

**2017 TRANSMISSION****Automatic Transmission - 1ET25 (MMF) - Bolt EV****SPECIFICATIONS****TEMPERATURE VERSUS RESISTANCE (TRANSMISSION FLUID TEMPERATURE SENSOR)**

| Temperature | Temperature | Minimum Resistance | Nominal Resistance | Maximum Resistance |
|-------------|-------------|--------------------|--------------------|--------------------|
| °C          | °F          | Ω                  | Ω                  | Ω                  |
| -40         | -40         | 95,953             | 100,865            | 105,777            |
| -35         | -31         | 69,076             | 72,437             | 75,798             |
| -30         | -22         | 50,264             | 52,594             | 54,923             |
| -25         | -13         | 36,959             | 38,583             | 40,207             |
| -20         | -4          | 27,439             | 28,582             | 29,725             |
| -15         | 5           | 20,559             | 21,371             | 22,183             |
| -10         | 14          | 15,540             | 16,120             | 16,700             |
| -5          | 23          | 11,844             | 12,261             | 12,678             |
| 0           | 32          | 9,097              | 9,399              | 9,701              |
| 5           | 41          | 7,041              | 7,263              | 7,485              |
| 10          | 50          | 5,493              | 5,658              | 5,823              |
| 15          | 59          | 4,318              | 4,441              | 4,564              |
| 20          | 68          | 3,418              | 3,511              | 3,604              |
| 25          | 77          | 2,725              | 2,795              | 2,865              |
| 30          | 86          | 2,185              | 2,240              | 2,295              |
| 35          | 95          | 1,763              | 1,806              | 1,849              |
| 40          | 104         | 1,430              | 1,465              | 1,500              |
| 45          | 113         | 1,167              | 1,195              | 1,223              |
| 50          | 122         | 958                | 980                | 1,002              |
| 55          | 131         | 791                | 809                | 827                |
| 60          | 140         | 656                | 671                | 686                |
| 65          | 149         | 547                | 559                | 571                |
| 70          | 158         | 459                | 469                | 479                |
| 75          | 167         | 387                | 395                | 403                |
| 80          | 176         | 327                | 334                | 341                |
| 85          | 185         | 277                | 283                | 289                |
| 90          | 194         | 236.7              | 241.8              | 246.8              |
| 95          | 203         | 202.5              | 207.1              | 211.6              |
| 100         | 212         | 173.8              | 178.0              | 182.1              |
| 105         | 221         | 149.9              | 153.6              | 157.3              |
| 110         | 230         | 129.7              | 133.1              | 136.5              |
| 115         | 239         | 112.7              | 115.7              | 118.7              |
| 120         | 248         | 98.2               | 100.9              | 103.6              |
| 125         | 257         | 85.9               | 88.3               | 90.7               |
| 130         | 266         | 75.3               | 77.5               | 79.6               |
| 135         | 275         | 66.4               | 68.3               | 70.2               |
| 140         | 284         | 58.6               | 60.3               | 62.0               |
| 145         | 293         | 51.9               | 53.4               | 56.2               |
| 150         | 302         | 46.1               | 47.5               | 48.9               |

**FASTENER SPECIFICATIONS (OFF VEHICLE)****Single Use Non-Threaded Fasteners/Components****NOTE:**

***All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.***

| Application                                     |
|-------------------------------------------------|
| Automatic Transmission Case Cover Gasket        |
| Automatic Transmission Case Gasket              |
| Automatic Transmission Fluid Filter             |
| Automatic Transmission Fluid Pump Seal          |
| Drive Motor Rotor Bearing Shim                  |
| Front Differential Bearing Shim                 |
| Front Wheel Drive Shaft Oil Seal Assembly (LHS) |
| Front Wheel Drive Shaft Oil Seal Assembly (RHS) |
| Main Shaft Bearing Shim                         |
| Manual Shift Shaft Pin                          |
| Manual Shift Shaft Seal                         |
| Output Shaft Retaining Ring                     |
| Shift Shaft Cover Gasket (Coolant Sump)         |
| Shift Shaft Cover Gasket (Oil Sump)             |
| Transmission Vent Pipe                          |
| Wiring Harness Connector Assembly               |

**Single Use Threaded Fastener/Component Tightening Specifications****NOTE:**

***All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.***

| Application                                                | Quantity | Size                    | Specification         |
|------------------------------------------------------------|----------|-------------------------|-----------------------|
|                                                            |          |                         | Metric<br>(English)   |
| Center Support                                             |          |                         |                       |
| <ul style="list-style-type: none"><li>First Pass</li></ul> | 6        | M10 X<br>1.5 X<br>40.65 | 58 N.m (43<br>lb ft)  |
| <ul style="list-style-type: none"><li>Final Pass</li></ul> | 6        | M10 X<br>1.5 X<br>40.65 | Plus 30<br>Degrees    |
| Drive Motor Position Sensor Stator Bolt                    | 3        | M6 X 1.0<br>X 16.4      | 9 N.m (80 lb<br>in)   |
| Drive Motor Stator Bolt                                    | 3        | M10 X<br>1.5 X 148      | 58 N.m (43<br>lb ft)  |
| Manual Shift Detent Lever Spring Bolt                      | 1        | M6 X 1.0<br>X 20.2      | 9 N.m (80 lb<br>in)   |
| Transmission Fill Plug                                     | 1        | M14 X<br>1.5            | 13 N.m (10<br>lb ft)  |
| Transmission Oil Level Check Plug                          | 1        | 1/8"-27<br>NPTF         | 12 N.m (106<br>lb in) |

**Reusable Threaded Fastener Tightening Specifications****NOTE:**

***All fasteners listed in this table can be reused after removal.***



NOTE:

All fasteners listed in this table can be reused after removal.

| Application                                                              | Quantity | Size                      | Specification<br>Metric<br>(English) |
|--------------------------------------------------------------------------|----------|---------------------------|--------------------------------------|
| Application                                                              | Quantity | Size                      | Specification                        |
|                                                                          |          |                           | Metric<br>(English)                  |
| Automatic Transmission Range Selector Lever Nut                          | 1        | M10<br>X 1.5              | 30 N.m (22<br>lb ft)                 |
| Automatic Transmission Case Bolt                                         | 18       | M8 X<br>1.25<br>X<br>35.7 | 22 N.m (16<br>lb ft)                 |
| Automatic Transmission Case Cover Bolt                                   | 13       | M8 X<br>1.25<br>X<br>35.7 | 22 N.m (16<br>lb ft)                 |
| Automatic Transmission Fluid Filter Bolt                                 | 1        | M6 X<br>1.0 X<br>20.2     | 9 N.m (80 lb<br>in)                  |
| Automatic Transmission Fluid Pump Bolt                                   | 3        | M8 X<br>1.25<br>X<br>40.7 | 22 N.m (16<br>lb ft)                 |
| Drive Motor Power Inverter Module Cable Terminal Insulator<br>Block Bolt | 2        | M6 X<br>1.0 X<br>20       | 9 N.m (80 lb<br>in)                  |
| Oil Pan Baffle Bolt                                                      | 2        | M6 X<br>1.0 X<br>20       | 9 N.m (80 lb<br>in)                  |
| Park Pawl Actuator Bracket Bolt                                          | 1        | M6 X<br>1.0 X<br>25       | 9 N.m (80 lb<br>in)                  |
| Park Pawl Actuator Bracket Bolt                                          | 2        | M6 X<br>1.0 X<br>20.2     | 9 N.m (80 lb<br>in)                  |
| Shift Shaft Cover Bolt (Coolant Sump)                                    | 14       | M6 X<br>1.0 X<br>20       | 9 N.m (80 lb<br>in)                  |
| Shift Shaft Cover Bolt (Oil Sump)                                        | 8        | M6 X<br>1.0 X<br>20       | 9 N.m (80 lb<br>in)                  |

## **FASTENER SPECIFICATIONS (ON VEHICLE)**

### **Single Use Non-Threaded Fasteners/Components**

| Application                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------|
| <b>NOTE:</b><br><i>All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.</i> |
| Automatic Transmission Fluid Pump Seal                                                                                      |
| Drive Motor Power Inverter Module 3 Phase Cable Connector Seal                                                              |
| Front Wheel Drive Shaft Oil Seal Assembly                                                                                   |
| Output Shaft Retaining Ring                                                                                                 |
| Shift Shaft Cover Gasket (Coolant Sump)                                                                                     |
| Shift Shaft Cover Gasket (Oil Sump)                                                                                         |

## Single Use Threaded Fastener/Component Tightening Specifications

| Application                                                                                                                 | Specification        |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------|
|                                                                                                                             | Metric (English)     |
| <b>NOTE:</b><br><i>All fasteners/components listed in this table MUST BE DISCARDED and replaced with NEW after removal.</i> |                      |
| Drive Motor Mount Body Side Bolt                                                                                            |                      |
| • First Pass:                                                                                                               | 58 N.m (43 lb ft)    |
| • Final Pass:                                                                                                               | Plus 60 - 75 degrees |
| Drive Motor Mount Motor Side Bolt                                                                                           |                      |
| • First Pass:                                                                                                               | 58 N.m (43 lb ft)    |
| • Final Pass:                                                                                                               | Plus 60 - 75 degrees |
| Drive Motor Rear Mount Bracket Drive Motor Side Bolt                                                                        |                      |
| • First Pass:                                                                                                               | 58 N.m (43 lb ft)    |
| • Final Pass:                                                                                                               | Plus 60 - 75 degrees |
| Drive Motor Rear Mount Drive Motor Side Bolt                                                                                |                      |
| • First Pass:                                                                                                               | 58 N.m (43 lb ft)    |
| • Final Pass:                                                                                                               | Plus 60 - 75 degrees |
| Drive Motor Rear Mount Frame Side Bolt                                                                                      |                      |
| • First Pass:                                                                                                               | 58 N.m (43 lb ft)    |
| • Final Pass:                                                                                                               | Plus 60 - 75 degrees |
| Transmission Fluid Drain Plug                                                                                               | 12 N.m (106 lb in)   |
| Transmission Fill Plug                                                                                                      | 13 N.m (10 lb ft)    |
| Transmission Level Check Plug                                                                                               | 12 N.m (106 lb in)   |

## Reusable Threaded Fastener Tightening Specifications

| Application                                                                            | Specification     |
|----------------------------------------------------------------------------------------|-------------------|
|                                                                                        | Metric (English)  |
| <b>NOTE:</b><br><i>All fasteners listed in this table can be reused after removal.</i> |                   |
| Automatic Transmission Electronic Control Bolt                                         | 9 N.m (80 lb in)  |
| Automatic Transmission Fluid Pump Bolt                                                 | 22 N.m (16 lb ft) |
| Automatic Transmission Range Selector Lever Nut                                        | 30 N.m (22 lb ft) |
| Drive Motor Mount Drive Motor Side Bolt                                                | 22 N.m (16 lb ft) |
| Drive Motor Power Inverter Module 3 Phase Cable Cover Bolt                             | 9 N.m (80 lb in)  |

| Application                                                    | Specification     |
|----------------------------------------------------------------|-------------------|
|                                                                | Metric (English)  |
| Drive Motor Power Inverter Module 3 Phase Cable Connector Bolt | 9 N.m (80 lb in)  |
| Range Selector Actuator Hardware Module Assembly Bolt          | 22 N.m (16 lb ft) |
| Range Selector Lever Link Adjustment Bolt                      | 5 N.m (44 lb in)  |
| Shift Shaft Cover Bolt (Coolant Sump)                          | 9 N.m (80 lb in)  |
| Shift Shaft Cover Bolt (Oil Sump)                              | 9 N.m (80 lb in)  |

## TRANSMISSION GENERAL SPECIFICATIONS

| Name                            | 1ET25                       |
|---------------------------------|-----------------------------|
| RPO Codes                       | MMF                         |
| Production Location             | Incheon, Korea              |
| Transmission Drive              | Front Wheel Drive Transaxle |
| Reverse                         | Electrically Variable       |
| EVT Mode                        | Electrically Variable       |
| Pressure Taps                   | Line Pressure (Fluid Pump)  |
| Transmission Fluid Type         | Dexron HP                   |
| Transmission Type: Electric     | Electrically Variable       |
| Transmission Type: EV           | 150 kW Drive Motor          |
| Transmission Type: T            | Transaxle Mount             |
| Transmission Type: 25           | Product Series              |
| Position Quadrant               | P, R, N, D, L               |
| Case Material                   | Die Cast Aluminum           |
| Transmission Net Weight (Wet)   | 77.4 kg (170.6 lbs)         |
| Maximum Trailer Towing Capacity | N/A                         |

## APPROXIMATE FLUID CAPACITIES

| Application                                     | Specification |            |
|-------------------------------------------------|---------------|------------|
|                                                 | Metric        | English    |
| 1ET25                                           |               |            |
| Dry Transmission (Empty) - Approximate Capacity | 2.9 liters    | 3.1 quarts |
| Fluid Change - Approximate Capacity             | 2.6 liters    | 2.7 quarts |

## SHIM SIZE SPECIFICATIONS

| Measured Clearance                  | Shim Thickness                      |
|-------------------------------------|-------------------------------------|
| 0.98 - 1.03 mm (0.0386~0.0406 in)   | 0.77 - 0.80 mm (0.0303 - 0.0315 in) |
| 1.03 - 1.08 mm (0.0406 - 0.0425 in) | 0.82 - 0.85 mm (0.0323 - 0.0335 in) |
| 1.08 - 1.13 mm (0.0425 - 0.0445 in) | 0.87 - 0.90 mm (0.0343 - 0.0354 in) |
| 1.13 - 1.18 mm (0.0445 - 0.0465 in) | 0.92 - 0.95 mm (0.0362 - 0.0374 in) |
| 1.18 - 1.23 mm (0.0465 - 0.0484 in) | 0.97 - 1.00 mm (0.0382 - 0.0394 in) |
| 1.23 - 1.28 mm (0.0484 - 0.0504 in) | 1.02 - 1.05 mm (0.0402 - 0.0413 in) |
| 1.28 - 1.33 mm (0.0504 - 0.0524 in) | 1.07 - 1.10 mm (0.0421 - 0.0433 in) |
| 1.33 - 1.38 mm (0.0524 - 0.0543 in) | 1.12 - 1.15 mm (0.0441 - 0.0453 in) |

| Measured Clearance                  | Shim Thickness                      |
|-------------------------------------|-------------------------------------|
| 1.38 - 1.43 mm (0.0543 - 0.0563 in) | 1.17 - 1.20 mm (0.0461 - 0.0472 in) |
| 1.43 - 1.48 mm (0.0563 - 0.0583 in) | 1.22 - 1.25 mm (0.0480 - 0.0492 in) |
| 1.48 - 1.53 mm (0.0583 - 0.0602 in) | 1.27 - 1.30 mm (0.0500 - 0.0512 in) |
| 1.53 - 1.58 mm (0.0602 - 0.0622 in) | 1.32 - 1.35 mm (0.0520 - 0.0532 in) |
| 1.58 - 1.63 mm (0.0622 - 0.0642 in) | 1.37 - 1.40 mm (0.0539 - 0.0551 in) |

## ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

| Application                  | Type of Material | GM Part Number |          |
|------------------------------|------------------|----------------|----------|
|                              |                  | United States  | Canada   |
| Automatic Transmission Fluid | Dexron HP        | 19331925       | 19300537 |

## TRANSMISSION INTERNAL MODE SWITCH LOGIC

### Transmission Internal Mode Switch Logic

| Gear Selector Position                              | Signal A | Signal B | Signal C | Signal P | Signal S |
|-----------------------------------------------------|----------|----------|----------|----------|----------|
| Park (P)                                            | High     | Low      | High     | Low      | High     |
| Reverse (R)                                         | Low      | High     | Low      | Low      | High     |
| Neutral (N)                                         | High     | High     | Low      | High     | Low      |
| Drive (D)                                           | High     | Low      | High     | High     | Low      |
| Low (L)                                             | Low      | Low      | High     | High     | Low      |
| Always High status: Open/short to voltage condition |          |          |          |          |          |
| Always Low status: Short to ground condition        |          |          |          |          |          |

### Typical Scan Tool Data

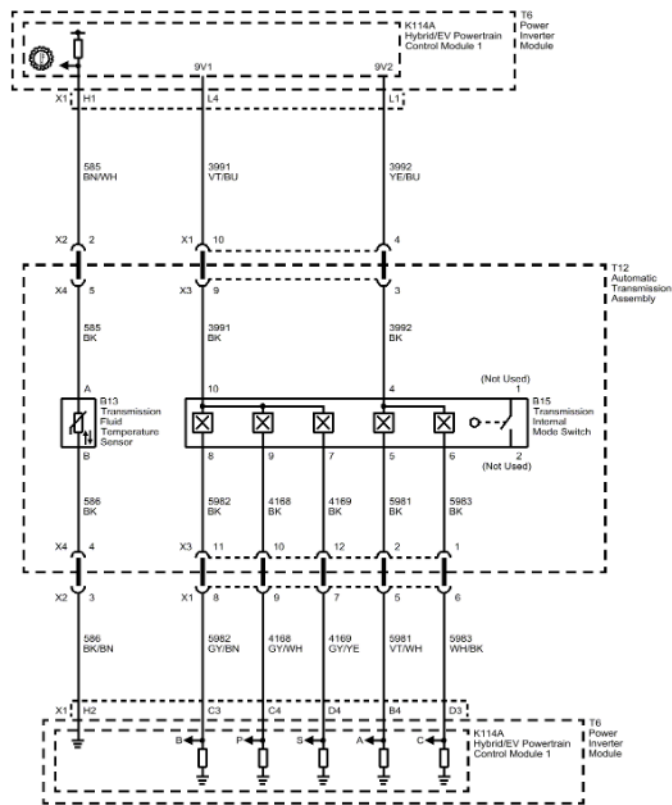
#### Internal Mode Switch A/B/C/P

| Circuit                                                         | Normal Range    | Short to Ground  | Open                | Short to Voltage    |
|-----------------------------------------------------------------|-----------------|------------------|---------------------|---------------------|
| <b>Operating Conditions:</b> Vehicle ON, range selector in Park |                 |                  |                     |                     |
| Internal Mode Switch A                                          | 1.62 V - 2.49 V | Less than 0.66 V | Greater than 2.49 V | Greater than 2.49 V |
| Internal Mode Switch B                                          | 0.66 V - 1.02 V | Less than 0.66 V | Greater than 2.49 V | Greater than 2.49 V |
| Internal Mode Switch C                                          | 0.66 V - 1.02 V | Less than 0.66 V | Greater than 2.49 V | Greater than 2.49 V |
| Internal Mode Switch P                                          | 1.62 V - 2.49 V | Less than 0.66 V | Greater than 2.49 V | Greater than 2.49 V |
| Internal Mode Switch S                                          | 1.62 V - 2.49 V | Less than 0.66 V | Greater than 2.49 V | Greater than 2.49 V |
| Valid High = Switch open = 1.62 V - 2.49 V                      |                 |                  |                     |                     |
| Valid Low = Switch Closed = 0.66 V - 1.02 V                     |                 |                  |                     |                     |

## SCHEMATIC WIRING DIAGRAMS

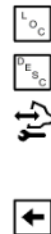
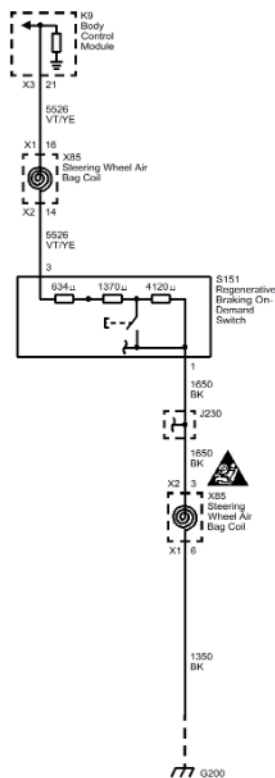
## AUTOMATIC TRANSMISSION CONTROLS WIRING SCHEMATICS

