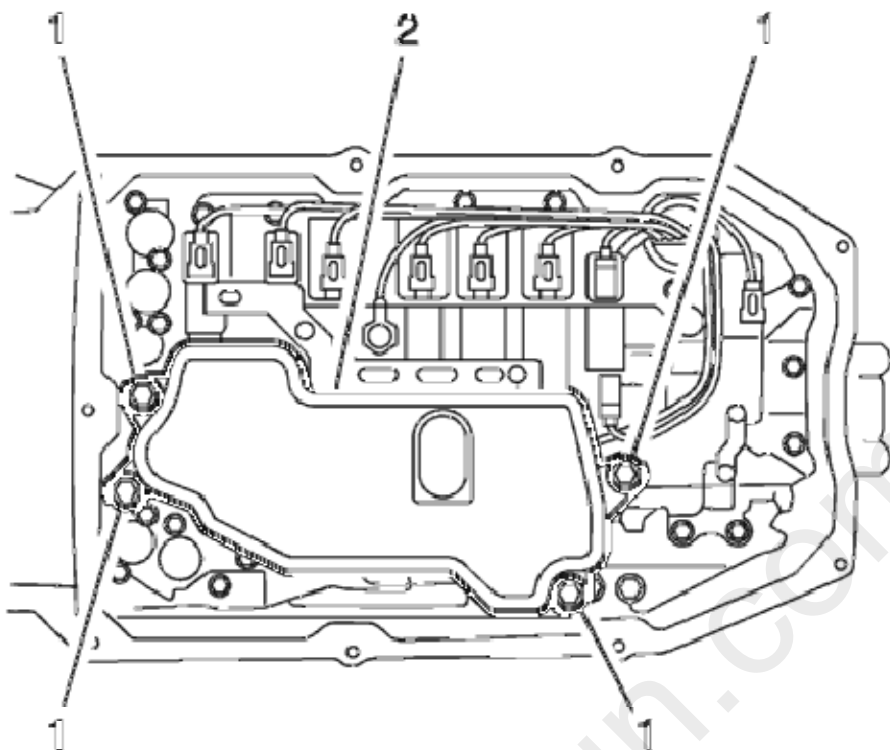


Fig. 36: Automatic Transmission Fluid Filter Retaining Bolts
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

3. Install the four oil filter retaining bolts (1) and tighten to 10 (89 lb in).
4. Install the oil pan. Refer to Oil Pan Replacement.

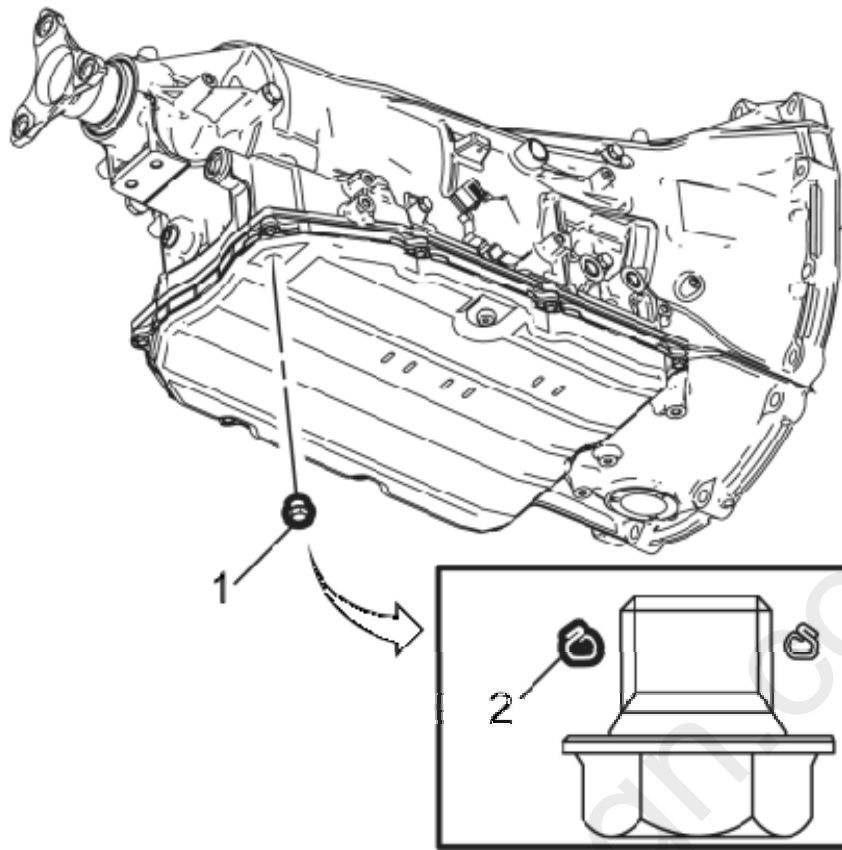


Fig. 37: Automatic Transmission Fluid Pan Drain Plug
Courtesy of GENERAL MOTORS COMPANY

5. Install the drain plug (1) with a New drain plug gasket (2), then tighten to 20 (15 lb ft).
6. Fill the transmission with fluid. Refer to **Transmission Fluid Level and Condition Check**.
7. Inspect the oil pan gasket for leaks.
8. Lower the vehicle.

AUTOMATIC TRANSMISSION FLUID PRESSURE TEST HOLE PLUG REPLACEMENT

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. If equipped with all wheel drive, remove the front propeller shaft. Refer to **Front Axle Propeller Shaft Replacement** .

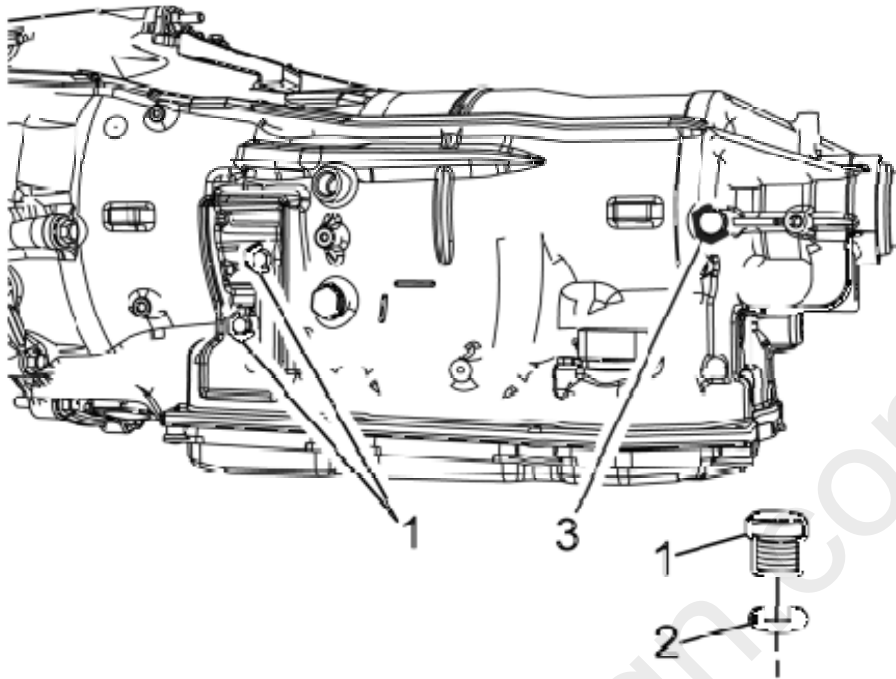


Fig. 38: Automatic Transmission Fluid Pressure Test Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

3. Clean the surrounding area of the fluid pressure test plugs.
4. Remove the oil pressure test plugs (1, 3) and discard the seals as necessary.

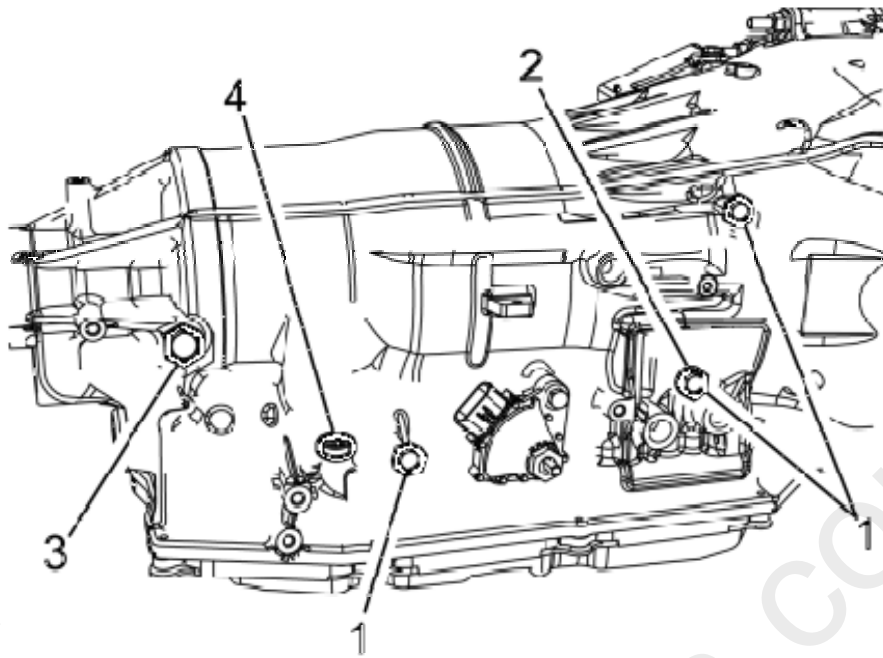


Fig. 39: Automatic Transmission Fluid Pressure Test Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

5. Clean the surrounding area of the fluid pressure test plugs.
6. Remove the oil pressure test plugs (1, 3, 4) and discard the seals as necessary.

Installation Procedure

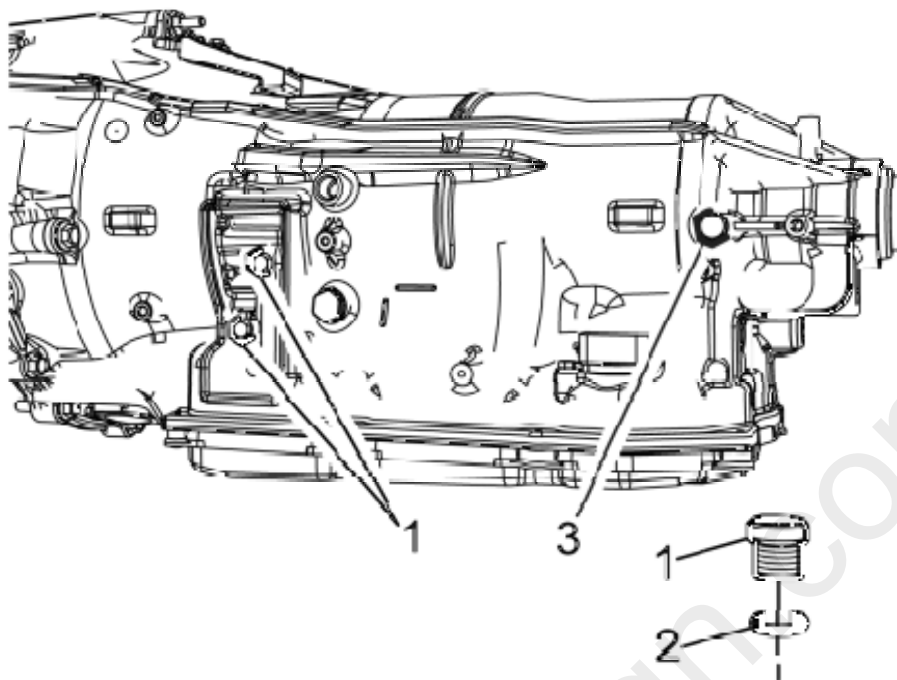


Fig. 40: Automatic Transmission Fluid Pressure Test Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

1. Install the fluid pressure test plugs (1) with NEW seal (2) and tighten to 7 (62 lb in).
2. Install the fluid pressure test plugs (3) with NEW seals and tighten to 11 (97 lb in).

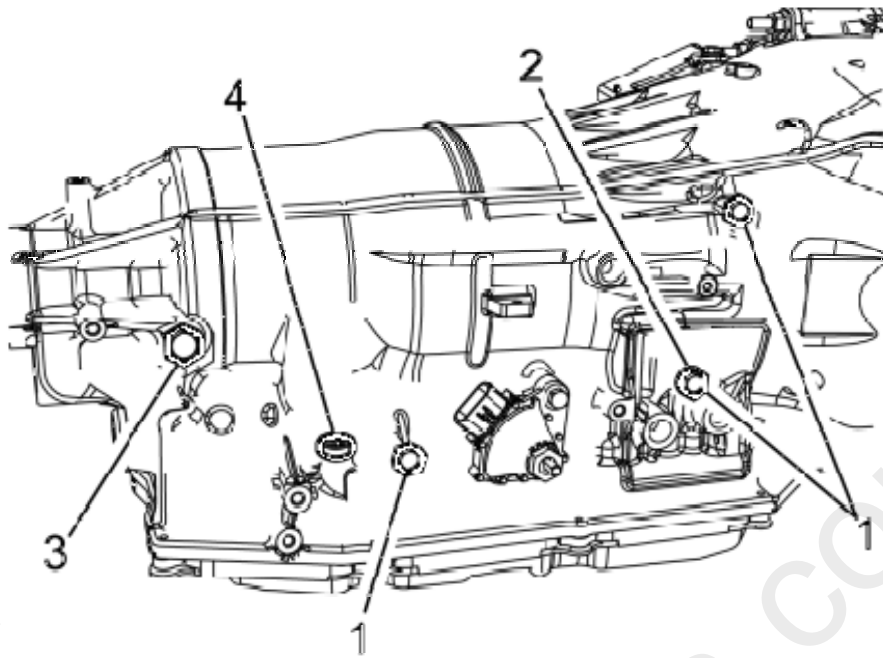


Fig. 41: Automatic Transmission Fluid Pressure Test Hole Plugs
Courtesy of GENERAL MOTORS COMPANY

3. Install the fluid pressure test plugs (1) with NEW seals and tighten to 7 (62 lb in).
4. Install the fluid pressure test plugs (3) with NEW seals and tighten to 11 (97 lb in).
5. Install the fluid pressure test plug (4) with a NEW seals and tighten to 40 (30 lb ft).
6. If equipped with all wheel drive, install the front propeller shaft. Refer to **Front Axle Propeller Shaft Replacement** .
7. Check the transmission fluid level and fill if necessary. Refer to **Transmission Fluid Level and Condition Check**, and **Transmission Fluid Fill Procedure**.
8. Lower the vehicle.

TRANSMISSION CASE PLUG REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .

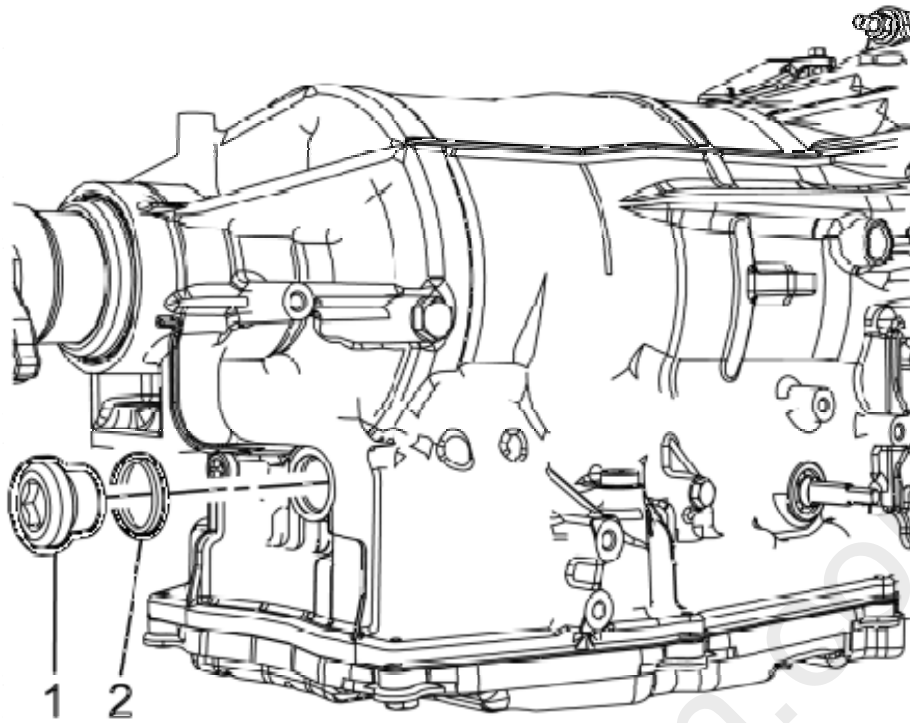


Fig. 42: Transmission Case Plug And Seal
Courtesy of GENERAL MOTORS COMPANY

2. Clean the surrounding area of the transmission case plug (1).
3. Remove the transmission case plug (1) and DISCARD the seal (2).

Installation Procedure

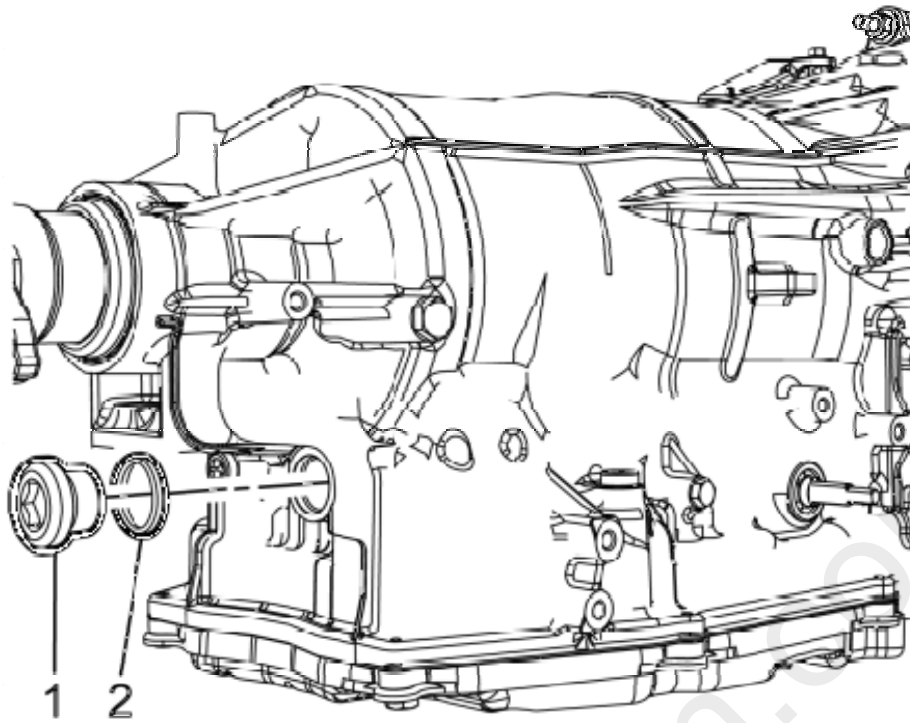


Fig. 43: Transmission Case Plug And Seal
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Component Fastener Tightening Caution .

1. Install the transmission case plug (1) and NEW seal (2) and tighten to 80 (59 lb ft).
2. Check the transmission fluid level , and fill if necessary. Refer to Transmission Fluid Fill Procedure, and Transmission Fluid Level and Condition Check.
3. Lower the vehicle.

TRANSMISSION VENT REPLACEMENT

Removal Procedure

1. Remove the intake manifold insulator. Refer to Intake Manifold Insulator Replacement .

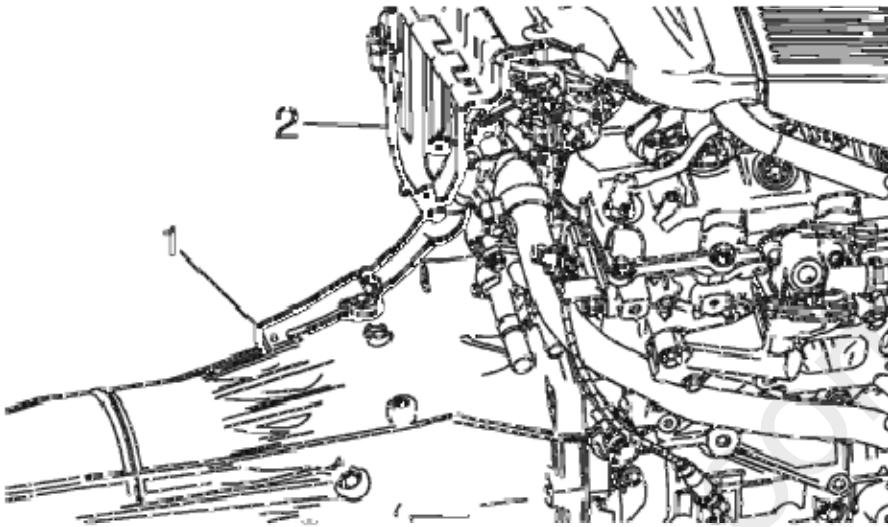


Fig. 44: Transmission Vent

Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the transmission vent hose assembly (1) from the engine compartment bracket (2).
3. Remove the transmission from the vehicle. Refer to **Transmission Replacement**.

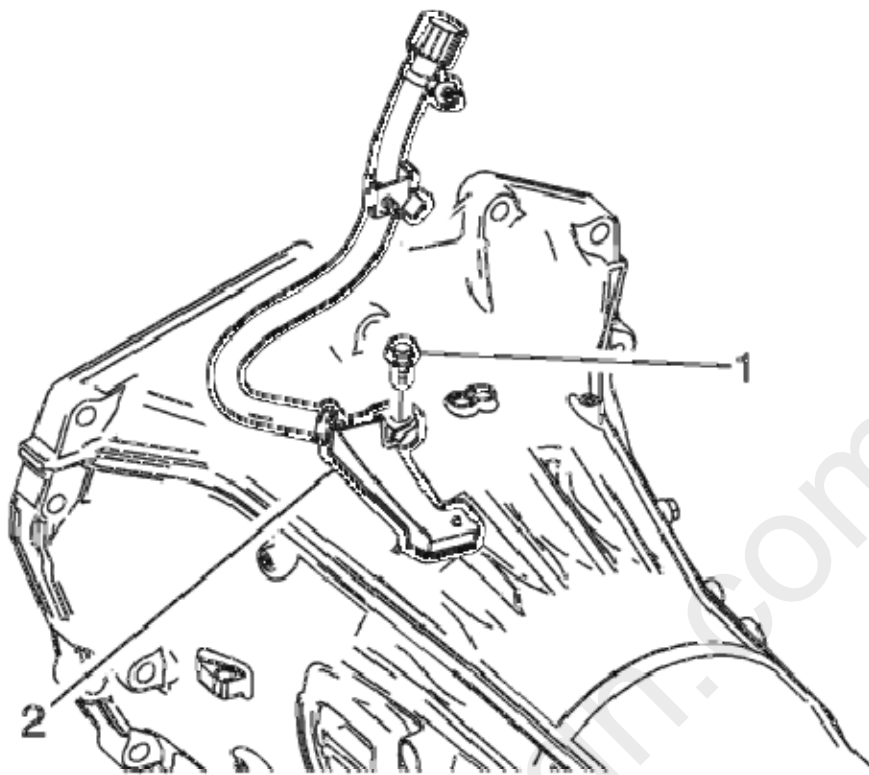


Fig. 45: Transmission Vent Hose Assembly Retaining Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Remove the transmission vent hose assembly retaining bolt (1) from the transmission.
5. Slide the transmission vent hose assembly (2) rearward, then remove the vent hose assembly from the vehicle.

Installation Procedure

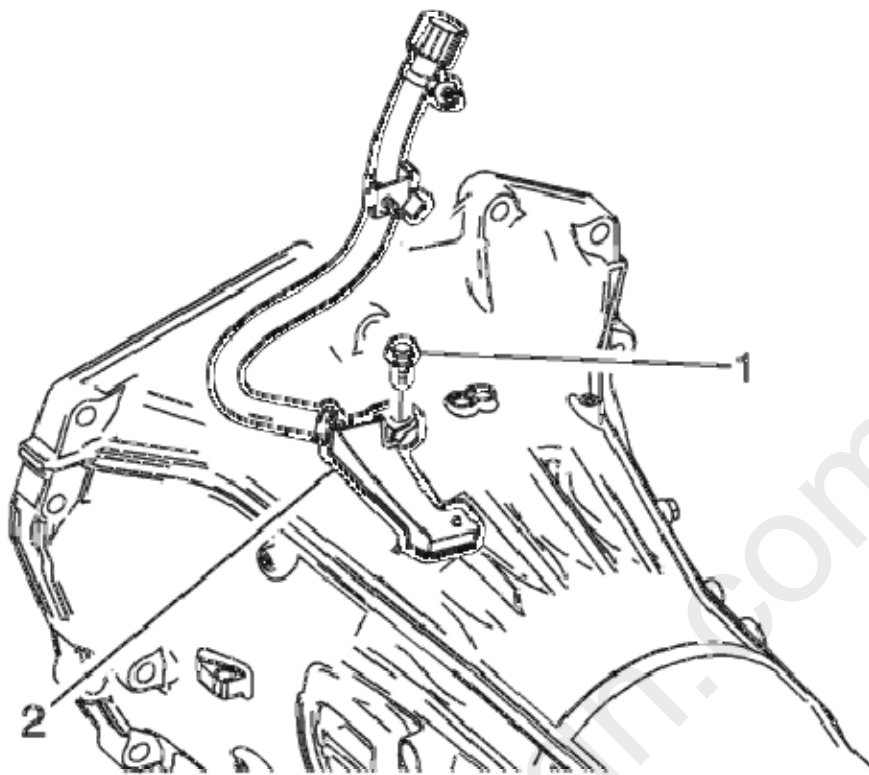


Fig. 46: Transmission Vent Hose Assembly Retaining Bolt
Courtesy of GENERAL MOTORS COMPANY

1. Slide the transmission vent hose assembly (2) forward to position the vent hose assembly to the transmission.

CAUTION: Refer to Fastener Caution .

2. Install the transmission vent hose assembly retaining bolt (1) and tighten to 6 (53 lb in).
3. Install the transmission to the vehicle. Refer to **Transmission Replacement**.

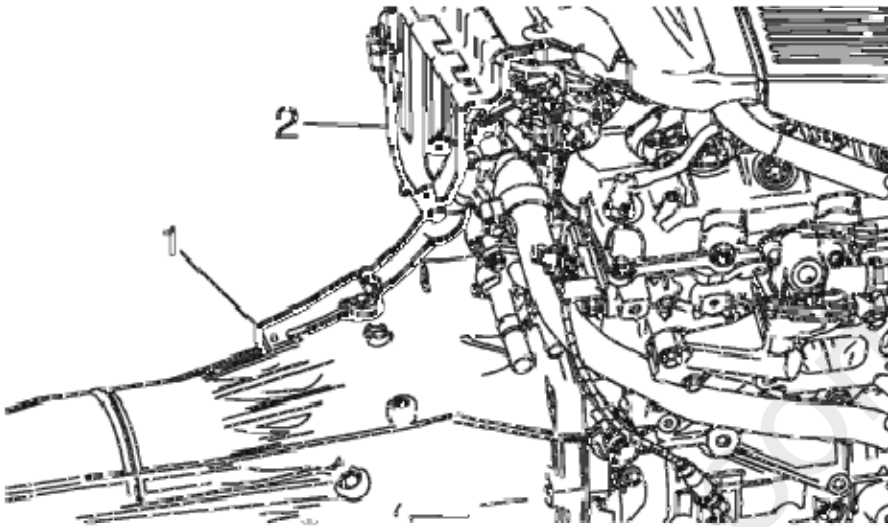


Fig. 47: Transmission Vent

Courtesy of GENERAL MOTORS COMPANY

NOTE: Ensure the vent hoses are free of kinks and routed clear of sharp objects.

4. Connect the transmission vent hose assembly (1) to the engine compartment bracket (2).
5. Install the intake manifold insulator. Refer to **Intake Manifold Insulator Replacement** .

TORQUE CONVERTER ASSEMBLY REPLACEMENT

Removal Procedure

1. Remove the transmission. Refer to **Transmission Replacement**.

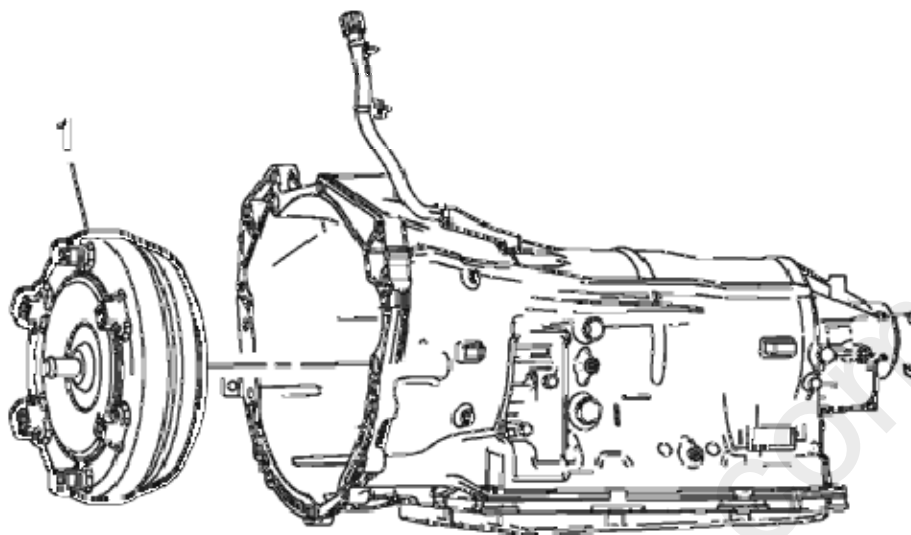


Fig. 48: Torque Converter Assembly
Courtesy of GENERAL MOTORS COMPANY

2. Carefully remove the torque converter from the transmission.

Installation Procedure

1. Using a flat bladed tool, center the drive gear in the oil pump assembly.

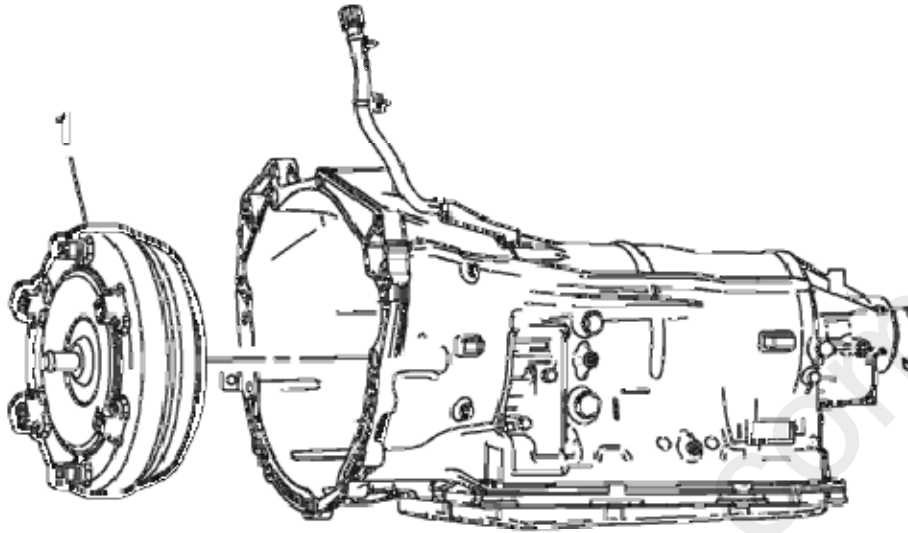


Fig. 49: Torque Converter Assembly
Courtesy of GENERAL MOTORS COMPANY

2. Carefully install the torque converter to the transmission.

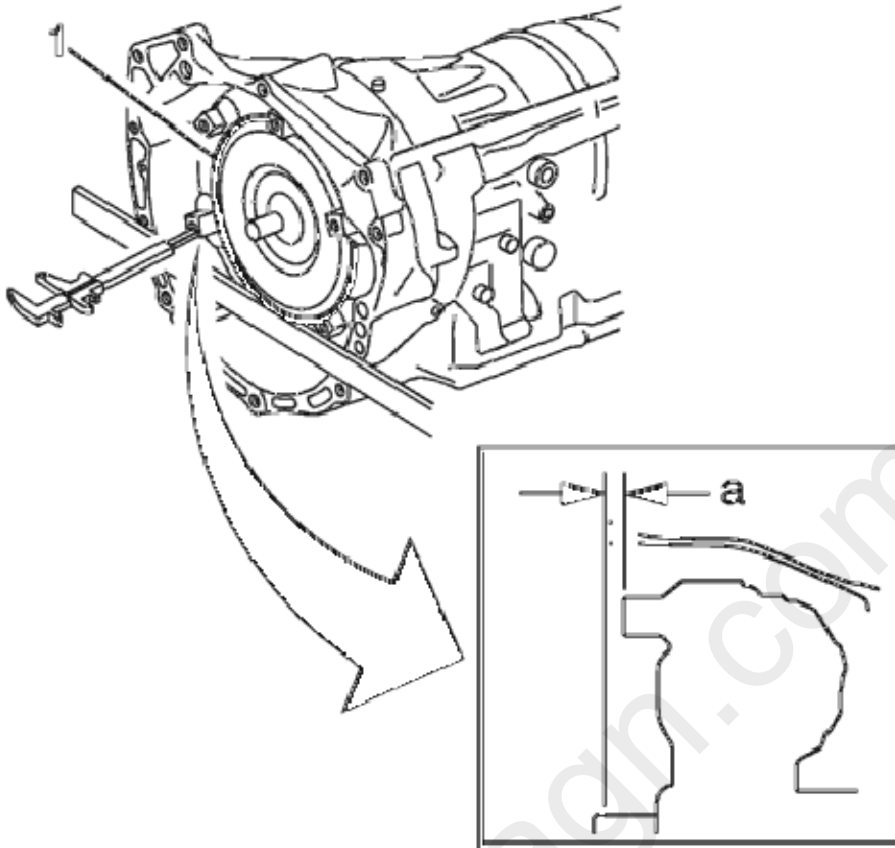


Fig. 50: Measuring Torque Converter Distance A
 Courtesy of GENERAL MOTORS COMPANY

3. Measure the distance A. The installed depth of the torque converter should be at least 10.57 mm (0.416 in).
4. Install the transmission. Refer to **Transmission Replacement**.

TORQUE CONVERTER FLUID SEAL REPLACEMENT

Special Tools

- **DT-5590** Torque Converter Seal Installer Driver
- **DT-6125-1B** Slide Hammer
- **DT-23129** Universal Seal Remover
- **DT-51262** Torque Converter Seal Installer

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Remove the torque converter. Refer to **Torque Converter Assembly Replacement**.

2. Use **DT-23129** universal seal remover and **DT-6125-1B** slide hammer to remove the torque converter seal from the transmission.

Installation Procedure

NOTE: **DT-51262 torque converter seal installer is included in the Torque Converter Seal Kit. It is not necessary to order the tool from Bosch Service Solutions.**

1. Install the torque converter seal using **DT-51262** torque converter seal installer and **DT-5590** torque converter seal installer driver .
2. Install the torque converter to the transmission. Refer to **Torque Converter Assembly Replacement.**

OUTPUT SHAFT SEAL REPLACEMENT

Special Tools

- **DT-22828** Rear Output Shaft Seal Installer Driver
- **DT-51206** Output Shaft Seal Installer
- **J-6125-1B** Slide Hammer
- **J-36825-A** Output Shaft Oil Seal Remover

For equivalent regional tools, refer to **Special Tools.**

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle .**
2. Place a drain pan under the rear of the transmission.
3. Remove the propeller shaft. Refer to **Two-Piece Propeller Shaft Replacement (LFX, LF3) , Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW) .**
4. Remove the propeller shaft transmission flange. Refer to **Propeller Shaft Transmission Flange Replacement.**
5. Remove the output shaft seal using **J-36825-A** output shaft oil seal remover and **J-6125-1B** slide hammer.

Installation Procedure

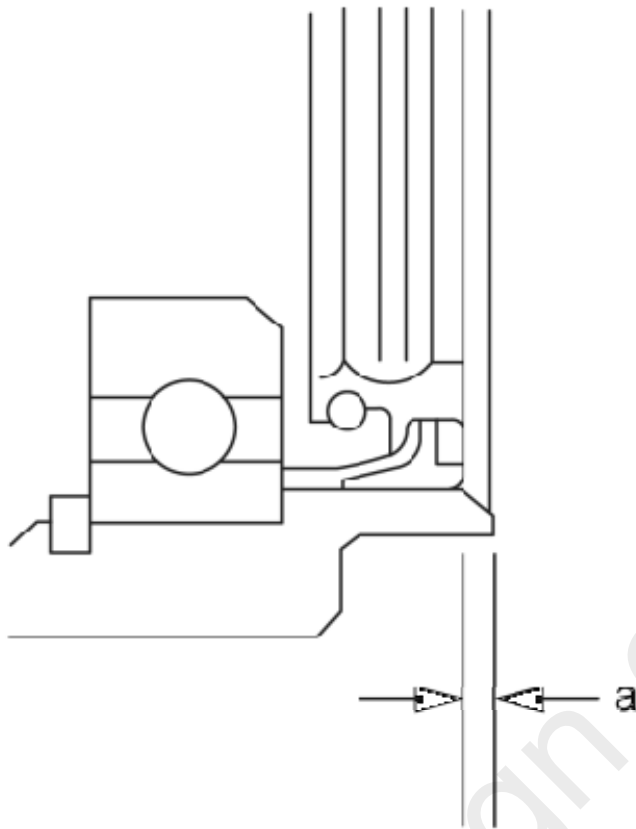


Fig. 51: Output Shaft Seal Installation Dimension
 Courtesy of GENERAL MOTORS COMPANY

NOTE:

- Dimension "a" is 3.5 mm (0.1377 in) is from the end of the transmission case (1).
- DT-51206 output shaft seal installer is included in the Output Shaft Seal Kit. It is not necessary to order the tool from Bosch Service Solutions.

1. Use the **DT-51206** output shaft seal installer and **DT-22828** rear output shaft seal installer driver to install the seal.
2. Lubricate the inside diameter of the new seal with transmission fluid.
3. Install the propeller shaft transmission flange. Refer to **Propeller Shaft Transmission Flange Replacement**.
4. Install the propeller shaft. Refer to **Two-Piece Propeller Shaft Replacement (LFX, LF3)** , **Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)** .
5. Remove the drain pan and lower the vehicle.
6. Fill the transmission to the proper level with transmission fluid. Refer to **Transmission Fluid Level and Condition Check**.

MANUAL SHIFT SHAFT SEAL REPLACEMENT

Removal Procedure

1. Remove the automatic transmission range selector lever. Refer to **Automatic Transmission Range Selector Lever Replacement**.
2. Remove the park/neutral switch from the transmission. Refer to **Park/Neutral Position Switch Replacement**.

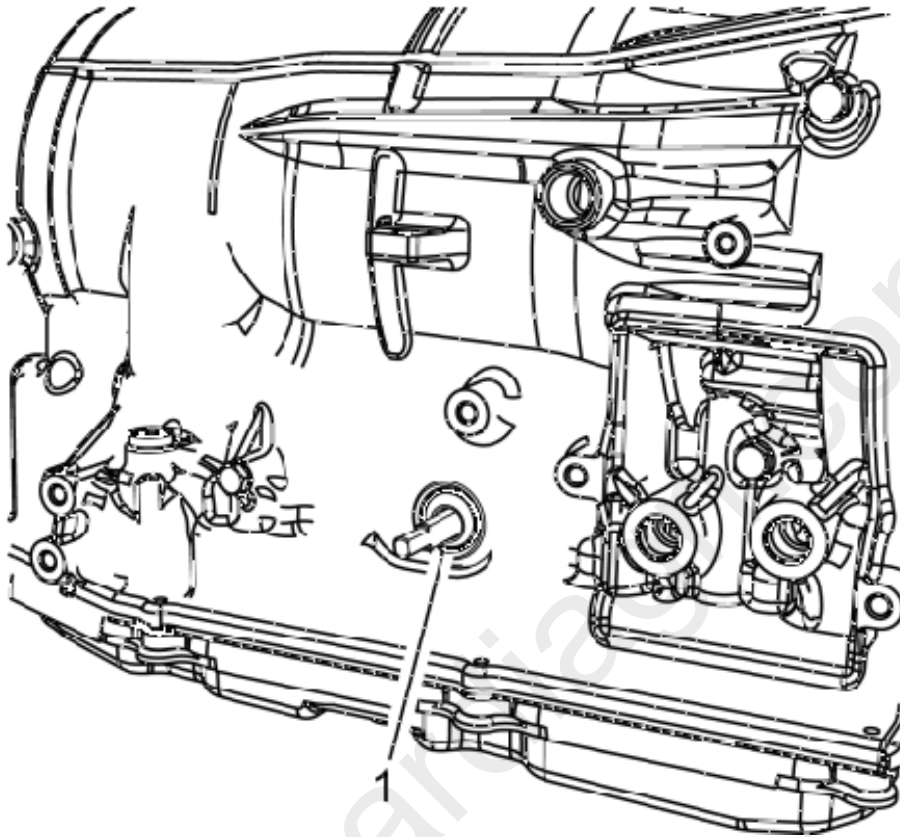


Fig. 52: Manual Shift Shaft Seal
Courtesy of GENERAL MOTORS COMPANY

3. Remove the manual shaft seal (1) from the transmission, using a seal pick or similar tool.

Installation Procedure

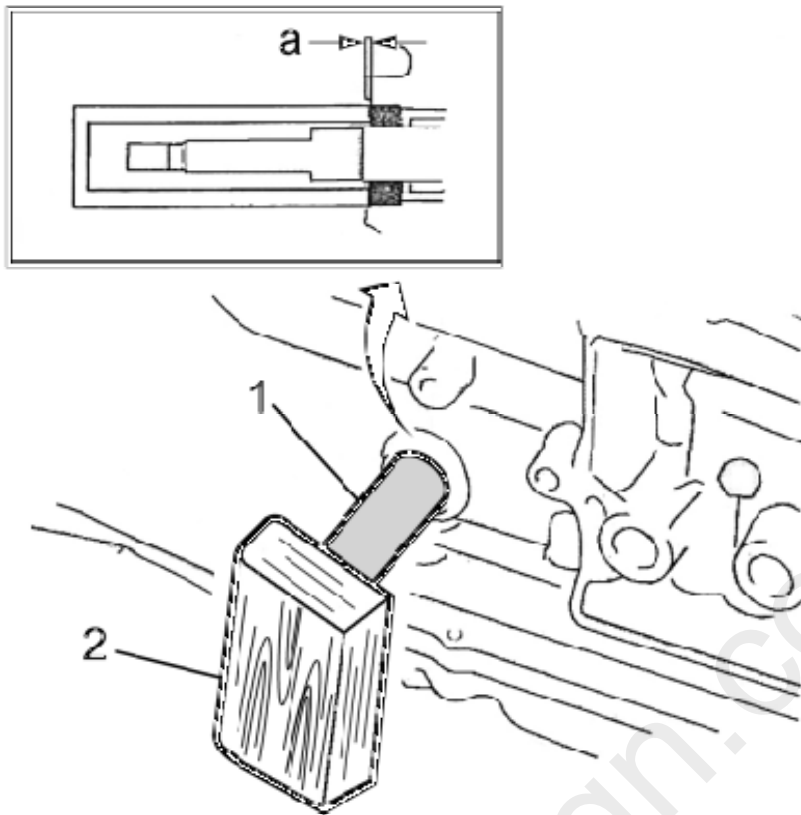


Fig. 53: Manual Shift Shaft Seal Installation Dimension
 Courtesy of GENERAL MOTORS COMPANY

NOTE: Dimension "a" is $0 - \pm 0.3 \text{ mm}$ (0.0011 in) to the transmission case surface.

1. Using a suitable socket (1) or equivalent and a block of wood (2), wedge the block of wood between the vehicle underbody and socket to push the manual shaft seal to the depth of dimension "a" into the transmission case.
2. Install the park/neutral switch to the transmission. Refer to **Park/Neutral Position Switch Replacement**.
3. Install the automatic transmission range selector lever. Refer to **Automatic Transmission Range Selector Lever Replacement**.

MANUAL SHIFT SHAFT REPLACEMENT

Removal Procedure

1. Remove the Park/Neutral Position (PNP) switch. Refer to **Park/Neutral Position Switch Replacement**.
2. Remove the valve body from the transmission. Refer to **Control Valve Body Replacement**.

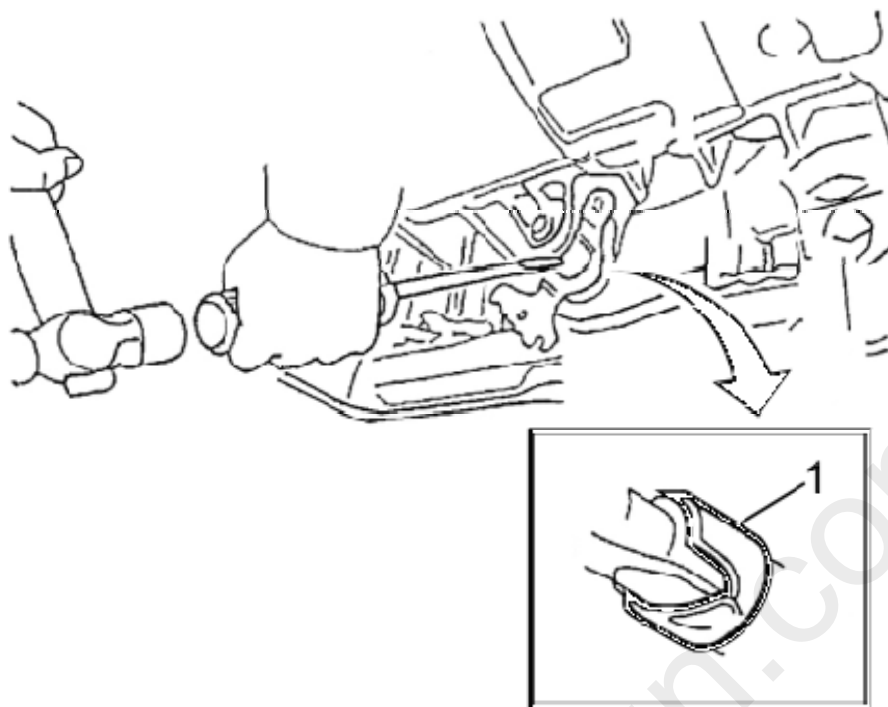


Fig. 54: Manual Shift Shaft Washer
Courtesy of GENERAL MOTORS COMPANY

NOTE: The manual shift shaft washer (1) is very thin and does not require much force to cut it apart.

3. Remove the manual shift shaft washer, using a small chisel and a hammer. DISCARD the washer.

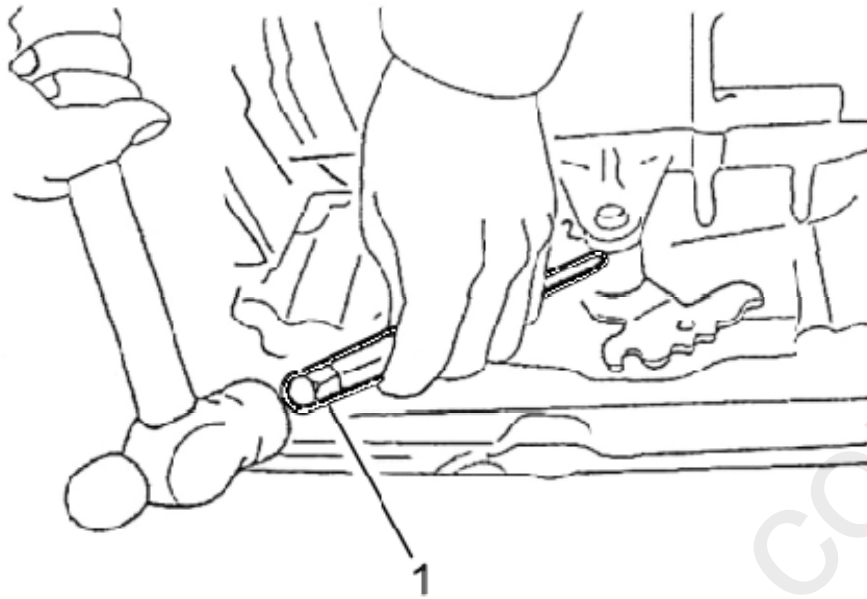


Fig. 55: Manual Shift Shaft Pin

Courtesy of GENERAL MOTORS COMPANY

4. Remove the manual shift shaft pin, using a punch (1) and a hammer.

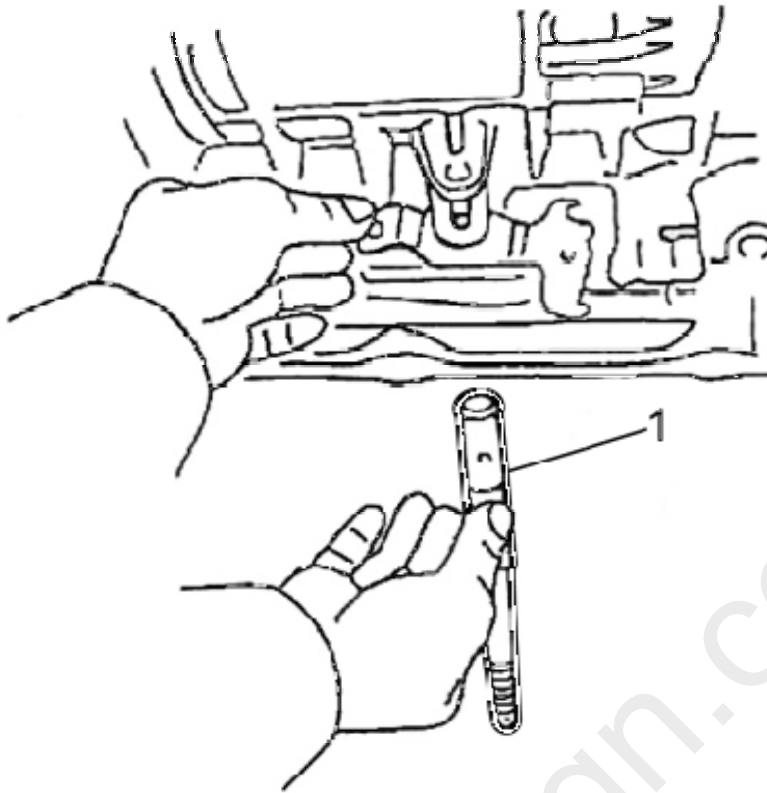


Fig. 56: Manual Shift Shaft Pin

Courtesy of GENERAL MOTORS COMPANY

5. Remove the manual shift shaft (1) from the transmission.
6. Remove the manual shift shaft seal and DISCARD the seal.

Installation Procedure

1. Install the manual shaft seal, using a suitable socket or equivalent to install the seal to a depth of 0 to $\pm$ 0.3 mm (0 - 0.011 in) to the transmission surface.

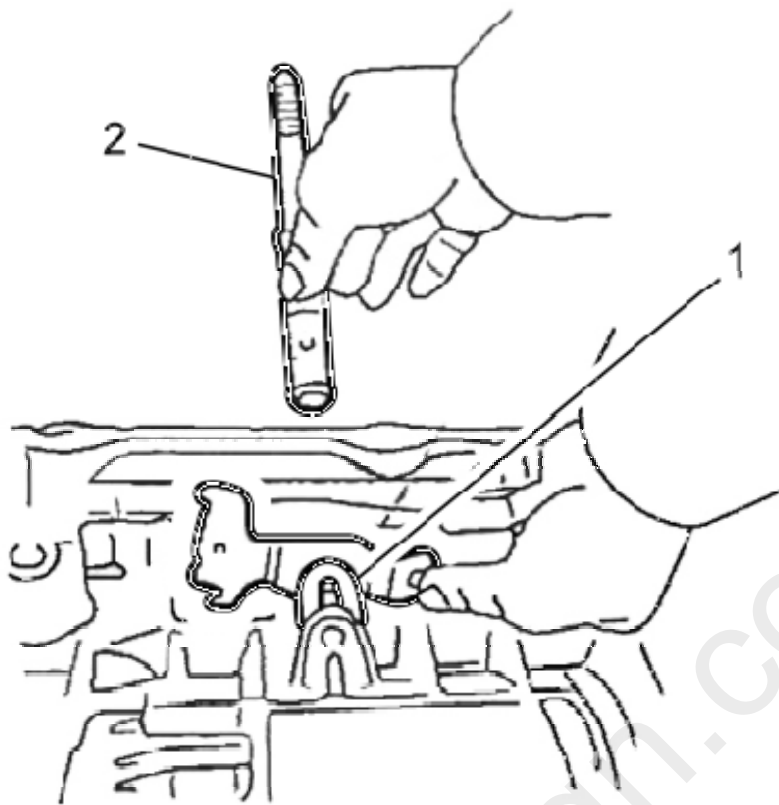


Fig. 57: Manual Shift Shaft And Washer
Courtesy of GENERAL MOTORS COMPANY

2. Install a NEW manual shift shaft washer (1) onto the detent lever.
3. Install the manual shift shaft (2) to the transmission.

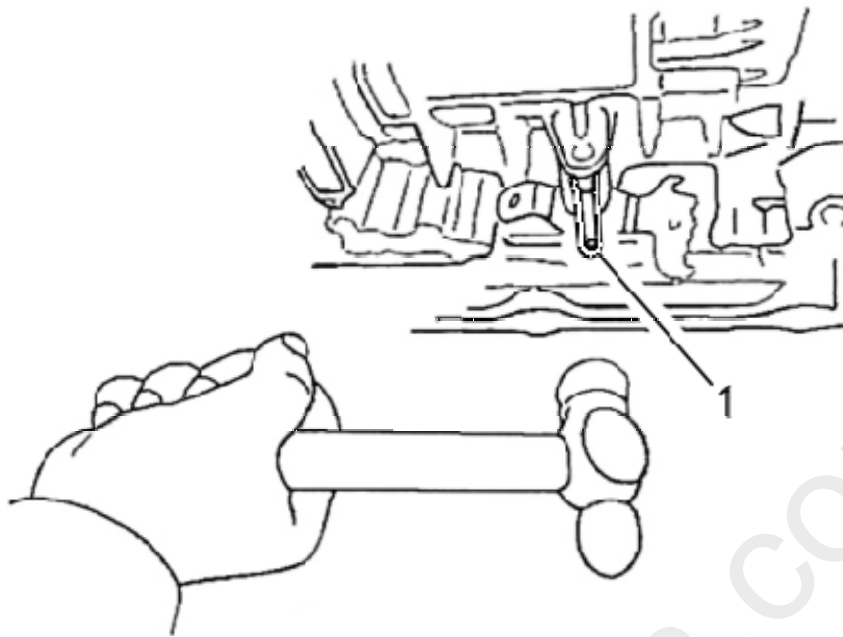


Fig. 58: Manual Shift Shaft Pin

Courtesy of GENERAL MOTORS COMPANY

4. Install the manual shift shaft pin (1) until equal lengths protrude from both sides of the manual shift shaft.

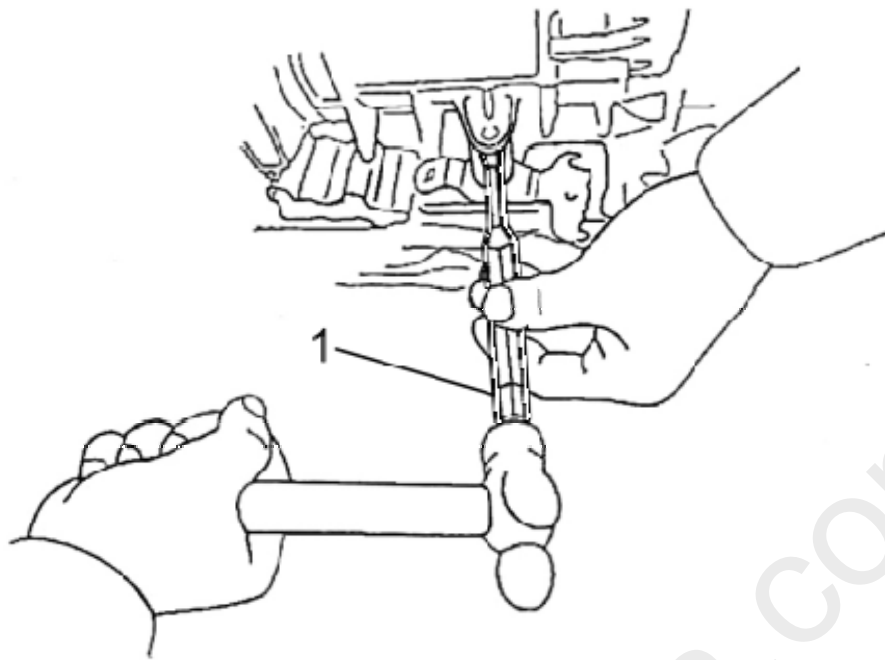


Fig. 59: Staking Manual Shift Shaft And Washer
Courtesy of GENERAL MOTORS COMPANY

5. Align the manual shift shaft indentation with the washer hole, and stake them together with a punch (1). Ensure the shaft rotates smoothly.
6. Install the valve body to the transmission. Refer to **Control Valve Body Replacement**.
7. Install the Park/Neutral Position (PNP) switch. Refer to **Park/Neutral Position Switch Replacement**.

PROPELLER SHAFT TRANSMISSION FLANGE FLUID SEAL REPLACEMENT

Special Tools

DT-23129 Universal Seal Remover

DT-6125-1B Slide Hammer

DT-6219 Seal Installer

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Place a drain pan under the rear of the transmission.

3. Remove the propeller shaft. Refer to **Two-Piece Propeller Shaft Replacement (LFX, LF3)** , **Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)** .
4. Remove the propeller shaft transmission flange. Refer to **Propeller Shaft Transmission Flange Replacement**.

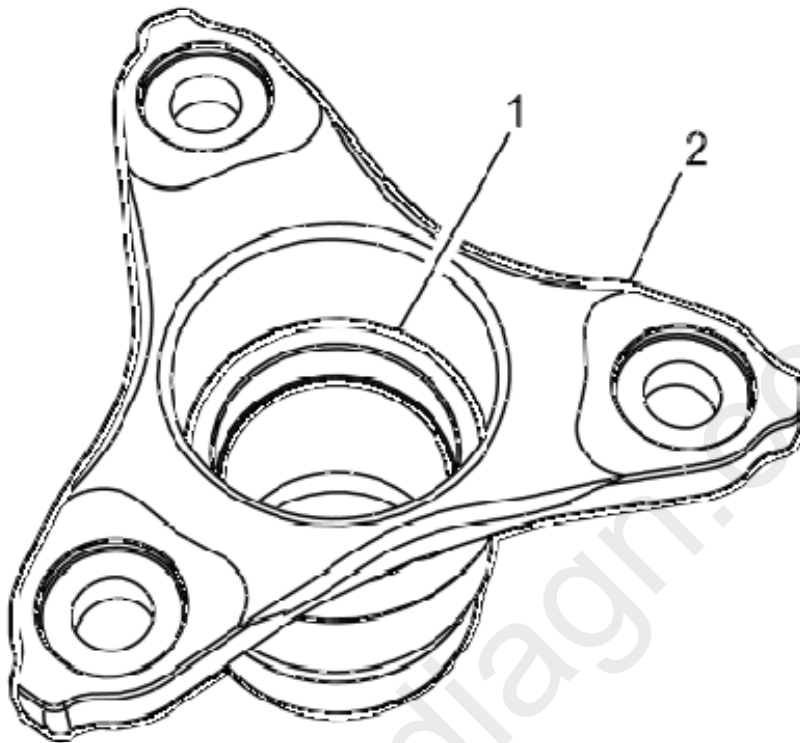


Fig. 60: Propeller Shaft Transmission Flange Seal
Courtesy of GENERAL MOTORS COMPANY

5. Using **DT-23129** Universal Seal Remover and **DT-6125-1B** Slide Hammer , remove the propeller shaft transmission flange seal (1).

Installation Procedure

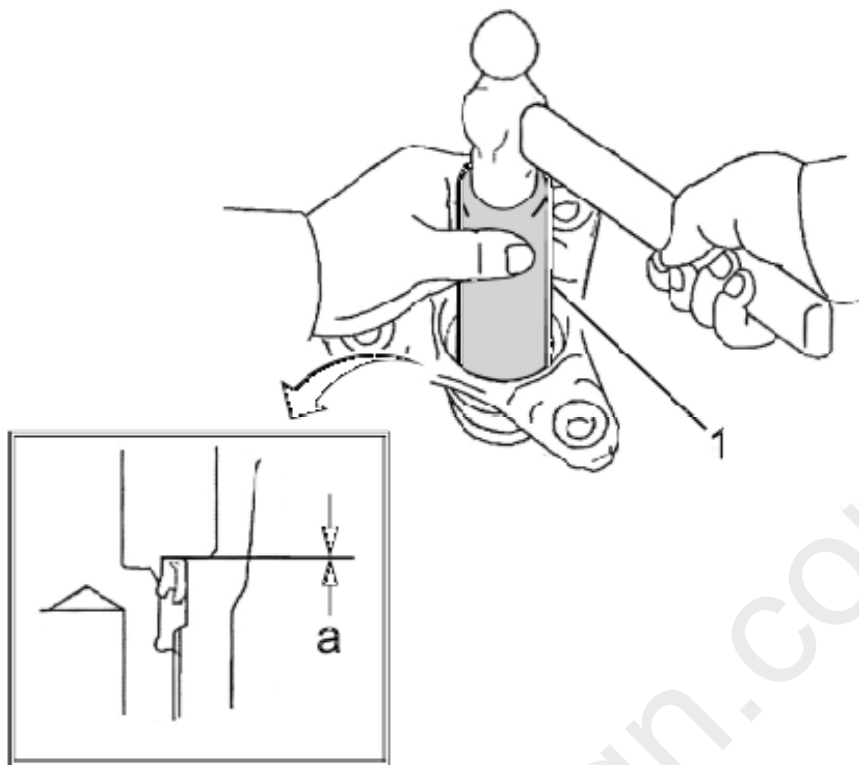


Fig. 61: Propeller Shaft Transmission Flange Seal Installation Dimension
 Courtesy of GENERAL MOTORS COMPANY

NOTE: Dimension "a" is 0 - 0.3 mm (0.0118 in) is from the end of the propeller shaft flange.

1. Using **DT-6219** Seal Installer (1), install the seal.
2. Lubricate the inside diameter of the NEW seal with transmission fluid.
3. Install the propeller shaft transmission flange. Refer to **Propeller Shaft Transmission Flange Replacement**.
4. Install the propeller shaft. Refer to **Two-Piece Propeller Shaft Replacement (LFX, LF3)** , **Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)** .
5. Remove the drain pan from under the rear of the transmission.
6. Fill the transmission to the proper level with transmission fluid. Refer to **Transmission Fluid Level and Condition Check**.

PROPELLER SHAFT TRANSMISSION FLANGE REPLACEMENT

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** .

2. Place a drain pan under the rear of the transmission.
3. Remove the propeller shaft. Refer to **Two-Piece Propeller Shaft Replacement (LFX, LF3)** , **Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)** .

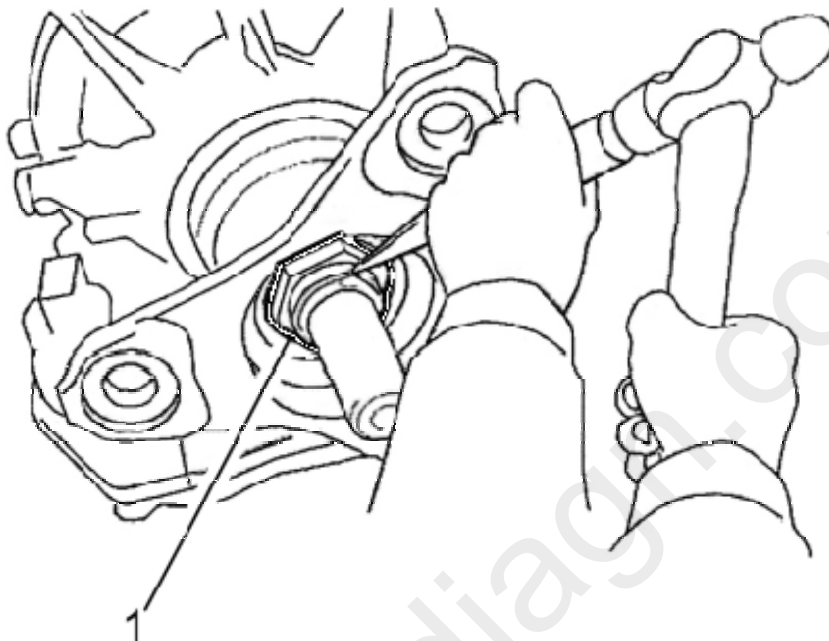


Fig. 62: Unstaking Propeller Shaft Transmission Flange Nut
Courtesy of GENERAL MOTORS COMPANY

4. Unstake the propeller shaft transmission flange nut (1), using a small chisel and a hammer.
5. Remove the propeller shaft transmission flange nut.
6. Using a suitable soft faced hammer, remove the propeller shaft transmission flange from the transmission.