### Temperature and Internal Mode Switch



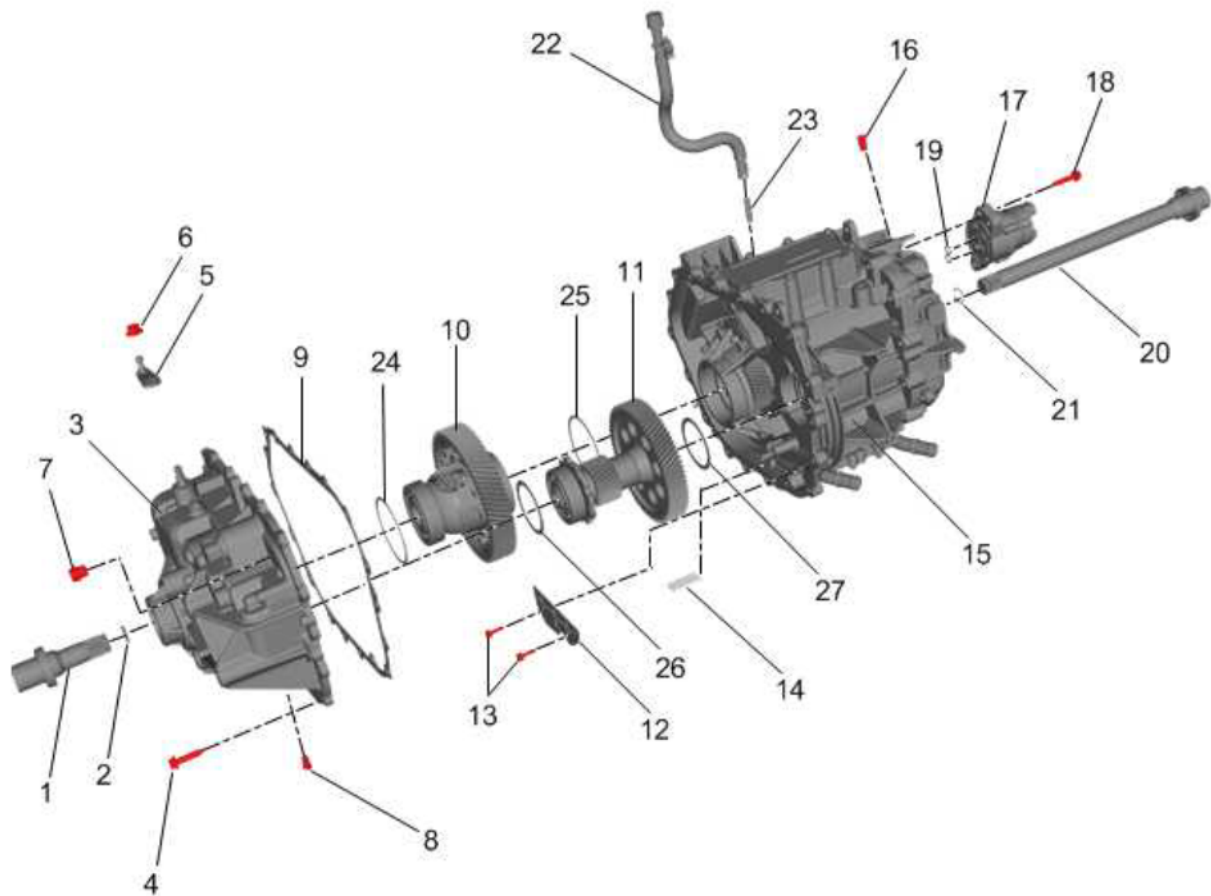
**Fig. 1: Temperature and Internal Mode Switch**  
Courtesy of GENERAL MOTORS COMPANY

### Regenerative Braking On-Demand Switch



**Fig. 2: Regenerative Braking On-Demand Switch**  
Courtesy of GENERAL MOTORS COMPANY

## Case and Associated Parts



**Fig. 3: Case and Associated Parts**

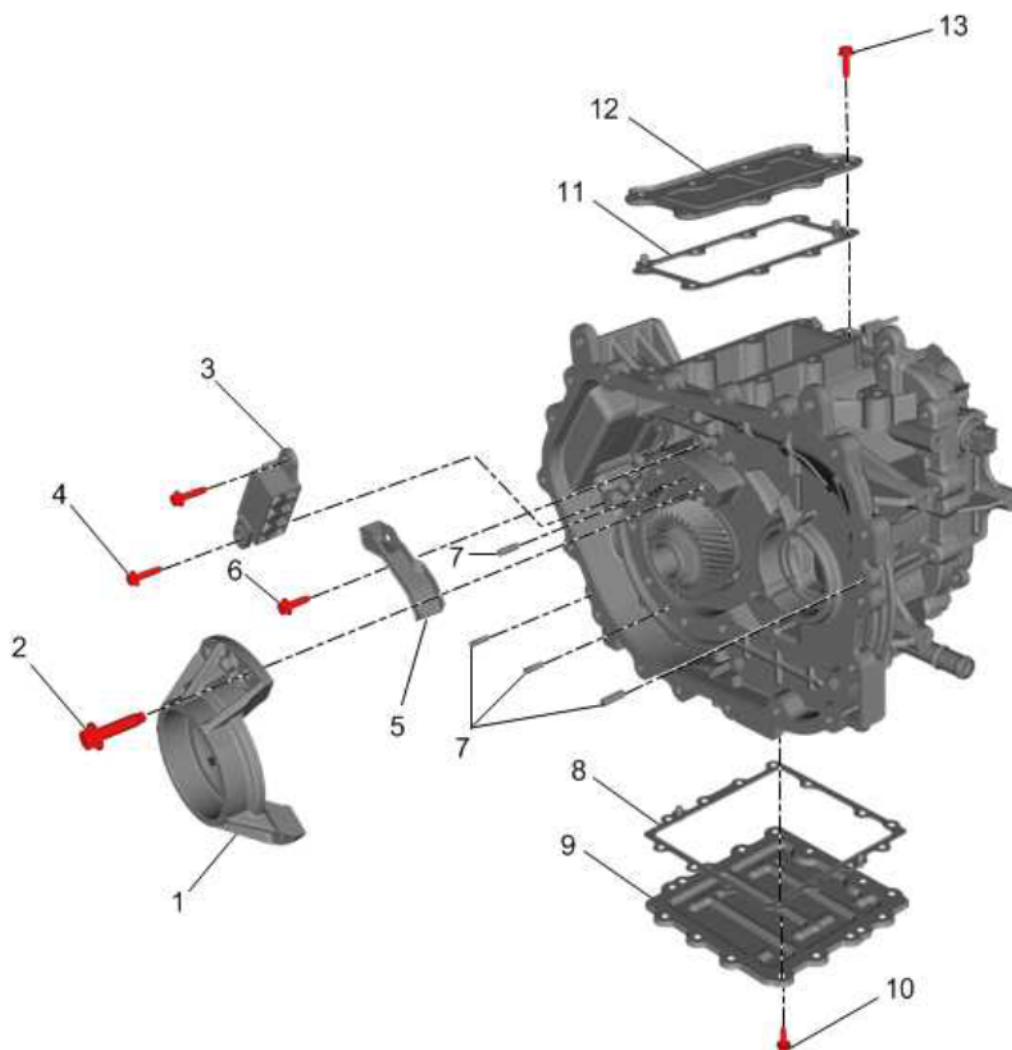
Courtesy of **GENERAL MOTORS COMPANY**

| Callout | Component Name                                  |
|---------|-------------------------------------------------|
| 1       | Output Shaft (RHS)                              |
| 2       | Output Shaft Retaining Ring                     |
| 3       | Automatic Transmission Case                     |
| 4       | Automatic Transmission Case Bolt (Qty: 18)      |
| 5       | Automatic Transmission Range Selector Lever     |
| 6       | Automatic Transmission Range Selector Lever Nut |
| 7       | Transmission Fill Plug                          |
| 8       | Transmission Fluid Drain Plug                   |
| 9       | Automatic Transmission Case Gasket              |
| 10      | Front Differential                              |
| 11      | Main Shaft                                      |
| 12      | Oil Pan Baffle                                  |
| 13      | Oil Pan Baffle Bolt (Qty: 2)                    |
| 14      | Automatic Transmission Fluid Pan Magnet         |
| 15      | Drive Motor Housing                             |
| 16      | Plug                                            |
| 17      | Automatic Transmission Fluid Pump               |
| 18      | Automatic Transmission Fluid Pump Bolt (Qty: 3) |
| 19      | Automatic Transmission Fluid Pump Seal          |



| Callout | Component Name                        |
|---------|---------------------------------------|
| 20      | Output Shaft (LHS)                    |
| 21      | Output Shaft Retaining Ring           |
| 22      | Transmission Vent Hose                |
| 23      | Transmission Vent Pipe                |
| 24      | Front Differential Bearing Shim (RHS) |
| 25      | Front Differential Bearing Shim (LHS) |
| 26      | Main Shaft Bearing Shim (RHS)         |
| 27      | Main Shaft Bearing Shim (LHS)         |

### Drive Motor Housing Assembly (1 of 2)

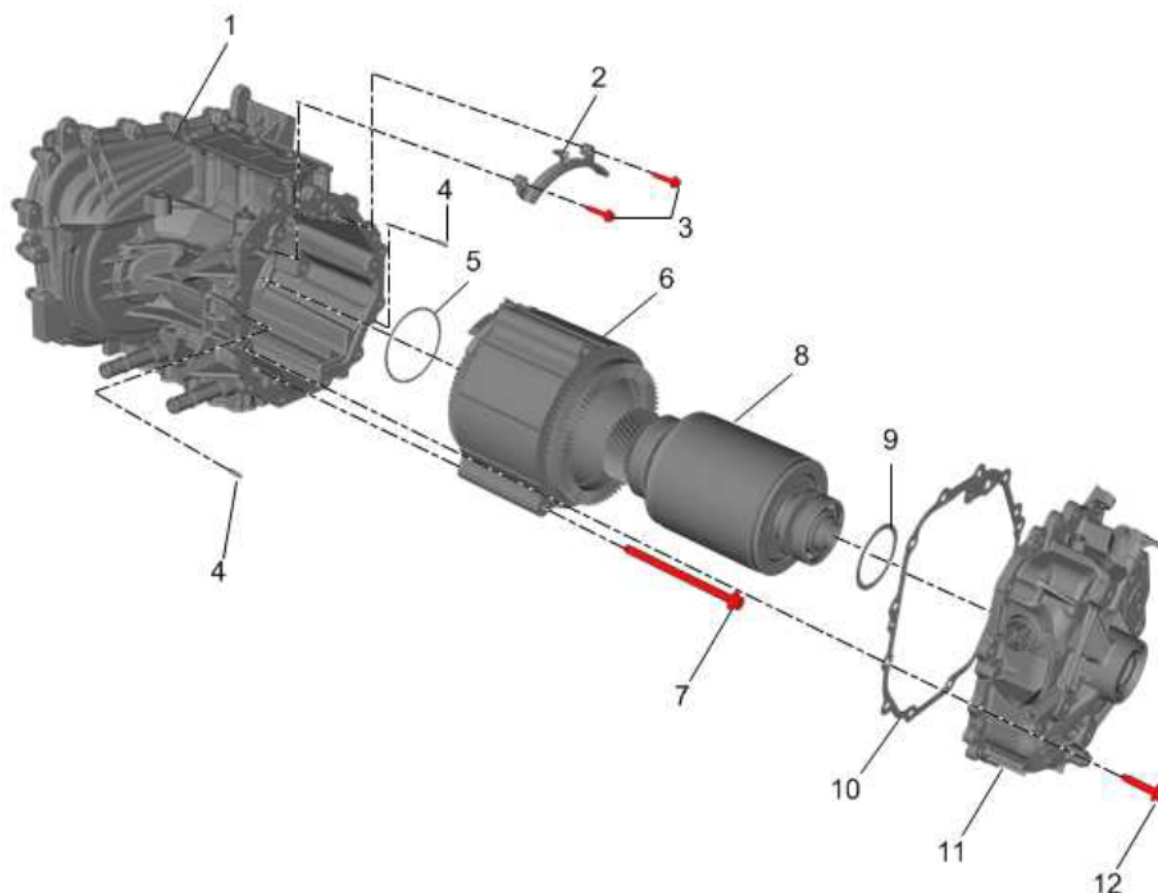


**Fig. 4: Drive Motor Housing Assembly (1 of 2)**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                 |
|---------|--------------------------------------------------------------------------------|
| 1       | Center Support                                                                 |
| 2       | Center Support Bolt (Qty: 2)                                                   |
| 3       | Drive Motor Power Inverter Module Cable Terminal Insulator Block               |
| 4       | Drive Motor Power Inverter Module Cable Terminal Insulator Block Bolt (Qty: 2) |
| 5       | Manual Transmission Oil Trough                                                 |
| 6       | Manual Transmission Oil Trough Bolt                                            |
| 7       | Pin (Qty: 4)                                                                   |
| 8       | Shift Shaft Cover Gasket                                                       |
| 9       | Shift Shaft Cover (Coolant Sump)                                               |
| 10      | Shift Shaft Cover Bolt (Qty: 14)                                               |

| Callout | Component Name                  |
|---------|---------------------------------|
| 11      | Shift Shaft Cover Gasket        |
| 12      | Shift Shaft Cover (Oil Sump)    |
| 13      | Shift Shaft Cover Bolt (Qty: 8) |

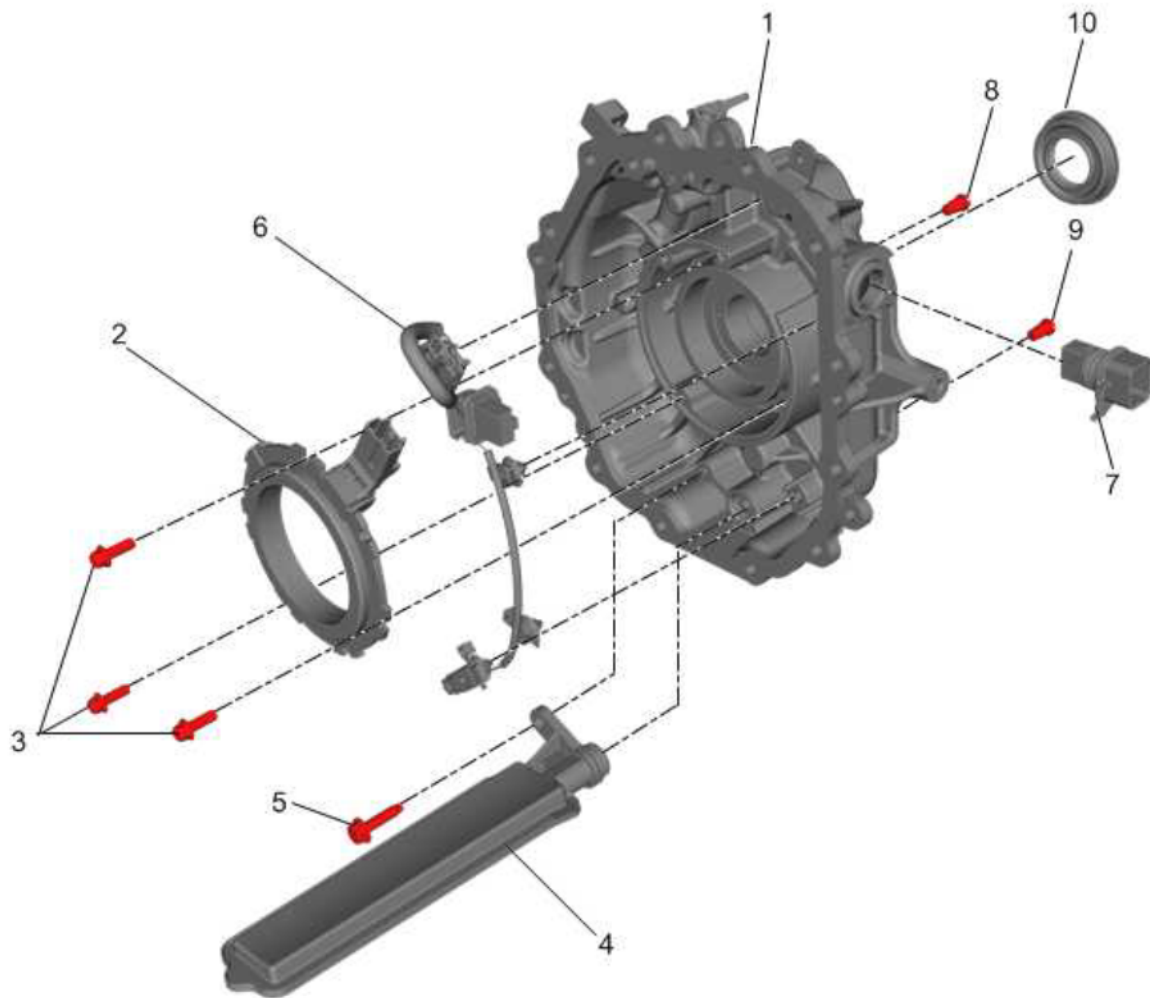
### Drive Motor Housing Assembly (2 of 2)



**Fig. 5: Drive Motor Housing Assembly (2 of 2)**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                               |
|---------|--------------------------------------------------------------|
| 1       | Drive Motor Housing                                          |
| 2       | Drive Motor Stator Coolant Distributor Channel               |
| 3       | Drive Motor Stator Coolant Distributor Channel Bolt (Qty: 2) |
| 4       | Pin (Qty: 2)                                                 |
| 5       | Drive Motor Rotor Bearing Shim (Right Side)                  |
| 6       | Drive Motor Stator                                           |
| 7       | Drive Motor Stator Bolt (Qty: 3)                             |
| 8       | Drive Motor Rotor                                            |
| 9       | Drive Motor Rotor Bearing Shim (Left Side)                   |
| 10      | Automatic Transmission Case Cover Gasket                     |
| 11      | Automatic Transmission Case Cover                            |
| 12      | Automatic Transmission Case Cover Bolt (Qty: 13)             |

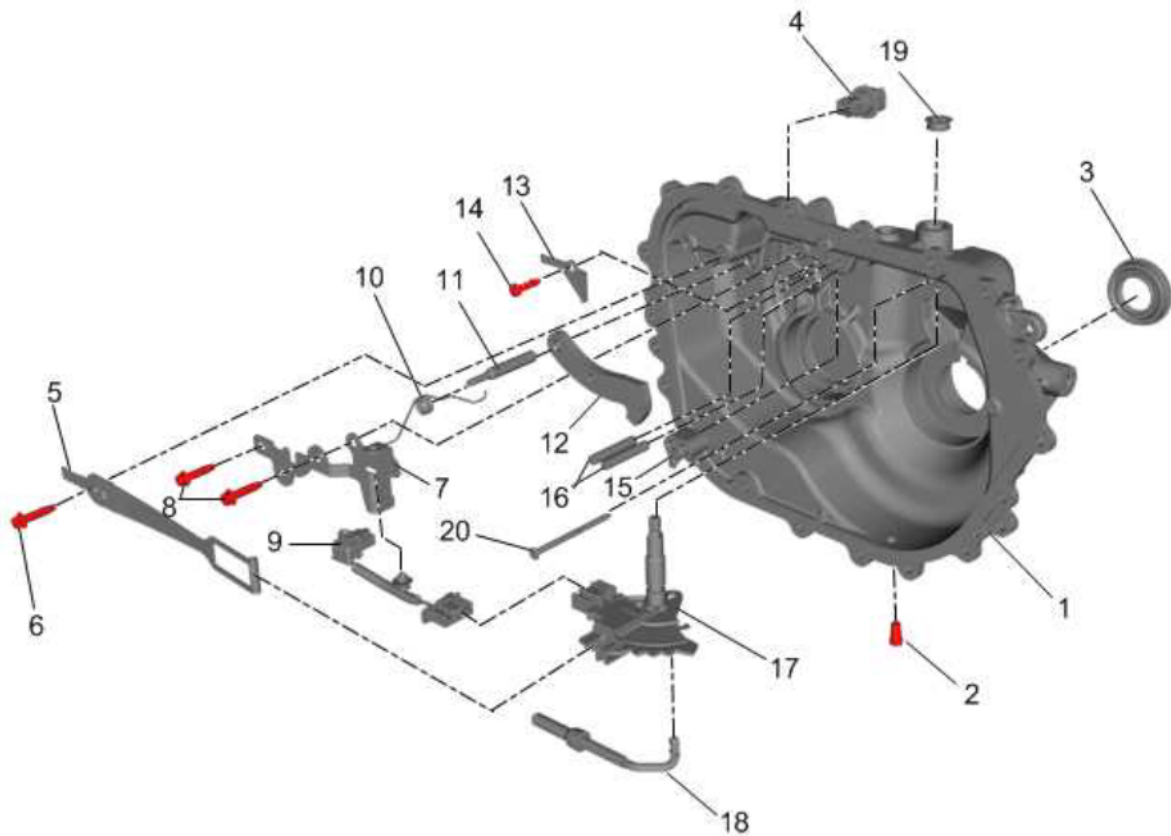
### Transmission Case Cover Assembly



**Fig. 6: Transmission Case Cover Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                   |
|---------|--------------------------------------------------|
| 1       | Automatic Transmission Case Cover                |
| 2       | Drive Motor Position Sensor Stator               |
| 3       | Drive Motor Position Sensor Stator Bolt (Qty: 3) |
| 4       | Automatic Transmission Fluid Filter              |
| 5       | Automatic Transmission Fluid Filter Bolt         |
| 6       | Automatic Transmission Control Wiring Harness    |
| 7       | Wiring Harness Electrical Connector              |
| 8       | Transmission Fluid Drain Plug                    |
| 9       | Transmission Oil Level Check Plug                |
| 10      | Front Wheel Drive Shaft Oil Seal (LHS)           |

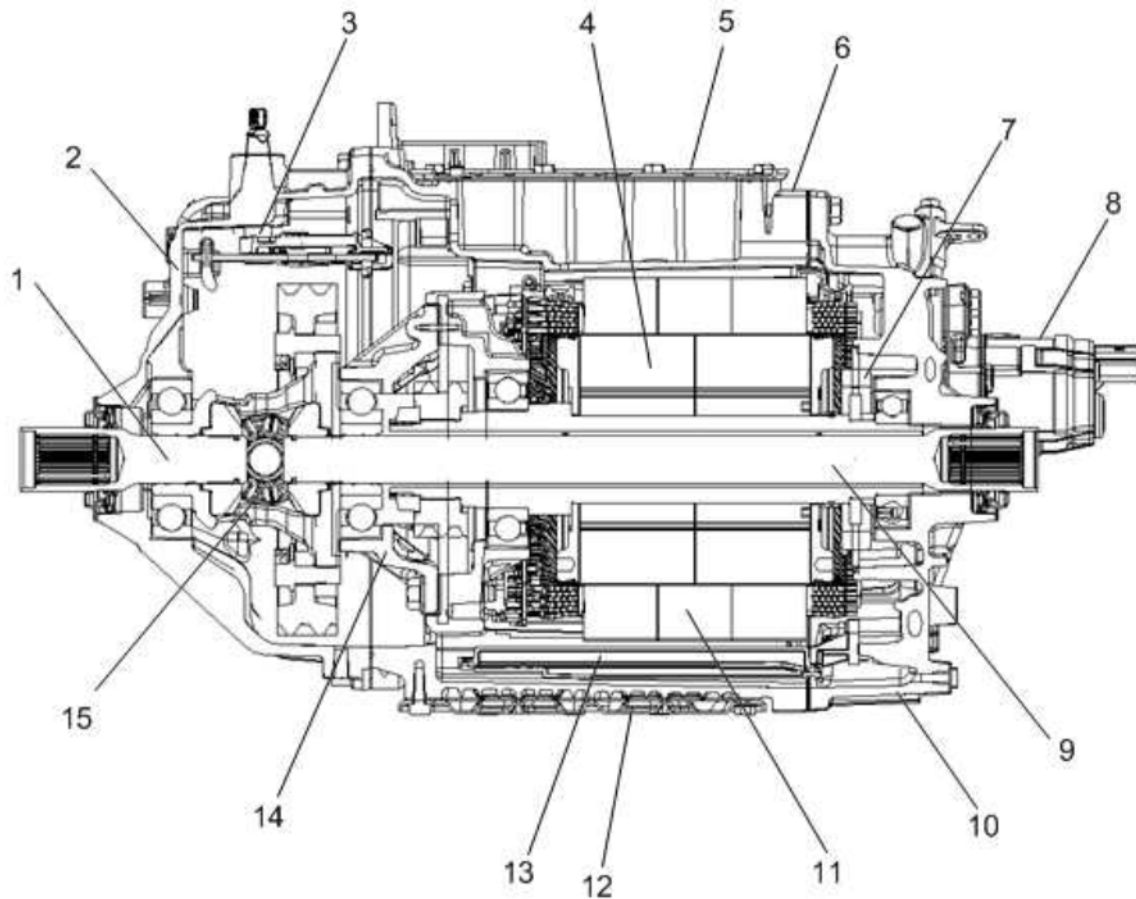
### Parking System Components



**Fig. 7: Parking System Components**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                |
|---------|-----------------------------------------------|
| 1       | Automatic Transmission Case                   |
| 2       | Transmission Fluid Drain Plug                 |
| 3       | Front Wheel Drive Shaft Oil Seal (RHS)        |
| 4       | Wiring Harness Electrical Connector           |
| 5       | Manual Shift Detent Lever Spring              |
| 6       | Manual Shift Detent Lever Spring Bolt         |
| 7       | Park Pawl Actuator Bracket                    |
| 8       | Park Pawl Actuator Bracket Bolt (Qty: 2)      |
| 9       | Automatic Transmission Control Wiring Harness |
| 10      | Park Pawl Spring                              |
| 11      | Park Pawl Shaft                               |
| 12      | Park Pawl Shaft                               |
| 13      | Park Pawl Actuator Bracket                    |
| 14      | Park Pawl Actuator Bracket Bolt               |
| 15      | Park Pawl Actuator Guide                      |
| 16      | Park Pawl Actuator Guide Pin (Qty: 2)         |
| 17      | Manual Shift Shaft Position Switch            |
| 18      | Park Pawl Actuator                            |
| 19      | Manual Shift Shaft Seal                       |
| 20      | Manual Shift Shaft Pin                        |



**Fig. 8: Transmission Components**

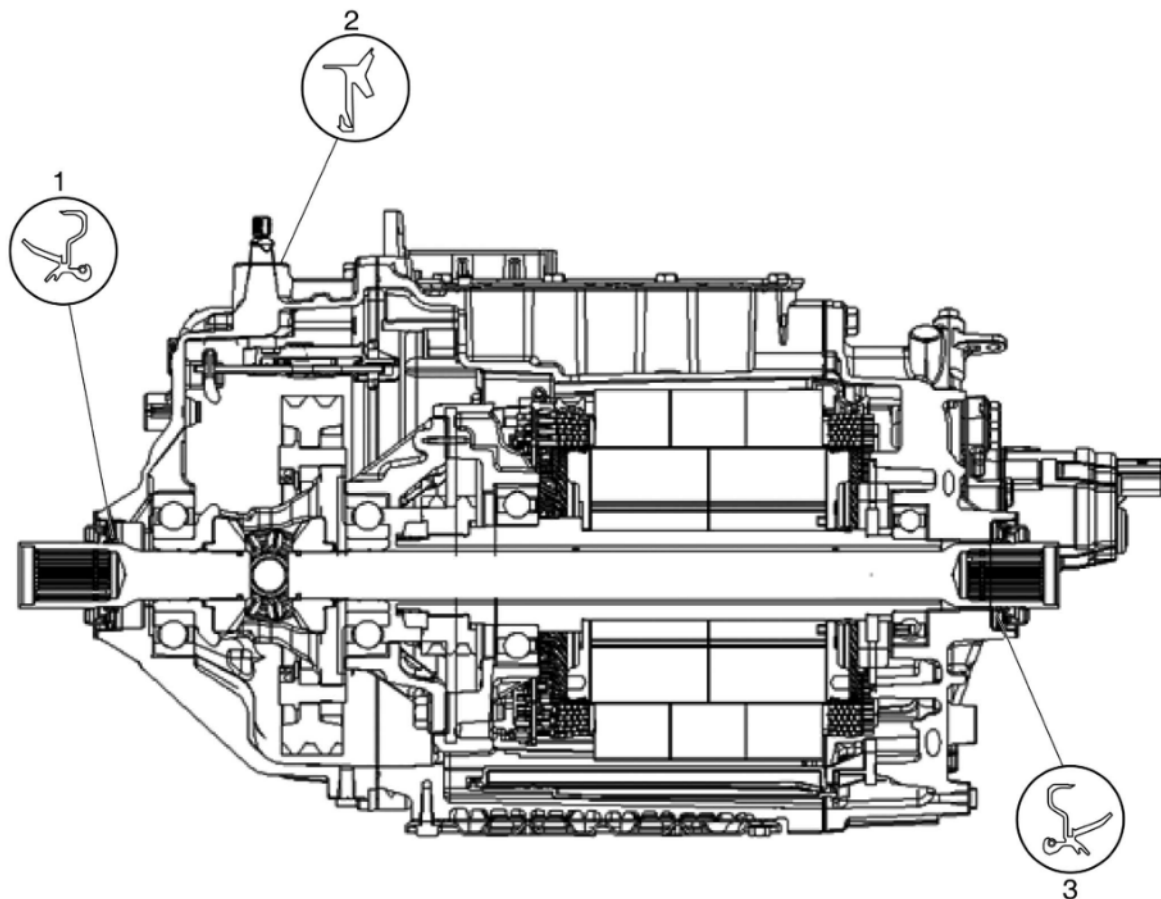
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                               |
|---------|----------------------------------------------|
| 1       | Output Shaft Assembly (RHS)                  |
| 2       | Automatic Transmission Case                  |
| 3       | Manual Shift Shaft Position Switch Assembly  |
| 4       | Drive Motor Rotor Assembly                   |
| 5       | Shift Shaft Cover (Oil Sump)                 |
| 6       | Drive Motor Housing                          |
| 7       | Drive Motor Position Sensor Stator Assembly  |
| 8       | Automatic Transmission Fluid Pump Assembly   |
| 9       | Output Shaft Assembly (LHS)                  |
| 10      | Automatic Transmission Case Cover            |
| 11      | Drive Motor Stator Assembly                  |
| 12      | Shift Shaft Cover (Coolant Sump)             |
| 13      | Automatic Transmission Fluid Filter Assembly |
| 14      | Center Support                               |
| 15      | Front Differential Assembly                  |

## SEAL LOCATIONS

Seal Locations (1 of 2)



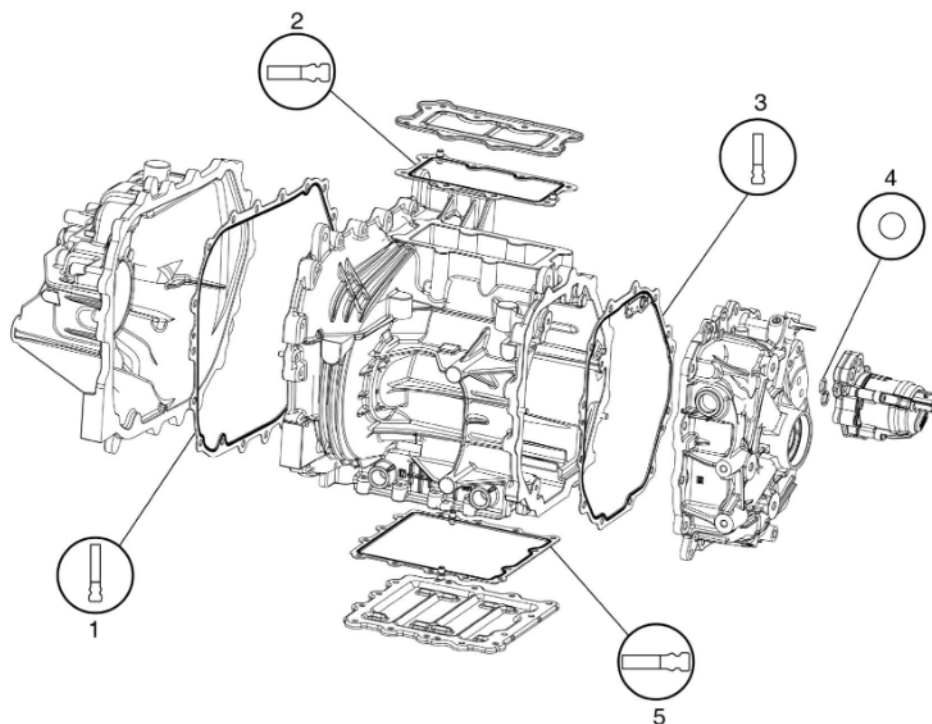


**Fig. 9: Seal Locations (1 of 2)**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                  |
|---------|-------------------------------------------------|
| 1       | Front Wheel Drive Shaft Oil Seal Assembly (RHS) |
| 2       | Manual Shift Shaft Seal                         |
| 3       | Front Wheel Drive Shaft Oil Seal Assembly (LHS) |

**Seal Locations (2 of 2)**





| <b>Callout</b> | <b>Component Name</b>                    |
|----------------|------------------------------------------|
| 1              | Automatic Transmission Case Gasket       |
| 2              | Shift Shaft Cover Gasket (Oil Sump)      |
| 3              | Automatic Transmission Case Cover Gasket |
| 4              | Automatic Transmission Fluid Pump Seal   |
| 5              | Shift Shaft Cover Gasket (Coolant Sump)  |

## **DIAGNOSTIC INFORMATION AND PROCEDURES**

### **DTC C1217, C1301, OR C1302: TRANSMISSION RANGE STATUS/ONE PEDAL DRIVING PARK BRAKE AUTONOMOUS APPLY REQUEST/ONE PEDAL DRIVING SHIFT TO PARK REQUEST - MESSAGE COUNTER(S) 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.
- Refer to **Diagnostic Procedure Instructions** to provide an overview of each diagnostic category.

#### **DTC Descriptor**

##### **DTC C1217**

Transmission Range Status Message Counter Incorrect

##### **DTC C1301**

One Pedal Driving Park Brake Autonomous Apply Request Message Counter Incorrect

##### **DTC C1302**

One Pedal Driving Shift To Park Request 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, the EBCM is constantly sending the K114B Hybrid/EV Powertrain Control Module 2 serial data messages with information regarding the rate of vehicle acceleration. The K114B Hybrid/EV Powertrain Control Module sets this DTC 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 system voltage is greater than 10.2 V.

#### **Conditions for Setting the DTC**

##### **C1217**

The K114B Hybrid/EV Powertrain Control Module detects 74 errors out of 101 samples in the rolling count value sent by the EBCM for 2.5 s.

OR

The K114B Hybrid/EV Powertrain Control Module detects calculated protection value signal does not match the calculated protection value signal sent by the EBCM for 2.5 s.

##### **C1301**

The K114B Hybrid/EV Powertrain Control Module detects 60 errors out of 80 samples in the calculated one pedal driving park brake autonomous apply request signal active rolling count value sent by the EBCM for 2 s.

OR

The K114B Hybrid/EV Powertrain Control Module detects calculated one pedal driving park brake protection value signal that does not match the calculated one pedal driving park brake protection value signal sent by the EBCM for 2 s.

### **C1302**

The K114B Hybrid/EV Powertrain Control Module detects 60 errors out of 80 samples in the calculated one pedal driving shift to park requested signal active rolling count value sent by the EBCM for 2 s.

OR

The K114B Hybrid/EV Powertrain Control Module detects calculated one pedal driving shift to park requested protection value signal does not match the one pedal driving shift to park requested protection value signal sent by the EBCM for 2 s.

### **Action Taken When the DTC Sets**

C1217, C1301, and C1302 are Type A DTCs.

### **C1217**

DC fast charging is disabled.

### **C1301 and C1302**

One Pedal Driving function is disabled.

### **Conditions for Clearing the DTC**

C1217, C1301, and C1302 are Type A DTCs.

### **Reference Information**

Schematic Reference

### **Automatic Transmission Controls Schematics**

Connector End View Reference

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

Description and Operation

- **[Electronic Component Description](#)**
- **[Transmission Component and System Description](#)**
- **[Transmission General 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

#### **NOTE:**

- C1217, C1301, and C1302 are informational DTCs.
- Diagnose all other T6 Power Inverter Module and K17 Electronic Brake Control Module DTCs prior to DTC P175F.

1. Verify there are no other T6 Power Inverter 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 serial data fault. Refer to [Scan Tool Does Not Communicate with Low Speed GMLAN Device](#) .

- If a serial data circuit fault is found

Repair as necessary.

- If a serial data circuit fault is not found

3. All OK.

### Repair Instructions

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

## **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.
- Refer to [Diagnostic Procedure Instructions](#) to provide 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

| Circuit                                      | Short to Ground | Open/High Resistance | Short to Voltage | Signal Performance |
|----------------------------------------------|-----------------|----------------------|------------------|--------------------|
| Transmission Fluid Temperature Sensor Signal | P0712           | P0713                | P0713            | P0711              |
| Low Reference                                | -               | P0713                | -                | P0711              |

**Transmission Fluid Temperature**

| Circuit                                                                                                                                             | Short to Ground              | Open/High Resistance      | Short to Voltage           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------------------|----------------------------|
| <b>Operating Conditions:</b> Engine running in Park, normal operating temperature<br><b>Parameter Normal Range:</b> -39 to +160Â°C (-38 to +320Â°F) |                              |                           |                            |
| Transmission Fluid Temperature Sensor Signal                                                                                                        | Greater than 160Â°C (320Â°F) | Less than -39Â°C (-38Â°F) | Less than -39Â°C (-38Â°F)* |
| Low Reference                                                                                                                                       | -                            | Less than -39Â°C (-38Â°F) | Less than -39Â°C (-38Â°F)* |
| * Internal Transmission Fluid Temperature Sensor damage may result if shorted to B+                                                                 |                              |                           |                            |

**Circuit/System Description**

The primary source of heat in the transmission is the drive motor generator. The drive motor generator is cooled by the transmission fluid. Hot fluid exits the drive motor generator and flows to the transmission cooler supply line. The supply line connects to the transmission cooler, which is internal to the radiator. The transmission fluid cooler pipe assembly is equipped with an internal thermostat that opens at 80Â°C (176Â°F) for optimum transmission operation and efficiency. The transmission cooler pipe thermostat is part of the transmission fluid cooler pipe assembly, located near the transmission and is not serviced separately. From the cooler, the fluid returns through the transmission fluid cooler pipe assembly and enters the lubrication circuits. The transmission fluid temperature sensor is part of the transmission control wire harness.

**Conditions for Running the DTC**

The system voltage is greater than or equal to 9 V.

**P0711**

- Cold soak average temperature is greater than or equal to -40Â°C (-40Â°F).
- DTC P0712 or P0713 is not set.
- Vehicle Off time is greater than 43,200 s.
- HV battery charging off time is greater than 25,200 s.
- HV battery thermal conditioning off time is greater than 25,200 s.
- Transmission Fluid Temperature is -40 to +80Â°C (-40 to +176Â°F).
- Vehicle is On for greater than or equal to 4.5 s.

**P0712 and P0713**

Vehicle is On.

**Conditions for Setting the DTC****P0711**

The difference between the Transmission Fluid Temperature and the cold soak average temperature is greater than 20Â°C (68Â°F) for 0.1 s:

- Drive Motor Inverter Temperature
- Auxiliary Transmission Fluid Pump Inverter Temperature
- Hybrid/EV electronics coolant temperature

**P0712**

The Transmission Fluid Temperature parameter is greater than 149Â°C (300.2Â°F) for greater than 2 s.

**P0713**

The Transmission Fluid Temperature parameter is less than or equal to -40Â°C (-40Â°F) for greater than 2 s.

### Action Taken When the DTC Sets

- DTCs P0711, P0712 and P0713 are Type A DTCs.
- The auxiliary transmission fluid pump is commanded to maximum speed.
- Reduced propulsion is commanded.

### Conditions for Clearing the DTC

DTCs P0711, P0712 and P0713 are Type A DTCs.

### Diagnostic Aids

While driving, the Transmission Fluid Temperature parameter on the scan tool should rise steadily to a normal operating temperature, and then stabilize.

### Reference Information

Schematic Reference

### Automatic Transmission Controls Schematics

Connector End View Reference

### COMPONENT CONNECTOR END VIEWS - INDEX

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- [Circuit Testing](#)
- [Connector Repairs](#)
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- [Wiring Repairs](#)

DTC Type Reference

### Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

[Control Module References](#) for scan tool information

Special Tools

**DT-44152** Jumper Harness

For equivalent regional tools, refer to [Special Tools](#).

### Circuit/System Verification

1. Vehicle ON.
2. Verify the scan tool Transmission Fluid Temperature Sensor parameter is between -39 to +120Â°C (-38 to +248Â°F) and changes with vehicle drive time.

- **If not between -39 to +120Â°C (-38 to +248Â°F) or does not change**

Refer to Circuit/System Testing.