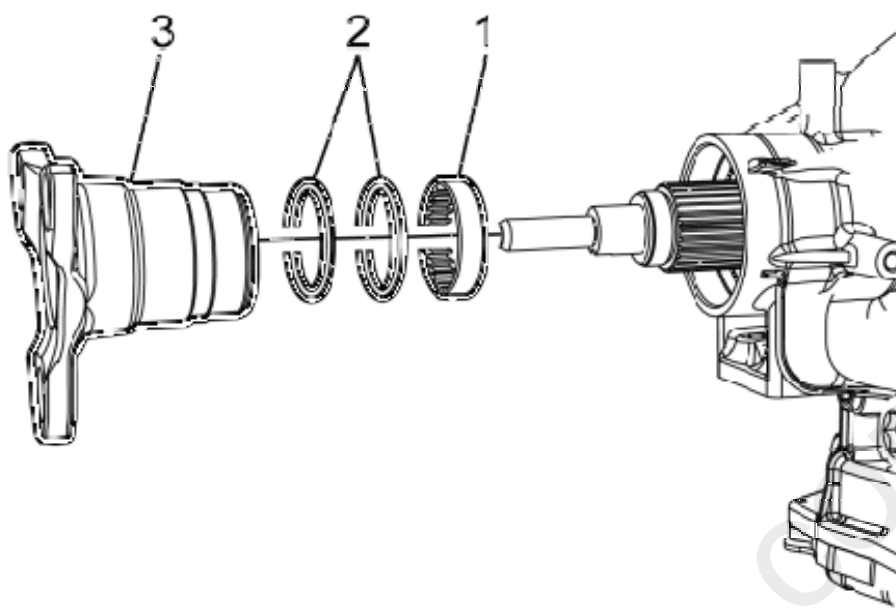


Fig. 63: Propeller Shaft Flange, Washer And Spacers
Courtesy of GENERAL MOTORS COMPANY

7. Remove the propeller shaft flange spacers (1, 2).

Installation Procedure

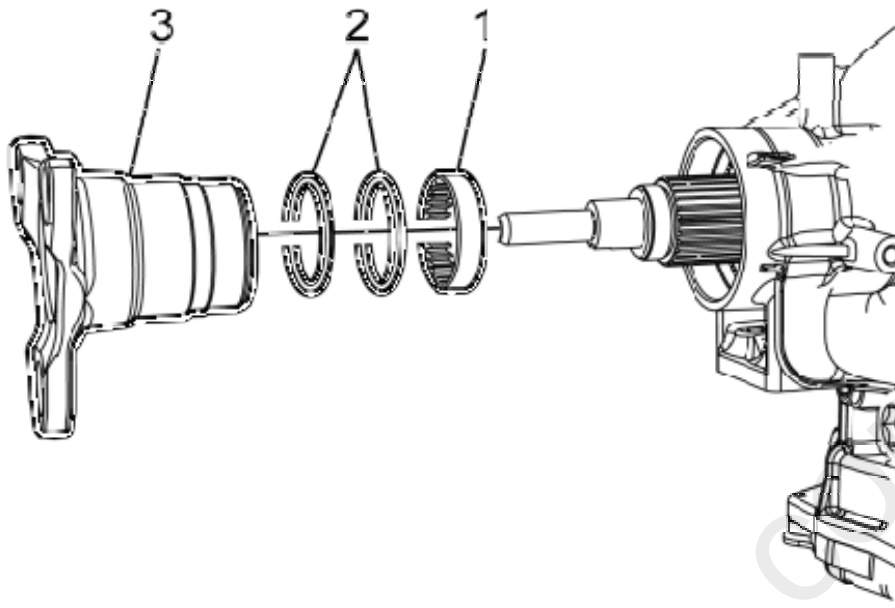


Fig. 64: Propeller Shaft Flange, Washer And Spacers
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install the propeller shaft flange spacers in their original positions. The thick washer (1) is installed first with the grooved side facing the transmission case. The 2 thinner spacers (2) go between the thick spacer and the propeller shaft flange (3). There is no orientation to the thinner spacers.

1. Install the propeller shaft flange spacers (1, 2).
2. Install the propeller shaft transmission flange (3) into the transmission.

CAUTION: Refer to Fastener Caution .

3. Install the propeller shaft transmission flange retaining nut and tighten to 135 (100 lb ft).

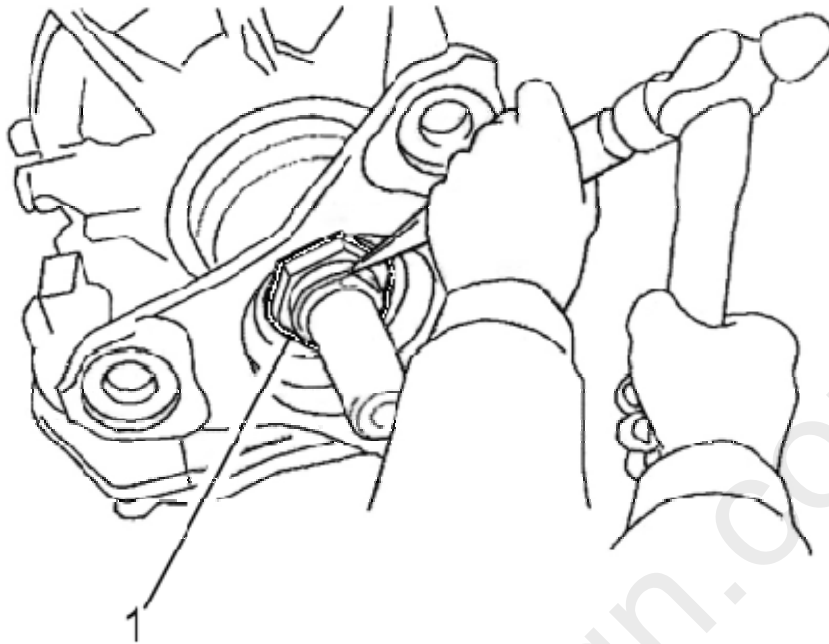


Fig. 65: Unstaking Propeller Shaft Transmission Flange Nut
Courtesy of GENERAL MOTORS COMPANY

4. Stake the flange nut (1) using a chisel and a hammer.
5. Install the propeller shaft. Refer to **Two-Piece Propeller Shaft Replacement (LFX, LF3)** , **Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)** .
6. Remove the drain pan and lower the vehicle.
7. Fill the transmission to the proper level with transmission fluid. Refer to **Transmission Fluid Level and Condition Check**.

TRANSMISSION MOUNT REPLACEMENT

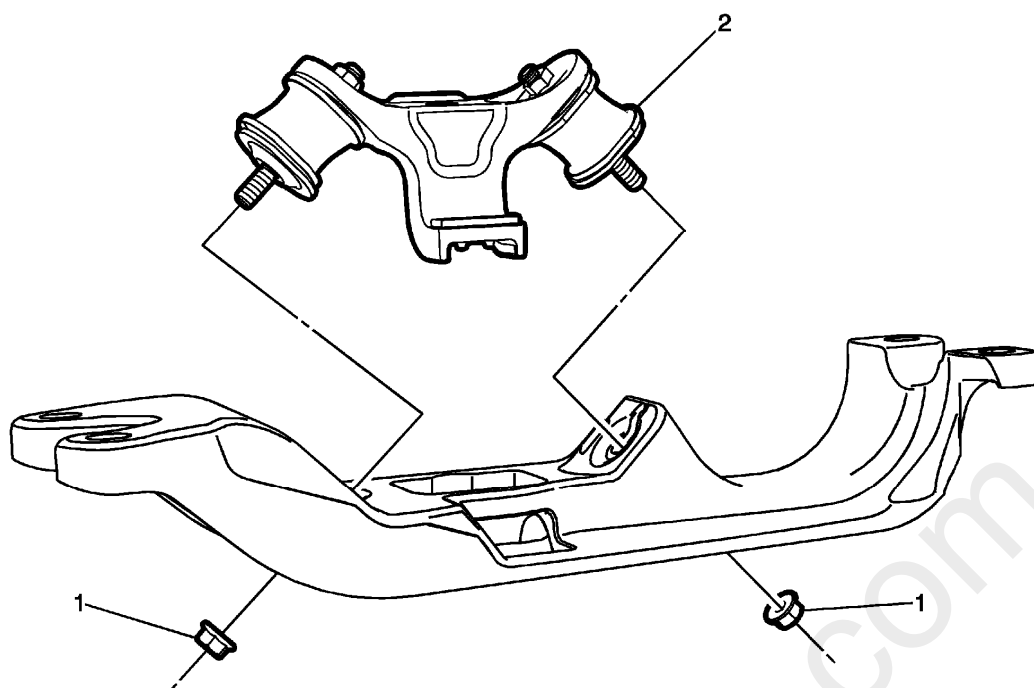


Fig. 66: Transmission Mount
 Courtesy of GENERAL MOTORS COMPANY

Transmission Mount Replacement

Callout	Component Name
Preliminary Procedures Remove the transmission support. Refer to <u>Transmission Support Replacement (RWD)</u> , <u>Transmission Support Replacement (AWD)</u> .	
1	Transmission Mount Nut (Qty: 2) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 22 (16 lb ft)
2	Transmission Mount

OIL PAN REPLACEMENT

Removal Procedure

CAUTION: When the transmission is at operating temperatures, take necessary precautions when removing the drain plug, to avoid being burned by draining fluid.

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Drain the transmission fluid. Refer to **Automatic Transmission Fluid and Filter Replacement**.

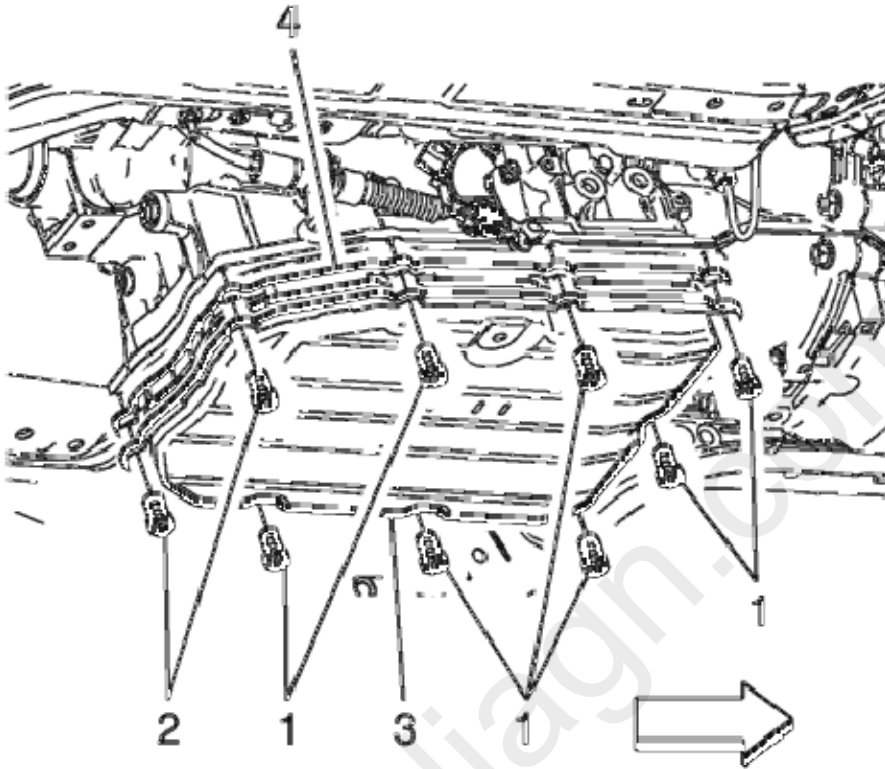


Fig. 67: Automatic Transmission Oil Pan And Bolts
Courtesy of GENERAL MOTORS COMPANY

3. Remove the oil pan bolts (1, 2).
4. Remove the oil pan (3) and the gasket (4). Discard the gasket.
5. Clean the transmission case and the oil pan gasket surfaces.

Installation Procedure

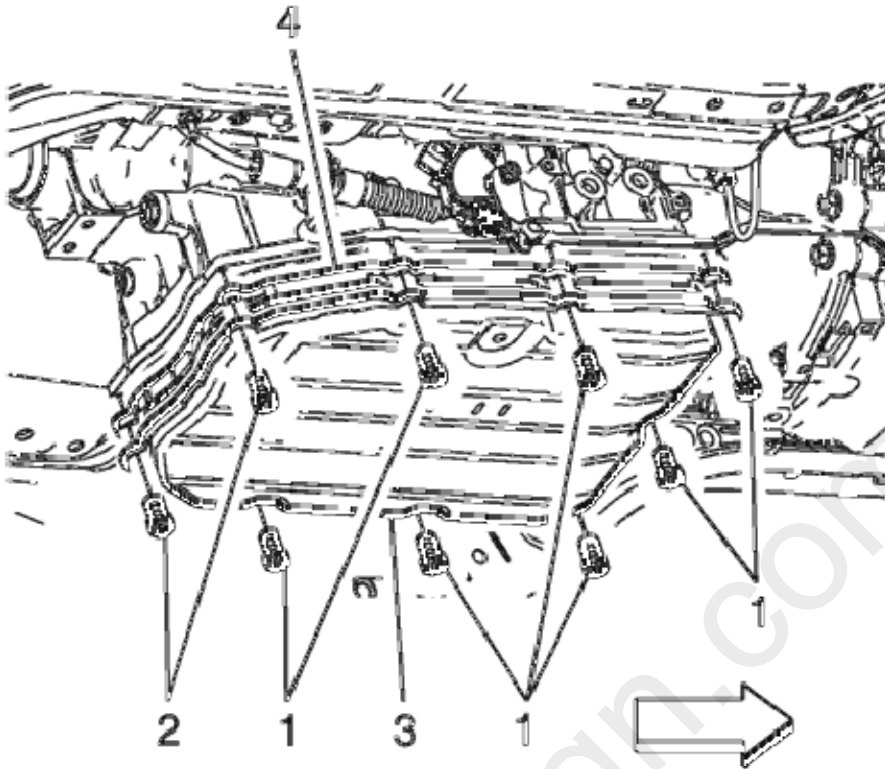


Fig. 68: Automatic Transmission Oil Pan And Bolts
Courtesy of GENERAL MOTORS COMPANY

1. Install the oil pan (3) with a New gasket (4).

CAUTION: Refer to Fastener Caution .

- 2.
3. Install the oil pan bolts (1,2) and tighten to 7 (62 lb in).
4. Fill the transmission with fluid. Refer to **Transmission Fluid Level and Condition Check.**
5. Inspect the oil pan gasket for leaks.
6. Lower the vehicle.

INPUT SPEED SENSOR REPLACEMENT

Removal Procedure

1. Remove the valve body from the transmission. Refer to **Control Valve Body Replacement.**

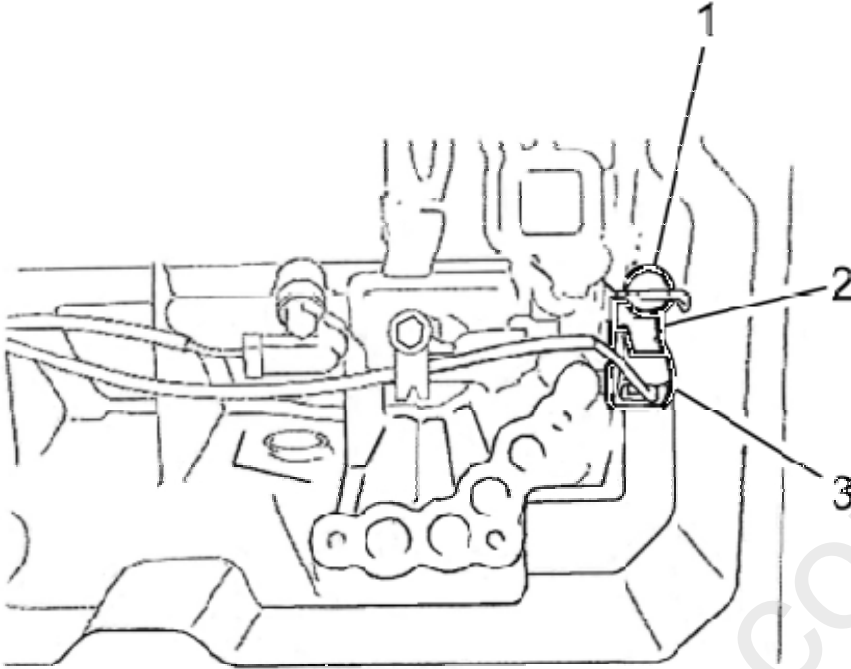


Fig. 69: Input Speed Sensor

Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the input speed sensor electrical connector (yellow) (3) from the sensor (2).
3. Remove the input speed sensor bolt (1).
4. Remove the input speed sensor (2).
5. Remove the input speed sensor O-ring and DISCARD.

Installation Procedure

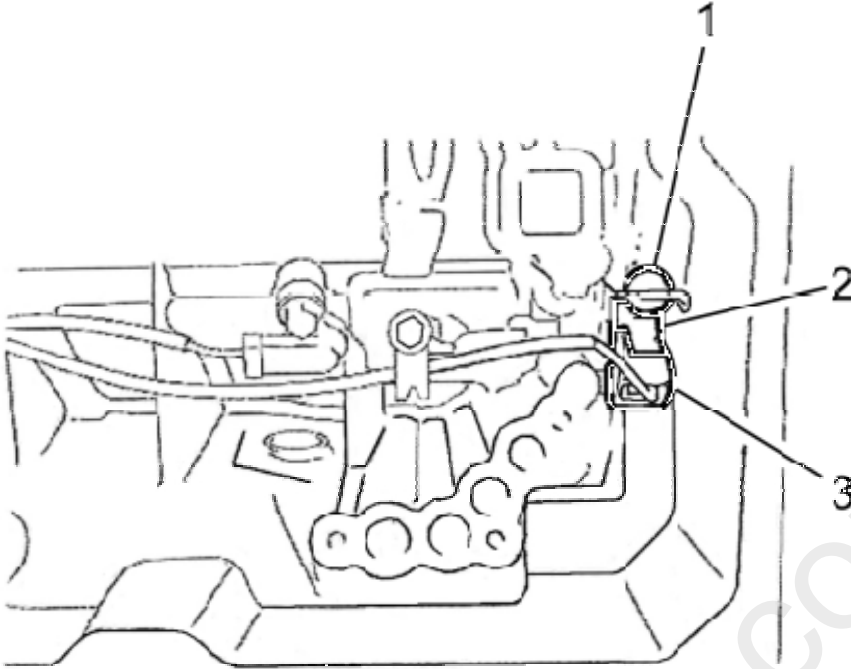


Fig. 70: Input Speed Sensor

Courtesy of GENERAL MOTORS COMPANY

1. Install a NEW input speed sensor O-ring.
2. Install the input speed sensor (2).

CAUTION: Refer to Fastener Caution .

3. Install the input speed sensor bolt (1) and tighten to 6 (53 lb in).
4. Connect the input speed sensor electrical connector (yellow) (3) to the sensor (2).
5. Install the valve body from the transmission. Refer to **Control Valve Body Replacement**.

OUTPUT SPEED SENSOR REPLACEMENT (INTERMEDIATE)

Removal Procedure

1. Remove the valve body from the transmission. Refer to **Control Valve Body Replacement**.

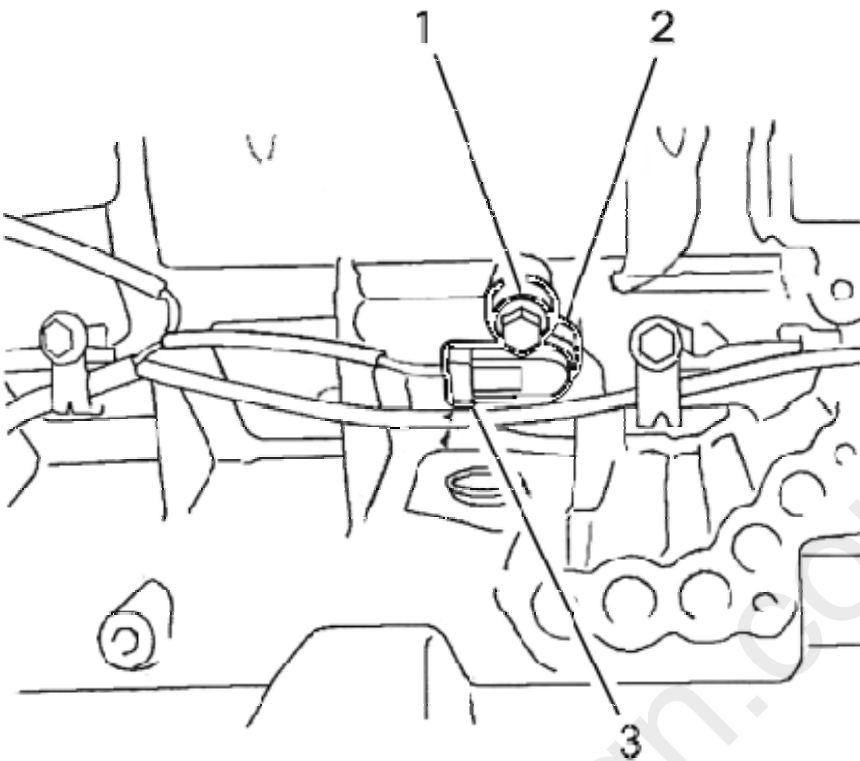


Fig. 71: Output Speed Sensor (Intermediate)
Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the intermediate output speed sensor electrical connector (white) (3) from the sensor (2).
3. Remove the intermediate output speed sensor bolt (1).
4. Remove the intermediate output speed sensor (2).

Installation Procedure

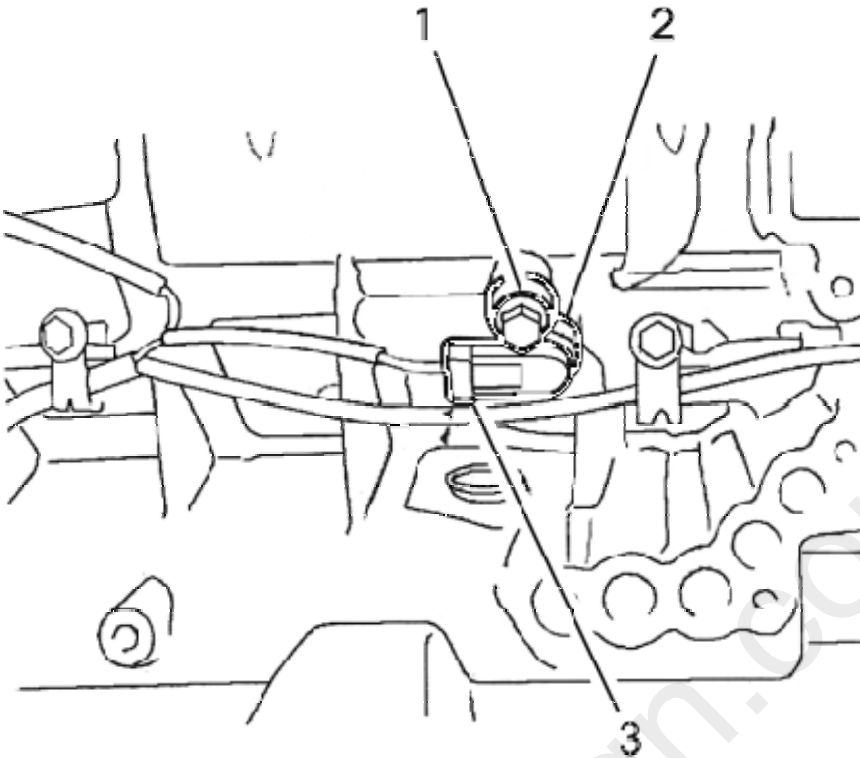


Fig. 72: Output Speed Sensor (Intermediate)
Courtesy of GENERAL MOTORS COMPANY

1. Install the intermediate output speed sensor (2).

CAUTION: Refer to Fastener Caution .

2. Install the intermediate output speed sensor bolt (1) and tighten to 6 (53 lb in).
3. Connect the intermediate output speed sensor electrical connector (white) (3) to the sensor (2).
4. Install the valve body from the transmission. Refer to Control Valve Body Replacement.

OUTPUT SPEED SENSOR REPLACEMENT (PRIMARY)

Removal Procedure

1. Remove the valve body from the transmission. Refer to Control Valve Body Replacement.

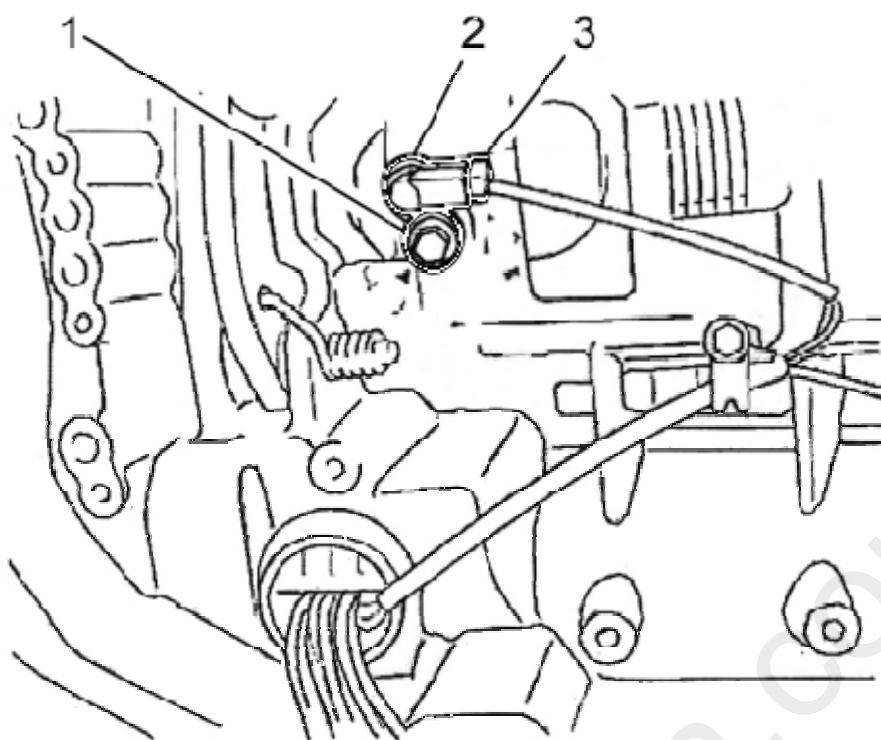


Fig. 73: Output Speed Sensor (Primary)
Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the output speed sensor electrical connector (Blue) (3) from the sensor (2).
3. Remove the output speed sensor bolt (1).
4. Remove the output speed sensor (2).

Installation Procedure

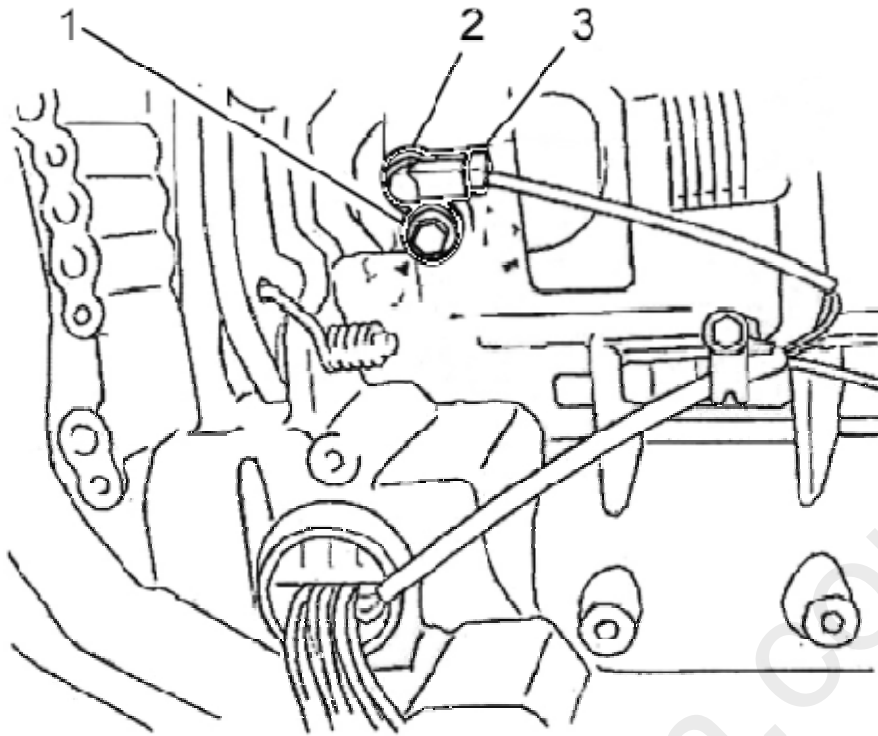


Fig. 74: Output Speed Sensor (Primary)
Courtesy of GENERAL MOTORS COMPANY

1. Install the output speed sensor (2).

CAUTION: Refer to Fastener Caution .

2. Install the output speed sensor bolt (1) and tighten to 6 (53 lb in).
3. Connect the output speed sensor electrical connector (blue) (3) to the sensor (2).
4. Install the valve body from the transmission. Refer to **Control Valve Body Replacement**.

TRANSMISSION CONTROL MODULE REPLACEMENT

Removal Procedure

1. Remove the front wheelhouse liner. Refer to **Front Wheelhouse Liner Replacement** .

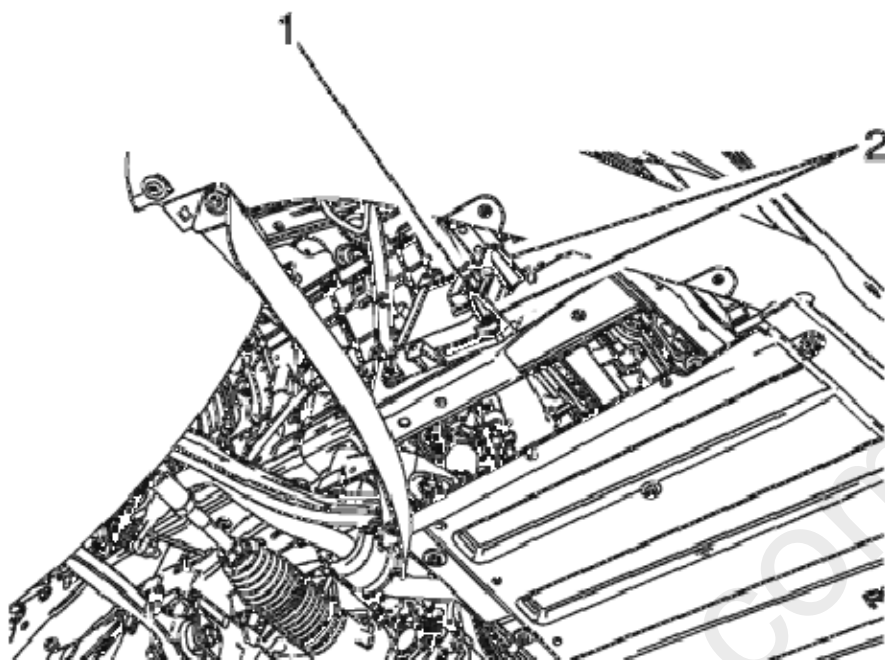


Fig. 75: Transmission Control Module
Courtesy of GENERAL MOTORS COMPANY

2. Disconnect the electrical connector from the transmission control module (TCM).
3. Pull back on the retaining tabs (2) to release the TCM.
4. Remove the TCM from the vehicle.

Installation Procedure

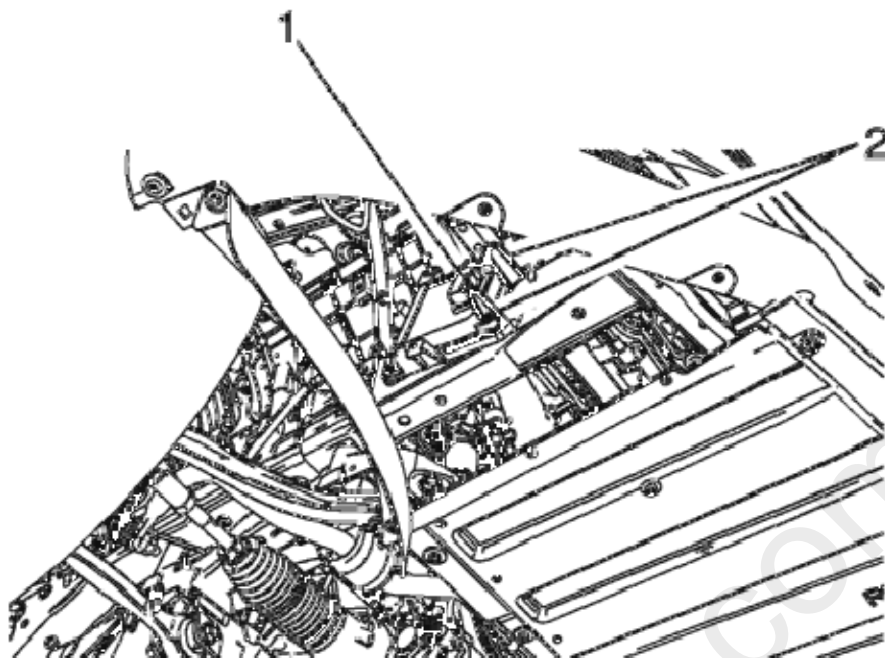


Fig. 76: Transmission Control Module
Courtesy of GENERAL MOTORS COMPANY

1. Pull back on the retaining tabs (2), then install the TCM.
2. Connect the electrical connector to the TCM.
3. Install the front wheelhouse liner. Refer to **Front Wheelhouse Liner Replacement** .
4. Perform the automatic transmission 8-speed learn procedure. Refer to **Automatic Transmission 8-Speed Learn Procedure (MGG)**.

CONTROL VALVE BODY REPLACEMENT

Special Tools

DT-36850-A Transjel Lubricant

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Remove the automatic transmission filter. Refer to **Automatic Transmission Fluid and Filter Replacement**.

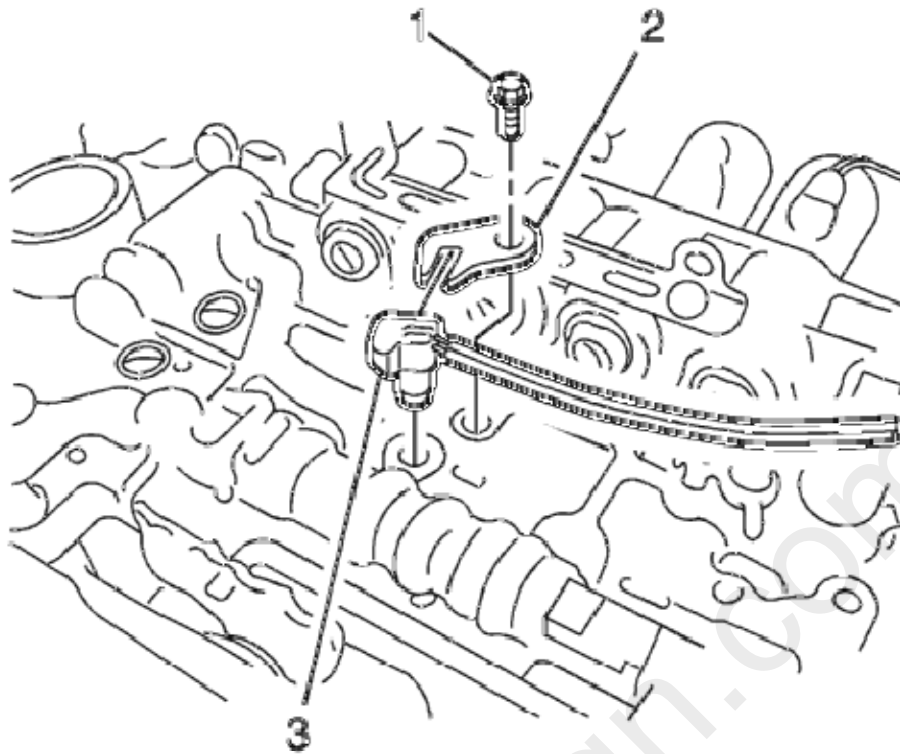


Fig. 77: Automatic Transmission Oil Temperature Sensor
Courtesy of GENERAL MOTORS COMPANY

2. Remove the transmission oil temperature sensor retaining clamp bolt (1), then remove the clamp (2).
3. Pull the transmission oil temperature sensor (3) from the valve body assembly.

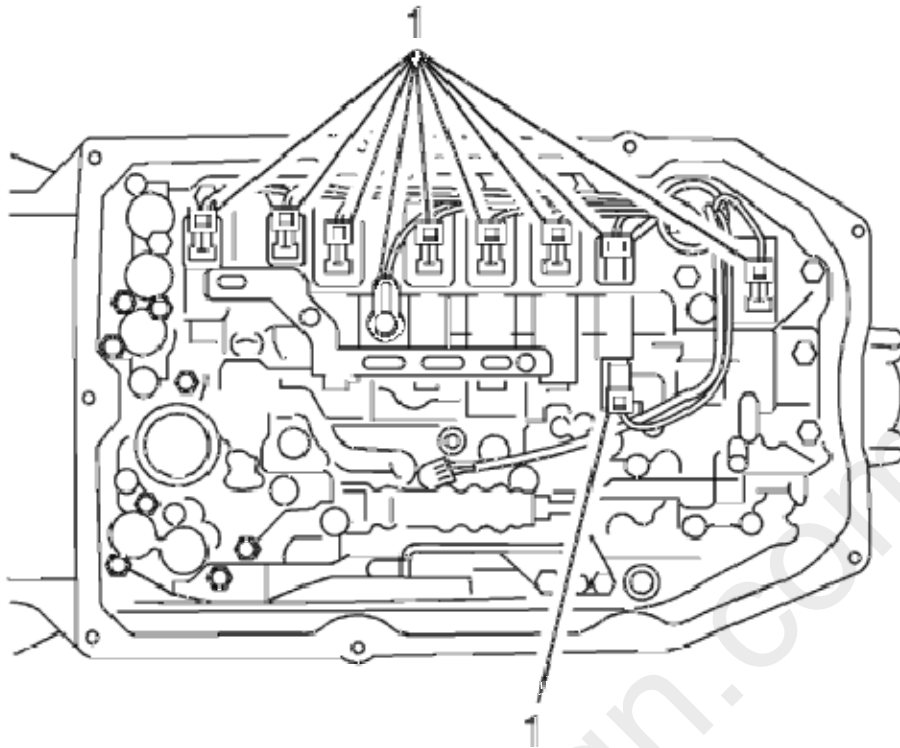


Fig. 78: Valve Body Assembly Connector
Courtesy of GENERAL MOTORS COMPANY

4. Disconnect the ten connectors (1) from the valve body assembly, then position the wiring harness out of the way.

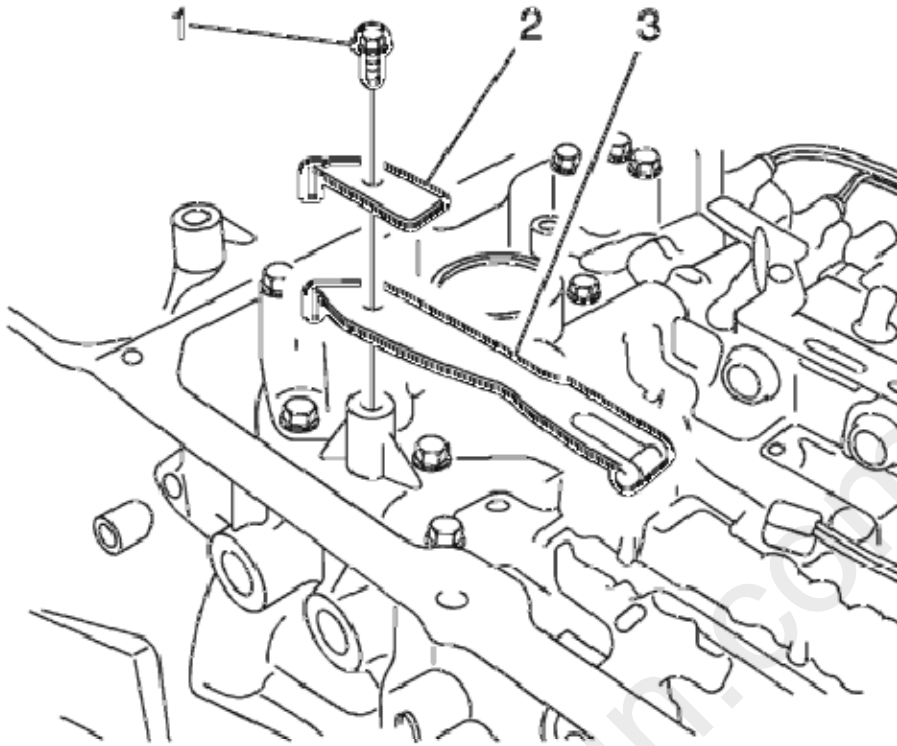


Fig. 79: Manual Detent Spring

Courtesy of GENERAL MOTORS COMPANY

5. Remove the manual detent bolt (1), manual detent cover (2) and manual detent spring (3) from the valve body assembly.

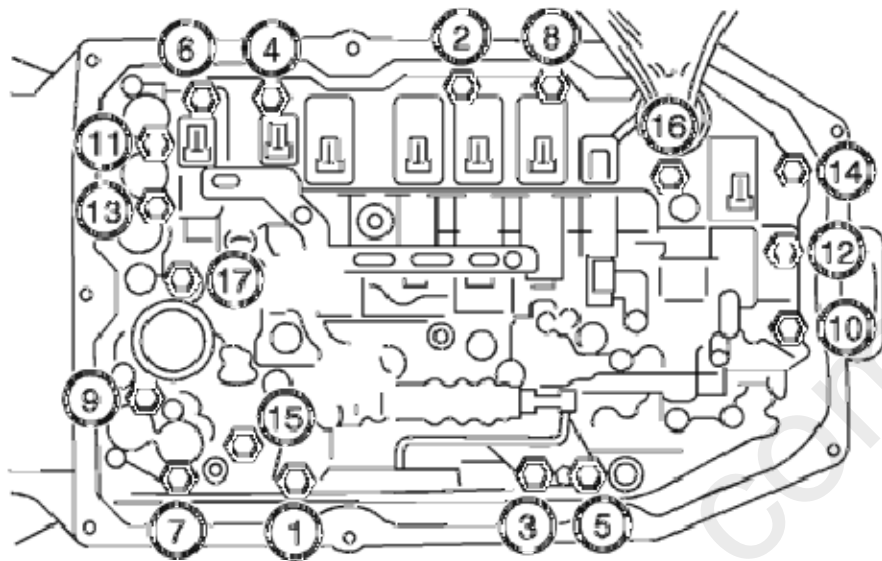


Fig. 80: Valve Body Assembly Bolt Loosening/Tightening Sequence
Courtesy of GENERAL MOTORS COMPANY

NOTE: Loosen the bolts evenly a little at time in the sequence shown.

6. Remove the seventeen valve body retaining bolts.

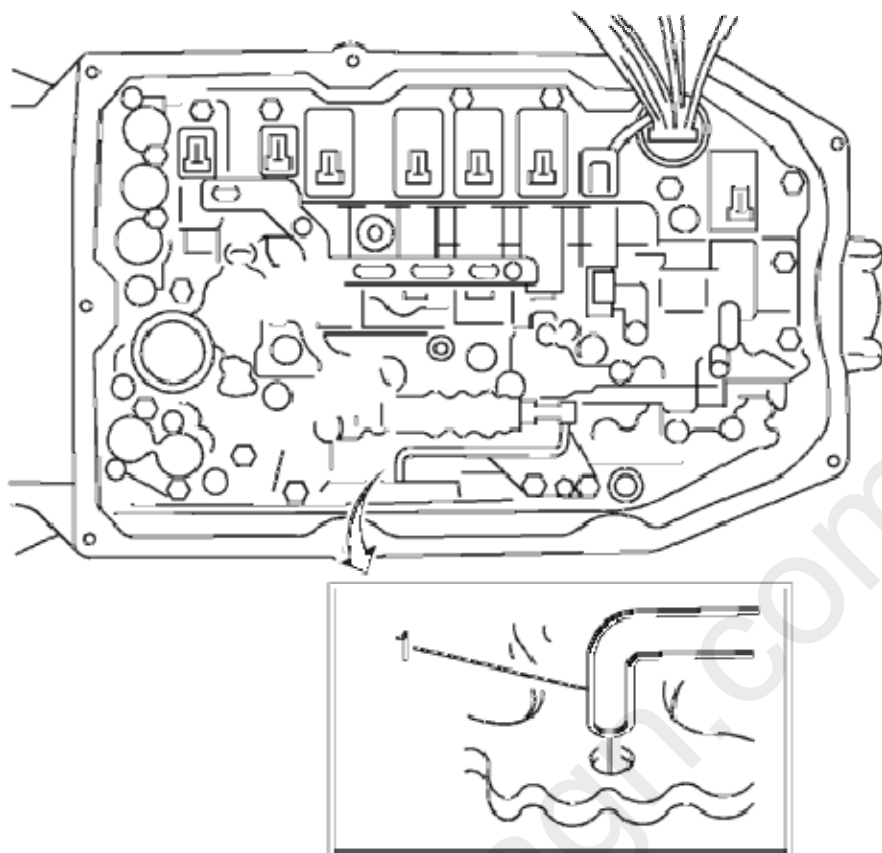


Fig. 81: Manual Valve Rod

Courtesy of GENERAL MOTORS COMPANY

7. Disconnect the manual valve rod (1) from the valve body.
8. Remove the valve body from the transmission.

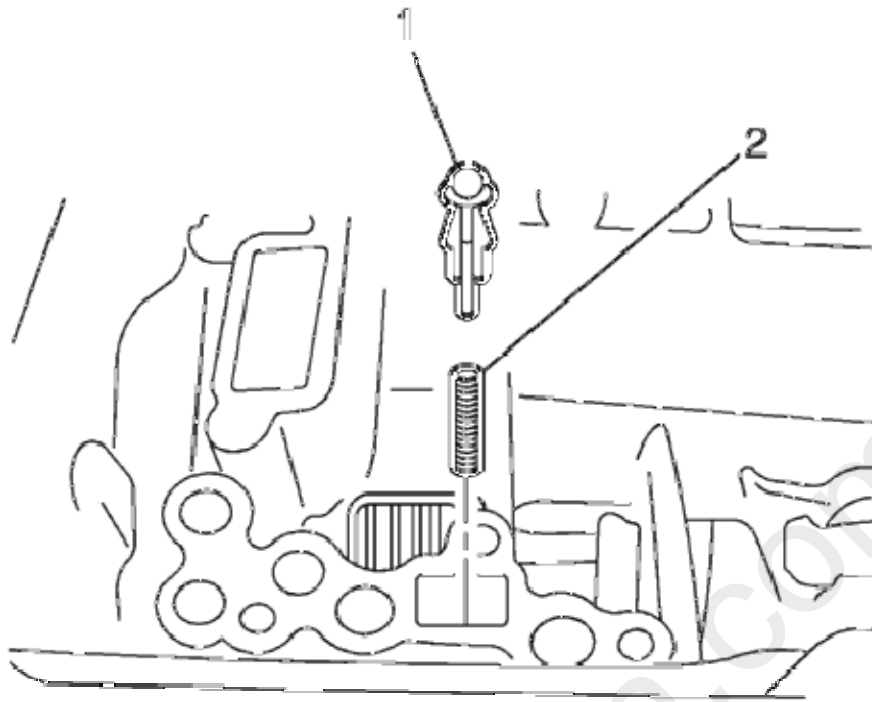


Fig. 82: Check Valve Sub-Assembly And Spring
Courtesy of GENERAL MOTORS COMPANY

9. Remove the check valve sub-assembly (1) and spring (2) from the transmission.

Installation Procedure

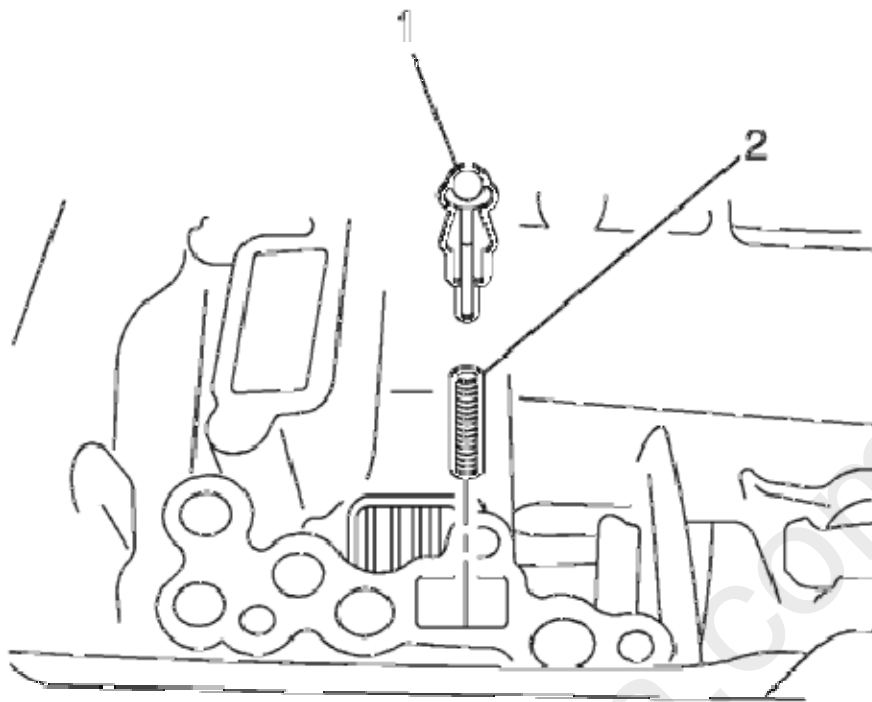


Fig. 83: Check Valve Sub-Assembly And Spring
Courtesy of GENERAL MOTORS COMPANY

NOTE: Apply DT-36850-A transjel lubricant to retain the check valve assembly in the transmission case.

1. Install the check valve assembly (1) and spring (2) into the transmission.

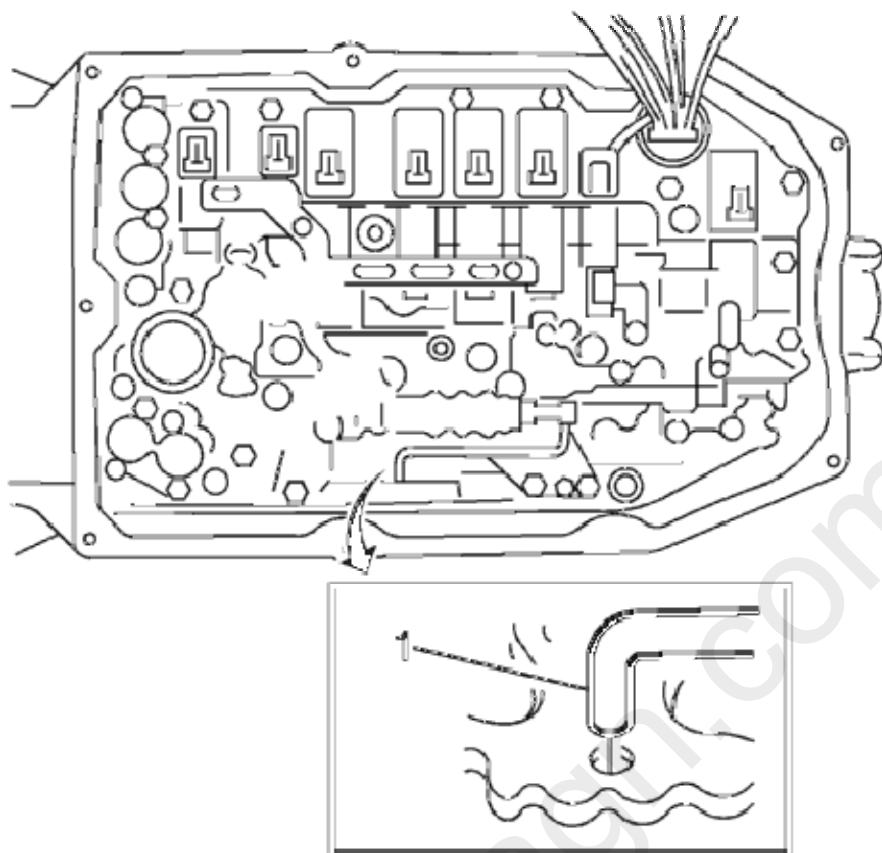


Fig. 84: Manual Valve Rod

Courtesy of GENERAL MOTORS COMPANY

2. Connect the manual valve rod (1) to the valve body.
3. Position the valve body to the transmission.

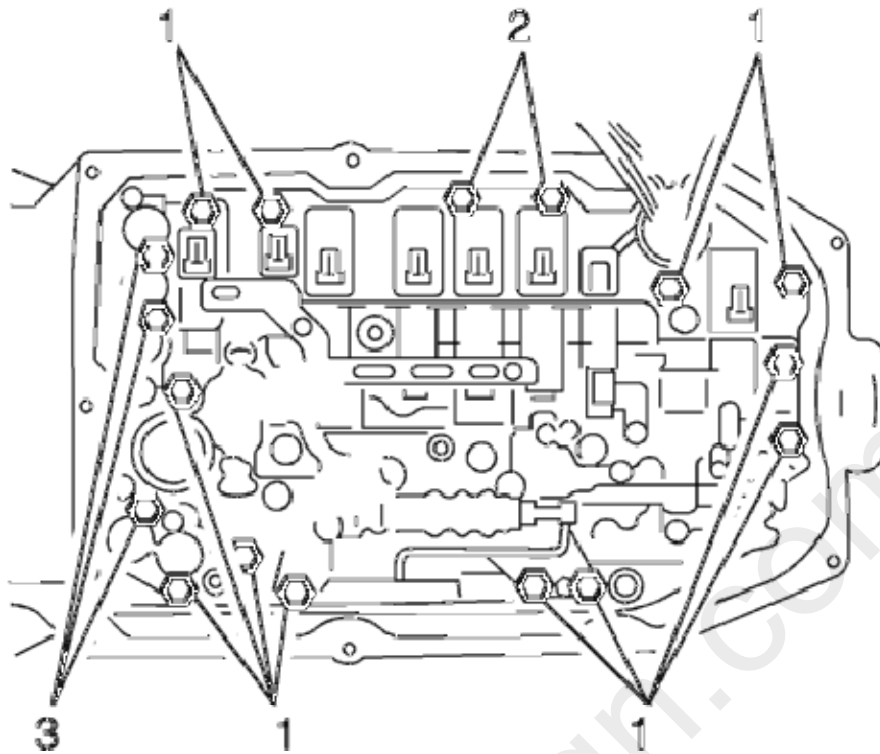


Fig. 85: Identifying Valve Body Assembly Bolt Locations
Courtesy of GENERAL MOTORS COMPANY

4. Position the bolts into their correct areas as shown:
- 1 = M6 x 1.0 x 31 mm (1.220 in)
 - 2 = M6 x 1.0 x 21 mm (0.826 in)
 - 3 = M6 x 1.0 x 64 mm (2.519 in)

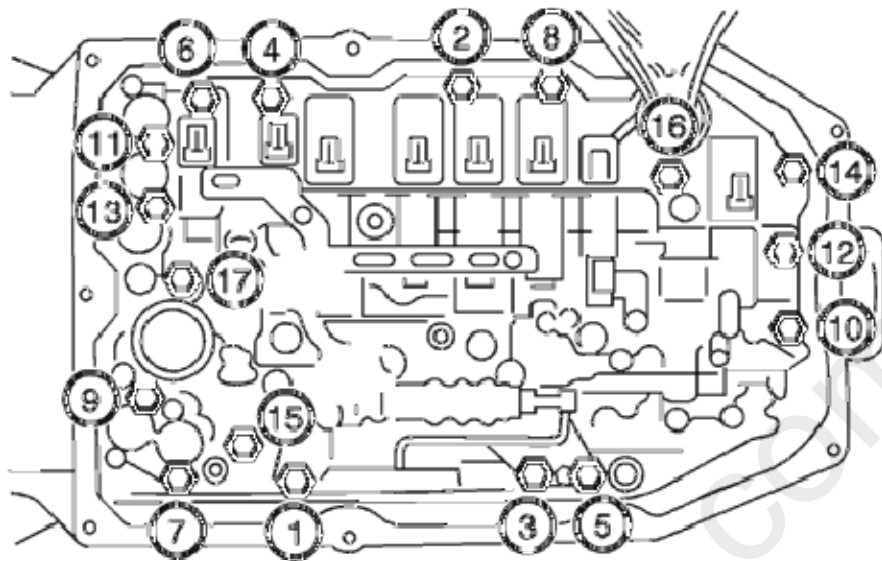


Fig. 86: Valve Body Assembly Bolt Loosening/Tightening Sequence
Courtesy of GENERAL MOTORS COMPANY

NOTE: Install the bolts evenly a little at time in the sequence shown until finger tight.

5. Install the seventeen valve body retaining bolts.

CAUTION: Refer to Fastener Caution .

6. Tighten the bolts in the sequence shown to 11 (8 lb ft).

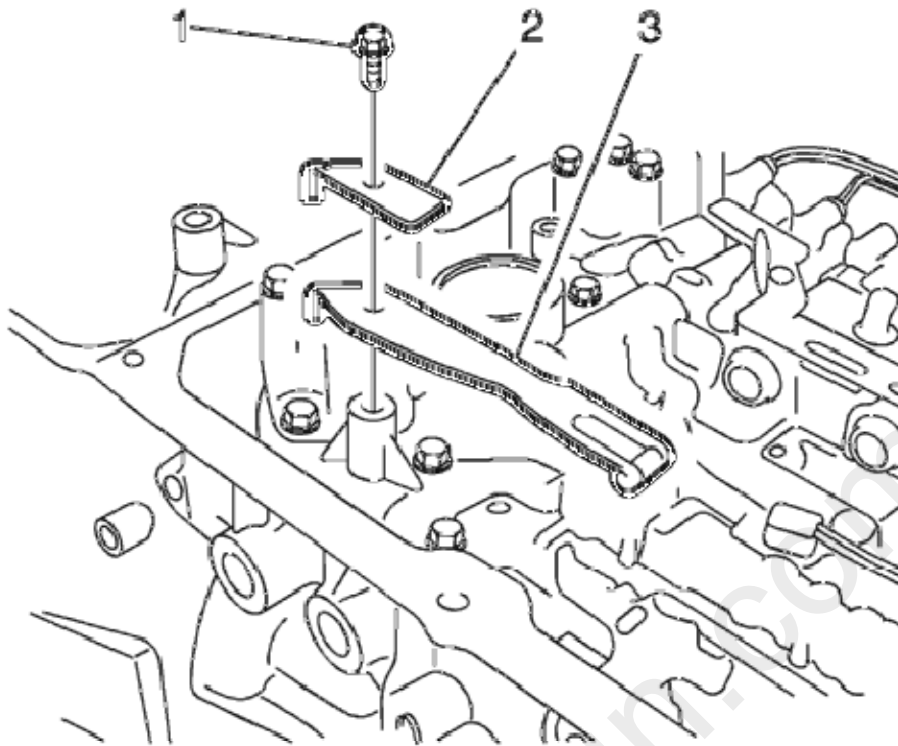


Fig. 87: Manual Detent Spring
Courtesy of GENERAL MOTORS COMPANY

7. Install the manual detent spring (3), manual detent cover (2) and manual detent bolt (1) to the valve body assembly.
8. Tighten the manual detent bolt (1) to 11 (8 lb ft).

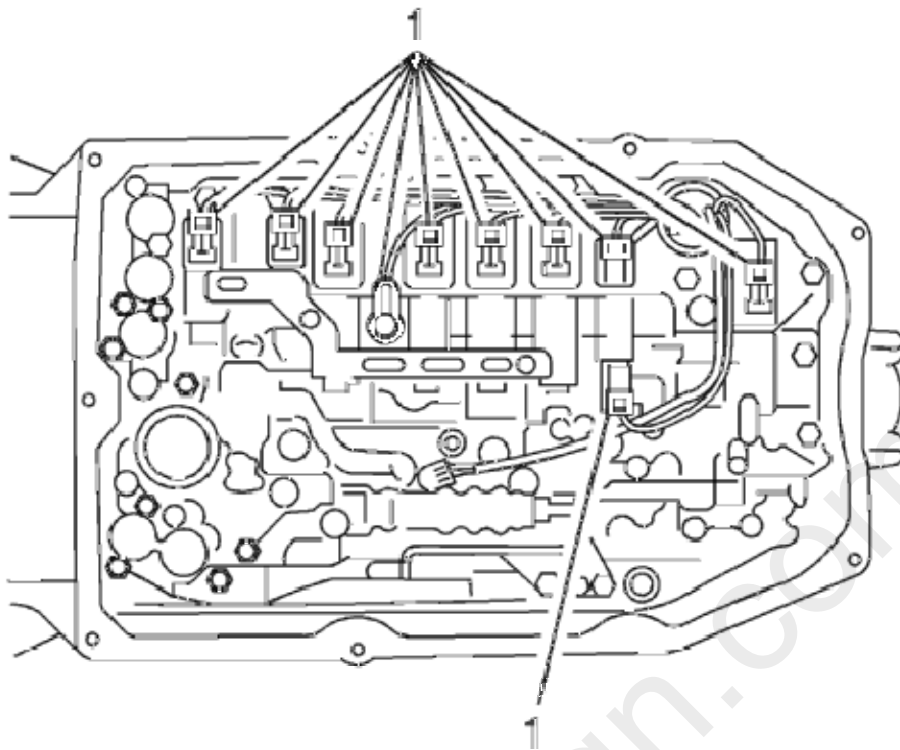


Fig. 88: Valve Body Assembly Connector
Courtesy of GENERAL MOTORS COMPANY

9. Connect the ten connectors (1) to the valve body assembly.
10. Push the transmission oil temperature sensor (3) into the valve body assembly.

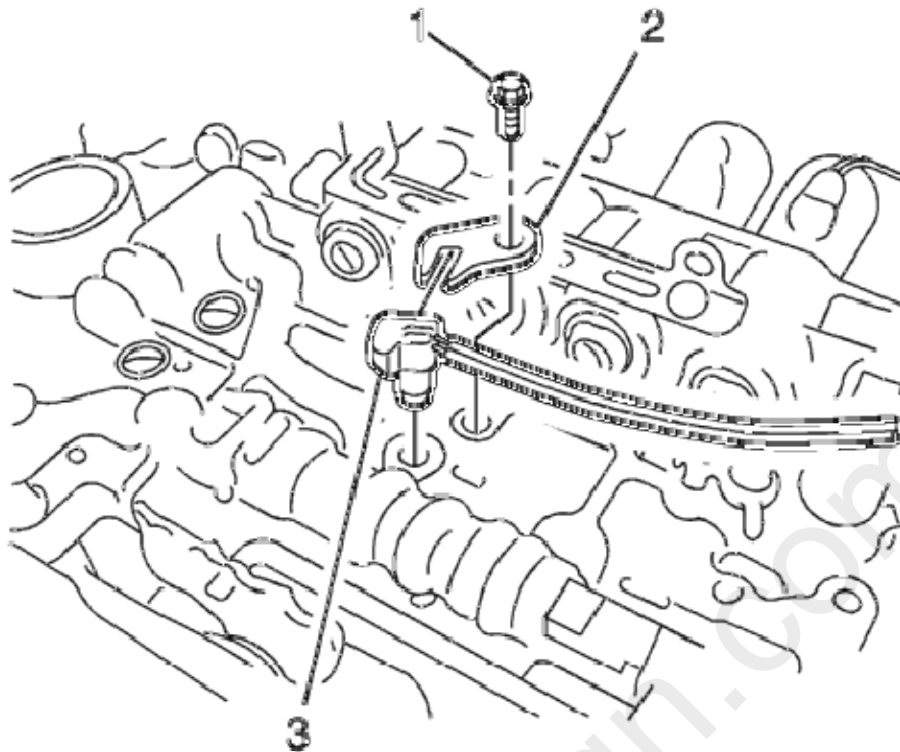


Fig. 89: Automatic Transmission Oil Temperature Sensor
Courtesy of GENERAL MOTORS COMPANY

11. Install the transmission oil temperature sensor retaining clamp, then the bolt (1).
12. Tighten the oil temperature sensor retaining bolt (1) to 11 (8 lb ft).
13. Install the automatic transmission filter. Refer to **Automatic Transmission Fluid and Filter Replacement**.
14. Perform the automatic transmission 8-speed learn procedure. Refer to **Automatic Transmission 8-Speed Learn Procedure (MGG)**.

AUTOMATIC TRANSMISSION WIRING HARNESS REPLACEMENT

Removal Procedure

1. Remove the valve body from the transmission. Refer to **Control Valve Body Replacement**.

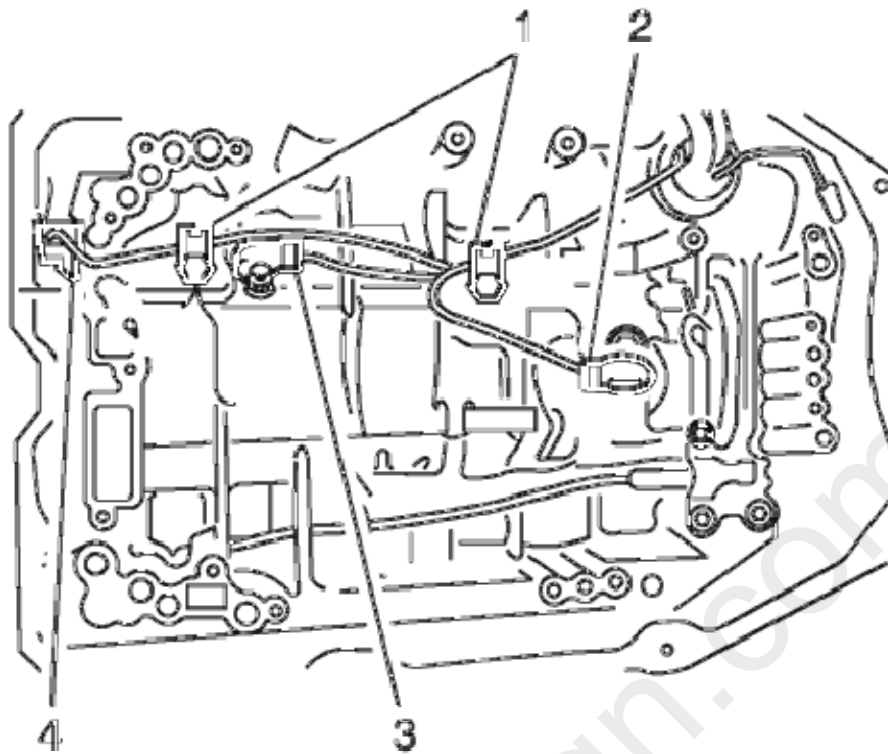


Fig. 90: Automatic Transmission Internal Wiring Harness
Courtesy of GENERAL MOTORS COMPANY

2. Remove the wiring harness clamps (1).
3. Disconnect the three electrical connectors (2,3,4).

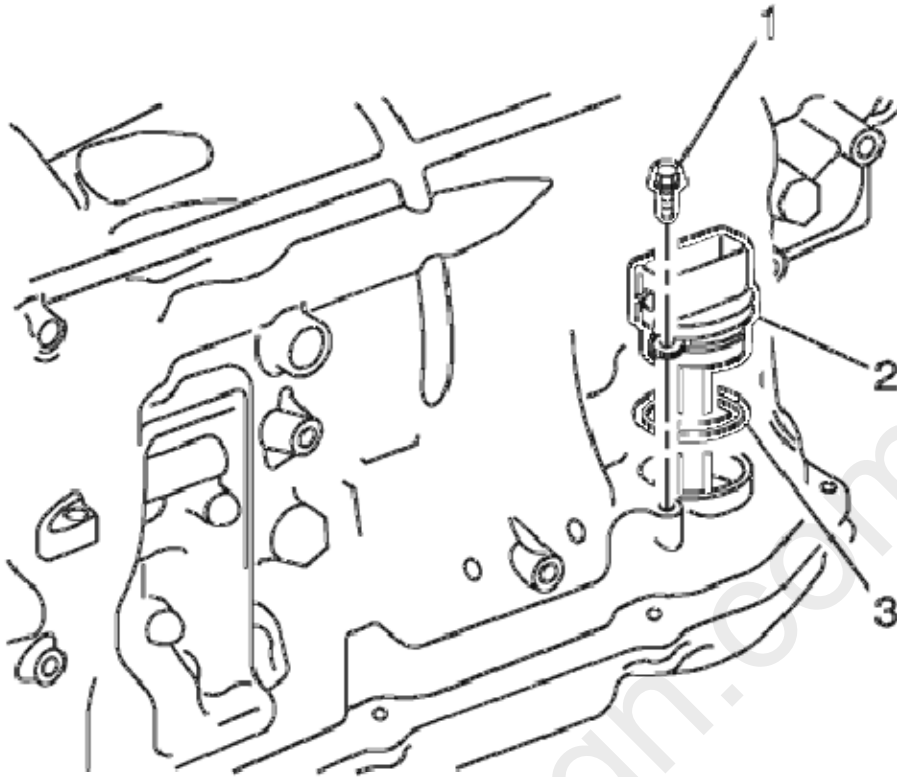


Fig. 91: Automatic Transmission Wiring Harness Connector Retaining Bolt
Courtesy of GENERAL MOTORS COMPANY

4. Remove wiring harness connector retaining bolt (1).
5. Remove the wiring harness assembly (2) from the transmission.
6. Remove and Discard the O-ring (3) from the wiring harness.