- **If between -39 to +120Â°C (-38 to +248Â°F) and changes**

3. Operate the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. [cardiagn.com](http://cardiagn.com)
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. Vehicle OFF and all vehicle systems OFF, disconnect the X2 harness connector at the T12 Automatic Transmission Assembly. It may take up to 2 minutes for all vehicle systems to power down.
2. Connect **DT-44152** jumper harness to the vehicle harness.
3. Test for less than 5  $\Omega$  between the Transmission Fluid Temperature Sensor low reference circuit terminal 3 and ground.
  - **If 5  $\Omega$  or greater**
    1. Vehicle OFF, disconnect the harness connector at the T6 Power Inverter Module.
    2. Test for less than 2  $\Omega$  in the Transmission Fluid Temperature Sensor low reference circuit end to end.
      - If 2  $\Omega$  or greater, repair the open/high resistance in the circuit.
      - If less than 2  $\Omega$ , replace the T6 Power Inverter Module.
  - **If less than 5  $\Omega$**
4. Vehicle ON.
5. Verify the scan tool Transmission Fluid Temperature Sensor parameter is colder than -39 $^{\circ}$ C (-38 $^{\circ}$ F).
  - **If warmer than -39 $^{\circ}$ C (-38 $^{\circ}$ F)**
    1. Vehicle OFF, disconnect the harness connector at the T6 Power Inverter Module.
    2. Test for infinite resistance between the Transmission Fluid Temperature Sensor signal circuit terminal 2 and ground.
      - If less than infinite resistance, repair the short to ground on the Transmission Fluid Temperature Sensor signal circuit.
      - If infinite resistance, replace the T6 Power Inverter Module.
  - **If colder than -39 $^{\circ}$ C (-38 $^{\circ}$ F)**
6. Install a 3 A fused jumper wire between the Transmission Fluid Temperature Sensor signal circuit terminal 2 and the Transmission Fluid Temperature Sensor low reference circuit terminal 3.
7. Verify the scan tool Transmission Fluid Temperature sensor parameter is warmer than 149 $^{\circ}$ C (300 $^{\circ}$ F).
  - **If colder than the 149 $^{\circ}$ C (300 $^{\circ}$ F)**
    1. Vehicle OFF, disconnect the harness connector at the T6 Power Inverter Module, vehicle ON.
    2. Test for less than 1 V between the Transmission Fluid Temperature Sensor signal circuit and ground.
      - If 1 V or greater, repair the short to voltage on the circuit.
      - If less than 1 V
    3. Vehicle OFF.
    4. Test for less than 2  $\Omega$  in the Transmission Fluid Temperature Sensor signal circuit end to end.
      - If 2  $\Omega$  or greater, repair the open/high resistance in the circuit.
      - If less than 2  $\Omega$ , replace the T6 Power Inverter Module.
  - **If warmer than 149 $^{\circ}$ C (300 $^{\circ}$ F)**
8. Test the Transmission Control Wiring Harness circuits 585 and 586 for a short to voltage, short to ground, an open/high resistance, or short together.
  - If not OK, replace the Transmission Control Wiring Harness.
  - If OK, test or replace the B13 Transmission Fluid Temperature Sensor.

**Static Test**

1. Vehicle OFF, disconnect the X2 transmission connector.

**NOTE:** A thermometer can be used to test the sensor off vehicle.

2. Test the B13 Transmission Fluid Temperature Sensor by comparing the sensor temperature to a known temperature while monitoring the sensor resistance. Compare the readings with the [Temperature Versus Resistance \(Transmission Fluid Temperature Sensor\)](#) table and verify that the resistance is within the specification.
  - **If the transmission fluid temperature resistance does not match the specified value**
    1. Test the Transmission Control Wiring Harness circuits 585 and 586 for a short to voltage, short to ground, an open/high resistance, or short together.
      - If not OK, replace the Transmission Control Wiring Harness.
      - If OK, test or replace the B13 Transmission Fluid Temperature Sensor.
  - **If transmission fluid temperature resistance tests OK**
3. All OK.

**Repair Instructions**

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

- Refer to [Automatic Transmission Control Wiring Harness Removal - Transmission Case](#) for transmission control wiring harness or transmission fluid temperature sensor replacement.
- Refer to [Control Module References](#) for T6 Power Inverter Module replacement, programming, and setup.

**DTC P152A OR P152D: REGENERATIVE BRAKING CONTROL SWITCH 1-2 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

**DTC Descriptors****DTC P152A**

Regenerative Braking Control Switch 1 Circuit

**DTC P152D**

Regenerative Braking Control Switch 1 and 2 Circuit

**Diagnostic Fault Information****Regenerative Braking On Demand**

| Circuit                                 | Short to Ground | Open/High Resistance                       | Short to Voltage                           | Signal Performance |
|-----------------------------------------|-----------------|--------------------------------------------|--------------------------------------------|--------------------|
| Normal Range = Inactive/Active          |                 |                                            |                                            |                    |
| Tap Up/Tap Down Switch Signal 2 Circuit | P152D           | Regenerative Braking On Demand Malfunction | Regenerative Braking On Demand Malfunction | P152A, P152C       |

**Circuit/System Description**

Regenerative Braking On Demand enables drivers to actively re-capture energy when slowing down, such as when approaching slower traffic or setting up for a tight turn. To engage Regenerative Braking On Demand, the driver releases the accelerator pedal and pulls back on the left steering-wheel paddle to begin regenerating electricity. When engaged, Regenerative Braking On Demand provides vehicle deceleration that is more than what a typical vehicle experiences while coasting or when the transmission shifter is in the L position, providing control and dynamic performance characteristics similar to downshifting in a manual-transmission vehicle. The feature does not bring the vehicle to a complete stop. Releasing the paddle cancels the Regeneration on Demand request, allowing the vehicle to coast normally. The driver can engage and disengage Regeneration on Demand as desired and as traffic conditions allow. When Regenerative Braking On Demand is requested, a signal is sent to the Body Control Module and then to the hybrid/EV powertrain control module 1 via serial data. The Regenerative Braking On Demand parameter is displayed as Inactive and Active on the scan tool. The Regenerative Braking On Demand parameter states are listed below:

- Inactive - when the S151 automatic transmission manual shift switch-left switch is not pressed
- Active - when the S151 automatic transmission manual shift switch-left is pressed

### Conditions for Running the DTC

Propulsion system is active.

### DTC P152A

DTC P152D is not set.

### Conditions for Setting the DTC

#### P152A

The hybrid/EV powertrain control module 1 detects the Regenerative Braking On Demand is active for greater than 600 s.

#### P152D

The hybrid/EV powertrain control module 1 detects an invalid voltage regenerative braking on demand switch - left circuit for 60 s.

### Action Taken When the DTC Sets

- DTC P152A and P152D are Type C DTCs.
- The hybrid/EV powertrain control module 1 disables regenerative braking on demand.

### Conditions for Clearing the DTC

DTC P152A and P152D are Type C DTCs.

### Diagnostic Aids

DTC P152A can be customer induced by holding regenerative braking control switch in the regeneration on demand position while driving for greater than 600 s. Verify the customer is not pressing the switch for greater than 600 s.

### Reference Information

Schematic Reference

### Automatic Transmission Controls Schematics

Connector End View Reference

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

- [Circuit Testing](#)
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- [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. Vehicle ON, verify with a scan tool the following hybrid/EV powertrain control module 1 parameter displays the correct values the S151 automatic transmission manual shift switch-left state:
  - Regenerative Braking On Demand displays Inactive when not pressed.
  - Regenerative Braking On Demand displays Active when pressed.
  - **If the hybrid/EV powertrain control module 1 parameter is incorrect**  
  
Refer to Circuit/System Testing.
  - **If the hybrid/EV powertrain control module 1 Regenerative Braking On Demand parameter is correct**
2. After performing the above step, verify that the DTC does not reset by operating the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. If the vehicle passes the Circuit/System Verification procedure, then STOP. Do not perform the Circuit/System Testing or Component Testing as this may result in an unnecessary part replacement. Refer to [Testing for Intermittent Conditions and Poor Connections](#).

## [Circuit/System Testing](#)

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S151 automatic transmission manual shift switch-left. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10  $\Omega$  between the ground circuit terminal 1 and ground.
  - **If 10  $\Omega$  or greater**
    1. Vehicle OFF.
    2. Test for less than 2  $\Omega$  in the ground circuit end to end.
      - If 2  $\Omega$  or greater, repair the open/high resistance in the circuit.
      - If less than 2  $\Omega$ , repair the open/high resistance in the ground connection.
  - **If less than 10  $\Omega$**
3. Vehicle ON.
4. Verify the scan tool Regenerative Braking On Demand parameter is Inactive.
  - **If not Inactive**
    1. Vehicle OFF, disconnect the harness connector at the K9 BCM X3 connector.
    2. Test for infinite resistance between the signal circuit terminal X3 21 and ground.
      - If less than infinite resistance, repair the short to ground on the circuit.
      - If infinite resistance, replace the K9 BCM.
  - **If Active**
5. Install a 3 A fused jumper wire between the signal circuit terminal 3 and the ground circuit terminal 1.
6. Verify the scan tool Regenerative Braking On Demand parameter is Active.



- **If not Inactive**

1. Vehicle OFF, remove the jumper wire, disconnect the X3 harness connector at the K9 BCM, vehicle ON.
2. Test for less than 1 V between the signal circuit terminal 21 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  $\Omega$  in the signal circuit end to end.
  - If 2  $\Omega$  or greater, repair the open/high resistance in the circuit.
  - If less than 2  $\Omega$ , replace the K9 BCM.

- **If Active**

7. Test or replace the S151 automatic transmission manual shift switch-left.

### Repair Instructions

Perform the [Diagnostic Repair Verification](#) after completing the diagnostic procedure.

- Refer to [Steering Wheel Replacement](#) for S151 automatic transmission manual shift switch-left replacement.
- Refer to [Control Module References](#) for K9 BCM replacement, programming, and setup.

## DTC P152C: REGENERATIVE BRAKING CONTROL 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

### DTC Descriptor

#### DTC P152C

Regenerative Braking Control Switch Signal Message Counter Incorrect

### Circuit/System Description

Hybrid Low Mode enables drivers to actively re-capture energy when slowing down, such as when approaching slower traffic or setting up for a tight turn. To engage hybrid low mode the shift lever is placed in low (L), the driver shift request, also known as the tap shift function, is activated. The driver shift request allows the vehicle operator to switch from L2 to L1 pressing the minus (-) button and back to L2 by pressing the plus (+) button. The body control module (BCM) supplies a signal circuit to the automatic transmission manual shift switch. The automatic transmission manual shift switch has switches connected to a resistor array. When the lever is in the L position, a voltage drop occurs across the resistor network. When the plus or minus button is pressed, a corresponding voltage drop occurs across the resistor network. This voltage drop is monitored by the BCM. The BCM will send the request to the hybrid/EV powertrain control module 1 to perform the transition from L2 to L1 or if already in L1 then back to L2. When the shifter is moved to the L position, the instrument cluster will display L2, the hybrid/EV powertrain control module 1 will command a higher level of regenerative braking than what is commanded in the D position. When the minus (-) button is pressed, the L1 mode is commanded by the hybrid/EV powertrain control module 1. When the plus (+) button is pressed when in L1 mode, the system will transition back to L2.

### Conditions for Running the DTC

The propulsion system is active.

### Conditions for Setting the DTC

The hybrid/EV powertrain control module 1 has detected a drive mode signal rolling count error for 10.0 s.



### Action Taken When the DTC Sets

- DTC P152C is a Type C DTC.
- The hybrid/EV powertrain control module 1 disables regenerative braking on demand.

### Conditions for Clearing the DTC

DTC P152C is a Type C DTC.

### Diagnostic Aids

When attempting to set hybrid/EV powertrain control module serial data DTCs, run the vehicle in propulsion system active mode for at least 1 minute, and then shut the vehicle off for 30 seconds. Following this procedure will allow for a complete hybrid/EV powertrain control module shutdown.

### Reference Information

Schematic Reference

### Automatic Transmission Controls Schematics

Connector End View Reference

### COMPONENT CONNECTOR END VIEWS - INDEX

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- [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. Run the vehicle in propulsion system active mode for 1 minute, then vehicle OFF for 30 seconds.
2. Verify DTC P152C is not set.
  - **If the DTC is set**
    1. Program the K114A Hybrid Powertrain Control Module.
    2. Verify the DTC does not set.
      - If the DTC is set, replace the T6 Power Inverter Module.
      - If the DTC does not set
  - 3. All OK.
  - **If the DTC is not set**
3. All OK.

### Repair Instructions

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

- Refer to [Control Module References](#) for T6 Power Inverter Module replacement, programming and setup.

## 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.
- Refer to **Diagnostic Procedure Instructions** to provide an overview of each diagnostic category.

## DTC Descriptor

### DTC P152E

Unexpected Vehicle Movement

## Circuit/System Description

The vehicle provides One-Pedal Driving modes that are selectable using the drive unit shifter or Regen on Demand. One-Pedal Driving modes allow for increased deceleration without use of the brake and will bring the vehicle to a complete stop in many cases. The brake pedal should still be used to hold the vehicle at a stop, even when it may not seem necessary. The brake pedal may be required to bring the vehicle to a stop on sloped surfaces.

Regen on Demand enables One-Pedal Driving by pressing and holding the steering wheel paddle in either D (Drive) or L (Low). The accelerator pedal must be less than halfway engaged for Regen on Demand to work. In addition to this, the Low gear also enables One-Pedal Driving, and used together with Regen on Demand will provide an even higher level of deceleration. When any of these One-Pedal Driving modes are enabled, the brake lights may illuminate during increased deceleration.

The deceleration provided by the One-Pedal Driving modes in Low and in Regen on Demand provide 100% regenerative braking and help to increase energy efficiency.

In One-Pedal Driving modes, the accelerator pedal can be used to control the deceleration rate of the car all the way to a stop. Completely lifting off of the accelerator pedal will result in an aggressive deceleration. However, by slowly lifting off of the accelerator pedal and making adjustments lightly on the accelerator pedal, the deceleration of the vehicle can be adjusted as desired.

If the vehicle begins to move after coming to a complete stop, the Electric Parking Brake may apply to prevent undesired movement. Applying the accelerator pedal will automatically release the Electric Parking Brake as the car moves forward.

## Conditions for Running the DTC

- One-Pedal Driving feature is active.
- Holding torque is greater than 90 for 3 s.
- Drive Motor torque is greater than 5.
- Holding torque and vehicle speed are in the same direction and output torque difference is greater than 40.

## Conditions for Setting the DTC

The Hybrid/EV Powertrain Control Module 1 detects a 0.08 g torque acceleration greater than the requested torque for 0.1875 s.

## Action Taken When the DTC Sets

- P152E is a Type A DTC.
- The Hybrid/EV Powertrain Control Module 1 requests the hybrid/EV powertrain control module 2 to open the high voltage contactor relays.

## Conditions for Clearing the DTC

P152E is a Type A DTC.

## Diagnostic Aids

This DTC may set if the vehicle is in One-Pedal Driving mode and is bumped or pushed while at a stop.

## Reference Information

Schematic Reference

## Automatic Transmission Controls Schematics

Connector End View Reference

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

### NOTE:

- P152E is an informational DTC.
- Diagnose all other T6 Power Inverter Module and K17 Electronic Brake Control Module DTCs prior to DTC P152E.

1. Verify there are no other T6 Power Inverter 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 serial data fault. Refer to [Scan Tool Does Not Communicate with Low Speed GMLAN Device](#) .

- **If a serial data circuit fault is found**

Repair as necessary.

- **If a serial data circuit fault is not found**

3. All OK.

## Repair Instructions

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

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**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.
- Refer to **Diagnostic Procedure Instructions** to provide 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 Hybrid/EV Powertrain Control Module 1 serial data messages with information regarding the rate of vehicle acceleration. The Hybrid/EV Powertrain Control Module 1 sets this DTC when it detects a discrepancy in the structure of the message, causing the signal message integrity to be questioned.

## **Conditions for Running the DTC**

- Battery voltage is between 10-11 V.
- Run/Crank voltage is greater than or equal to 11 V.
- No other serial data errors are present.

## **Conditions for Setting the DTC**

The Hybrid/EV Powertrain Control Module 1 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 estimated drive motor temperature will rise and possible de-rate drive motor torque.

## **Conditions for Clearing the DTC**

P175F is a Type C DTC.

## **Reference Information**

Schematic Reference

## **Automatic Transmission Controls Schematics**

Connector End View Reference

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

Description and Operation

- **Electronic Component Description**
- **Transmission Component and System Description**
- **Transmission General 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](#)

### **NOTE:**

- P175F is an informational DTC.
- Diagnose all other T6 Power Inverter Module and K17 Electronic Brake Control Module DTCs prior to DTC P175F.

1. Verify there are no other T6 Power Inverter 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 serial data fault. Refer to [Scan Tool Does Not Communicate with Low Speed GMLAN Device](#) .

- **If a serial data circuit fault is found**

Repair as necessary.

- **If a serial data circuit fault is not found**

3. All OK.

## [Repair Instructions](#)

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

## **DTC P1762: TRANSMISSION MODE 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

### [DTC Descriptor](#)

### **DTC P1762**

Transmission Mode Switch Signal Message Counter Incorrect

### [Circuit/System Description](#)

The ECM monitors the state of the drive mode switch signal message from the body control module (BCM), over the serial data circuits. The ECM uses this message to determine the following driver selected mode of operation:

- Normal
- Sport

### [Conditions for Running the DTC](#)

The propulsion system is active.



### **Conditions for Setting the DTC**

The ECM has detected a drive mode signal rolling count error for 10 s.

### **Action Taken When the DTC Sets**

- DTC P1762 is a Type C DTC.
- Driver cannot transition to Sport mode.

### **Conditions for Clearing the DTC**

DTC P1762 is a Type C DTC.

### **Diagnostic Aids**

When attempting to set ECM serial data DTCs, run the vehicle in propulsion system active mode for at least 1 minute, and then shut the vehicle off for 30 seconds. Following this procedure will allow for a complete ECM shutdown.

### **Reference Information**

Schematic Reference

### **Automatic Transmission Controls Schematics**

Connector End View Reference

### **COMPONENT CONNECTOR END VIEWS - INDEX**

Electrical Information Reference

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

DTC Type Reference

### **Powertrain Diagnostic Trouble Code (DTC) Type Definitions**

Scan Tool Reference

**Control Module References** for scan tool information.

### **Circuit/System Verification**

1. Run the vehicle in propulsion system active mode for 1 minute, then vehicle OFF for 30 seconds.
2. Verify DTC P1762 is not set.
  - **If the DTC is set**
    1. Program the K20 ECM.
    2. Verify the DTC does not set.
      - If the DTC is set, replace the K20 ECM.
      - If the DTC does not set
    3. All OK.
  - **If the DTC is not set**
3. All OK.

### **Repair Instructions**

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

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- Refer to **Control Module References** for ECM replacement, programming and setup.

## **DTC P1775: TRANSMISSION RANGE REQUEST 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

### **DTC Descriptor**

#### **DTC P1775**

Transmission Range Request Signal Message Counter Incorrect

### **Circuit/System Description**

The Hybrid/EV Powertrain Control Module 1 monitors the serial data messages from the K173 Transmission Range Control Module with information regarding the transmission range state. The Hybrid/EV Powertrain Control Module 1 sets this DTC when it detects a count error of the message.

### **Conditions for Running the DTC**

- Vehicle is On for greater than 3 s.
- Run/Crank voltage is greater than 11 V.

### **Conditions for Setting the DTC**

The Hybrid/EV Powertrain Control Module 1 detects an error in the alive rolling count value that does not match with the alive rolling count value sent by the K173 Transmission Range Control Module.

### **Action Taken When the DTC Sets**

- P1775 is a Type B DTC.
- The Hybrid/EV Powertrain Control Module 1 inhibits the K173 Transmission Range Control Module from shifting to Low (L).

### **Conditions for Clearing the DTC**

P1775 is a Type B DTC.

### **Reference Information**

Schematic Reference

#### **Automatic Transmission Controls Schematics**

Connector End View Reference

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

Description and Operation

- [Electronic Component Description](#)
- [Transmission Component and System Description](#)
- [Transmission General 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](#)

### **NOTE:**

- **P1775 is an informational DTC.**
- **Diagnose all other T6 Power Inverter Module and K173 Transmission Range Control Module DTCs prior to DTC P1775.**

1. Verify there are no other T6 Power Inverter Module or K173 Transmission Range 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 serial data fault. Refer to [Scan Tool Does Not Communicate with Low Speed GMLAN Device](#) .

- **If a serial data circuit fault is found**

Repair as necessary.