Installation Procedure

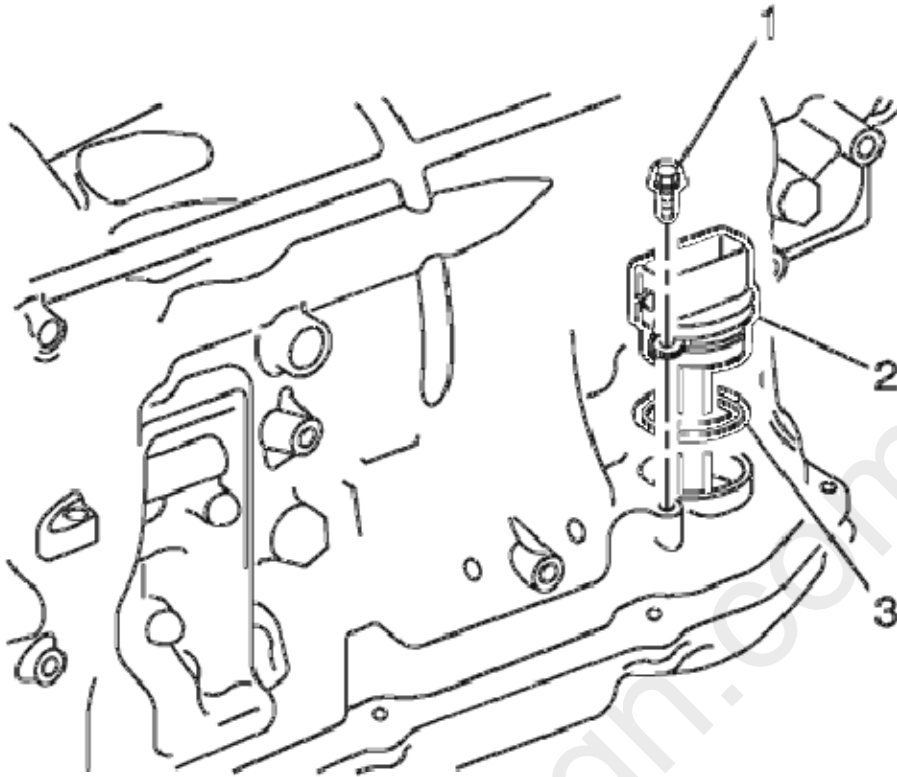


Fig. 92: Automatic Transmission Wiring Harness Connector Retaining Bolt
Courtesy of GENERAL MOTORS COMPANY

1. Install a New O-ring (3) to the wiring harness.
2. Position the wiring harness assembly (2) in the transmission.

CAUTION: Refer to Fastener Caution .

3. Install the wiring harness connector retaining bolt (1) and tighten to 6 (53 lb in).

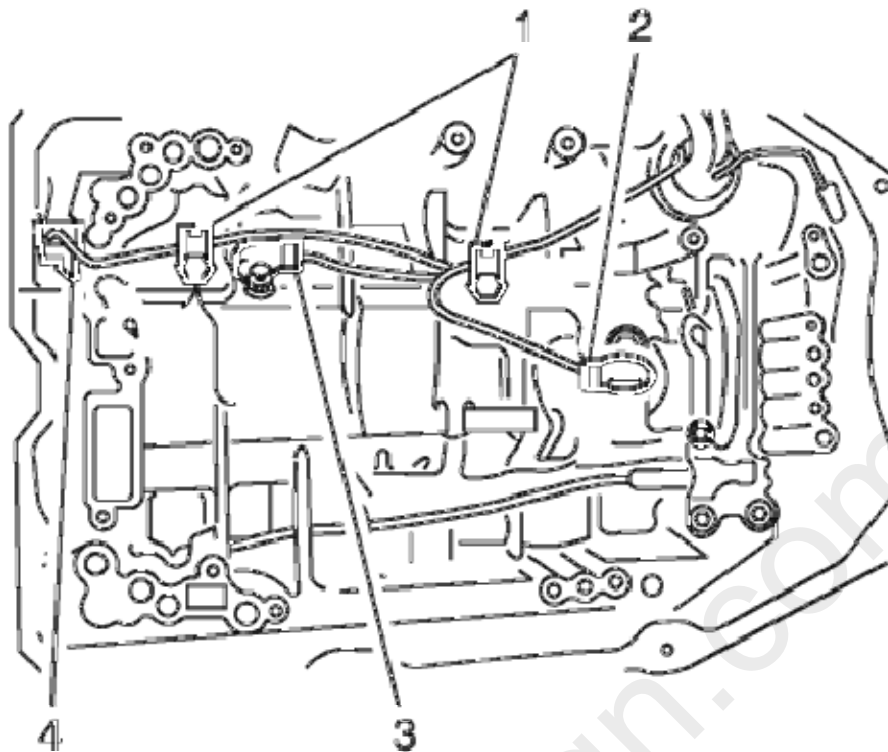


Fig. 93: Automatic Transmission Internal Wiring Harness
Courtesy of GENERAL MOTORS COMPANY

- 4.
5. Connect the three electrical connectors (2 - blue, 3 - white and 4 - yellow).
6. Install the wiring harness clamps (1) and bolts then tighten to 6 (53 lb in) .
7. Install the valve body to the transmission. Refer to **Control Valve Body Replacement**.

TRANSMISSION REPLACEMENT

Special Tools

J-21366 Torque Converter Holding Strap

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

NOTE: It is not necessary to remove the thermostat housing completely, just reposition to gain access to the top transmission retaining bolt.

1. Remove the thermostat housing and reposition to gain access to the top transmission to engine fastener. Refer to **Engine Coolant Thermostat Housing Replacement (LFX, LF3)** , **Engine Coolant Thermostat Housing Replacement (LTG)** .

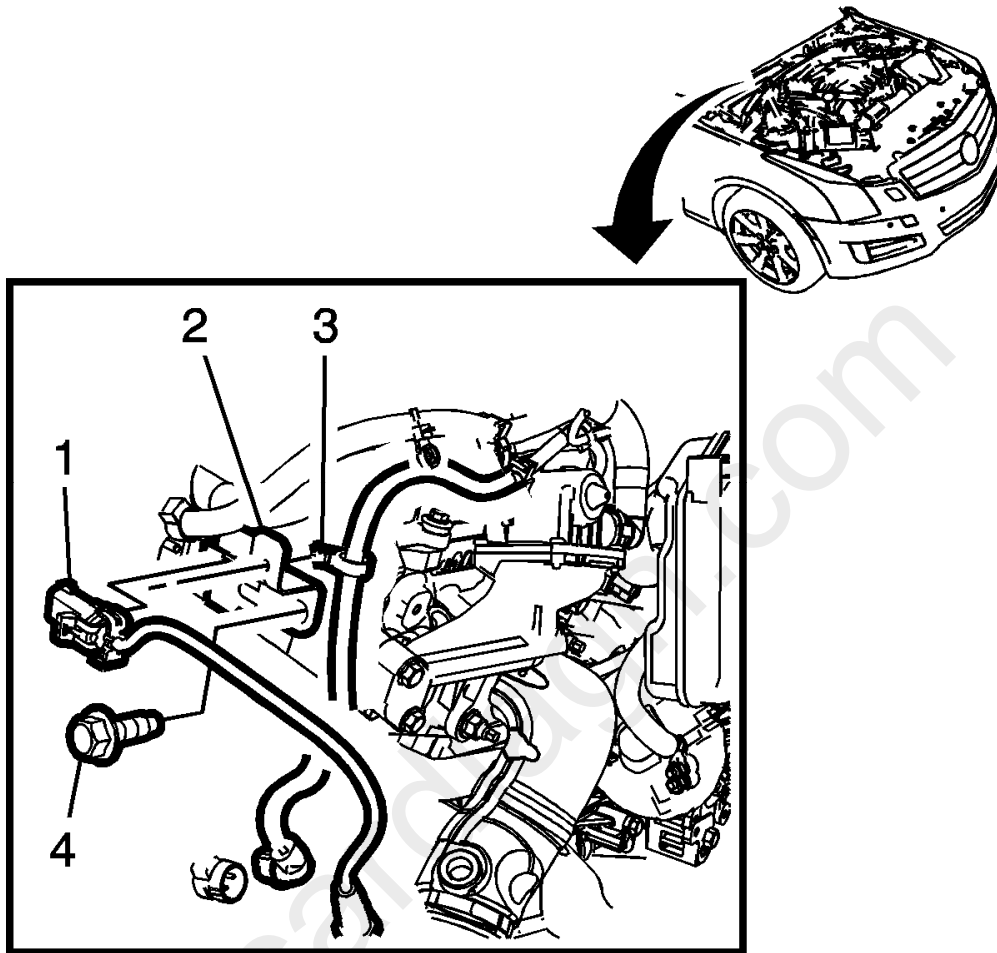


Fig. 94: Radiator Outlet Pipe Retaining Bracket
Courtesy of GENERAL MOTORS COMPANY

2. Remove the radiator outlet pipe retaining bracket fastener (4) on the rear of the cylinder head.
3. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
4. Remove the front compartment lower noise shield. Refer to **Front Compartment Lower Noise Shield Replacement (AWD)** , **Front Compartment Lower Noise Shield Replacement (RWD)** .

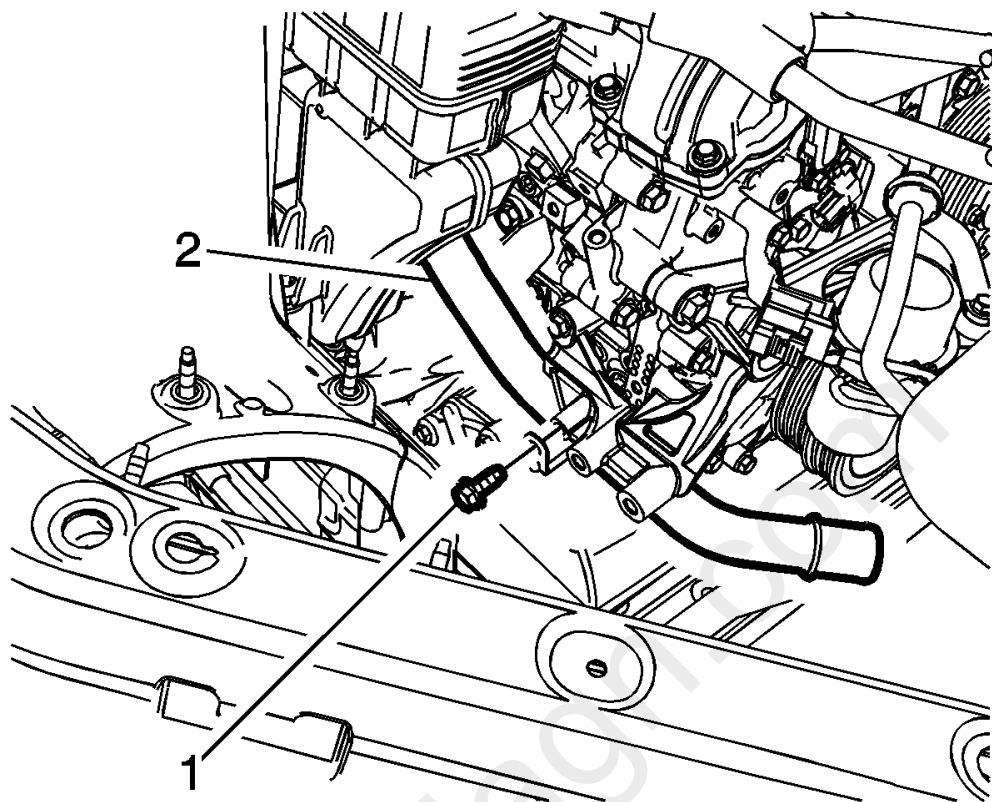


Fig. 95: Radiator Outlet Pipe

Courtesy of GENERAL MOTORS COMPANY

5. Remove the radiator outlet pipe clamp fastener (1) on the generator bracket.
6. Remove the propeller shaft. Refer to **Two-Piece Propeller Shaft Replacement (LFX, LF3)** , **Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)** .
7. Disconnect the wiring harness and connectors from the transmission.

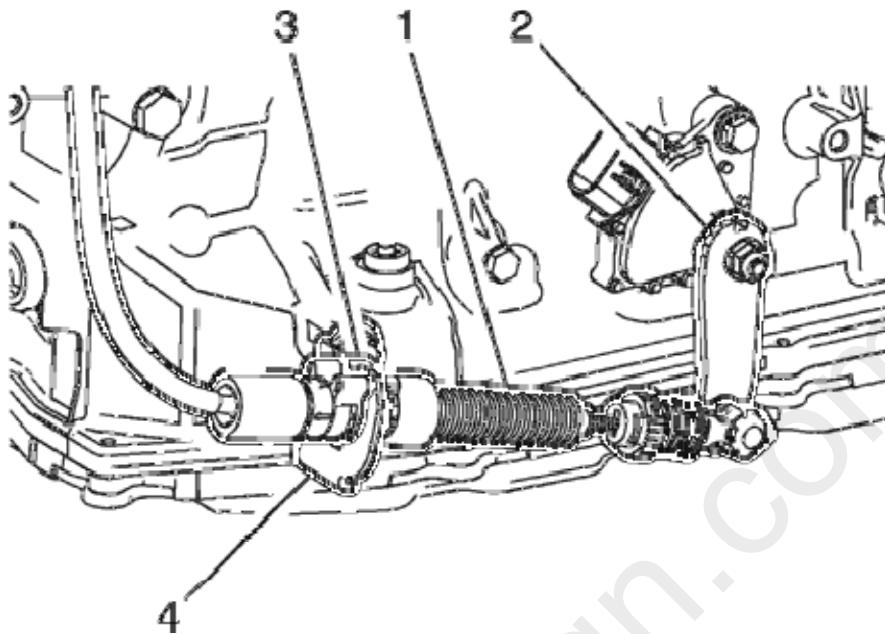


Fig. 96: Automatic Transmission Range Selector Lever Cable
Courtesy of GENERAL MOTORS COMPANY

8. Disconnect the transmission range selector lever cable terminal (1) from the transmission manual shift lever pin (2).
9. Remove the transmission range selector lever.
10. Slide the retainer (3) forward to release the transmission range selector lever cable from the bracket.
11. Remove the transmission range selector lever cable bracket.
12. Remove the starter motor. Refer to **Starter Replacement (LFX)** , **Starter Replacement (LTG)** , **Starter Replacement (LF3)** .

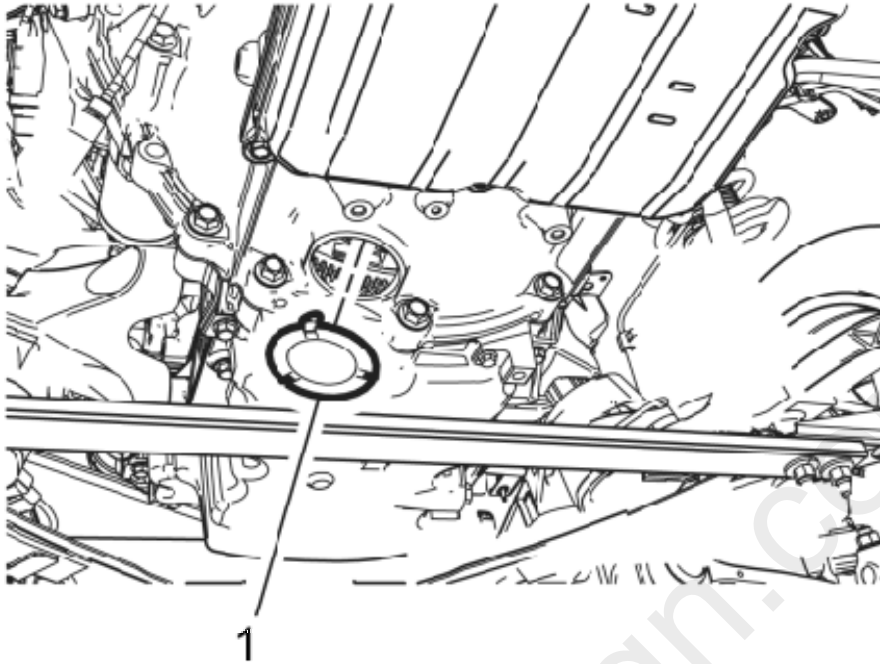


Fig. 97: Transmission Close Out Plug
Courtesy of GENERAL MOTORS COMPANY

13. Remove the transmission close out plug (1).
14. Mark the torque converter to flexplate orientation to ensure proper realignment.

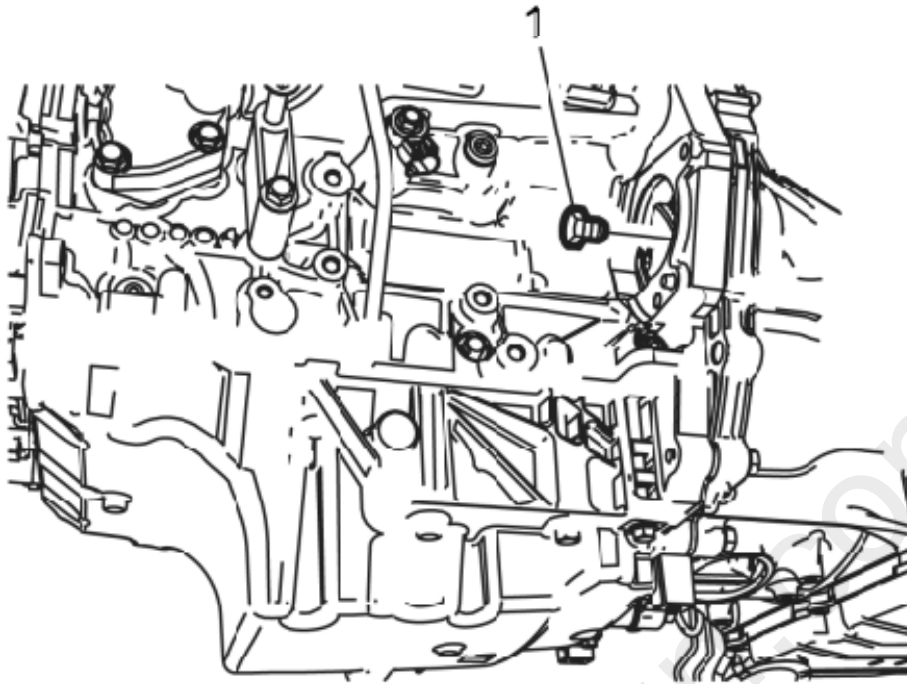


Fig. 98: Accessing Torque Converter Bolt Through Starter Opening
Courtesy of GENERAL MOTORS COMPANY

15. Repeat the following steps for all torque converter bolts (1):
 1. Rotate the harmonic balancer center bolt clockwise ONLY, in order to align the torque converter bolt with the starter opening.
 2. Remove and discard the torque converter bolt.
16. Place an oil drain pan under the transmission fluid cooler pipes.

NOTE: For the LFX engine, only refer to removal Steps 13 through 16 to reposition the pipes. For the LF3 engine only refer to removal Steps 15 through 18 to reposition the pipes within the transmission fluid cooler inlet and outlet pipe replacement procedure.

17. Remove the transmission fluid cooler inlet and outlet pipes from the transmission, and position aside. Refer to **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LFX, LTG MYA with V03)** , **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LFX, LTG MYA without V03)** , **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LFX MGG)** , **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LF3 with MGG and V03)** .
18. Plug the open fluid ports to prevent fluid loss and contamination.
19. Support the transmission with a suitable transmission jack.

20. Remove the transmission support. Refer to **Transmission Support Replacement (RWD)** , **Transmission Support Replacement (AWD)** .
21. Lower the transmission jack just enough to expose the lower transmission to engine bolts.

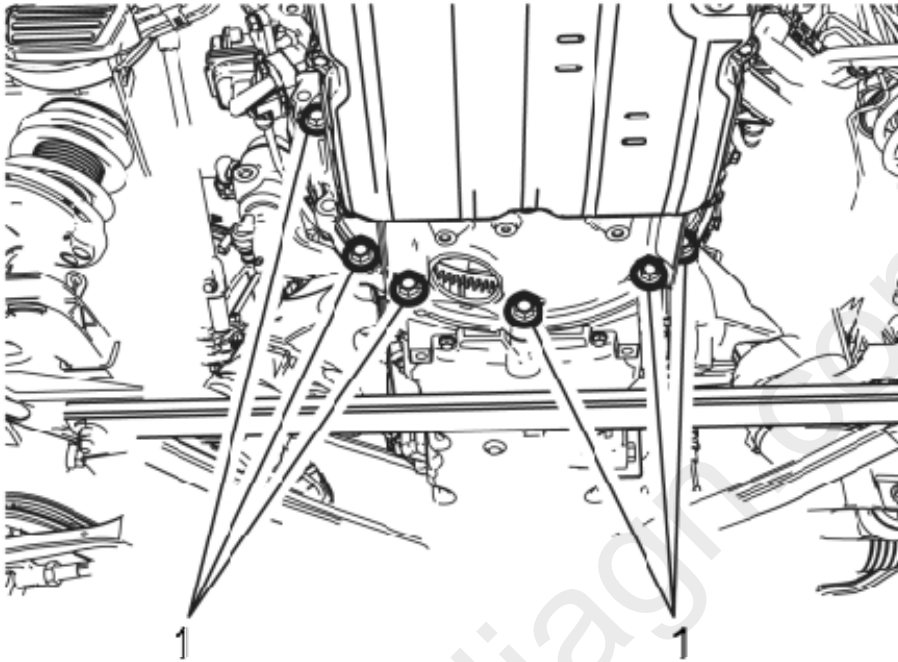


Fig. 99: Lower Transmission To Engine Bolts
Courtesy of GENERAL MOTORS COMPANY

22. Remove the lower transmission to engine bolts (1).

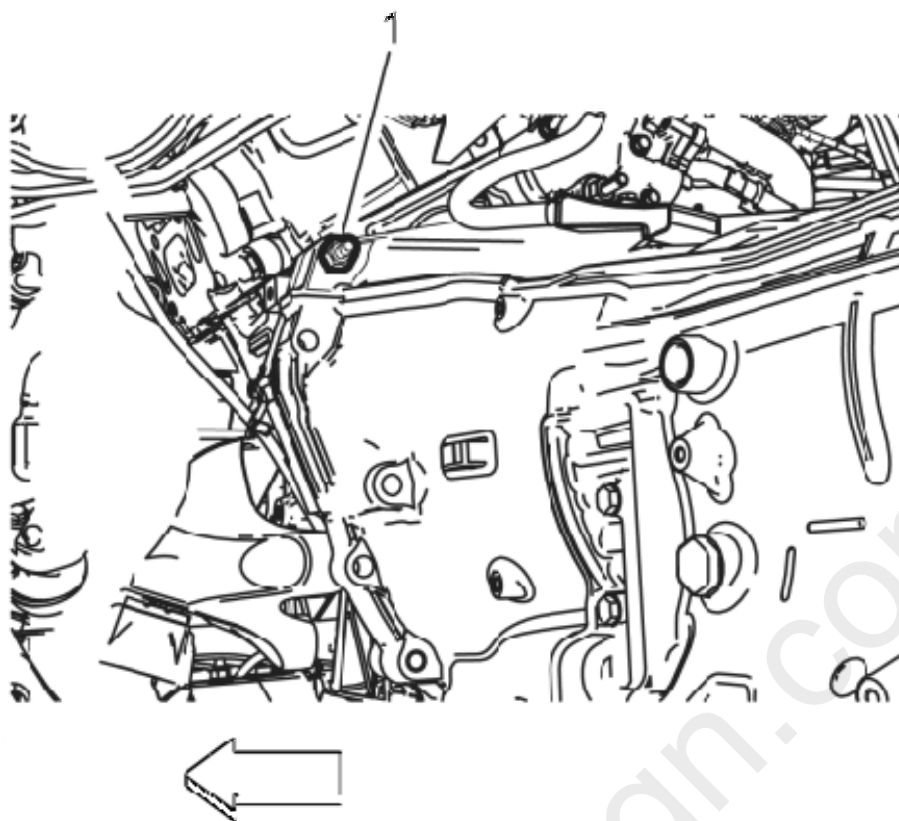


Fig. 100: Left Upper Transmission To Engine Bolt
Courtesy of GENERAL MOTORS COMPANY

23. Remove the left upper transmission to engine bolt (1).

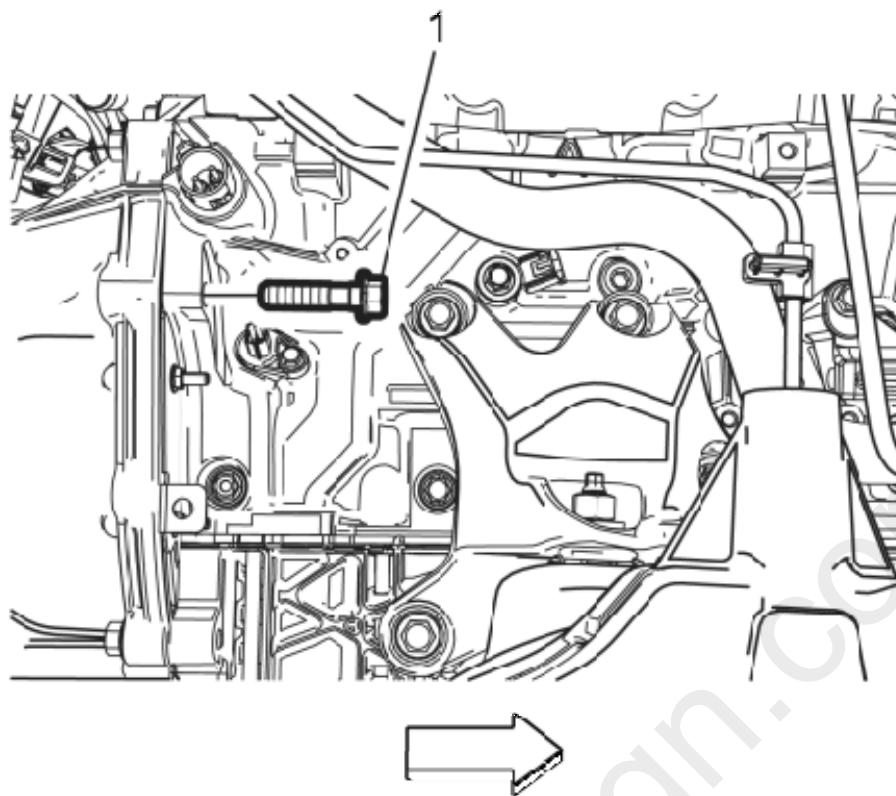


Fig. 101: Right Upper Transmission To Engine Bolt
Courtesy of GENERAL MOTORS COMPANY

24. Remove the right upper transmission to engine bolt (1).

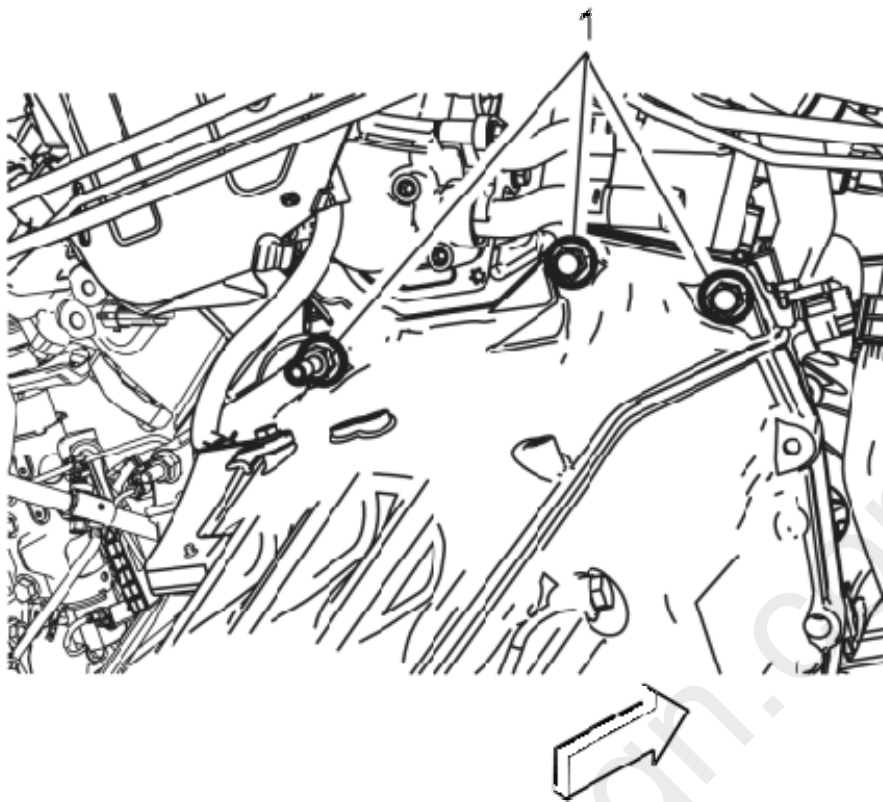


Fig. 102: Upper Transmission To Engine Bolts
Courtesy of GENERAL MOTORS COMPANY

25. Remove the three transmission to engine bolts (1).
26. Pull the transmission straight back.
27. Install the **J-21366** strap onto the transmission bell housing to retain the torque converter.
28. Remove the transmission from the vehicle.

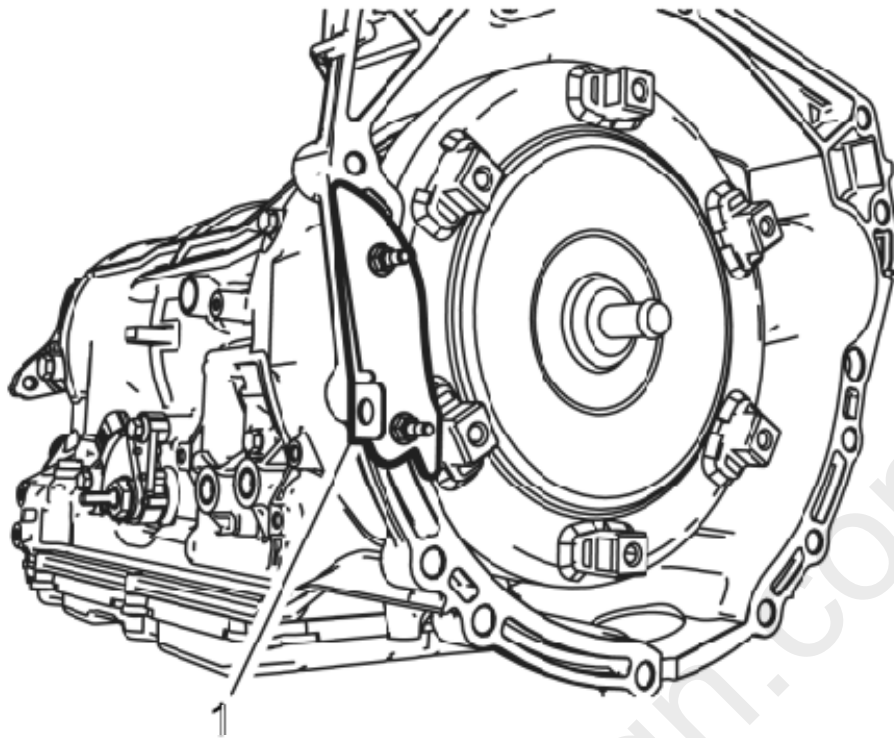


Fig. 103: Transmission Converter Cover
Courtesy of GENERAL MOTORS COMPANY

29. Remove the transmission converter cover (1).

Installation Procedure

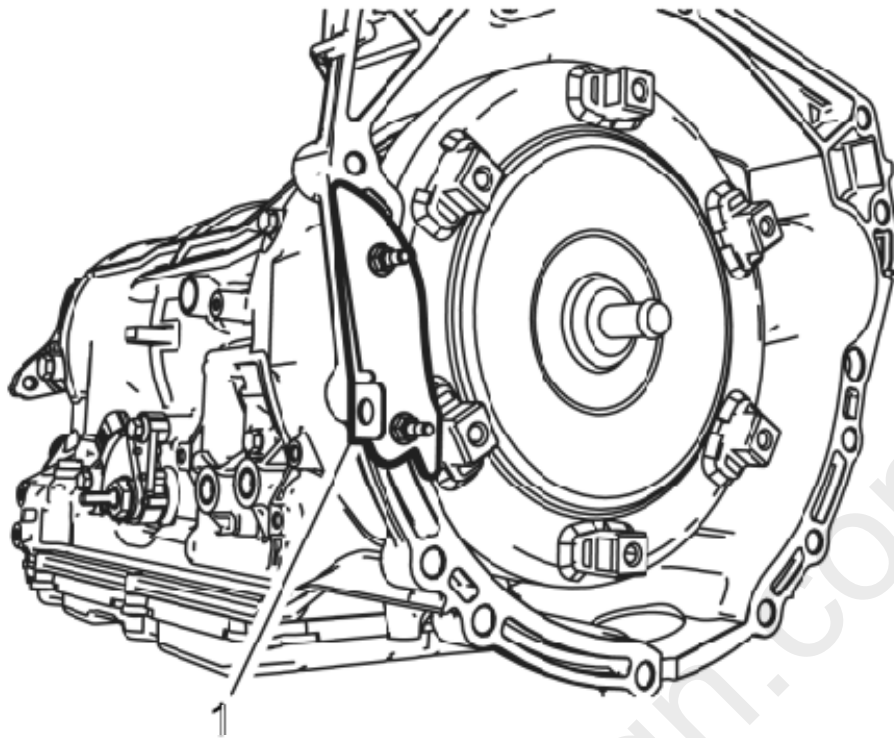


Fig. 104: Transmission Converter Cover
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

1. Install the transmission converter cover (1) and tighten the bolts to 10 (89 lb in).
2. Remove the J-21366 strap from the transmission bell housing.
3. Install the transmission to the vehicle.

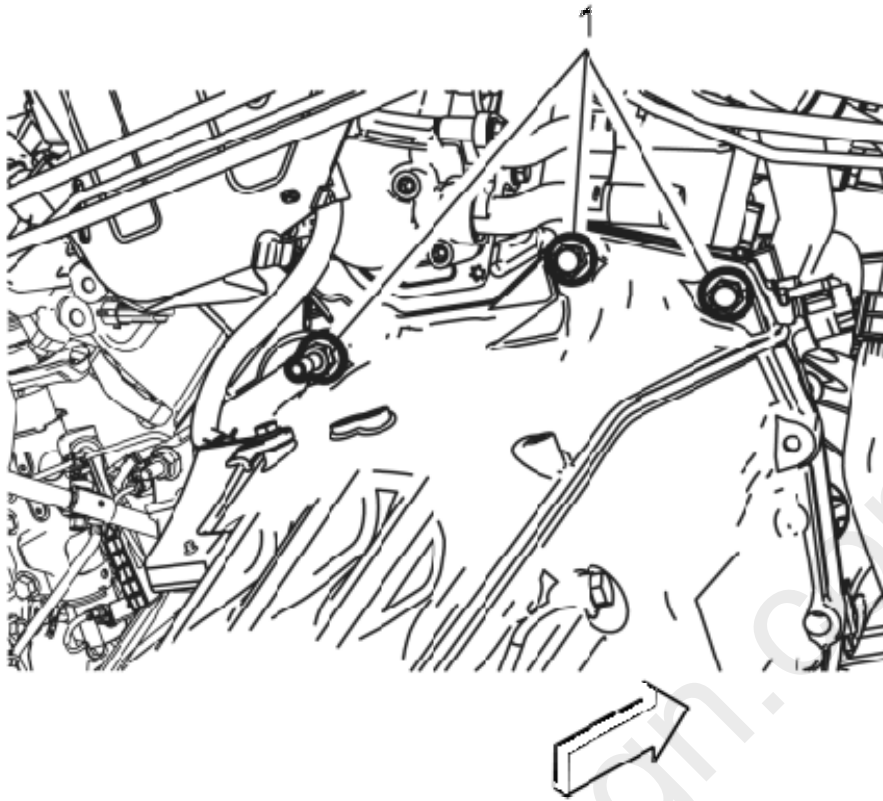


Fig. 105: Upper Transmission To Engine Bolts
Courtesy of GENERAL MOTORS COMPANY

4. Install the three upper transmission to engine bolts (1) and tighten to 50 (37 lb ft).
5. Using a small pry bar, move the torque converter toward the flexplate.
6. Align the torque converter to flexplate orientation marks made during the removal procedure.

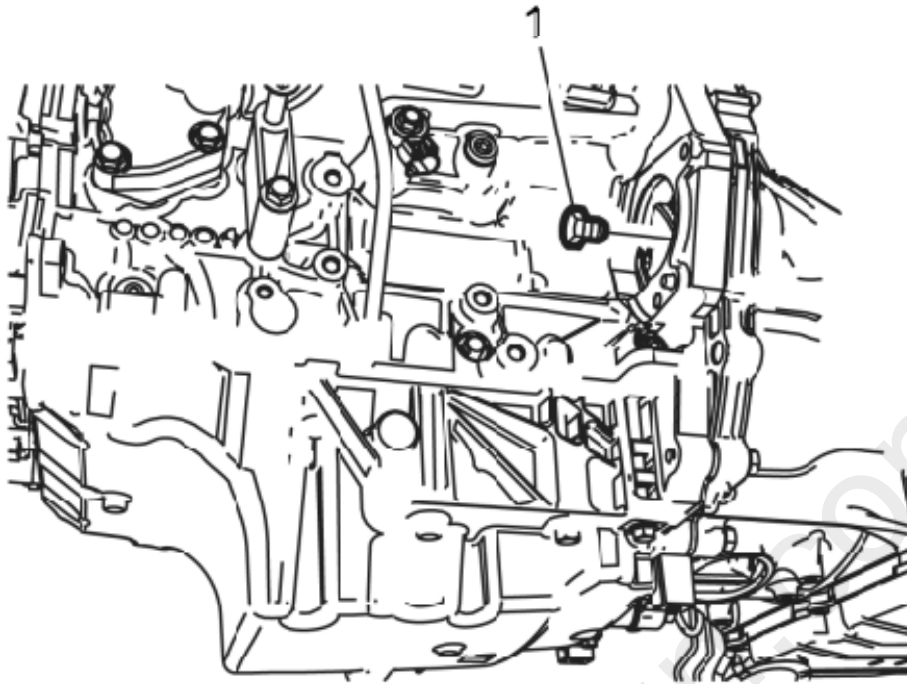


Fig. 106: Accessing Torque Converter Bolt Through Starter Opening
Courtesy of GENERAL MOTORS COMPANY

NOTE: Torque converter bolts are self-locking and must be replaced with **NEW** torque converter bolts every time the bolts are removed.

7. Complete the following steps for all torque converter bolts (1):
 1. Rotate the harmonic balancer center bolt clockwise **ONLY**, in order to align the torque converter bolt holes in the flexplate with the starter opening in the engine block.
 2. For vehicles equipped with the LFX engine, install all **NEW** torque converter bolts (1) and tighten to 63 (46 lb ft).
 3. For vehicles equipped with the LF3 engine, install all **NEW** torque converter bolts (1) and tighten to 100 (74 lb ft).

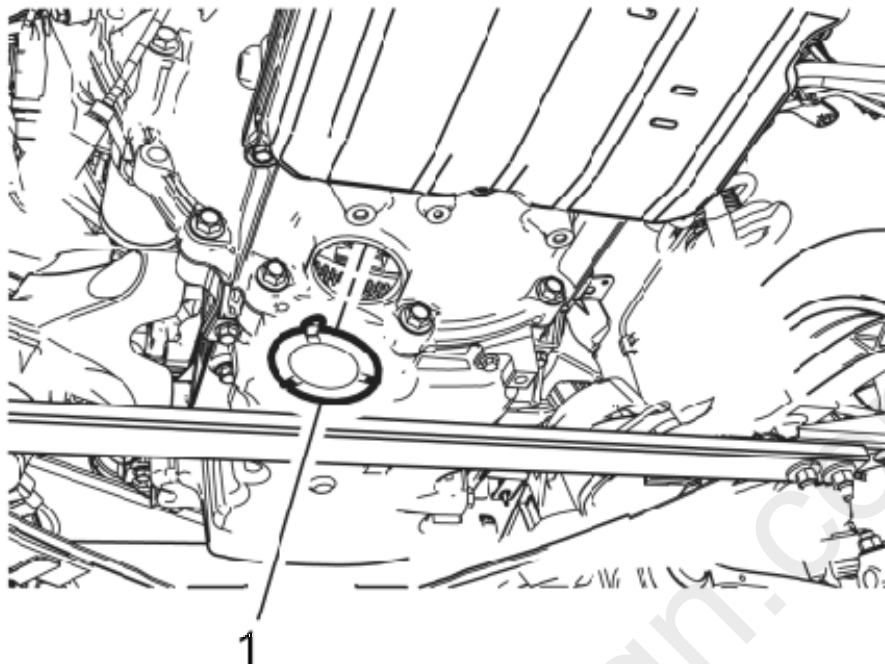


Fig. 107: Transmission Close Out Plug
Courtesy of GENERAL MOTORS COMPANY

8. Install the transmission close out plug (1).
9. Install the starter motor. Refer to **Starter Replacement (LFX)** , **Starter Replacement (LTG)** , **Starter Replacement (LF3)** .

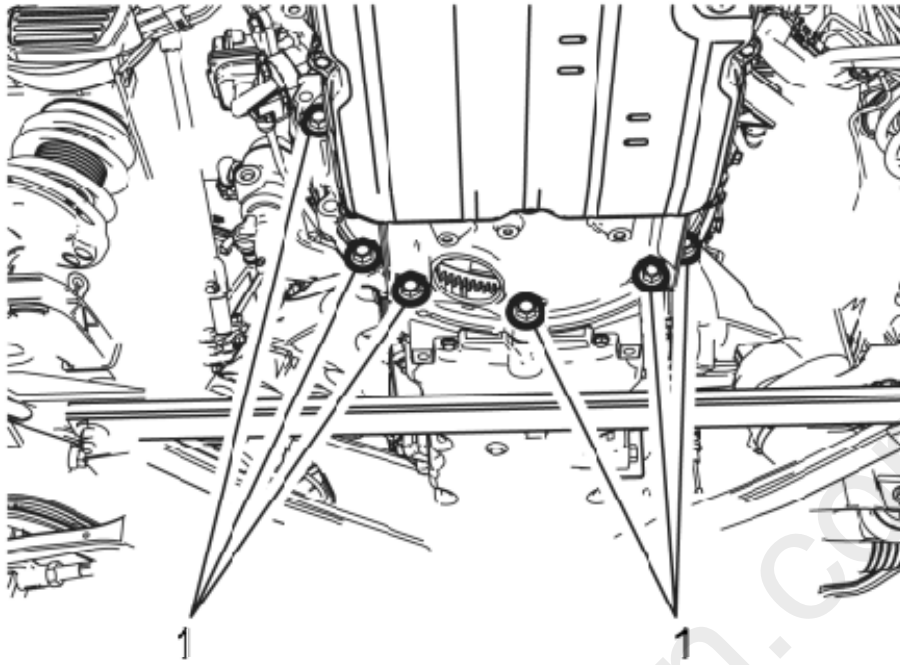


Fig. 108: Lower Transmission To Engine Bolts
Courtesy of GENERAL MOTORS COMPANY

10. Install the lower transmission to engine bolts (1) and tighten to 50 (37 lb ft).

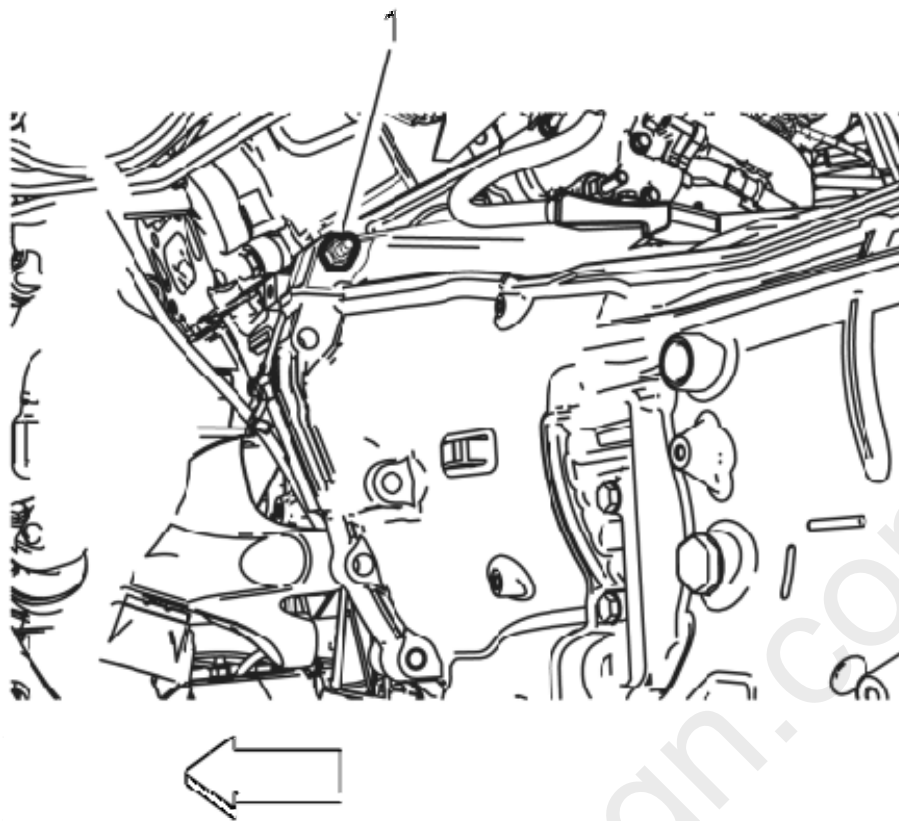


Fig. 109: Left Upper Transmission To Engine Bolt
Courtesy of GENERAL MOTORS COMPANY

11. Install the left transmission to engine bolt (1) and tighten to 50 (37 lb ft).

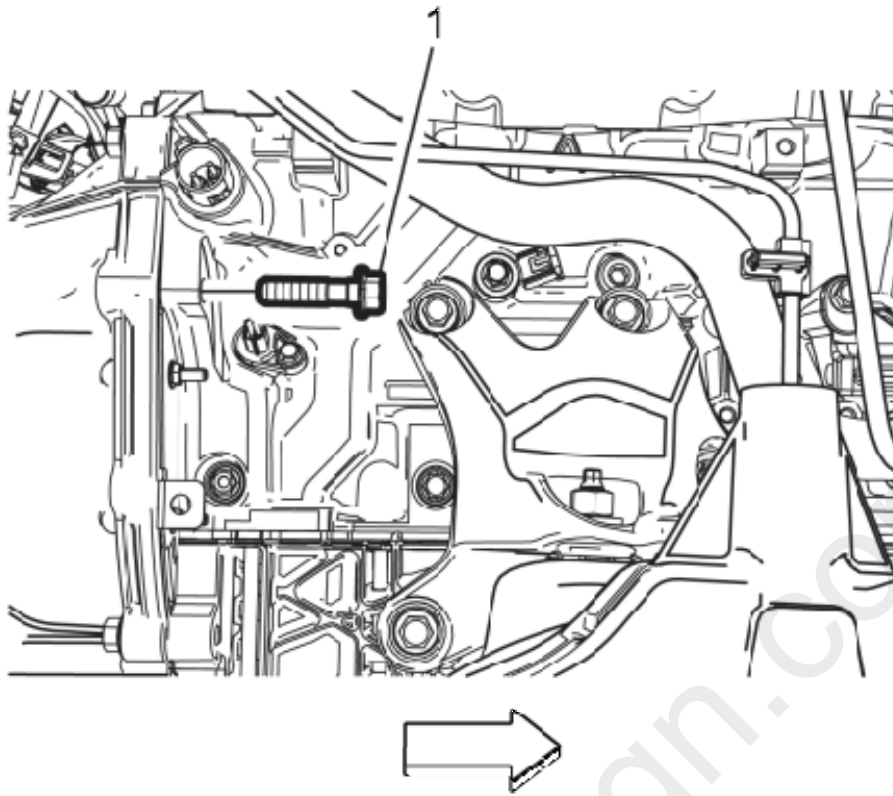


Fig. 110: Right Upper Transmission To Engine Bolt
Courtesy of GENERAL MOTORS COMPANY

12. Install the right transmission to engine bolt (1) and tighten to 50 (37 lb ft).
13. Install the transmission support. Refer to **Transmission Support Replacement (RWD)** , **Transmission Support Replacement (AWD)** .
14. Remove the transmission jack from under the vehicle.
15. Adjust the Park/Neutral Position Switch if it was loosened or removed. Refer to **Park/Neutral Position Switch Replacement**.
16. Install the transmission fluid cooler inlet and outlet pipe to the transmission. Refer to **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LFX, LTG MYA with V03)** , **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LFX, LTG MYA without V03)** , **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LFX MGG)** , **Transmission Fluid Cooler Inlet and Outlet Pipe Replacement (LF3 with MGG and V03)** .
17. Connect the wiring harness and connectors to the transmission.

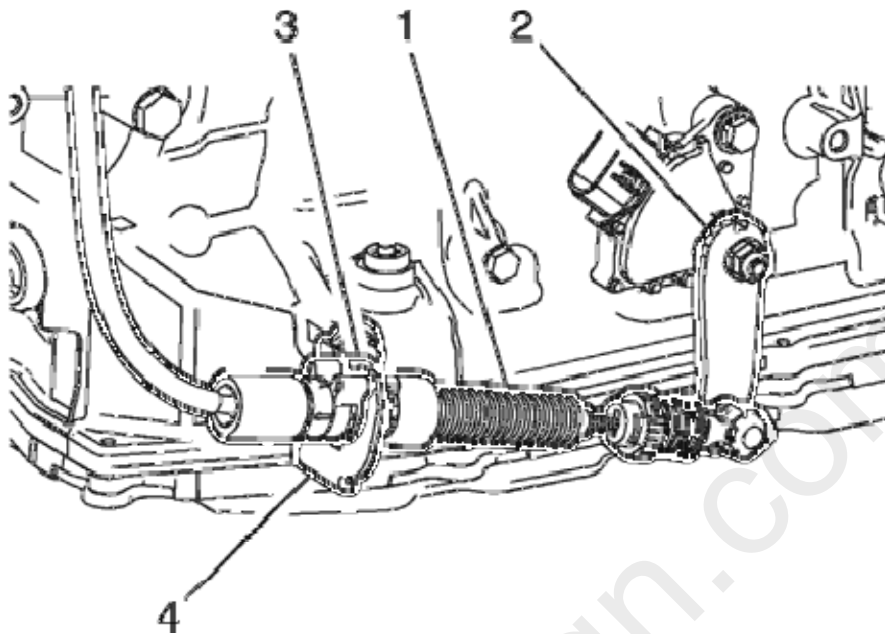


Fig. 111: Automatic Transmission Range Selector Lever Cable
Courtesy of GENERAL MOTORS COMPANY

18. Install the transmission range selector lever cable bracket and tighten the bolts to 22 (16 lb ft).
19. Install the cable in the bracket, then slide the retainer (3) forward to lock the transmission range selector lever cable in the bracket.
20. Install the transmission range selector cable lever nut and tighten to 30 (22 lb ft).
21. Connect the transmission range selector lever cable terminal (1) to the transmission manual shift lever pin (2).
22. Adjust the cable. Refer to **Range Selector Lever Cable Adjustment** .
23. Install the propeller shaft. Refer to **Two-Piece Propeller Shaft Replacement (LFX, LF3)** , **Two-Piece Propeller Shaft Replacement (LTG, LCV, LKW)** .

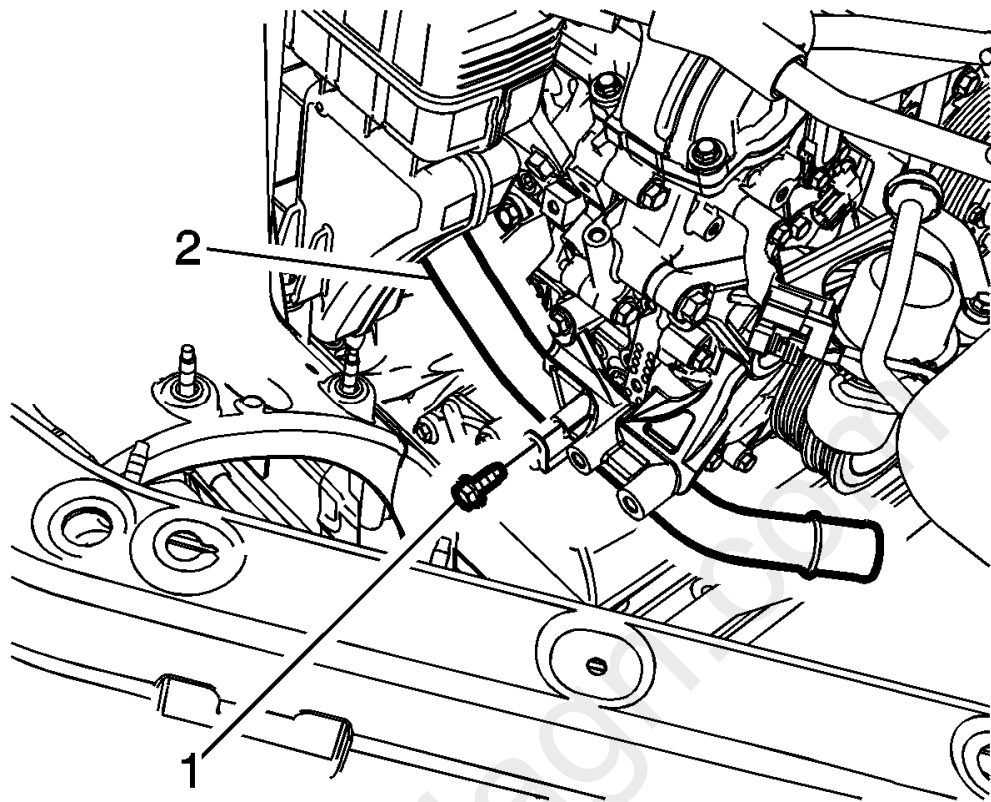


Fig. 112: Radiator Outlet Pipe

Courtesy of GENERAL MOTORS COMPANY

24. Install the radiator outlet pipe clamp fastener on the generator bracket and tighten to 22 (16 lb ft).
25. Install the front compartment lower noise shield. Refer to **Front Compartment Lower Noise Shield Replacement (AWD)** , **Front Compartment Lower Noise Shield Replacement (RWD)** .
26. Lower the vehicle.

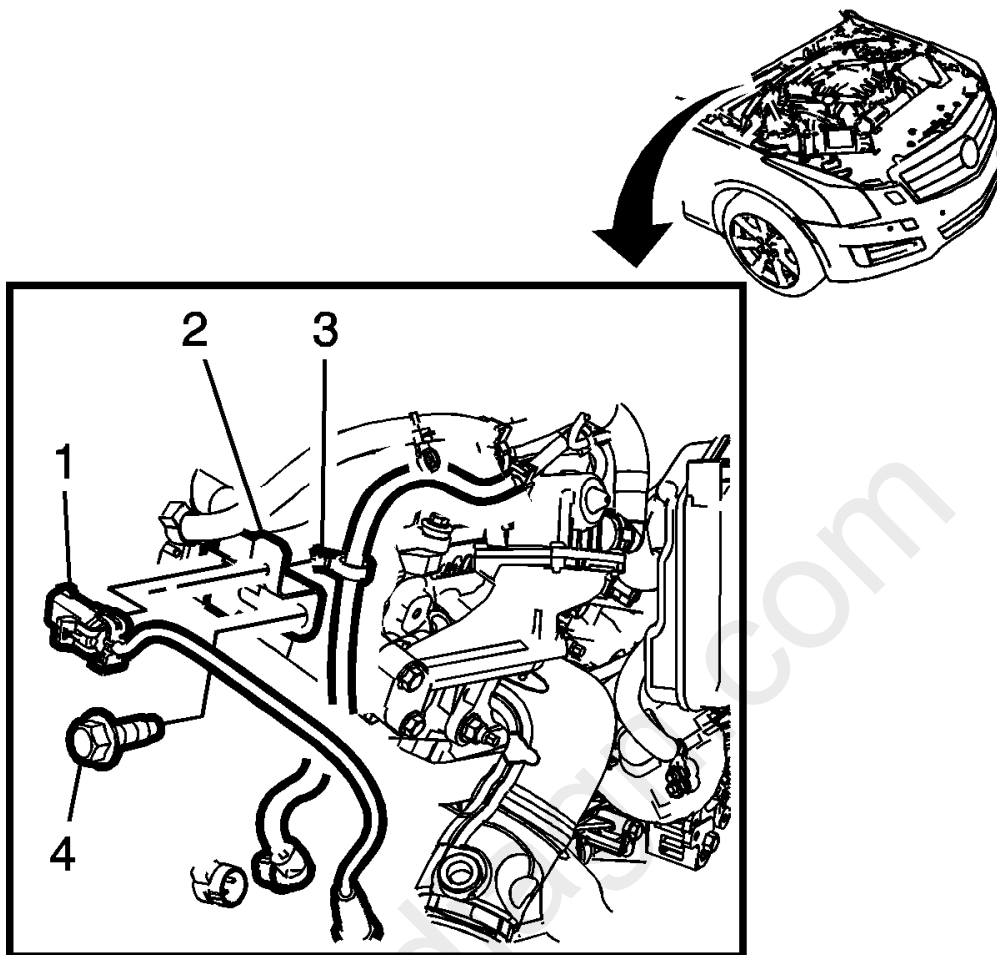


Fig. 113: Radiator Outlet Pipe Retaining Bracket
Courtesy of GENERAL MOTORS COMPANY

27. Install the radiator outlet pipe retaining bracket fastener on the rear of the cylinder head and tighten to 58 (43 lb ft).
28. Install the thermostat housing. Refer to **Engine Coolant Thermostat Housing Replacement (LFX, LF3)** , **Engine Coolant Thermostat Housing Replacement (LTG)** .
29. Check the transmission fluid level and fill if necessary. Refer to **Transmission Fluid Level and Condition Check**.

NOTE: Failure to perform the self-learn procedure after a repair/replacement may result in poor transmission performance, DTCs being set or customer dissatisfaction.

30. Perform the Automatic Transmission 8-Speed Learn Procedure. Refer to **Automatic Transmission 8-Speed Learn Procedure (MGG)**.

DESCRIPTION AND OPERATION

ELECTRONIC COMPONENT DESCRIPTION

Transmission Control Module

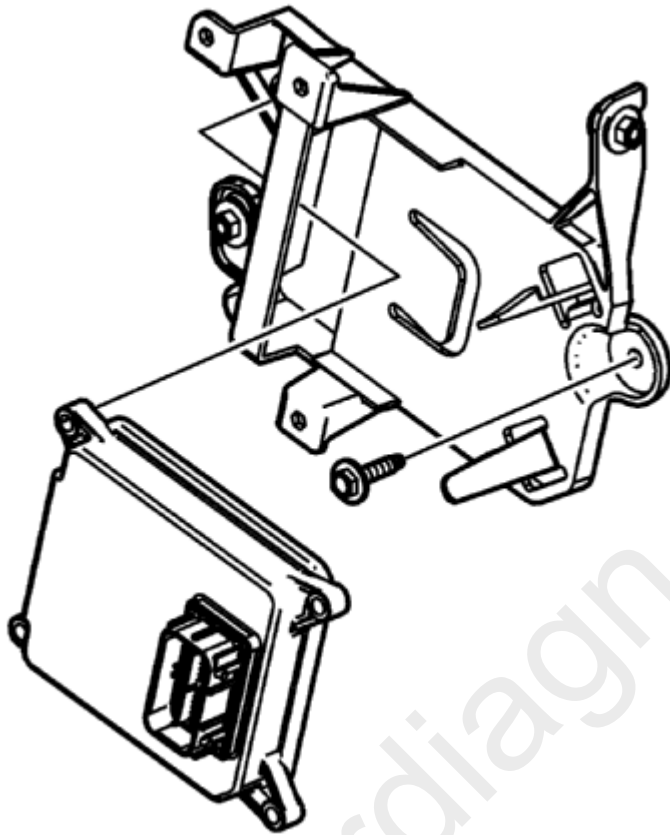


Fig. 114: Transmission Control Module
Courtesy of GENERAL MOTORS COMPANY

The Transmission Control Module (TCM) for this transmission is a standalone controller mounted on the lower right front frame rail of the vehicle. The TCM has one 56 way connector to interface with vehicle electrical system, transmission assembly and other vehicle control modules.

The TCM sends and receives various input and output signals from a number of switches and sensors internal and external to the transmission. In addition, the TCM is part of a network of other control modules on the vehicle. The network of control modules will share information with each other, over a common serial data communications line. Based upon the calibrations and input information the TCM receives, it will always have final authority of when to allow an upshift or downshift whether in manual mode operation or in drive position for automatic shifting.

Park/Neutral Position Switch Assembly

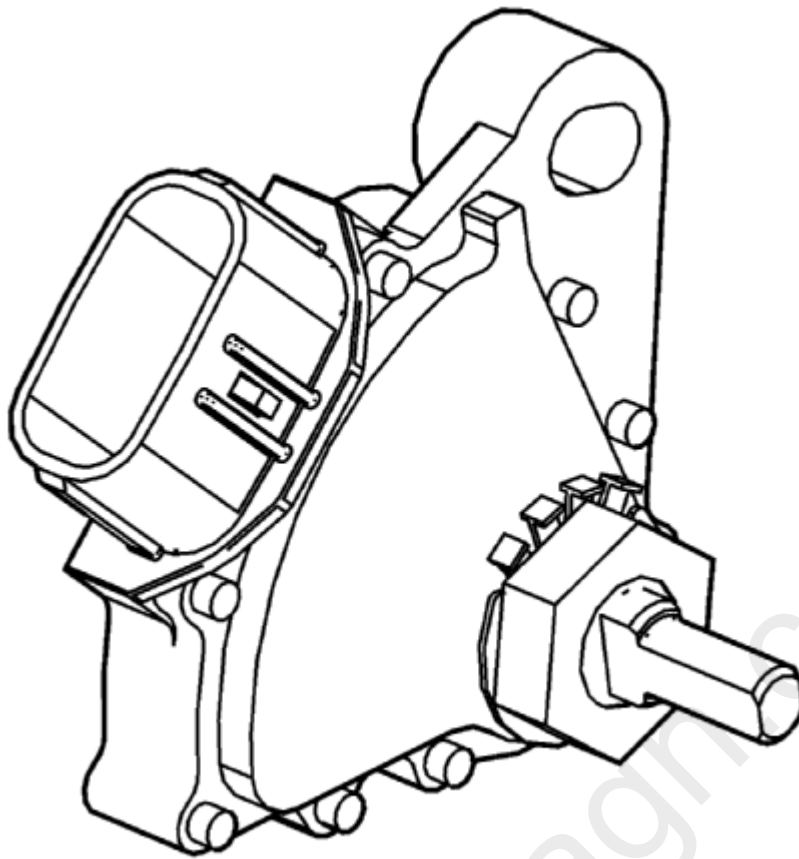


Fig. 115: Park/Neutral Position Switch Assembly
Courtesy of GENERAL MOTORS COMPANY

The park/neutral position switch contains 5 separate switches in one assembly. One switch circuit is for the park/neutral position switch which is used for engine starting. The other 4 switches are called the transmission range switches and are used to indicate the gear position the vehicle operator has selected. The park/neutral position switch assembly is mounted on the exterior right side of the transmission case.

Park Neutral Position Switch

The park/neutral position switch indicates to the Engine Control Module (ECM) if the vehicle is in park/neutral or in a drive gear range. With the ignition ON, the ECM provides 12 V on the park/neutral signal circuit to the park/neutral position switch. A separate ground wire from the park/neutral position switch to chassis ground completes the circuit. When the gear shift lever is in park or neutral, the switch closes and drops the voltage on the signal circuit to 0 V. In this state the engine will start and run. In reverse or drive range the park/neutral position switch opens, 12 V is then present on the signal circuit which will inhibit engine starting.

Transmission Range Switch

The transmission range switch indicates to the TCM which gear position the vehicle operator has selected. The 4 positions are Park, Reverse, Neutral and Drive. Each position has its own individual 12 V signal circuit, switch and ground circuit. All four ground circuits are connected together at a common chassis ground. The

TCM supplies and monitors each 12 V signal circuit for a voltage drop. When a range is selected the switch closes and the circuit changes from high to low. Depending on which switch closes, this action signals the TCM as to which gear the vehicle operator has selected and applies the correct clutches. The transmission range switch parameter will display High with the switch open, Low with the switch closed or Invalid, when stuck between 2 positions.