- **If a serial data circuit fault is not found**

3. All OK.

## [Repair Instructions](#)

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

**DTC P1824, P182A-P182F, P1838-P1841, P18B5-P18B9, P18BA, P18BC, P18BF, P18C0, P18C2, OR P18C3: INTERNAL MODE SWITCH CIRCUIT(S)**

## [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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

## [DTC Descriptors](#)

### **DTC P1824**

Internal Mode Switch P Circuit High Voltage

### **DTC P182A**

Internal Mode Switch A Circuit Low Voltage

### **DTC P182B**

Internal Mode Switch B Circuit Low Voltage

### **DTC P182C**

Internal Mode Switch B Circuit High Voltage

**DTC P182D**

Internal Mode Switch P Circuit Low Voltage

**DTC P182E**

Internal Mode Switch Indicates Invalid Range

**DTC P182F**

Internal Mode Switch C Circuit High Voltage

**DTC P1838**

Internal Mode Switch A Circuit High Voltage

**DTC P1839**

Internal Mode Switch C Circuit Low Voltage

**DTC P1840**

Internal Mode Switch S Circuit Low Voltage

**DTC P1841**

Internal Mode Switch S Circuit High Voltage

**DTC P18B5**

Internal Mode Switch A Circuit Shorted

**DTC P18B6**

Internal Mode Switch B Circuit Shorted

**DTC P18B7**

Internal Mode Switch C Circuit Shorted

**DTC P18B8**

Internal Mode Switch P Circuit Shorted

**DTC P18B9**

Internal Mode Switch S Circuit Shorted

**DTC P18BA**

Internal Mode Switch A Stuck Off

**DTC P18BC**

Internal Mode Switch C Stuck Off

**DTC P18BF**

Internal Mode Switch A Stuck On

**DTC P18C0**

Internal Mode Switch B Stuck On

**DTC P18C2**

**DTC P18C3**

Internal Mode Switch S Stuck On

**Diagnostic Fault Information**

| Circuit                     | Short to Ground | Open/High Resistance | Short to Voltage    | Signal Performance |
|-----------------------------|-----------------|----------------------|---------------------|--------------------|
| Transmission Range Signal A | P182A           | P1838                | P1838               | P182E, P18B5       |
| Transmission Range Signal B | P182B           | P182C                | P182C, P18B6        | P182E, P18C0       |
| Transmission Range Signal C | P1839           | P182F                | P182F, P18BC        | P182E              |
| Transmission Range Signal P | P182D           | P1824                | P1824               | P182E, P18C2       |
| Transmission Range Signal S | P1840           | P1841                | P182E, P1841, P18B9 | P18C3              |

**Typical Scan Tool Data****Internal Mode Switch A/B/C/P/S**

| Circuit                                                         | Normal Range    | Short to Ground  | Open                | Short to Voltage    |
|-----------------------------------------------------------------|-----------------|------------------|---------------------|---------------------|
| <b>Operating Conditions:</b> Vehicle ON, range selector in Park |                 |                  |                     |                     |
| Internal Mode Switch A                                          | 1.62 V - 2.49 V | Less than 0.66 V | Greater than 2.49 V | Greater than 2.49 V |
| Internal Mode Switch B                                          | 0.66 V - 1.02 V | Less than 0.66 V | Greater than 2.49 V | Greater than 2.49 V |
| Internal Mode Switch C                                          | 0.66 V - 1.02 V | Less than 0.66 V | Greater than 2.49 V | Greater than 2.49 V |
| Internal Mode Switch P                                          | 1.62 V - 2.49 V | Less than 0.66 V | Greater than 2.49 V | Greater than 2.49 V |
| Internal Mode Switch S                                          | 1.62 V - 2.49 V | Less than 0.66 V | Greater than 2.49 V | Greater than 2.49 V |
| Valid High = Switch open = 1.62 V - 2.49 V                      |                 |                  |                     |                     |
| Valid Low = Switch Closed = 0.66 V - 1.02 V                     |                 |                  |                     |                     |

**Transmission Internal Mode Switch Logic**

| Gear Selector Position | Signal A | Signal B | Signal C | Signal P | Signal S |
|------------------------|----------|----------|----------|----------|----------|
| Park (P)               | High     | Low      | High     | Low      | High     |
| Reverse (R)            | Low      | High     | Low      | Low      | High     |
| Neutral (N)            | High     | High     | Low      | High     | Low      |
| Drive (D)              | High     | Low      | High     | High     | Low      |
| Low (L)                | Low      | Low      | High     | High     | Low      |

**Circuit/System Description**

The transmission internal mode switch, often referred to as the automatic transmission manual shift shaft position switch, is a hall-effect switch attached to the transmission case within the transmission. The 5 outputs from the switch indicate which position is selected by the transmission manual shaft. Five outputs (A, B, C, P, S) are range selection inputs to the hybrid/EV powertrain control module 1. The input voltage at the modules is high when the switch is open and low when the switch is closed to ground. The state of each input is displayed on the scan tool as Internal Mode Switch A/B/C/P/S. The Internal Mode Switch Range input parameters represented are transmission range signal A, signal B, signal C, and signal P signal S. The hybrid/EV powertrain control module 1 is internal to the power



inverter module, often referred to as the drive motor generator power inverter module, and is not serviced separately.

### Conditions for Running the DTC

#### **P1824, P182A-P182F, P1838-P1841, P18B5-P18BA, P18BC, P18C0, P18C2, or P18C3**

- Ignition voltage is greater than or equal to 9 V.
- Run/Crank voltage is greater than 5 V.

#### **P18BF**

- Ignition voltage is greater than or equal to 9 V.
- Run/Crank voltage is greater than 5 V.
- Shift lever is in Park.

And

- Internal Mode Switch signal A is not High for 1.5 s.

#### **P18C0**

- Ignition voltage is greater than or equal to 9 V.
- Run/Crank voltage is greater than 5 V.
- Shift lever is in Drive.

And

- Internal Mode Switch signal B is not High for 1.5 s.

#### **P18C3**

- Ignition voltage is greater than or equal to 9 V.
- Run/Crank voltage is greater than 5 V.
- Shift lever is in Park.

And

- Internal Mode Switch signal S is not High for 1.5 s.

### Conditions for Setting the DTC

#### **P1824**

Internal Mode Switch P circuit voltage is greater than 2.49 V for 1.75 s in a 2 s window.

#### **P182A**

Internal Mode Switch A circuit voltage is less than or equal to 0.66 V for 1.75 s in a 2 s window.

#### **P182B**

Internal Mode Switch B circuit voltage is less than or equal to 0.66 V for 1.75 s in a 2 s window.

#### **P182C**

Internal Mode Switch B circuit voltage is greater than 2.49 V for 1.75 s in a 2 s window.

#### **P182D**

Internal Mode Switch P circuit voltage is less than or equal to 0.66 V for 1.75 s in a 2 s window.

#### **P182E**

The Hybrid/EV Powertrain Control Module 1 has detected an invalid Internal Mode Switch range for 2.7 s in a 3.13 s window.

**P182F**

Internal Mode Switch C circuit voltage is greater than 2.49 V for 1.75 s in a 2 s window.

**P1838**

Internal Mode Switch A circuit voltage is greater than 2.49 V for 1.75 s in a 2 s window.

**P1839**

Internal Mode Switch C circuit voltage is less than or equal to 0.66 V for 1.75 s in a 2 s window.

**P1840**

Internal Mode Switch S circuit voltage is less than or equal to 0.66 V for 1.75 s in a 2 s window.

**P1841**

Internal Mode Switch S circuit voltage is greater than 2.49 V for 1.75 s in a 2 s window.

**P18B5**

Internal Mode Switch A circuit voltage is 1.01 - 1.62 V for 1.75 s in a 2 s window.

**P18B6**

Internal Mode Switch B circuit voltage is 1.01 - 1.62 V for 1.75 s in a 2 s window.

**P18B7**

Internal Mode Switch C circuit voltage is 1.01 - 1.62 V for 1.75 s in a 2 s window.

**P18B8**

Internal Mode Switch P circuit voltage is 1.01 - 1.62 V for 1.75 s in a 2 s window.

**P18B9**

Internal Mode Switch S circuit voltage is 1.01 - 1.62 V for 1.75 s in a 2 s window.

**P18BA**

Internal Mode Switch A circuit is Low when it is expected to be High for 2.7 s in a 3.13 s window.

**P18BC**

Internal Mode Switch C circuit is Low when it is expected to be High for 2.7 s in a 3.13 s window.

**P18BF**

Internal Mode Switch A circuit is High when it is expected to be Low for 2.7 s in a 3.13 s window.

**P18C0**

Internal Mode Switch B circuit is High when it is expected to be Low for 2.7 s in a 3.13 s window.

**P18C2**

Internal Mode Switch P circuit is High when it is expected to be Low for 2.7 s in a 3.13 s window.

**P18C3**

Internal Mode Switch S circuit is High when it is expected to be Low for 2.7 s in a 3.13 s window.

### Action Taken When the DTC Sets

### DTCs P1824, P182A-P182D, P182F, P1838-P1841, P18B5-P18BA, P18BC, P18BF, P18C0, P18C2, or P18C3

- DTCs P1824, P182A-P182D, P182F, P1838-P1841, P18B5-P18BA, P18BC, P18BF, P18C0, P18C2, or P18C3 are Type B DTCs.
- No creep or coast torque from the drive motor. The BCM will keep the vehicle awake due to an invalid transmission range signal.

### DTC P182E

- DTC P182E is a Type A DTC
- No creep or coast torque from the drive motor but pedal torque is still available.

### Conditions for Clearing the DTC

- DTC P182E is a Type A DTC.
- DTCs P1824, P182A-P182D, P182F, P1838-P1841, P18B5-P18B9, P18BA, P18BC, P18BF, P18C0, P18C2, and P18C3 are Type B DTCs.

### Diagnostic Aids

The transmission Internal Mode Switch connects electrically to the hybrid/EV powertrain control 1. Inspect the transmission internal mode switch, harness, connector, and hybrid/EV powertrain control module 1 pins for metallic debris. Use a terminal test kit for any test that requires probing the control solenoid assembly harness connector or a component harness connector. The transmission internal mode switch can be damaged by currents exceeding 2 mA. Test the transmission internal mode switch for an open condition whenever a short to voltage condition is observed.

### Reference Information

Schematic Reference

### Automatic Transmission Controls Schematics

Connector End View Reference

### COMPONENT CONNECTOR END VIEWS - INDEX

Electrical Information Reference

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

DTC Type Reference

### Powertrain Diagnostic Trouble Code (DTC) Type Definitions

Scan Tool Reference

[Control Module References](#) for scan tool information.

### Circuit/System Verification

1. Vehicle ON, observe the scan tool Internal Mode Switch A/B/C/P/S parameter while moving the gear shift lever from Park, through all gear selector positions, and back to Park. The parameter should match each gear range that is selected. Refer to [Transmission Internal Mode Switch Logic](#).

2. Verify all the Internal Mode Switch Status parameters display Valid while moving the gear shift lever from Park, through all gear selector positions, and back to Park.

- **If any of the parameters display Invalid**

Refer to Circuit/System Testing.

- **If all the parameters display valid**

3. Verify all the Internal Mode Switch parameters display 1.62 V - 2.49 V when High and 0.66 V - 1.02 V when Low.

- **If any of the parameters display outside of the specified range**

Refer to Circuit/System Testing.

- **If all the parameters display within the specified range**

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

5. Verify **DTC P1824, P182A-P182F, P1838-P1841, P18B5-P18B9, P18BA, P18BC, P18BF, P18C0, P18C2, or P18C3** is not set.

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

Refer to Circuit/System Testing.

- **If none of the DTCs are set**

6. All OK

### Circuit/System Testing

**NOTE:** You must perform the Circuit/System Verification before proceeding with Circuit/System Testing.

1. Vehicle OFF.

2. Disconnect the transmission X1 connector.

3. Vehicle in Service Mode.

4. Test for 8.3 V to 9.4 V between both 9 V reference circuits X1 terminal 4, X1 terminal 10 and ground.

- **If not within the specified range**

Test the reference circuits for an open/high resistance or short to ground end to end.

- If 2  $\Omega$  or greater, replace the A/Trans Wiring Extension Harness Assembly.
- If 2  $\Omega$  or less, replace the T6 Power Inverter Module.

- **If within the specified range**

5. Vehicle ON.

6. Install a 3 A fused jumper wire between each signal circuit listed below and the 9 V reference circuit:

- Switch Signal A: X1 terminal 5 and X1 terminal 4
- Switch Signal B: X1 terminal 8 and X1 terminal 10
- Switch Signal C: X1 terminal 6 and X1 terminal 4
- Switch Signal P: X1 terminal 9 and X1 terminal 10
- Switch Signal S: X1 terminal 7 and X1 terminal 10

7. Verify each scan tool Internal Mode Switch A/B/C/P/S voltage parameter displays 4.88 - 5.12 V when jumped.

- **If any parameter does not display 4.88 - 5.12 V when jumped**

Test the signal circuit for an open/short to voltage or short together.

- If an open/short to voltage or short together is not found, replace the T6 Power Inverter Module.
  - **If each signal circuit parameter displays 4.88 - 5.12 V when jumped**
8. Test the transmission control wiring harness for open/short to voltage, short to ground or short together.
- If a circuit concern is found, replace the transmission control wiring harness, do not repair.
  - If the transmission control wiring harness tests OK, replace the B15 Transmission Internal Mode Switch.

### Repair Instructions

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

- Refer to [Automatic Transmission Control Wiring Harness Removal - Transmission Case](#) for Transmission Control Wiring Harness replacement.
- Refer to [Manual Shift Shaft Position Switch Removal](#) for B15 Transmission Internal Mode Switch, often referred to as the Automatic Transmission Manual Shift Detent Lever with Shaft Position Switch Assembly, replacement.
- Refer to [Control Module References](#) for T6 Power Inverter Module, often referred to as the Drive Motor Generator Power Inverter Module, replacement, programming and setup.

## DTC P215B: VEHICLE SPEED - OUTPUT SHAFT SPEED NOT PLAUSIBLE

### 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.
- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

### DTC Descriptor

#### DTC P215B

Vehicle Speed - Output Shaft Speed Not Plausible

### Circuit/System Description

The ECM determines vehicle speed based on drive motor speed. This signal is interpreted by the hybrid/EV powertrain control module 1, for speed and direction and is transmitted through the serial data circuits to the ECM module. The ECM and hybrid/EV powertrain control module 1 compare the output speed signal with the anti-lock brake system (ABS) wheel speed sensor signal from the electronic brake control module.

### Conditions for Running the DTC

- Serial data communication is active for greater than 1 s.
- The vehicle is not in Park or neutral.

### Conditions for Setting the DTC

The ECM OSS signal and the ABS wheel speed sensor signals differ by greater than 20 km/h (12 mph) for 0.125 s in a 0.2 s window.

### Action Taken When the DTC Sets

PROPULSION POWER REDUCED message is displayed on the driver information center.

### Conditions for Clearing the DTC

P215B is a Type A DTC.

### Diagnostic Aids



The propulsion system is very sensitive to the vehicle speed signal for overall operation. The following conditions listed below may cause this DTC to set:

- Transmission mechanical concern such as a broken differential or axle.
- Certain slippery road conditions resulting in erratic wheel spin.
- Certain vehicle spin out or loss of control conditions.

#### **Reference Information**

Schematic Reference

#### **Automatic Transmission Controls Schematics**

Connector End View Reference

#### **COMPONENT CONNECTOR END VIEWS - INDEX**

Electrical Information Reference

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

DTC Type Reference

#### **Powertrain Diagnostic Trouble Code (DTC) Type Definitions**

Scan Tool Reference

**Control Module References** for scan tool information.

#### **Circuit/System Verification**

1. Verify DTC C1207-C1210, C1221-C1228, C1232-C1235, U0073, U0074, or U0129 is not set.

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

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

- **If the DTCs are not set**

2. Verify there are no transmission mechanical concerns such as a broke axle or differential.

- **If a transmission mechanical concern exists**

Refer to **Symptoms - Automatic Transmission**.

- **If no mechanical concerns**

Refer to Circuit/System Testing.

#### **Circuit/System Testing**

1. Program the control module which set the DTC with the latest software version and retest for DTCs.

- **If the DTC resets**

Replace the control module which set the DTC.

- **If the DTC does not reset**

2. All OK.

#### **Repair Instructions**

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

Refer to [Control Module References](#) for K20 ECM or Drive Motor Generator Power Inverter Module, also called the T6 Power Inverter Module replacement, programming, and setup.

## **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](#)
  - [Fluid Leak Diagnosis](#)
  - [Automatic Transmission Fluid Leaks](#)
- Noise and Vibration Diagnosis
  - [Whine/Growl Noise That Changes with Vehicle Speed](#)
  - [Noise in Drive or Reverse Gear](#)
  - [Vibration](#)
  - [Noise and Vibration Analysis](#)
- Range Performance Diagnosis
  - [No Park or Drive](#)
  - [No Drive in All Ranges](#)
  - [No Reverse](#)
- [No Drive in All Ranges](#)
- Symptom Not Found or No Symptom Detected
  - [Transmission Fluid Level and Condition Check](#)
  - [Drive Motor Power Inverter Module 3 Phase Cable Inspection](#)
  - [Road Test](#)
  - [Case Porosity Repair](#)

## **REGENERATIVE BRAKING ON DEMAND MALFUNCTION**

### **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.

- Refer to [Diagnostic Procedure Instructions](#) to provide an overview of each diagnostic category.

## Diagnostic Fault Information

### Regenerative Braking On Demand

| Circuit                                    | Short to Ground | Open/High Resistance                          | Short to Voltage                              | Signal Performance |
|--------------------------------------------|-----------------|-----------------------------------------------|-----------------------------------------------|--------------------|
| Normal Range = Inactive/Active             |                 |                                               |                                               |                    |
| Tap Up/Tap Down Switch<br>Signal 2 Circuit | P152D           | Regenerative Braking On Demand<br>Malfunction | Regenerative Braking On Demand<br>Malfunction | P152A, P152C       |

### Circuit/System Description

Regenerative Braking On Demand enables drivers to actively re-capture energy when slowing down, such as when approaching slower traffic or setting up for a tight turn. To engage Regenerative Braking On Demand, the driver releases the accelerator pedal and pulls back on the left steering-wheel paddle to begin regenerating electricity. When engaged, Regenerative Braking On Demand provides vehicle deceleration that is more than what a typical vehicle experiences while coasting or when the transmission shifter is in the L position, providing control and dynamic performance characteristics similar to downshifting in a manual-transmission vehicle. The feature does not bring the vehicle to a complete stop. Releasing the paddle cancels the Regeneration on Demand request, allowing the vehicle to coast normally. The driver can engage and disengage Regeneration on Demand as desired and as traffic conditions allow. When Regenerative Braking On Demand is requested, a signal is sent to the Body Control Module and then to the hybrid/EV powertrain control module 1 via serial data. The Regenerative Braking On Demand parameter is displayed as Inactive and Active on the scan tool. The Regenerative Braking On Demand parameter states are listed below:

- Inactive - when the S151 automatic transmission manual shift switch-left is not pressed
- Active - when the S151 automatic transmission manual shift switch-left is pressed

### Diagnostic Aids

The Regenerative Braking On Demand feature has a maximum of 60 kW charging power. Performance may be reduced when the high voltage battery is cold and/or the high voltage battery is fully charged. The following conditions listed below will reduce or inhibit Regenerative Braking On Demand performance:

- The high voltage battery is warmer than 20Â°C (68Â°F), and battery state of charge is greater than 80%.
- The high voltage battery is warmer than 10Â°C (50Â°F), and battery state of charge is greater than 75%.
- The high voltage battery is warmer than 0Â°C (32Â°F), and battery state of charge is greater than 60%.
- The high voltage battery is colder than -10Â°C (+14Â°F).
- If the battery state of charge is greater than 90%, Regenerative Braking On Demand is inhibited.

### Reference Information

Schematic Reference

### [Automatic Transmission Controls Schematics](#)

Connector End View Reference

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

Electrical Information Reference

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- [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. Vehicle ON, verify with a scan tool the following hybrid/EV powertrain control module 1 parameter displays the correct values the S151 automatic transmission manual shift switch-left state:
  - Regenerative Braking On Demand displays Inactive when not pressed.
  - Regenerative Braking On Demand displays Active when pressed.
  - **If the hybrid/EV powertrain control module 1 parameter is incorrect**  
  
Refer to Circuit/System Testing.
  - **If the hybrid/EV powertrain control module 1 Regenerative Braking On Demand parameter is correct**
2. After performing the above step, verify that the DTC does not reset by operating the vehicle within the Conditions for Running the DTC. You may also operate the vehicle within the conditions that you observed from the Freeze Frame/Failure Records data. If the vehicle passes the Circuit/System Verification procedure then STOP. Do not perform the Circuit/System Testing or Component Testing as this may result in an unnecessary part replacement. Refer to [Testing for Intermittent Conditions and Poor Connections](#).

### Circuit/System Testing

1. Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S151 automatic transmission manual shift switch-left. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10  $\Omega$  between the ground circuit terminal 1 and ground.
  - **If 10  $\Omega$  or greater**
    1. Vehicle OFF.
    2. Test for less than 2  $\Omega$  in the ground circuit end to end.
      - If 2  $\Omega$  or greater, repair the open/high resistance in the circuit.
      - If less than 2  $\Omega$ , repair the open/high resistance in the ground connection.
  - **If less than 10  $\Omega$**
3. Vehicle ON.
4. Verify the scan tool Regenerative Braking On Demand parameter is Inactive.
  - **If not Inactive**
    1. Vehicle OFF, disconnect the harness connector at the K9 BCM X3 connector.
    2. Test for infinite resistance between the signal circuit terminal X3 21 and ground.
      - If less than infinite resistance, repair the short to ground on the circuit.
      - If infinite resistance, replace the K9 BCM.
  - **If Active**
5. Install a 3 A fused jumper wire between the signal circuit terminal 3 and the ground circuit terminal 1.
6. Verify the scan tool Regenerative Braking On Demand parameter is Active.
  - **If not Inactive**
    1. Vehicle OFF, remove the jumper wire, disconnect the X3 harness connector at the K9 BCM, vehicle ON.
    2. Test for less than 1 V between the signal circuit terminal 21 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  $\Omega$  in the signal circuit end to end.
    - If 2  $\Omega$  or greater, repair the open/high resistance in the circuit.
    - If less than 2  $\Omega$ , replace the K9 BCM.
- **If Active**
7. Test or replace the S151 automatic transmission manual shift switch-left.

### Repair Instructions

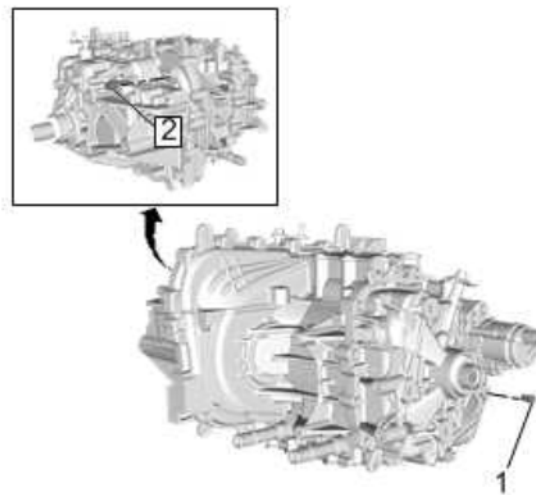
Perform the [Diagnostic Repair Verification](#) after completing the diagnostic procedure.

- Refer to [Steering Wheel Replacement](#) for S151 automatic transmission manual shift switch-left replacement.
- Refer to [Control Module References](#) for K9 BCM 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 fill plug in the top of the transmission and level set plug is used to set the fluid level.

**CAUTION:** The transmission fluid level must be checked when the transmission fluid temperature is at 15 - 35°C (59 - 95°F). If the transmission fluid temperature is not at this range, operate the vehicle or allow the fluid to cool as required. Setting the transmission fluid level with fluid temperature outside this range will result in either an under or over-filled transmission. Fluid temperature higher than 35°C will result in an under-filled condition. Fluid temperature lower than 15°C will result in an over-filled condition. An under-filled transmission will cause premature component damage. An over-filled transmission will cause fluid to discharge out the vent tube, fluid foaming, or pump cavitation.



**Fig. 11: Transmission Fluid Level Plug And Fill Plug**

Courtesy of GENERAL MOTORS COMPANY

**NOTE:** The transmission fluid pump must not be running when the transmission fluid level plug is removed or excessive fluid loss will occur, resulting in an under-filled condition.

**NOTE:** Continue to monitor the Transmission Fluid Temperature. If the Transmission Fluid Temperature is not within the specified values,



reinstall the transmission fluid level plug and repeat the previous steps.

1. Drive vehicle until transmission fluid temperature is 15 - 35°C (59 - 95°F).
2. Vehicle Off with the transmission in Park (P).
3. Raise the vehicle.
4. Remove Front Wheelhouse Liner. Refer to [Front Wheelhouse Liner Replacement](#)
5. Remove Front Compartment Air Deflector. Refer to [Front Compartment Air Deflector Replacement](#)
6. Remove the transmission fluid level plug (1).
7. Verify fluid slowly drips from the transmission fluid level check hole.
  - If the fluid is flowing as a steady stream, wait until the fluid begins to drip. Go to step 9 procedure.
  - If no fluid comes out, remove the transmission fill plug (2) and add 0.5 L (0.52 qts) of fluid using a commercially available hand pump through the case fill hole until fluid drips out. Go to step 8 procedure.

**CAUTION:** Refer to [Fastener Caution](#) .

8. Install the NEW transmission fill plug (2) and tighten to 13 N.m (115 lb in).
9. Install the NEW transmission fluid level plug (1) and tighten to 12 N.m (106 lb in).
10. Vehicle in service mode with the transmission in Park (P).
11. Using the scan tool, command the transmission fluid pump speed to on for 1 minute for lubrication.
12. Vehicle Off.
13. Install Front Compartment Air Deflector. Refer to [Front Compartment Air Deflector Replacement](#)
14. Install Front Wheelhouse Liner. Refer to [Front Wheelhouse Liner Replacement](#)

### Fluid Condition Inspection

- If the fluid has a burnt odor, inspect the fluid for excessive metal particles or other debris which may indicate transmission wear or damage. Refer to [Road Test](#) to verify transmission operation. Change the transmission fluid if a burnt odor is the only condition found.
- Fluid that is cloudy or milky or appears to be contaminated with water indicates engine coolant or water contamination. Change the transmission fluid.

### ROAD TEST

**NOTE:** The Road Test Procedure should be performed only as part of the Symptom Diagnosis. Refer to [Symptoms - Automatic Transmission](#).

The following test provides a method of evaluating the condition of the automatic transmission. The test is structured so that most driving conditions would be achieved. The test is divided into the following parts:

- Electrical Function Check
- Torque Control
- Part Throttle Torque Control
- Coasting

**NOTE:** Complete the test in the sequence given. Incomplete testing cannot guarantee an accurate evaluation.

Before the road test, ensure the following:

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- Transmission fluid level is correct. Refer to [Transmission Fluid Level and Condition Check](#).

- Tire pressure is correct.

During the road test:

- Perform the test only when traffic conditions permit.
- Operate the vehicle in a controlled, safe manner.
- Observe all traffic regulations.
- View the scan tool data while conducting this test.

Take along qualified help in order to operate the vehicle safely.

- Observe any unusual sounds or smells.

After the road test, check the following:

- Inspect for proper transmission fluid level. Refer to [Transmission Fluid Level and Condition Check](#).
- Inspect for any diagnostic trouble codes (DTCs) that may have set during the testing. Refer to the applicable DTC.
- Monitor the scan tool data for any abnormal readings or data.
- Inspect for fluid leaks. Refer to [Fluid Leak Diagnosis](#).

### Electrical Function Check

Perform this procedure first in order to ensure the electronic transmission components are functioning properly. If these components are not checked, a simple electrical condition could be misdiagnosed.

1. Connect the scan tool.
2. Ensure the gear selector is in PARK and set the parking brake.
3. Verify that the following scan tool data can be obtained and is functioning properly.

Refer to [K20 Engine Control Module: Scan Tool Information](#) for typical data values. Data that is questionable may indicate a concern.

- Driver Requested Axle Torque
  - Vehicle Speed
  - Output Shaft Direction
  - Brake Switch
  - IMS A/B/C/P
  - IMS
  - Trans. Fluid Temp.
4. Check the garage shifts.
    1. Apply the brake pedal and ensure the parking brake is set.
    2. Move the gear selector through the following ranges:
      1. PARK to REVERSE
      2. REVERSE to NEUTRAL
      3. NEUTRAL to DRIVE
    3. Pause 2 to 3 seconds in each gear position.

**NOTE:** These shifts can-not be felt when trans is functioning properly.

4. Verify the gear engagements are immediate and not harsh.
5. Monitor transmission range on the scan tool, trans data list.
  1. Apply the brake pedal and ensure the parking brake is set.
  2. Move the gear selector through all ranges.
  3. Pause 2 to 3 seconds in each range.

4. Return gear selector to PARK.
5. Verify that all selector positions match the scan tool display.
6. Check throttle position input.
  1. Apply the brake pedal and ensure the parking brake is set.
  2. Ensure the gear selector is in PARK.

If any of the above checks do not perform properly, record the result for reference after completion of the road test.

### Manual Gear Range Selection

This range is used to slow the vehicle more when the driver's foot is lifted from the throttle.

### Reverse

Perform the following test using a 10 - 15 percent throttle position.

1. With the vehicle stopped, move the gear selector to REVERSE.
2. Slowly accelerate the vehicle.
3. Verify that there is no noticeable slip, noise or vibration.

### CASE POROSITY REPAIR

Some external leaks are caused by case porosity in non-pressurized areas. You can usually repair these leaks with the transmission in the vehicle.

1. Thoroughly clean the area to be repaired with a cleaning solvent. Air dry the area.

**WARNING:** Epoxy adhesive may cause skin irritations and eye damage. Read and follow all information on the container label as provided by the manufacturer.

2. Using instructions from the manufacturer, mix a sufficient amount of an epoxy to make the repair.
3. While the transmission case is still hot, apply the epoxy. You can use a clean, dry soldering acid brush to clean the area and also to apply the epoxy cement. Make certain that the area to be repaired is fully covered.
4. Allow the epoxy cement to cure for three hours before operating the vehicle.
5. Repeat the fluid leak diagnosis procedures.

### AUTOMATIC TRANSMISSION FLUID LEAKS

| Checks              | Causes                                                                                                                                                                                                                                                                                                   |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Case Assembly       | <ul style="list-style-type: none"> <li>• Inspect for porosity or damage on the sealing surfaces</li> <li>• Inspect for damaged manual shift shaft seal</li> <li>• Inspect for damaged or worn axle seal or axle seal Slinger on the axle shafts</li> <li>• Inspect for loose fluid level plug</li> </ul> |
| Case Cover assembly | <ul style="list-style-type: none"> <li>• Inspect for porosity or damage on the sealing surface</li> <li>• Inspect for damaged case cover gasket</li> <li>• Inspect for loose case cover assembly bolts</li> <li>• Inspect for loose, damaged or leaking case cover assembly bore plugs</li> </ul>        |

### 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.
3. Operate the vehicle for 24 km (15 mi), or until normal operating temperatures are reached.
4. Park the vehicle over clean paper or cardboard.
5. Shut OFF the vehicle.
6. Look for fluid spots on the paper.
7. Make the necessary repairs.

## Powder Method

**CAUTION:** Do not clean using brake cleaner or other reactive solvents as these solvents can damage rubber gaskets, seals and bushings.

1. Thoroughly clean the suspected leak area using a rag.
2. Apply an aerosol type leak tracing powder to the suspected leak area.
3. Operate the vehicle for 24 km (15 mi), or until normal operating temperatures are reached.
4. Shut OFF the vehicle.
5. Inspect the suspected leak area.
6. Trace the leak path through the powder in order to find the source of the leak.
7. Make the necessary repairs.

## Dye and Black Light Method

A fluid dye and black light kit is available from various tool manufacturers.

1. Follow the manufacturer's instructions in order to determine the amount of dye to use.
2. Operate the vehicle for 24 km (15 mi) or until normal operating temperatures are reached.
3. Detect the leak with the black light.
4. Make the necessary repairs.

## Find the Cause of the Leak

Pinpoint the leak and trace the leak back to the source. You must determine the cause of the leak in order to repair the leak properly. For example, if you replace a gasket, but the sealing flange is bent, the new gasket will not repair the leak. You must also repair the bent flange. Before you attempt to repair a leak, check for the following conditions, and make repairs as necessary:

### Gaskets

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Improperly tightened fasteners
- Dirty or damaged threads
- Warped flanges or sealing surface
- Scratches, burrs, or other damage to the sealing surface
- Damaged or worn gasket
- Cracking or porosity of the component
- Improper sealant used, where applicable
- Incorrect gasket

### Seals

- Fluid level/pressure is too high
- Plugged vent or drain-back holes
- Damaged seal bore
- Damaged or worn seal
- Improper installation
- Cracks in component
- Manual shaft or output shaft surface is scratched, nicked, or damaged
- Loose or worn bearing causing excess seal wear

### Possible Points of Fluid Leaks

#### Transmission Case Side Cover

- Incorrectly tightened bolts
- Improperly installed or damaged gasket/seal
- Damaged mounting face
- Incorrect gasket seal

#### Case Leak

- Damaged manual shaft seal
- Worn or damaged axle shaft oil seal
- Loose line pressure pipe plug or fluid level pipe plug
- Porous casting

#### Leak at the Vent

- Overfilled system
- Water or coolant in the fluid; The fluid will appear milky
- Transmission case porous
- Plugged vent

## DRIVE MOTOR POWER INVERTER MODULE 3 PHASE CABLE INSPECTION

**WARNING:** Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure will perform the following tasks:

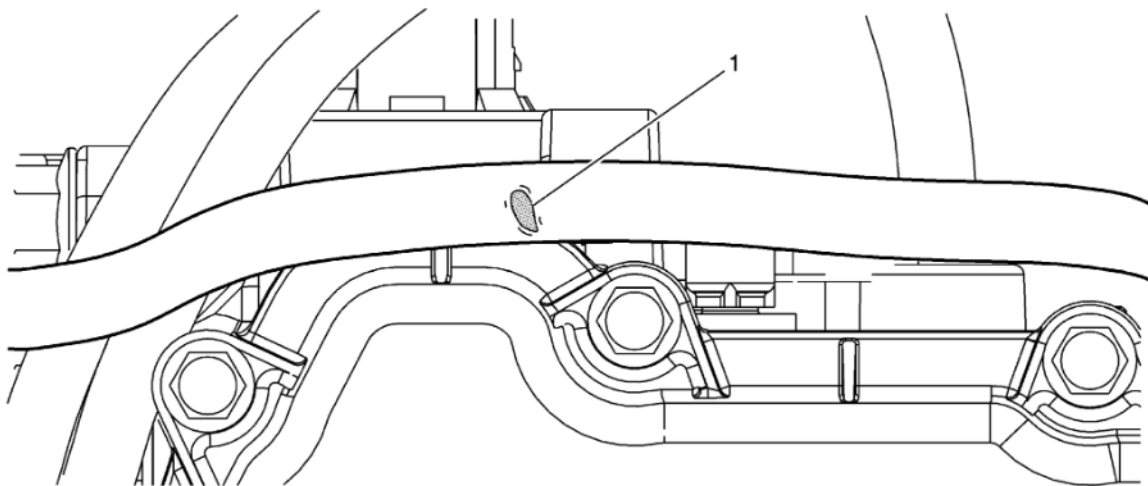
- Identify how to disable high voltage.
- Identify how to test for the presence of high voltage.
- Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.

Failure to follow the procedures exactly as written may result in serious injury or death.

**NOTE:** This procedure is for inspection and repair of the 3 phase high voltage cable outer sheathing only.

### Visual/Physical Inspection





**Fig. 12: Inspecting Outer Cable Jacket Or Sheathing**

Courtesy of GENERAL MOTORS COMPANY

### Cable Construction

- Outer Abrasion Sleeve
- Outer Jacket or Sheathing
- Braided Shield
- Insulated Conductor
- 3 Individual Cables per Cable Assembly, all of the same construction

1. Disconnect or remove the drive motor generator power inverter module cover to gain better visibility of 3 phase cables.
2. Disconnect the 3 phase cable P-clip from the APM shield bracket.
3. Disconnect and drop the cradle assembly with drive unit. If the cable needs to be replaced then this is required anyway, since you cannot remove the 3 phase cable from the Drive unit without first removing the rear drive unit mount.
4. Inspect all three lengths of cable.
5. Determine if the exposure is limited to the braided shield or has penetrated to the insulated conductor.
6. If the conductor wire is exposed, the cable assembly must be replaced.

**NOTE:** If the 3 phase cable drive motor generator power inverter module connector is removed two new seals must be used.

7. Examine the cables for abrasion or damage.
8. If any damage is present then the cable must be replaced.
9. If connector/s to SPIM were removed, install with new seal and torque nuts to 9 N.m +/- 1.5 N.m (80 lb in +/- 1 1/2 lb in). The two nuts clamp both the connector and cover, trapping both seals.

### VIBRATION

| Checks                      | Causes                                  |
|-----------------------------|-----------------------------------------|
| Counter Shaft Assembly      | Inspect for wear or damage.             |
| Front Differential Assembly | Inspect for damaged gears and bearings. |

### 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.

- 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 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

### WHINE/GROWL NOISE THAT CHANGES WITH VEHICLE SPEED

| Checks                      | Causes                                  |
|-----------------------------|-----------------------------------------|
| Front Differential Assembly | Inspect for damaged gears and bearings. |

### NOISE IN DRIVE OR REVERSE GEAR

| Checks                      | Causes                                  |
|-----------------------------|-----------------------------------------|
| Front Differential Assembly | Inspect for damaged gears and bearings. |
| Drive Motor Assembly        | Inspect for damaged bearings.           |

### NO PARK OR DRIVE

| Checks                      | Causes                                  |
|-----------------------------|-----------------------------------------|
| Counter Shaft Assembly      | Inspect for wear or damage.             |
| Front Differential Assembly | Inspect for damaged gears and bearings. |

### NO DRIVE IN ALL RANGES

| Checks                      | Causes                                                                                                                                                                                                                           |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Front Differential Assembly | <ul style="list-style-type: none"> <li>• Inspect for damaged front differential assembly.</li> <li>• Inspect for damaged front differential bearings.</li> </ul>                                                                 |
| Drive Motor with Generator  | <b>Motor Failure</b> <ul style="list-style-type: none"> <li>• Inspect 3 phase cables</li> <li>• Inspect connections at motor</li> <li>• Inspect 1st gear</li> <li>• Inspect motor end bearings</li> </ul>                        |
| Counter Shaft Assembly      | <ul style="list-style-type: none"> <li>• Inspect for damaged counter shaft assembly.</li> <li>• Inspect for damaged counter shaft bearings.</li> </ul>                                                                           |
| Fluid Filter Assembly       | <ul style="list-style-type: none"> <li>• Inspect for damaged or restricted fluid filter assembly.</li> <li>• Inspect for damaged fluid filter seal assembly or improper sealing interface, leaks, and fluid aeration.</li> </ul> |

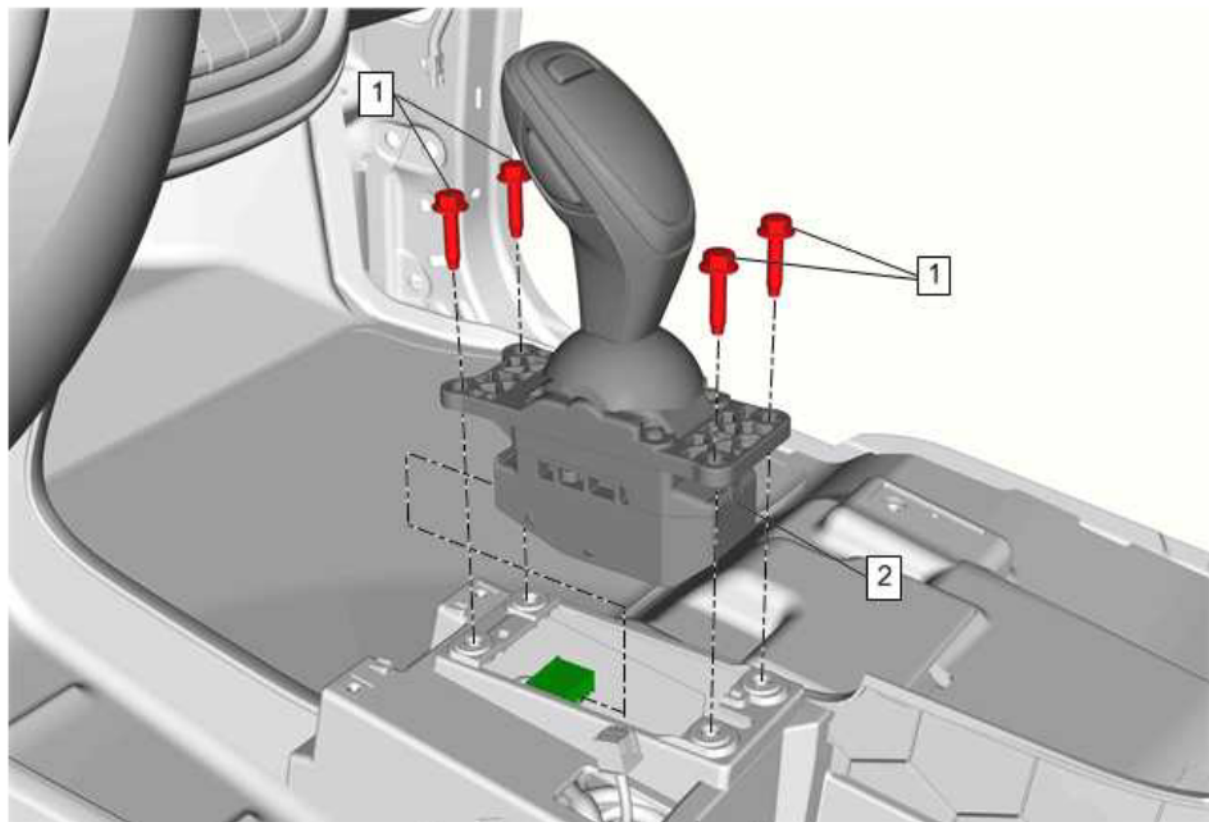
| Checks              | Causes                                                                                                                     |
|---------------------|----------------------------------------------------------------------------------------------------------------------------|
| Fluid Pump Assembly | <ul style="list-style-type: none"> <li>Inspect for worn or damaged seal.</li> <li>Inspect the fluid pump motor.</li> </ul> |