Speed Sensors

Input Speed Sensor

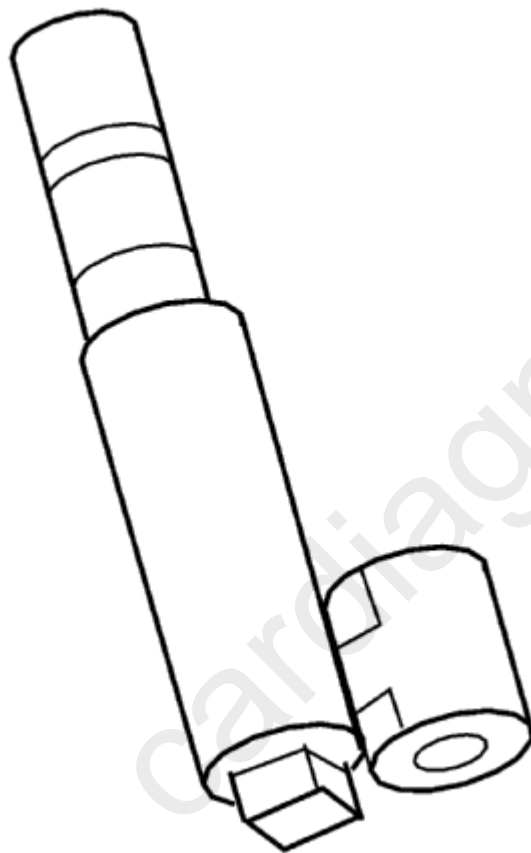


Fig. 116: Input Speed Sensor

Courtesy of GENERAL MOTORS COMPANY

The input speed sensor assembly is a two wire hall-effect type sensor. The TCM supplies a 12 V signal circuit and a low reference circuit to the input speed sensor. The input speed sensor produces a square wave signal by toggling the 12 V signal circuit low and high based on the leading and trailing edges on the splines that are cast on the transmission input shaft. As the rotational speed of the input shaft increases, the frequency of the input speed sensor signal increases. The TCM uses the input speed sensor signal along with the intermediate and output speed sensor signals to determine transmission line pressure, shift patterns, torque converter clutch slip speed and the correct gear ratio.

Intermediate Speed Sensor

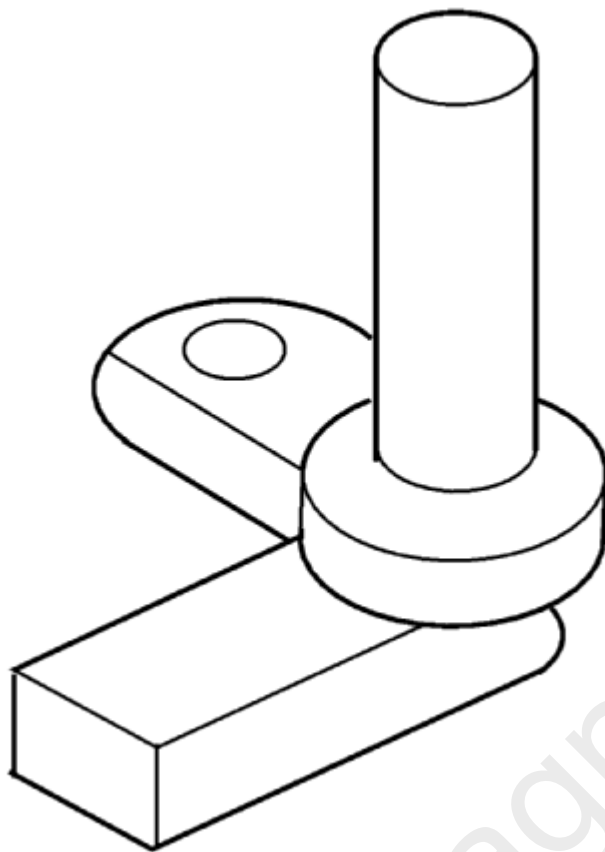


Fig. 117: Intermediate Speed Sensor
Courtesy of GENERAL MOTORS COMPANY

The intermediate speed sensor assembly is a two wire hall-effect type sensor. The TCM supplies a 12 V signal circuit and a low reference circuit to the intermediate speed sensor. The intermediate speed sensor produces a square wave signal by toggling the 12 V signal circuit low and high based on the leading and trailing edges of the splines that are on the outside diameter of the C3 clutch drum. As the rotational speed of the C3 clutch drum increases, the frequency of the intermediate speed sensor signal increases. The TCM uses the intermediate speed sensor signal along with the input and output speed sensor signals to determine transmission line pressure, shift patterns, torque converter clutch slip speed and the correct gear ratio.

Output Speed Sensor

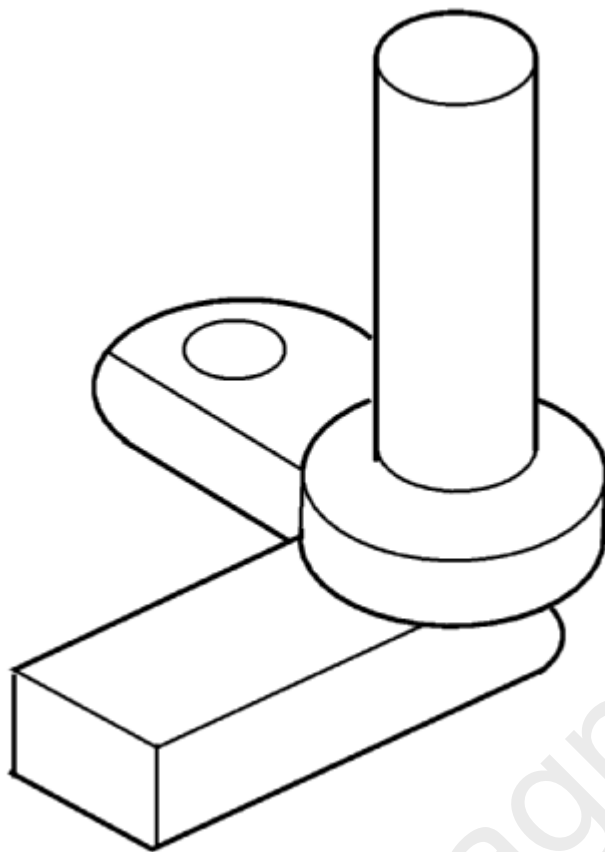


Fig. 118: Output Speed Sensor
Courtesy of GENERAL MOTORS COMPANY

The output speed sensor assembly is a two wire hall-effect type sensor. The TCM supplies a 12 V signal circuit and a low reference circuit to the output speed sensor. The output speed sensor produces a square wave signal by toggling the 12 V signal circuit low and high based on the leading and trailing edges of the splines that are on the outside diameter of the rear planetary ring gear drum. As the rotational speed of the rear planetary ring gear drum increases, the frequency of the output speed sensor signal increases. The TCM uses the output speed sensor signal along with the input and intermediate speed sensor signals to determine transmission line pressure, shift patterns, torque converter clutch slip speed and the correct gear ratio.

Transmission Internal Wire Harness Assembly

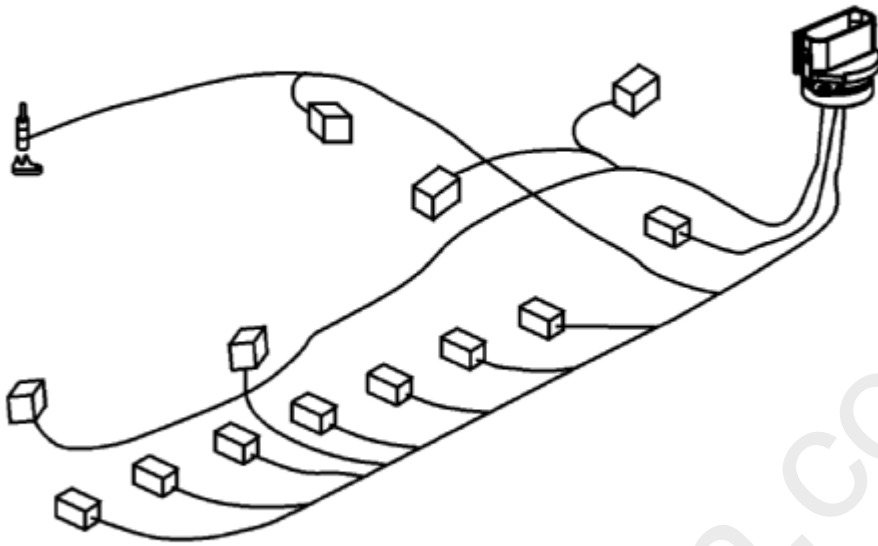


Fig. 119: Transmission Internal Wire Harness
Courtesy of GENERAL MOTORS COMPANY

The transmission internal wire harness assembly also includes the pass-thru in-line connector to the external vehicle harness connector. The internal wire harness connects to the transmission fluid temperature sensor, oil pressure switch, pressure control solenoids, on/off solenoids, input, intermediate and output speed sensors. The transmission fluid temperature sensor is also part of the internal wire harness assembly, with no serviceable part. If the transmission fluid temperature sensor is faulty, then replace the complete internal wire harness assembly.

Transmission Fluid Temperature Sensor

The transmission fluid temperature sensor is a 2 wire negative temperature coefficient thermistor. The TCM supplies a 12 V signal circuit and a low reference circuit to the transmission fluid temperature sensor. The transmission fluid temperature sensor measures the temperature of the oil in the transmission fluid oil pan. As the temperature of the fluid increases, the resistance of the sensor decreases, varying the voltage on the signal circuit. The transmission fluid temperature sensor is part of the transmission internal wire harness assembly and has no serviceable parts. If the transmission fluid temperature sensor is faulty, then replace the complete internal transmission wire harness assembly.

Transmission Valve Body Assembly

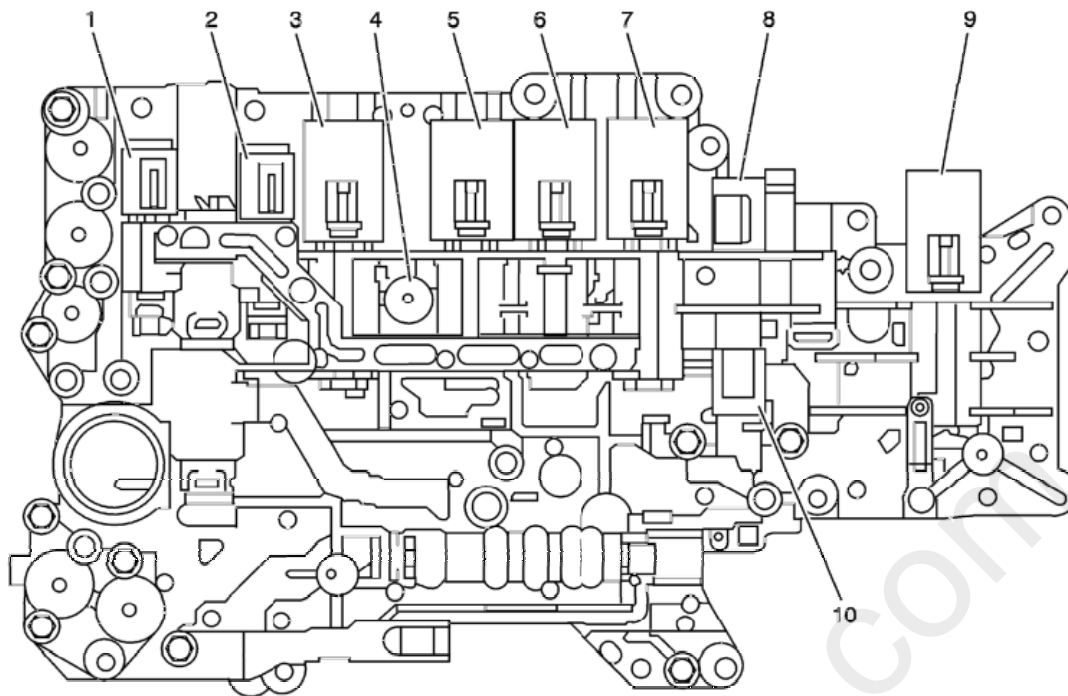


Fig. 120: Transmission Valve Body Assembly
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Pressure Control Solenoid Valve 1
2	Torque Converter Clutch (TCC) Pressure Control Solenoid Valve
3	Pressure Control Solenoid Valve 2
4	Transmission Fluid Pressure Switch
5	Pressure Control Solenoid Valve 6
6	Pressure Control Solenoid Valve 5
7	Pressure Control Solenoid Valve 4
8	Torque Converter Clutch (TCC) Enable Solenoid Valve
9	Pressure Control Solenoid Valve 3
10	Shift Solenoid Valve 1

Transmission Fluid Pressure Switch

The transmission fluid pressure switch is part of the transmission valve body which has no serviceable parts. The transmission fluid pressure switch is a normally open switch. A 12 V signal circuit is provided by the transmission control module to the transmission fluid pressure switch. The ground circuit is provided through the transmission fluid pressure switch housing to the transmission case. The transmission fluid pressure switch detects the fluid pressure when the pressure control solenoid valve 2 is commanded ON.

Pressure Regulating Solenoids

Pressure Control Solenoid Valve 1

This pressure control solenoid is installed on the valve body and linearly controls hydraulic pressure based on output signals from the TCM. This linear solenoid regulates hydraulic pressure based on current flow. The solenoid receives 12 V from an individual high side driver internal to the TCM. The solenoid has a control circuit to an individual low side driver circuit that is pulsed-width modulated (ON and OFF) from the TCM. As current to this solenoid increases (ON time) there is a corresponding decrease in oil pressure. The normal operating range for these solenoids is between 0.2-1.0 amps. If the TCM detects an electrical circuit malfunctions or excessive current flow, the TCM will shut OFF the high side driver to the solenoid and set a DTC. The high side driver will reset when the circuit fault is corrected.

Pressure Control Solenoids 2, 3, 4, 5, 6 and Torque Converter Clutch (TCC) Pressure Control Solenoid Valve

These pressure control solenoids are installed on the valve body and linearly control hydraulic pressure based on output signals from the TCM. These linear solenoids regulate hydraulic pressure based on current flow. Each solenoid receives 12 V from an individual high side driver internal to the TCM. Each solenoid has a control circuit to an individual low side driver circuit that is pulsed-width modulated (ON and OFF) from the TCM. As current to a solenoid increases (ON time) there is a corresponding increase in oil pressure. The normal operating range for these solenoids is between 0.2-1.0 amps. If the TCM detects an electrical circuit malfunction or excessive current flow, the TCM will shut OFF the high side driver to that solenoid and set a DTC. The high side driver will reset when the circuit fault is corrected.

ON and OFF Solenoids

Shift Solenoid Valve 1

The shift solenoid valve 1 is a normally open, ON/OFF solenoid. In a normally open solenoid, a spring assembly is pushing or holding open the shift solenoid valve 1. When the solenoid becomes energized, electromotive force overcomes the spring force and closes the valve. The shift solenoid valve 1 is supplied 12 V by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset. To complete the circuit, ground is provided by the housing of the shift solenoid valve 1, to the transmission case.

Torque Converter Clutch (TCC) Enable Solenoid Valve

The TCC enable solenoid valve is a normally closed, ON/OFF solenoid. In a normally closed solenoid, a spring assembly is pushing or holding closed the TCC enable solenoid valve. When the solenoid becomes energized, electromotive force overcomes the spring force and opens the valve. The TCC enable solenoid valve is supplied 12 V by the TCM through a high side driver. The high side driver protects the circuit and components from excessive current flow. If excessive current flow is detected, the high side driver will turn OFF. When the fault is corrected, the high side driver will reset. To complete the circuit, ground is provided by the housing of the TCC enable solenoid valve, to the transmission case.

MANUAL MODE DESCRIPTION AND OPERATION

Transmission Manual Shift Switch

Manual Mode operation can be entered when the shift lever is in Drive (D) position, by pressing the Transmission Manual Shift Switch button located on top of the shift lever. When manual mode is selected, the letter M of the PRNDM display will illuminate to indicate the transmission is in manual mode.

Transmission Manual Shift Switch - Right and Left

The Transmission Manual Shift Switches consist of 2 separate switches mounted on the forward facing (back) side of the steering wheel. The upshift (+) switch is located on the right side and the downshift (-) switch is located on the left side of the steering wheel. The letter M will also change to a number (1 through 8), indicating the current gear the transmission is in or the desired gear that the operator has selected.

The Transmission Manual Shift Switch - Right and Left signals are hard wire and interface with the Body Control Module. The upshift and downshift commands are sent out on the serial data line from the Body Control Module to the Transmission Control Module.

Transmission Control Module

In manual mode, the Transmission Control Module will always have final authority of when to allow an upshift or downshift. The Transmission Control Module only allows an upshift or downshift into the appropriate gear based on engine RPM, vehicle speed and other control parameters. The transmission will not automatically downshift to the next lower gear if it would cause an engine over speed condition or an upshift if it would result in too low of engine RPM.

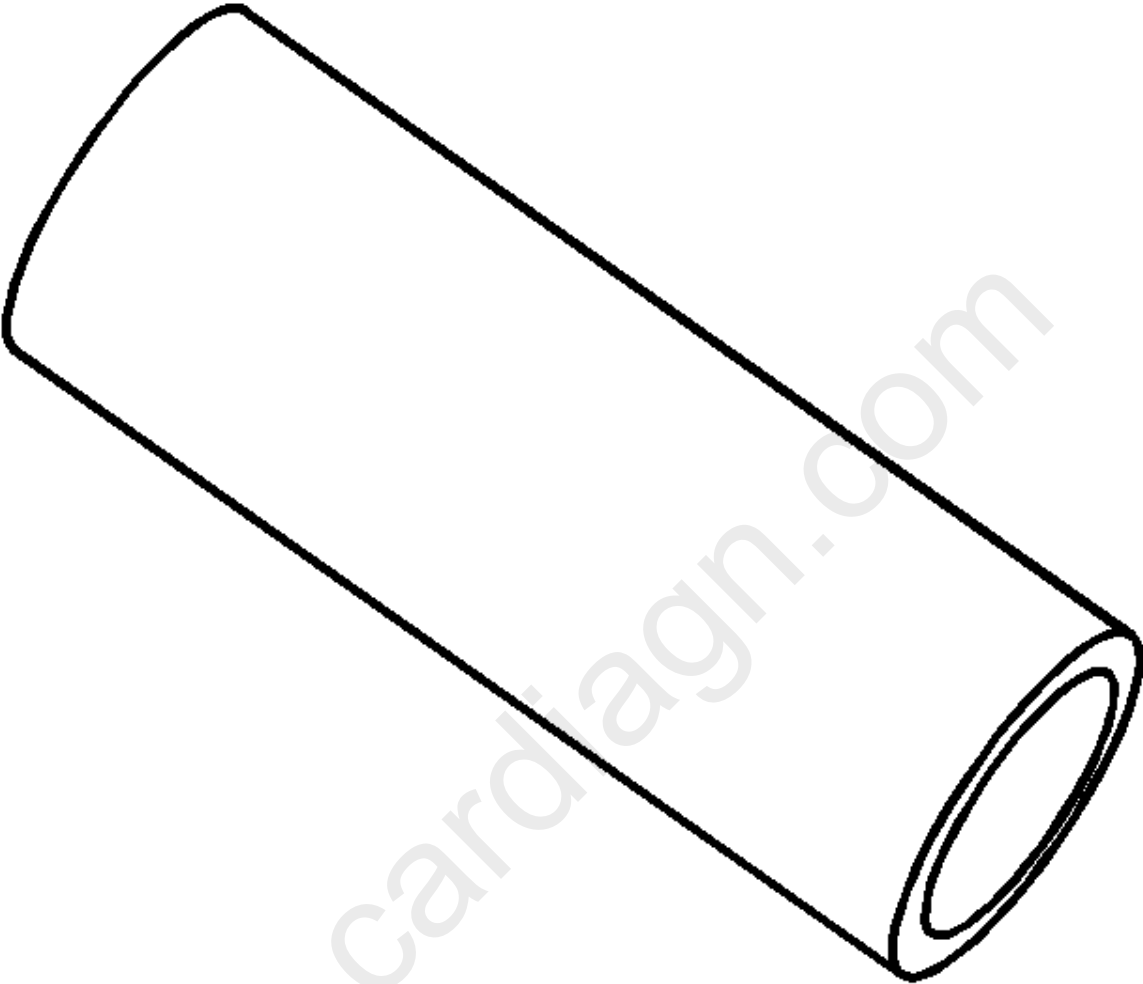
If the Transmission Control Module prevents an upshift or downshift for any reason, a SHIFT DENIED message will be displayed on the instrument cluster.

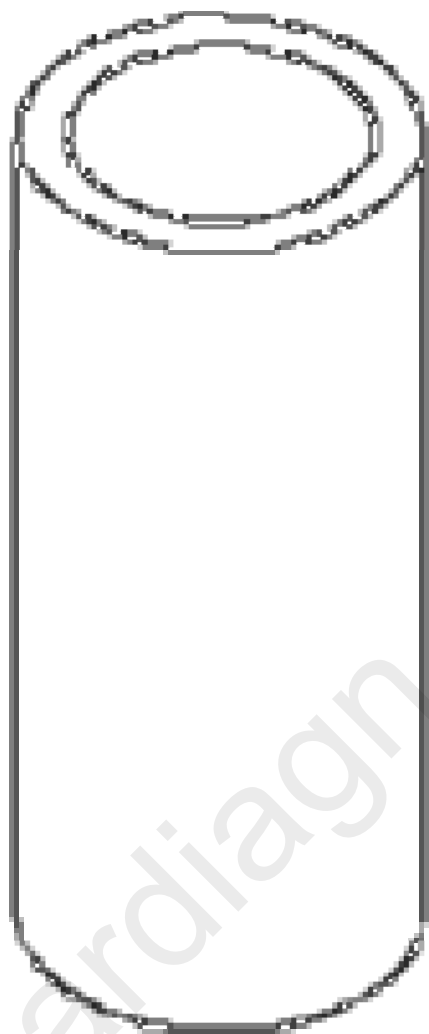
Manual Mode Shifting Operation

1. With the engine running, place the shift lever in Drive (D) position.
2. Press and release the Transmission Manual Shift Switch located on top of the Transmission Shift Lever. The letter M of PRNDM display will initially illuminate to indicate Manual Mode, and then change to indicate the current gear.
3. Momentary pressing the Transmission Manual Shift Switch - Right will command the transmission to the next higher gear. The current number indicated on the PRNDM display will change to a number to indicate the gear that the vehicle operator has selected, and if conditions are appropriate, commands the Transmission Control Module to upshift to that gear.
4. Momentary pressing the Transmission Manual Shift Switch - Left will command the transmission to the next lower gear. The current number indicated on the PRNDM display will change to a number to indicate the gear that the vehicle operator has selected, and if conditions are appropriate, commands the Transmission Control Module to downshift to that gear.
5. To exit Manual Mode, press and release the Transmission Manual Shift Switch button on top of the Transmission Shift lever.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

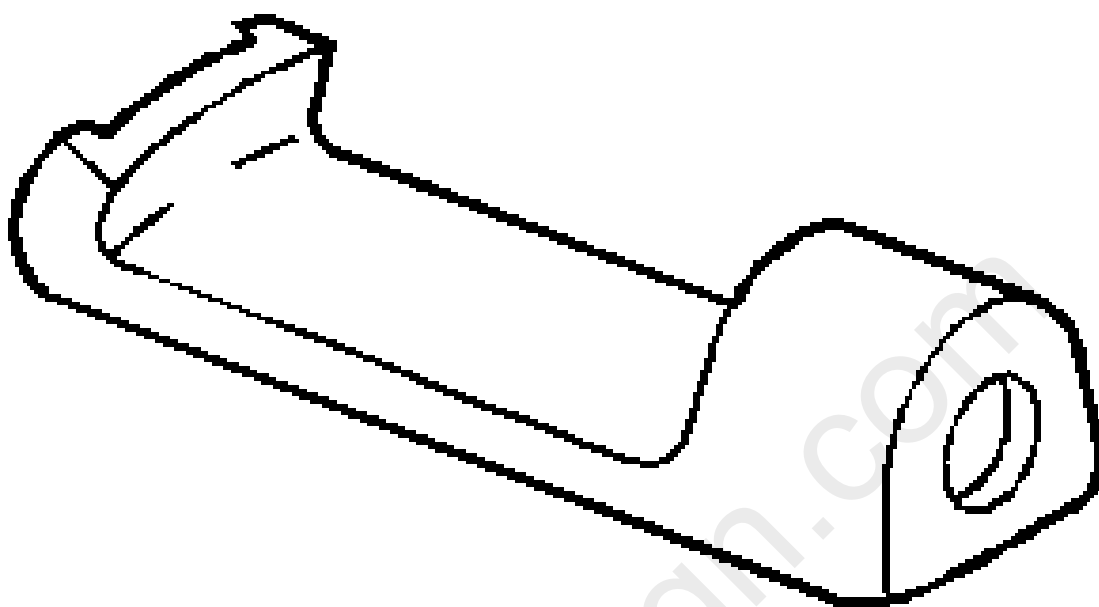
Illustration	Tool Number/Descrip
	DT-5590 J-5590 Torque Convert Seal Installer Dri



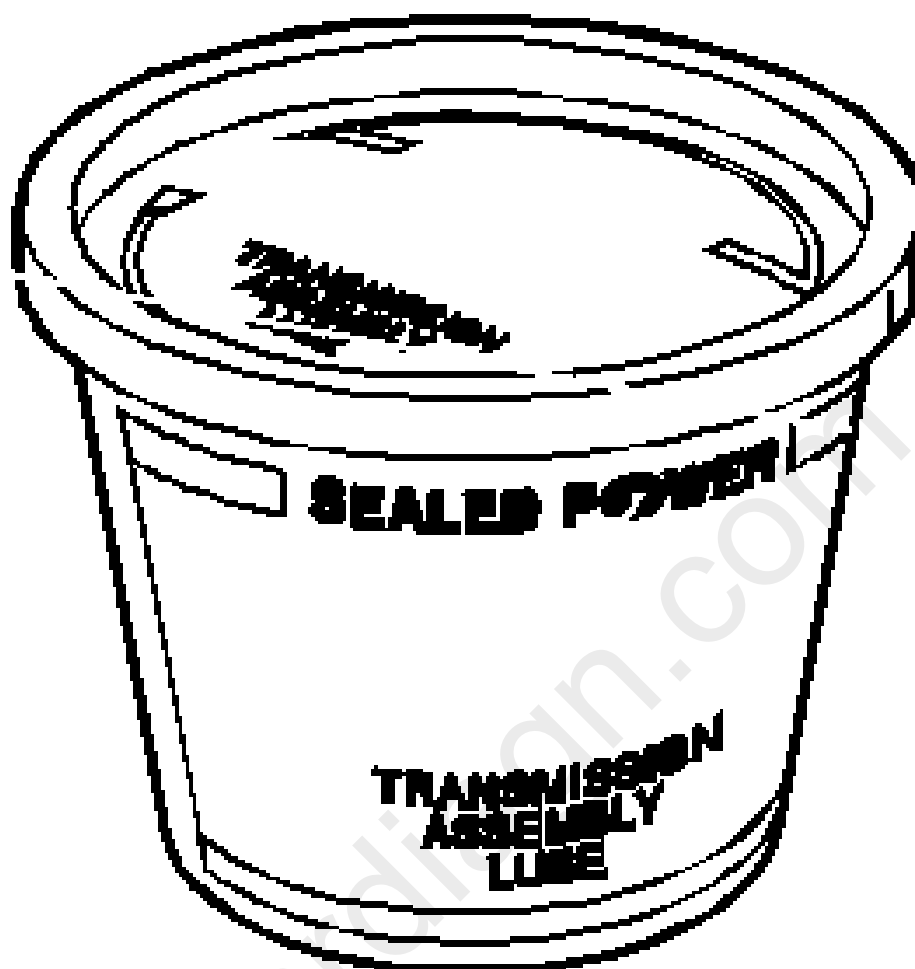
DT-6219
J-6219
Prop Shaft Sea
Installer



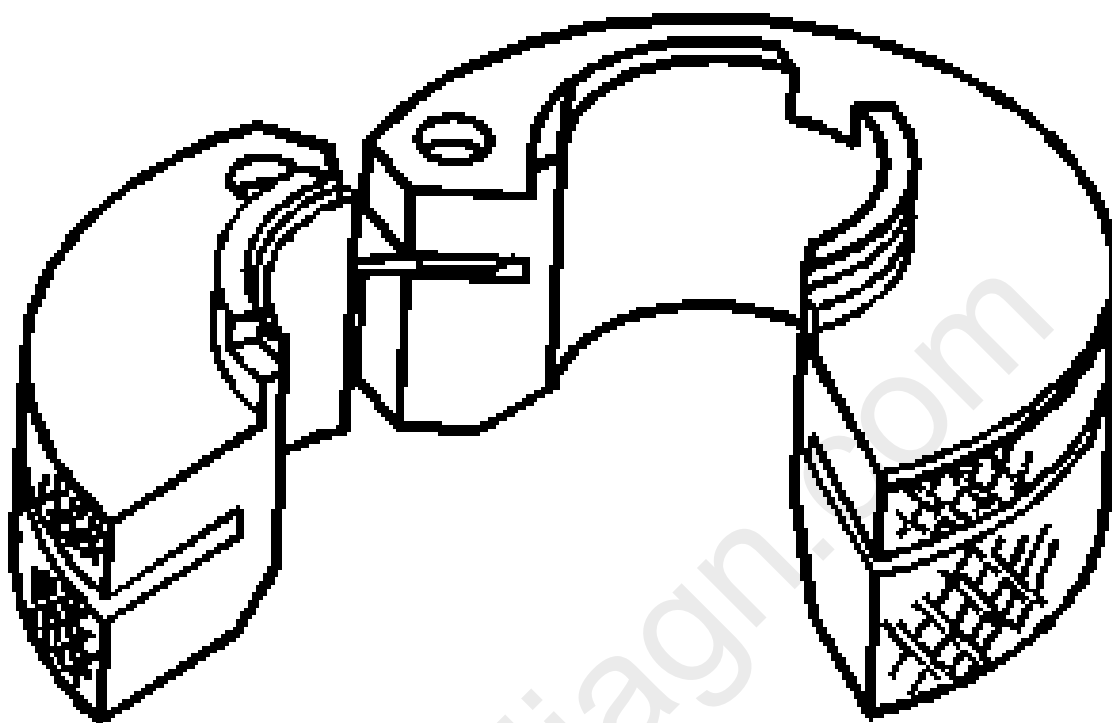
DT-22828
J-22828
Rear Output Sha
Seal Installer Dri



DT-23129
J-23129
KM-586
Universal Sea
Remover



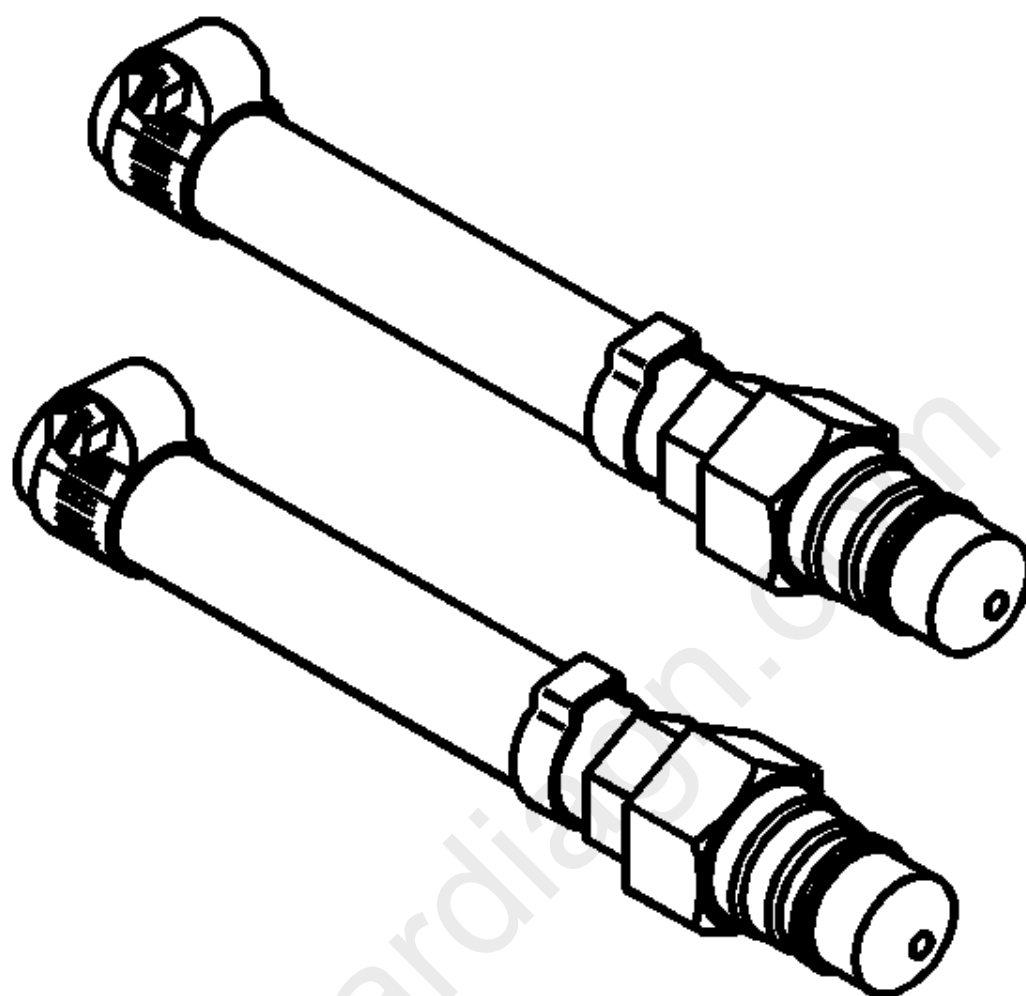
DT-36850-A
J-36850-A
J-36850
Transjel Lubricants