## NO REVERSE

| Checks                      | Causes                                                                                                                                                                                                                       |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drive Motor with Generator  | <b>Motor Failure</b> <ul style="list-style-type: none"> <li>Inspect 3 phase cables.</li> <li>Inspect connections at motor.</li> <li>Inspect motor end bearings.</li> </ul>                                                   |
| Output Shaft Assembly       | Inspect for damaged internal gears.                                                                                                                                                                                          |
| Front Differential Assembly | Inspect for damaged gears and bearings.                                                                                                                                                                                      |
| Counter Shaft Assembly      | Inspect for spline wear or damage.                                                                                                                                                                                           |
| Fluid Filter Assembly       | <ul style="list-style-type: none"> <li>Inspect for damaged or restricted fluid filter assembly.</li> <li>Inspect for damaged fluid filter seal assembly or improper sealing interface, leaks, and fluid aeration.</li> </ul> |
| Fluid Pump Seal             | Inspect for worn or damaged seal.                                                                                                                                                                                            |

## REPAIR INSTRUCTIONS - ON VEHICLE

### TRANSMISSION ELECTRONIC CONTROL REPLACEMENT



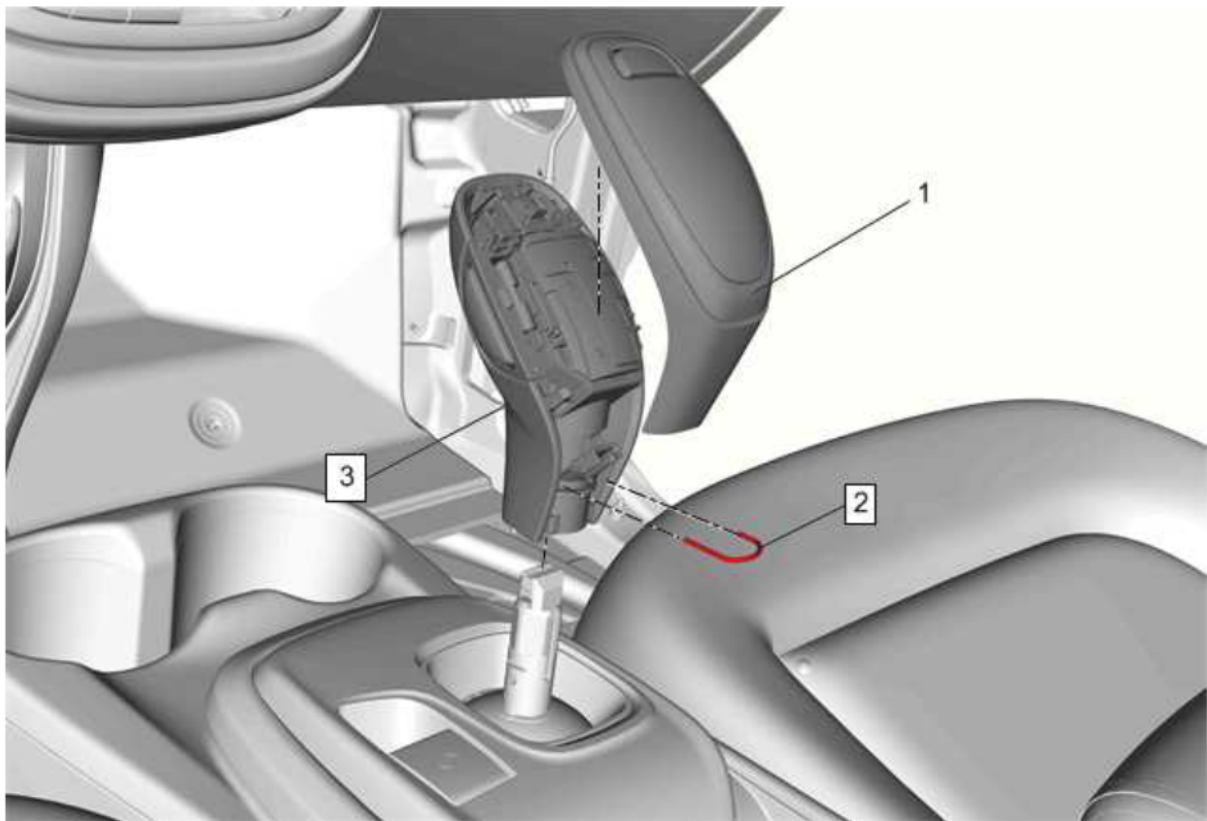
**Fig. 13: Transmission Electronic Control**  
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name |
|---------|----------------|
|         |                |

| Callout                                                                                                                                                                                                                                                                                         | Component Name                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b>                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                          |
| <ol style="list-style-type: none"> <li>1. Disconnect the negative battery cable. Refer to <a href="#">Battery Negative Cable Disconnection and Connection</a></li> <li>2. Remove Front Floor Console Cup Holder. Refer to <a href="#">Front Floor Console Cup Holder Replacement</a></li> </ol> |                                                                                                                                                                                                                                                                                          |
| 1                                                                                                                                                                                                                                                                                               | Automatic Transmission Electronic Control Bolt (Qty: 4)<br><br><b>CAUTION:</b><br>Refer to <a href="#">Fastener Caution</a><br><br><b>Tighten</b><br>9 N.m (80 lb in)                                                                                                                    |
| 2                                                                                                                                                                                                                                                                                               | Automatic Transmission Electronic Control<br><br><b>Procedure</b> <ol style="list-style-type: none"> <li>1. Disconnect the electrical connector.</li> <li>2. Connect the negative battery cable. Refer to <a href="#">Battery Negative Cable Disconnection and Connection</a></li> </ol> |

## TRANSMISSION CONTROL LEVER KNOB REPLACEMENT

### Removal Procedure

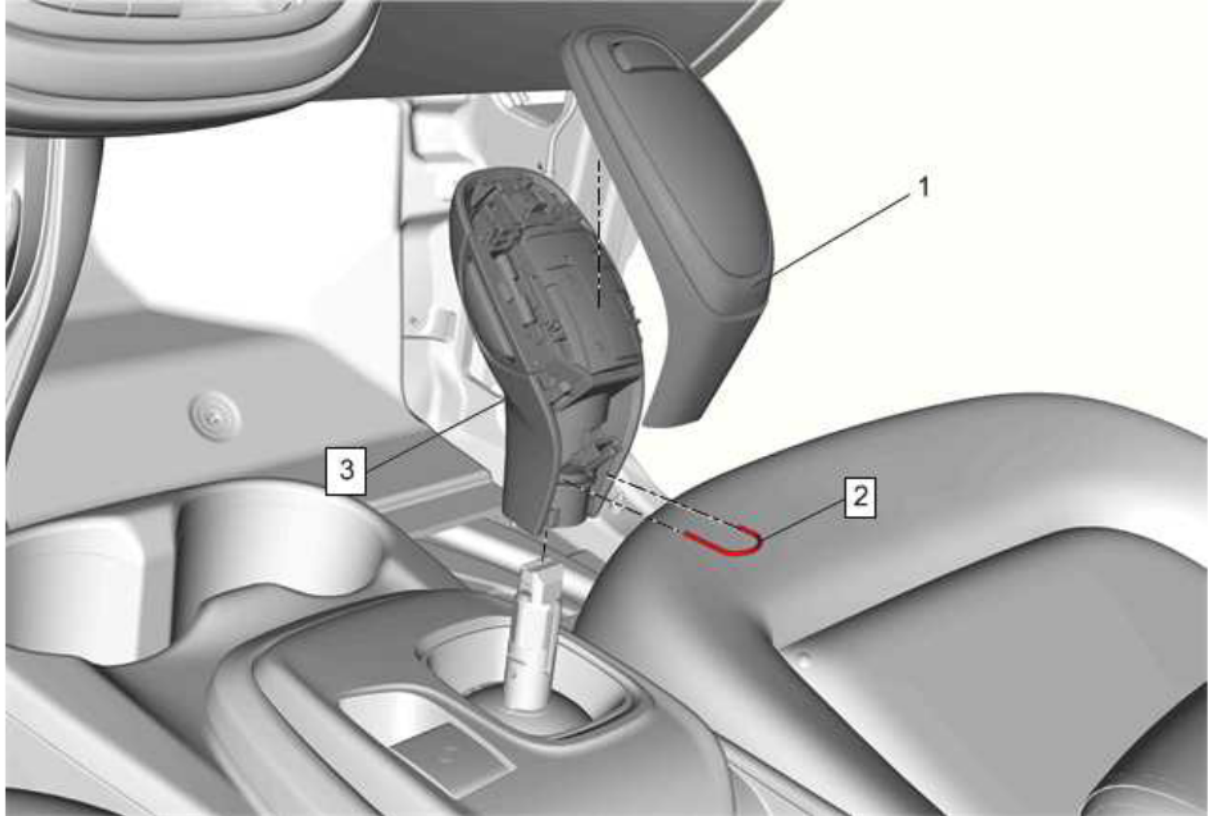


**Fig. 14: Transmission Control Lever Knob, Cover And Retaining Clip**  
 Courtesy of GENERAL MOTORS COMPANY

1. Using a flat-bladed trim tool, remove the knob cover (1) from transmission control lever knob.
2. Remove Retaining Clip (2)
3. Remove Transmission Control Lever Knob (3) @ Transmission Control Assembly

### Installation Procedure





**Fig. 15: Transmission Control Lever Knob, Cover And Retaining Clip**

Courtesy of GENERAL MOTORS COMPANY

**NOTE:** One side is longer. Install the retaining clip correctly.

1. Insert the retaining clip (2) into the transmission control lever knob (3).
2. Ensure the manual shift button is properly assembled.
3. Install Knob Cover (1) @ Transmission Control Lever Knob (3)
4. Install the transmission control lever knob (3) to the transmission control assembly. Ensure the knob is locked in place.

## **AUTOMATIC TRANSMISSION RANGE SELECTOR ACTUATOR HARDWARE MODULE REPLACEMENT**

### **Removal Procedure**

1. Set the parking brake and chock the wheels.

**NOTE:** If re-installing the original automatic transmission range selector actuator hardware module back into the vehicle, the Backup Park Lock Actuator must be activated prior to removal.

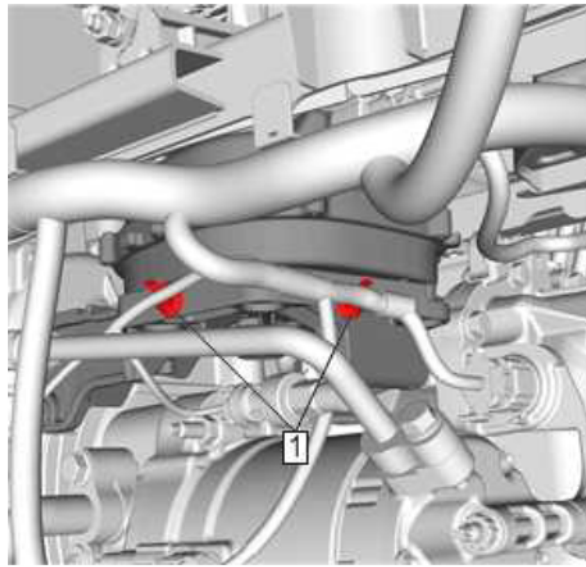
**NOTE:** If the automatic transmission range selector actuator hardware module is being replaced due to a malfunction, the original module does not need to be activated prior to removal. Proceed to Step 3.

**NOTE:** Perform this procedure before disconnecting the battery and removal of the actuator.

2. Perform the Backup Park Lock Actuator Disarming procedure. Refer to [Backup Park Lock Actuator Disarming](#)
3. Before performing this procedure, review the high voltage safety information. Refer to [High Voltage Safety](#)
4. Disable the high voltage system. Refer to [High Voltage Disabling](#)
5. Remove Drive Motor Battery Charger. Refer to [Drive Motor Battery Charger Replacement](#) accordingn.com  
(Except Dubai) [Drive Motor Battery Charger Replacement \(Dubai\)](#)



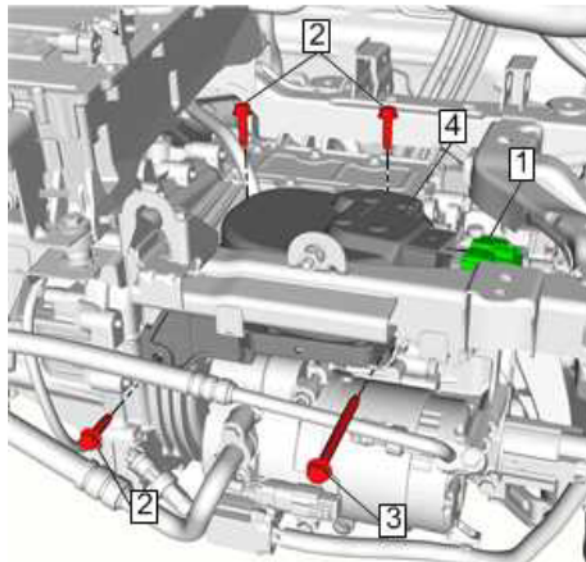
6. Remove the left front wheelhouse liner. Refer to [Front Wheelhouse Liner Replacement](#)



**Fig. 16: Retainers**

Courtesy of GENERAL MOTORS COMPANY

7. Remove Retainers (1) (Qty: 2)

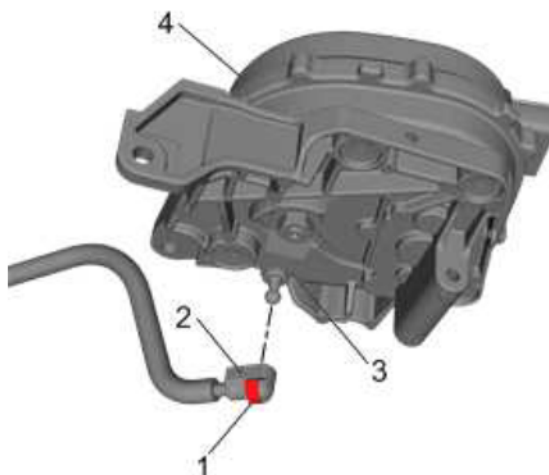


**Fig. 17: Range Selector Actuator Hardware Module, Bolts And Electrical Connector**

Courtesy of GENERAL MOTORS COMPANY

8. Disconnect Electrical Connector (1) @ Range Selector Actuator Hardware Module (4)

9. Remove Range Selector Actuator Hardware Module Bolts (2, 3) (Qty: 4)

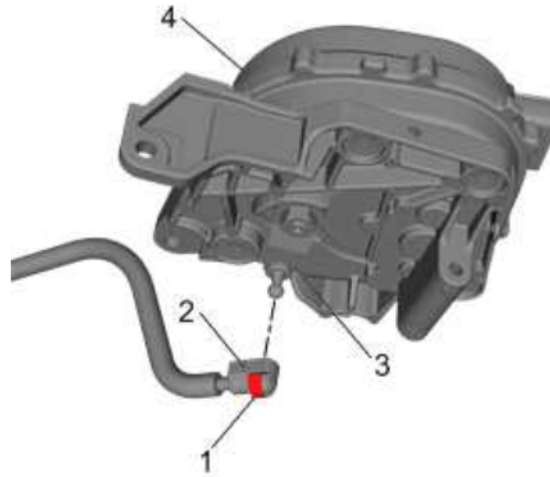


**Fig. 18: Transmission Range Selector Lever Link, Retainer And Range Selector Actuator Hardware Module**

Courtesy of GENERAL MOTORS COMPANY

10. Using a suitable tool, remove the transmission range selector lever link (2) while pulling the range selector lever link retainer (1).
11. Remove Range Selector Actuator Hardware Module (4)

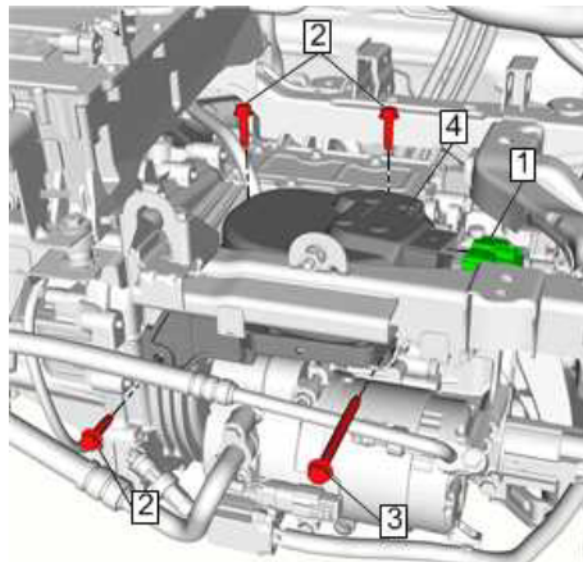
**Installation Procedure**



**Fig. 19: Transmission Range Selector Lever Link, Retainer And Range Selector Actuator Hardware Module**

Courtesy of GENERAL MOTORS COMPANY

1. Verify the transmission range selector actuator hardware module lever is in the park position.
2. Install the transmission range selector lever link (2) to the range selector actuator hardware module lever (3).



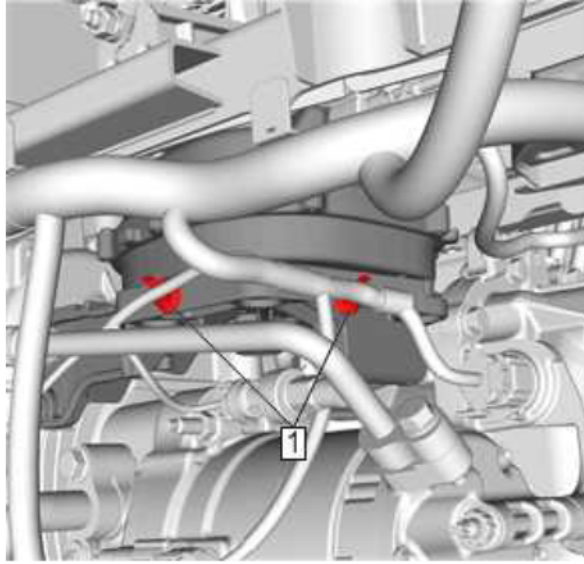
**Fig. 20: Range Selector Actuator Hardware Module, Bolts And Electrical Connector**

Courtesy of GENERAL MOTORS COMPANY

3. Install Range Selector Actuator Hardware Module (4) @ Transmission

**CAUTION:** Refer to **Fastener Caution** .

4. Install and tighten Range Selector Actuator Hardware Module Bolts (2, 3) (Qty: 4) to 22 N.m (16 lb ft)
5. Connect Electrical Connector (1) @ Range Selector Actuator Hardware Module (4)



**Fig. 21: Retainers**

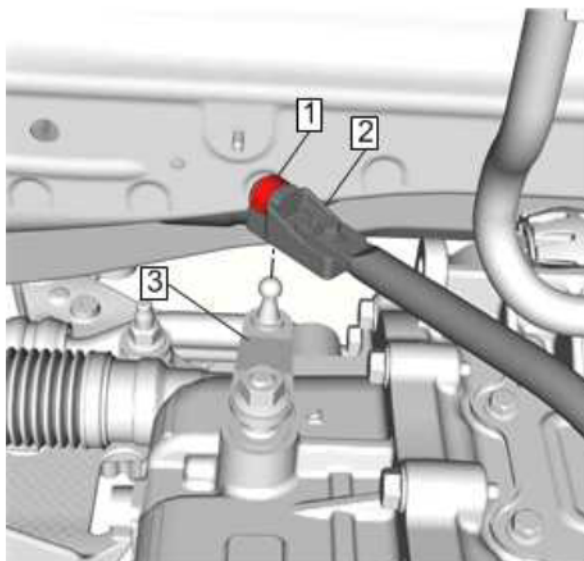
Courtesy of GENERAL MOTORS COMPANY

6. Install Retainers (1) (Qty: 2)
7. Check the range selector lever link adjustment. Refer to [Range Selector Lever Link Adjustment](#)
8. Install the left front wheelhouse liner. Refer to [Front Wheelhouse Liner Replacement](#)
9. Install Drive Motor Battery Charger. Refer to [Drive Motor Battery Charger Replacement \(Except Dubai\)](#) [Drive Motor Battery Charger Replacement \(Dubai\)](#)
10. Enable the high voltage system. Refer to [High Voltage Disabling](#)
11. Program the transmission range control module. Refer to [Control Module References](#)

## **AUTOMATIC TRANSMISSION RANGE SELECTOR LEVER REPLACEMENT**

### **Removal Procedure**

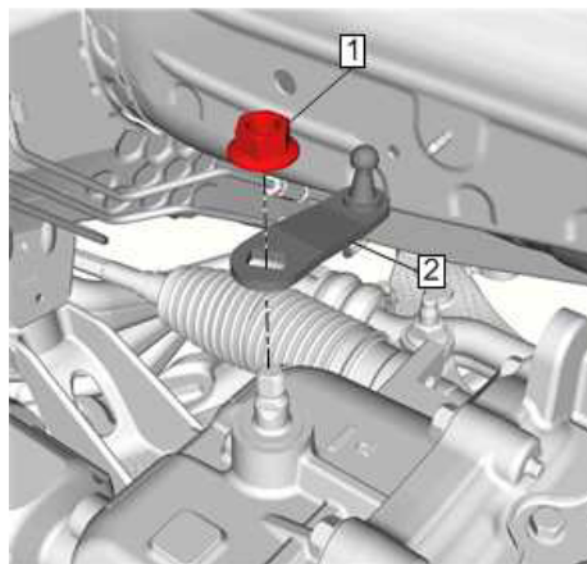
1. Set the parking brake and chock the wheels.
2. Before performing this procedure, review the high voltage safety information. Refer to [High Voltage Safety](#)
3. Disable the high voltage system. Refer to [High Voltage Disabling](#)
4. Remove Drive Motor Power Inverter Module. Refer to [Drive Motor Power Inverter Module Replacement](#)
5. Ensure that the transmission range selector lever is in the park (P) position.