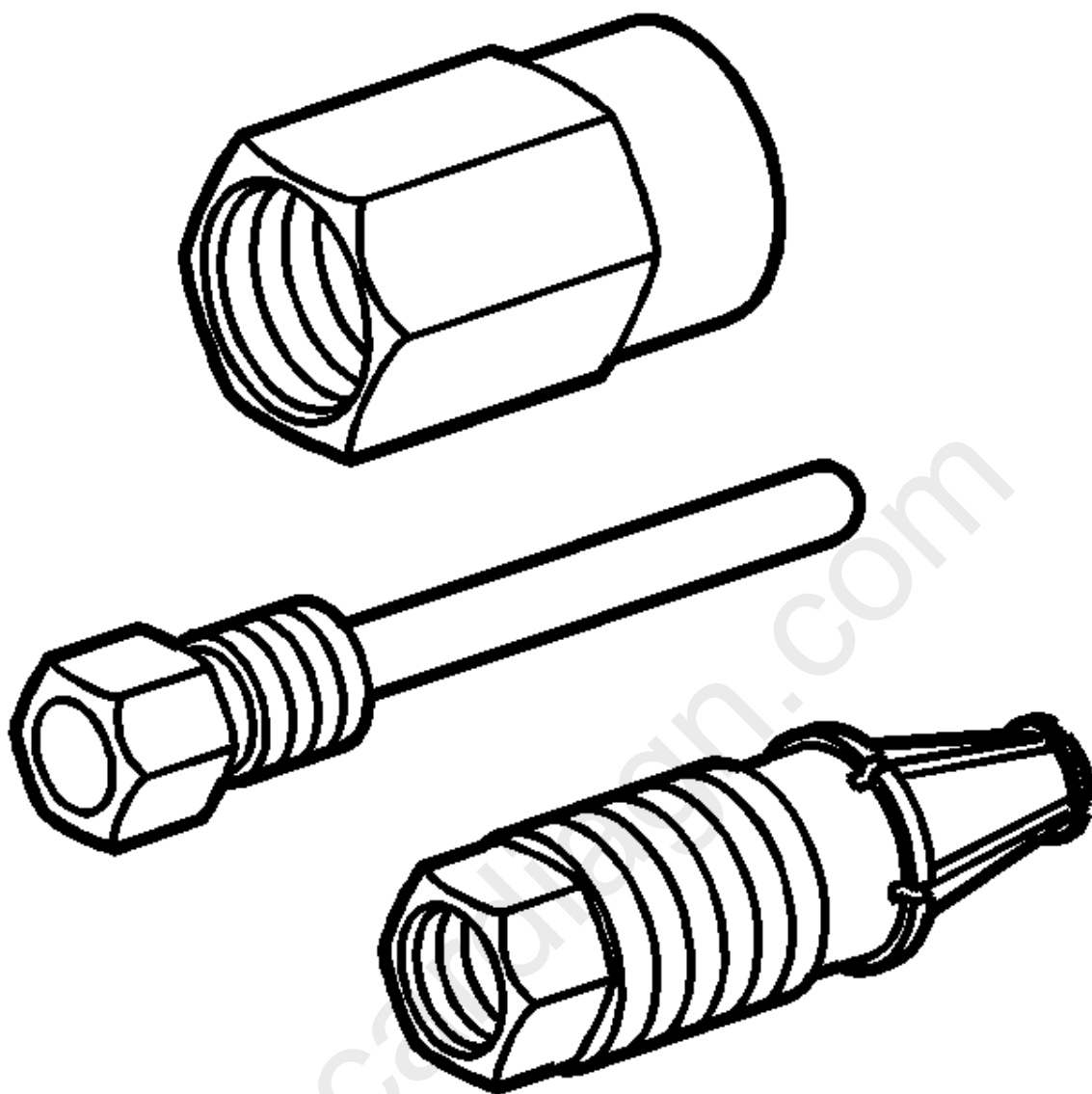
DT-41623-B
J-41623-B
KM-J-41623-I
Cooler Quick
Connect Tool



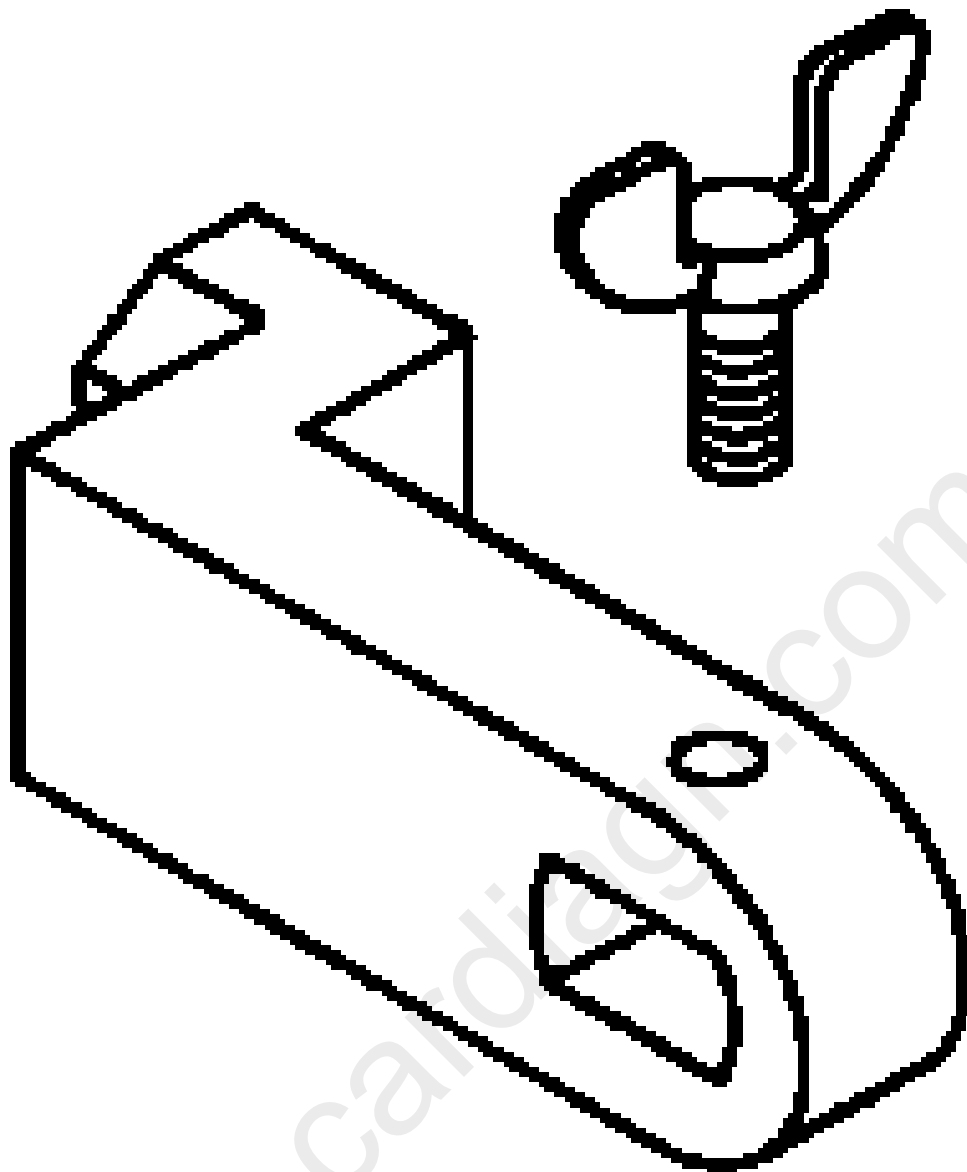
DT-45096
J-45096
Transmission C
Cooling Syster
Flush and Flow T
Tool



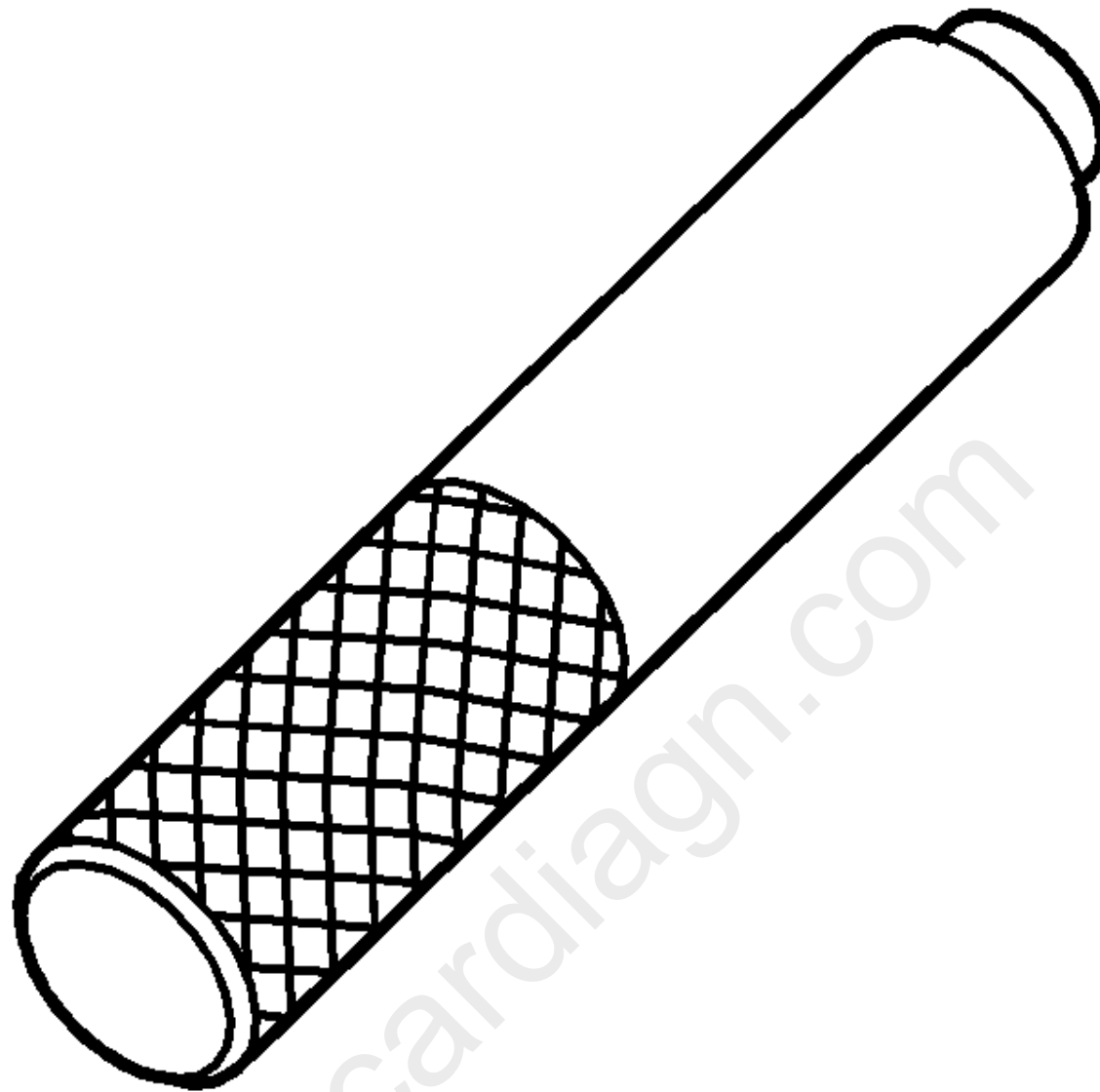
DT-45096-30
J-45096-30
Transmission Co
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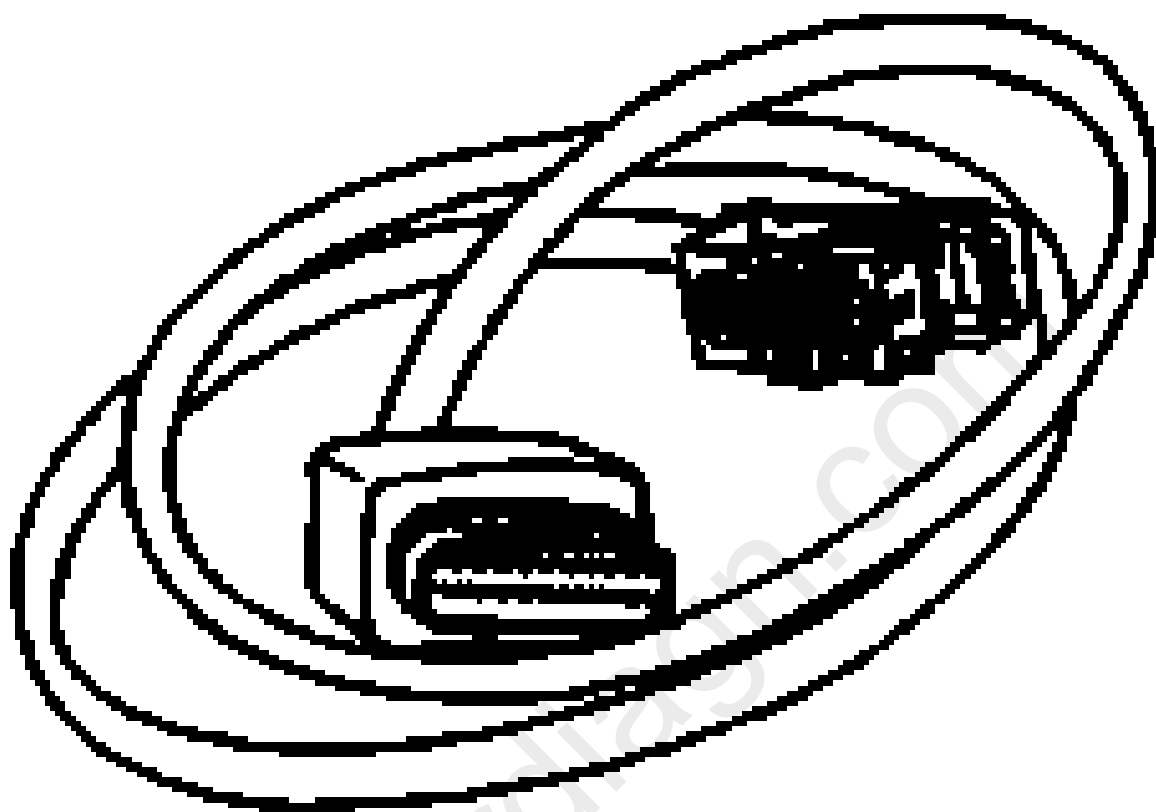
DT-45201
J-45201
DT-48203
87 92 756
Cooler Line Se.
Remover



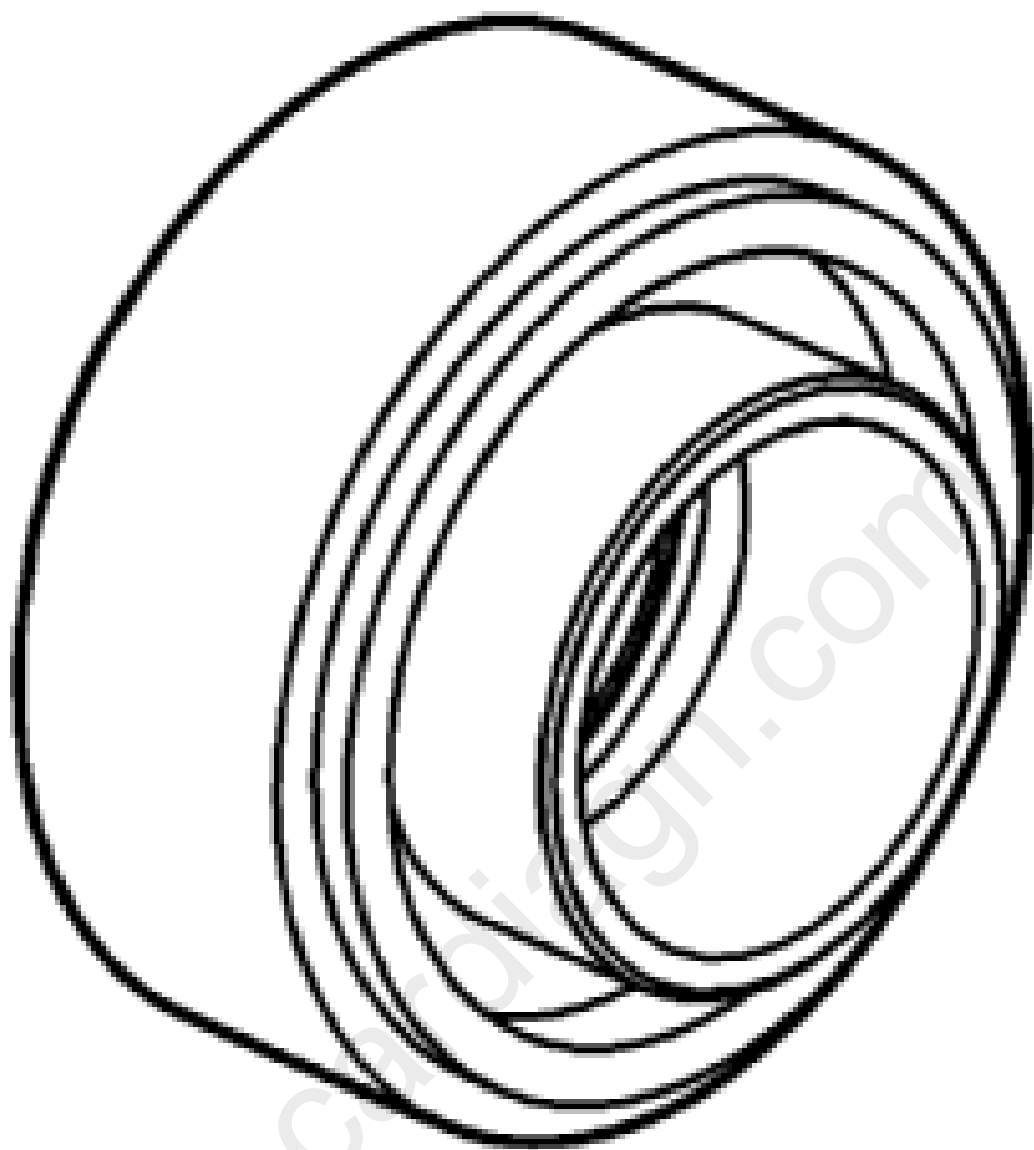
DT-45404
J-45404
Transmission
Indicator Alignm
Tool



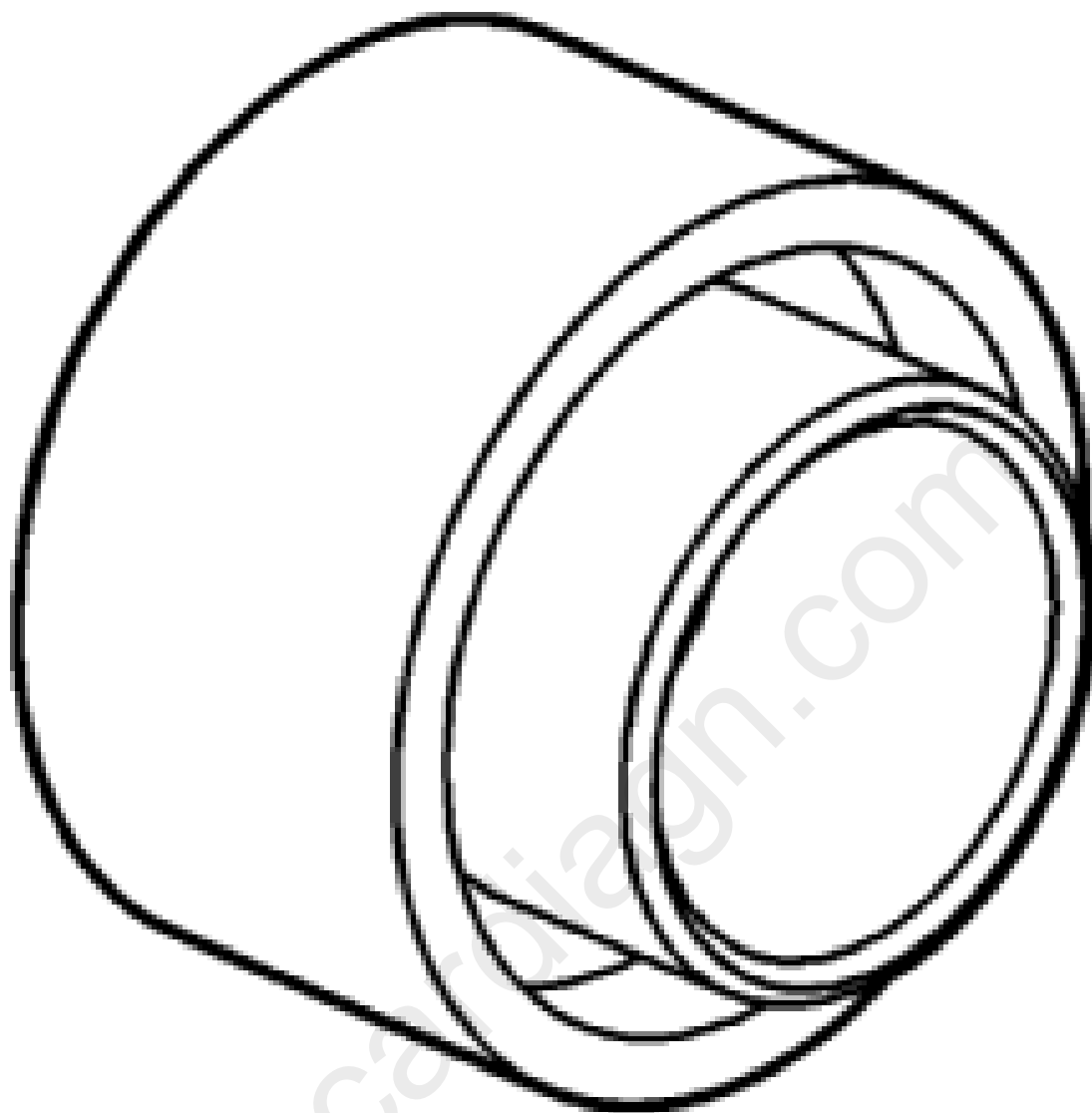
DT-47770
Cooler Line Se.
Installer



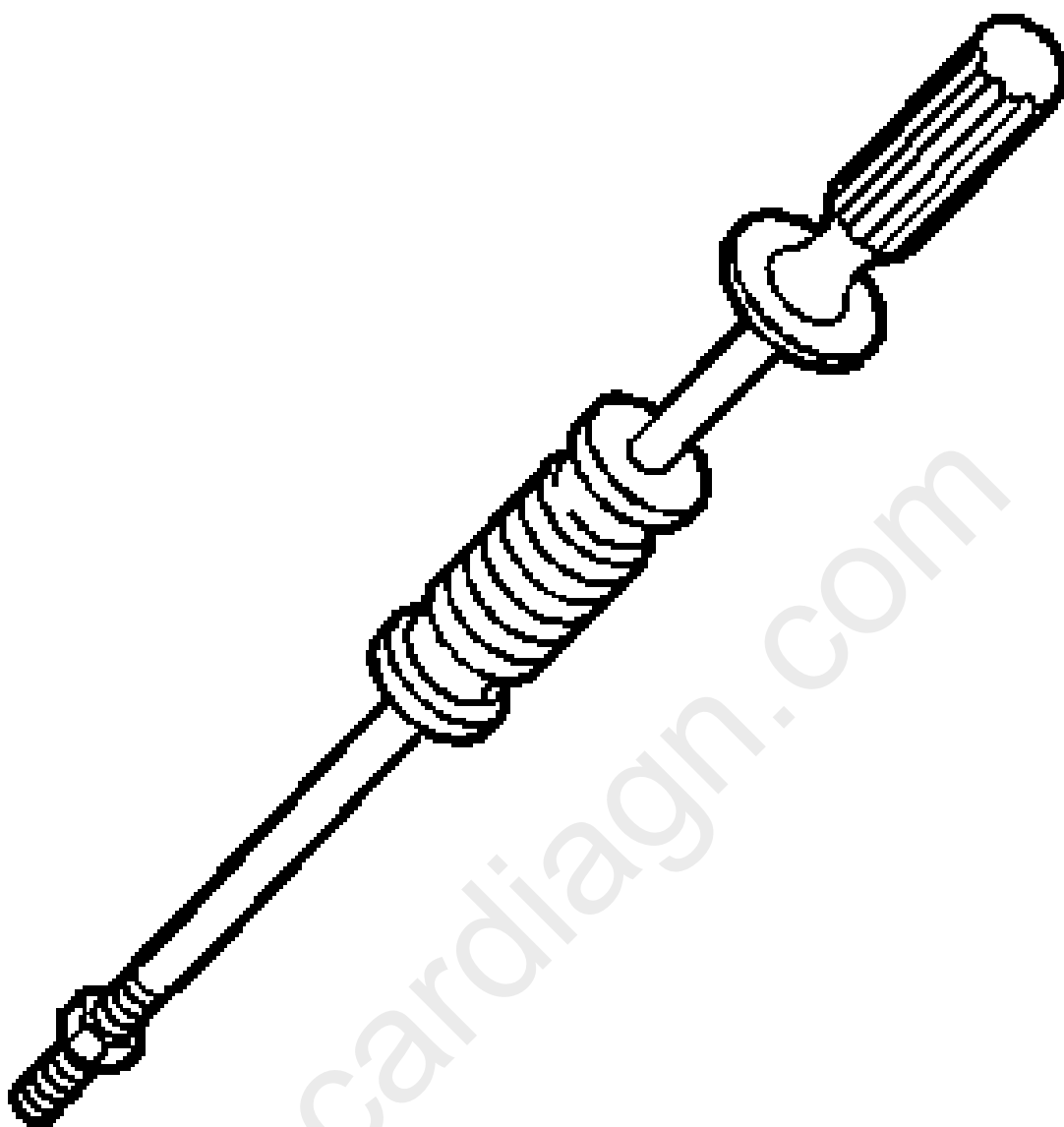
DT-47825-20
Adapter Harness



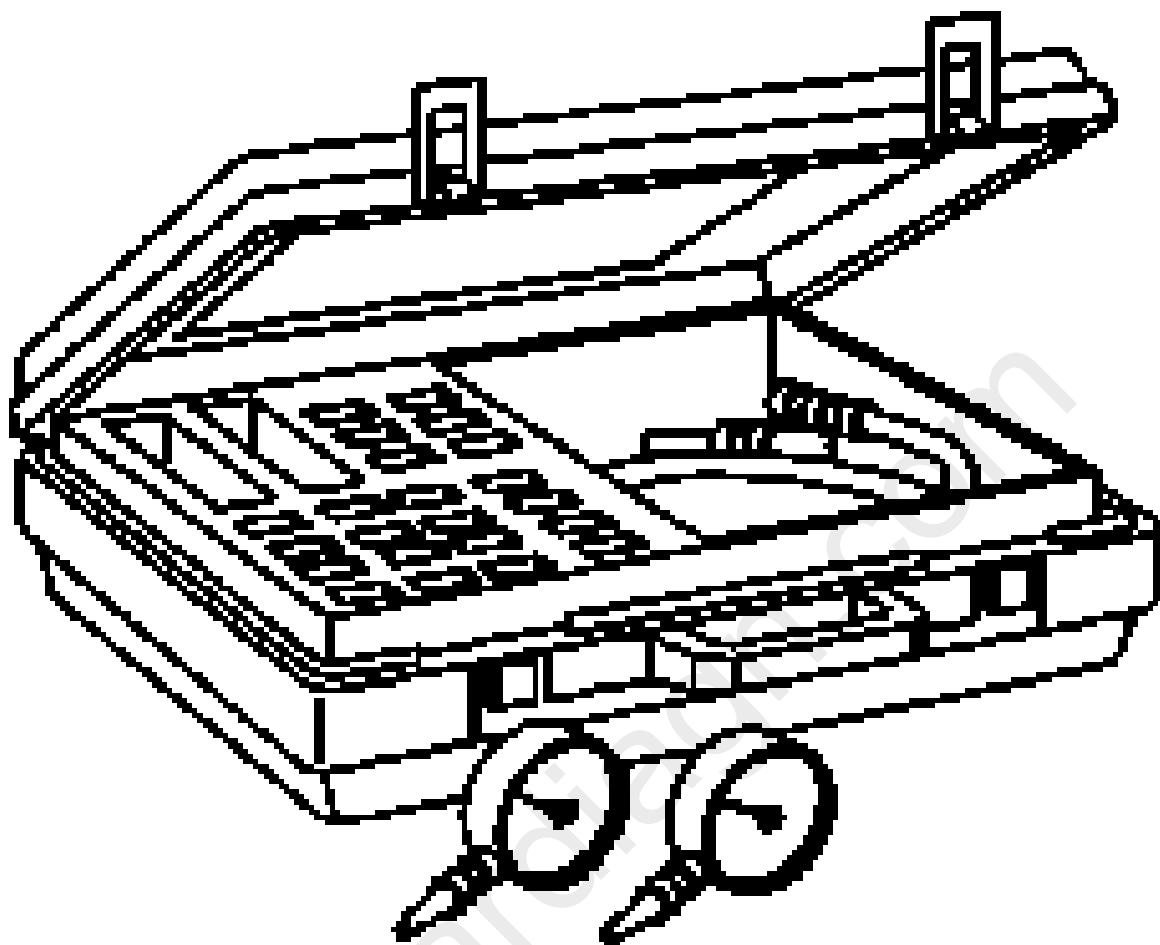
DT-51206
Rear Output Shaft
Seal Installer



DT-51262
Torque Convert
Seal Installer

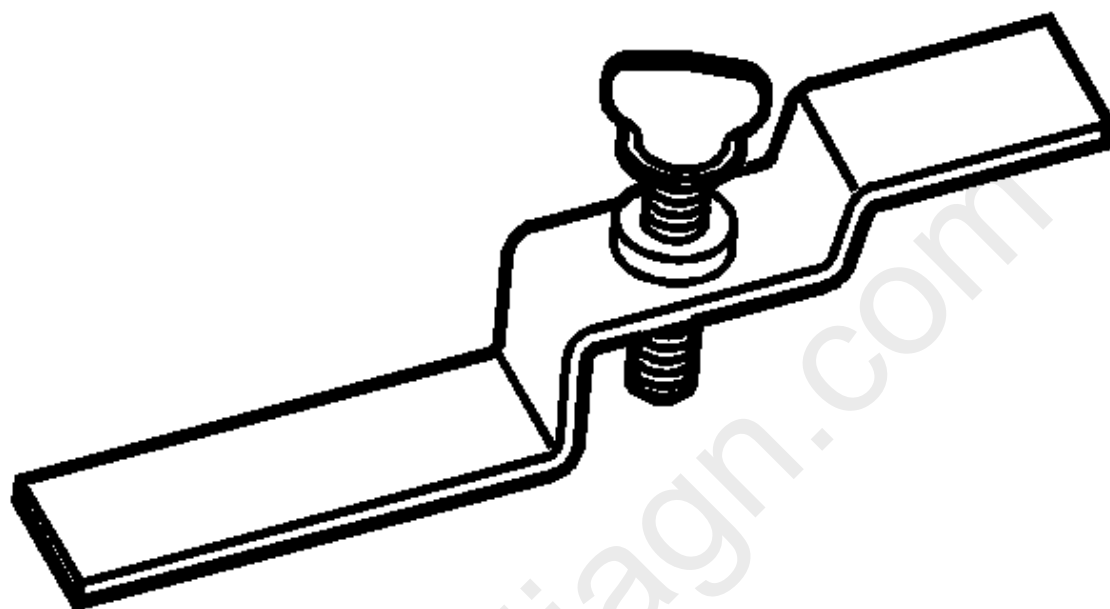


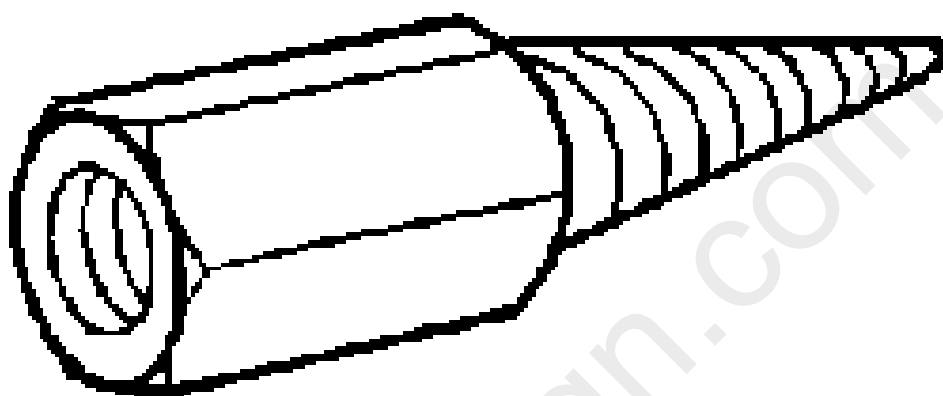
GE-6125-1B
J-6125-1B
J-6125-B
KM-J-7004
Slide Hammer w
Adapter



GE-21867-A
J-21867-A
KM-498-B
DW240-010-0
87 91 600
Transmission C
Pressure Gauge]

J-21366
Converter Holdi
Strap





J-36825-A
Output Shaft Oil :
Remover