**Fig. 22: Transmission Range Selector Lever Link And Retainer**

Courtesy of GENERAL MOTORS COMPANY

6. Using a suitable tool, remove the transmission range selector lever link (2) while pulling the range selector lever link retainer (1).



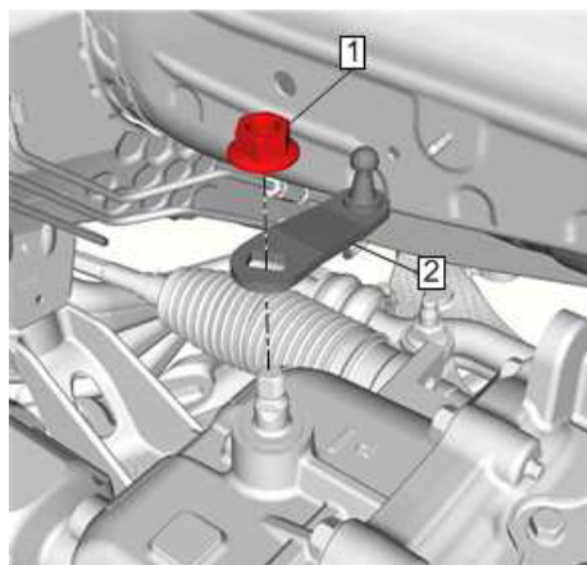
**Fig. 23: Transmission Range Selector Lever And Nut**

Courtesy of GENERAL MOTORS COMPANY

**WARNING:** Hold the transmission range selector lever while removing or installing the lever 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.

7. Remove Transmission Range Selector Lever Nut (1)
8. Remove Transmission Range Selector Lever (2)

#### Installation Procedure



**Fig. 24: Transmission Range Selector Lever And Nut**

Courtesy of GENERAL MOTORS COMPANY

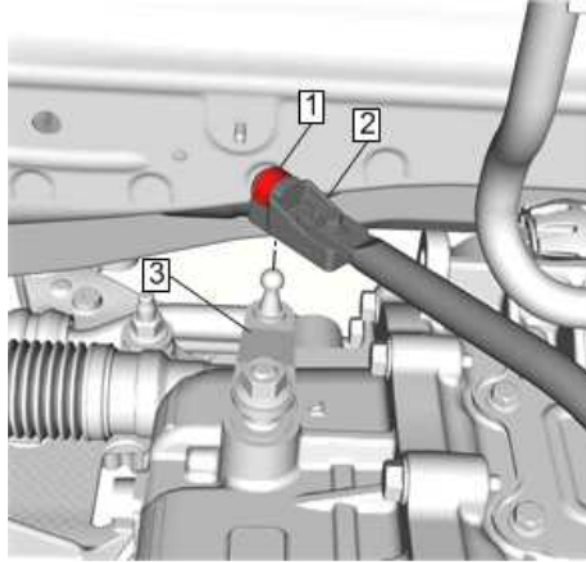
1. Install Transmission Range Selector Lever (2)

**WARNING:** Hold the transmission range selector lever while removing or installing the lever 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 [Fastener Caution](#) .

2. Install and tighten Transmission Range Selector Lever Nut (1) to 30 N.m (22 lb ft)





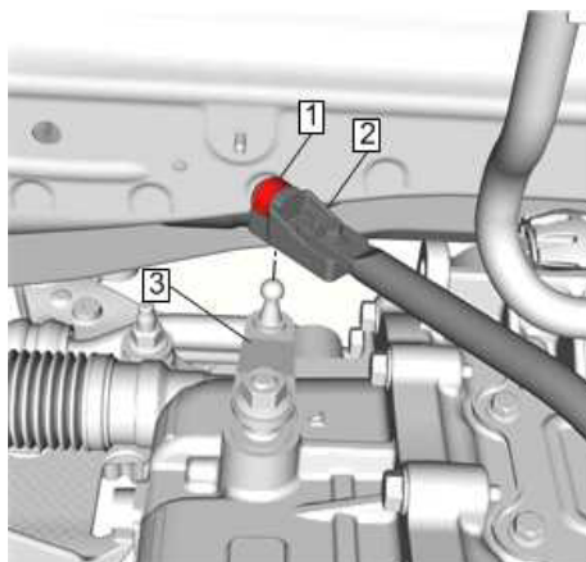
**Fig. 25: Transmission Range Selector Lever Link And Retainer**  
 Courtesy of GENERAL MOTORS COMPANY

3. Install Automatic Transmission Range Selector Lever Link (2) @ Transmission Range Selector Lever (3)
4. Check the range selector lever link adjustment. Refer to [Range Selector Lever Link Adjustment](#)
5. Install Drive Motor Power Inverter Module. Refer to [Drive Motor Power Inverter Module Replacement](#)
6. Enable the high voltage system. Refer to [High Voltage Enabling](#)
7. Perform the transmission range control module range motor position learn. Refer to [Transmission Range Control Module Range Motor Position Learn](#)

## **RANGE SELECTOR LEVER LINK REPLACEMENT**

### **Removal Procedure**

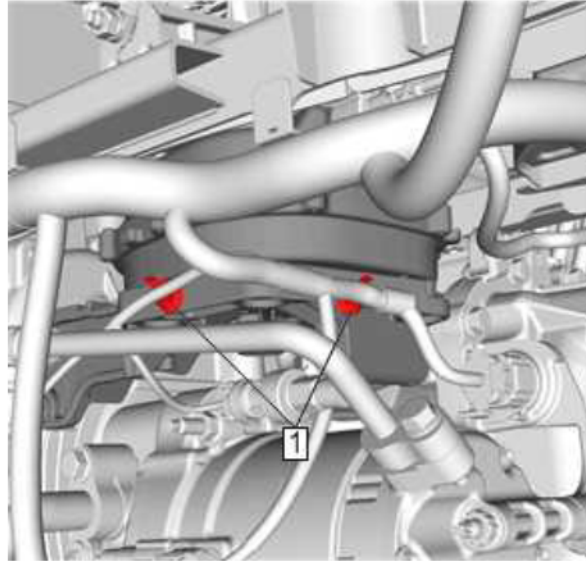
1. Set the parking brake and chock the wheels.
2. Before performing this procedure, review the high voltage safety information. Refer to [High Voltage Safety](#)
3. Disable the high voltage systems. Refer to [High Voltage Disabling](#)
4. Remove Drive Motor Battery Charger. Refer to [Drive Motor Battery Charger Replacement \(Except Dubai\)](#) [Drive Motor Battery Charger Replacement \(Dubai\)](#)
5. Remove Drive Motor Power Inverter Module. Refer to [Drive Motor Power Inverter Module Replacement](#)
6. Remove the left front wheelhouse liner. Refer to [Front Wheelhouse Liner Replacement](#)





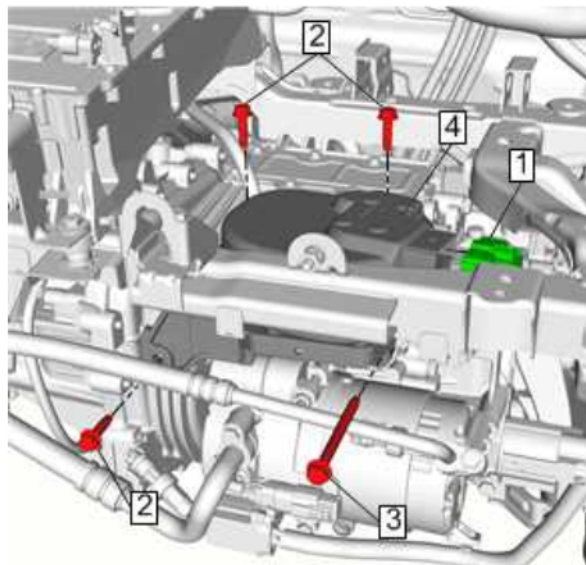
**Fig. 26: Transmission Range Selector Lever Link And Retainer**  
Courtesy of GENERAL MOTORS COMPANY

7. Using a suitable tool, remove the transmission range selector lever link (2) while pulling the range selector lever link retainer (1).



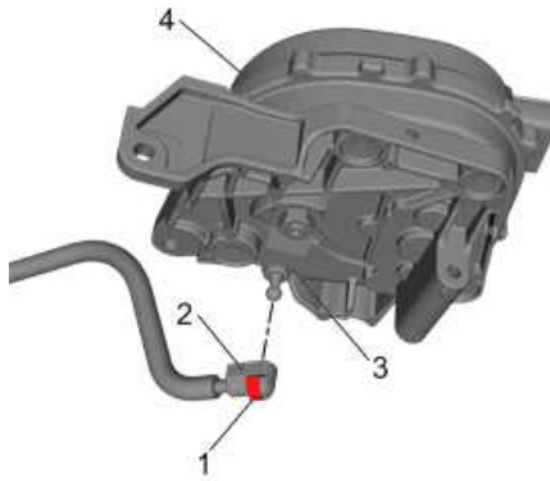
**Fig. 27: Retainers**  
Courtesy of GENERAL MOTORS COMPANY

8. Remove Retainers (1) (Qty: 2)



**Fig. 28: Range Selector Actuator Hardware Module, Bolts And Electrical Connector**  
Courtesy of GENERAL MOTORS COMPANY

9. Disconnect Electrical Connector (1) @ Range Selector Actuator Hardware Module (4)
10. Remove Range Selector Actuator Hardware Module Bolts (2, 3) (Qty: 4)

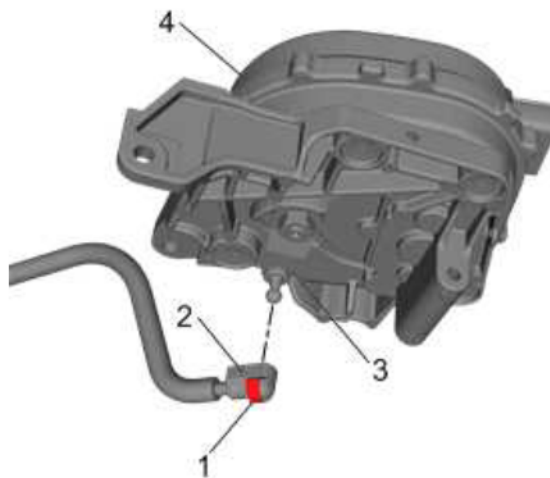


**Fig. 29: Transmission Range Selector Lever Link, Retainer And Range Selector Actuator Hardware Module**

**Courtesy of GENERAL MOTORS COMPANY**

11. Remove the transmission range selector lever link (2) and range selector actuator hardware module (4) from the vehicle.
12. Using a suitable tool, remove the transmission range selector lever link (2) while pulling the range selector lever link retainer (1).

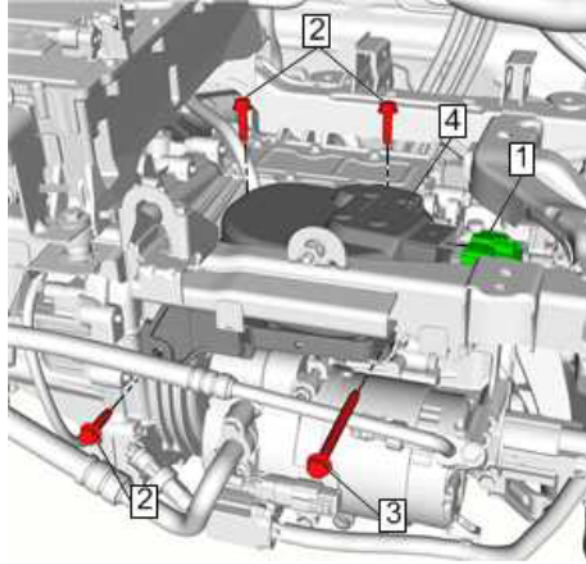
#### **Installation Procedure**



**Fig. 30: Transmission Range Selector Lever Link, Retainer And Range Selector Actuator Hardware Module**

**Courtesy of GENERAL MOTORS COMPANY**

1. Verify the transmission range selector actuator hardware module lever is in the park position.
2. Install the range selector lever link (2) to the range selector actuator hardware module lever (3).

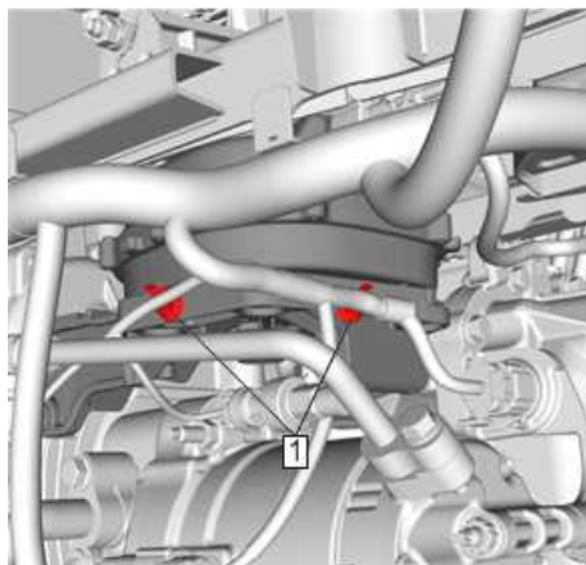


**Fig. 31: Range Selector Actuator Hardware Module, Bolts And Electrical Connector**  
 Courtesy of GENERAL MOTORS COMPANY

3. Install Range Selector Actuator Hardware Module (4) @ Transmission

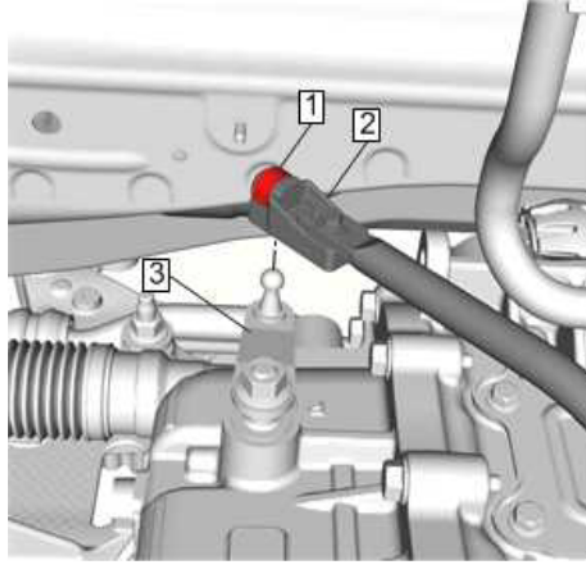
**CAUTION:** Refer to [Fastener Caution](#) .

4. Install and tighten Range Selector Actuator Hardware Module Bolts (2, 3) (Qty: 2) to 22 N.m (16 lb ft)
5. Connect Electrical Connector (1) @ Range Selector Actuator Hardware Module (4)



**Fig. 32: Retainers**  
 Courtesy of GENERAL MOTORS COMPANY

6. Install Retainers (1) (Qty: 2)

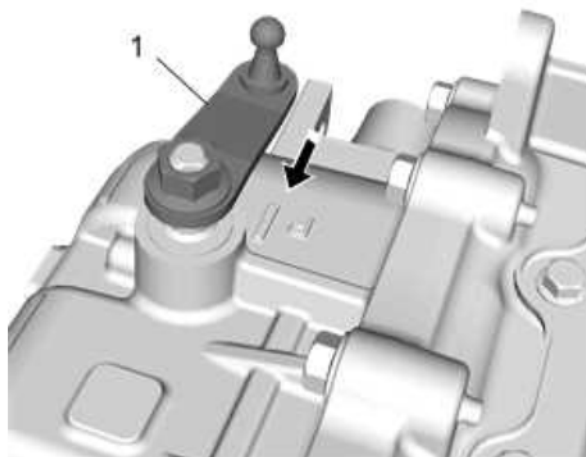


**Fig. 33: Transmission Range Selector Lever Link And Retainer**  
 Courtesy of GENERAL MOTORS COMPANY

7. Verify the transmission range selector lever is in the park position.
8. Install Automatic Transmission Range Selector Lever Link (2) @ Transmission Range Selector Lever (3)
9. Check the range selector lever link adjustment. Refer to [Range Selector Lever Link Adjustment](#)
10. Install the left front wheelhouse liner. Refer to [Front Wheelhouse Liner Replacement](#)
11. Install Drive Motor Power Inverter Module. Refer to [Drive Motor Power Inverter Module Replacement](#)
12. Install Drive Motor Battery Charger. Refer to [Drive Motor Battery Charger Replacement \(Except Dubai\)](#) [Drive Motor Battery Charger Replacement \(Dubai\)](#)
13. Enable the high voltage system. Refer to [High Voltage Enabling](#)
14. Perform the transmission range control module range motor position learn. Refer to [Transmission Range Control Module Range Motor Position Learn](#)

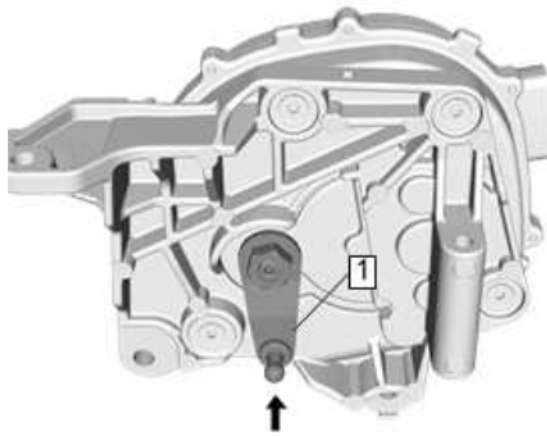
### **RANGE SELECTOR LEVER LINK ADJUSTMENT**

1. Set the parking brake and chock the wheels.
2. Remove Range Selector Lever Link. Refer to [Range Selector Lever Link Replacement](#)



**Fig. 34: Transmission Range Selector Lever**  
 Courtesy of GENERAL MOTORS COMPANY

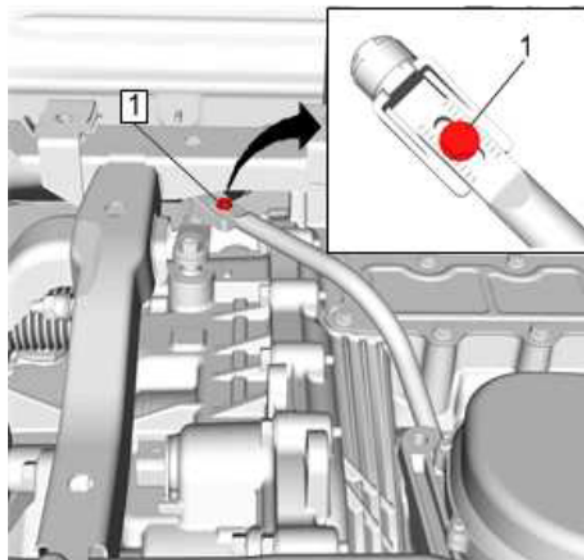
3. Verify the transmission range selector lever (1) is in the park position (arrow).



**Fig. 35: Transmission Range Selector Actuator Hardware Module Lever**  
 Courtesy of GENERAL MOTORS COMPANY

**NOTE:** If the transmission range selector actuator hardware module lever is not in the park position, Set the park position by maximum turning the lever (1) clockwise.

4. Verify the transmission range selector actuator hardware module lever (1) is in the park position (arrow).
5. Loosen the adjustment bolt on the range selector lever link.
6. Install the range selector lever link with the adjustment bolt loose.
7. Install Range Selector Lever Link. Refer to [Range Selector Lever Link Replacement](#)

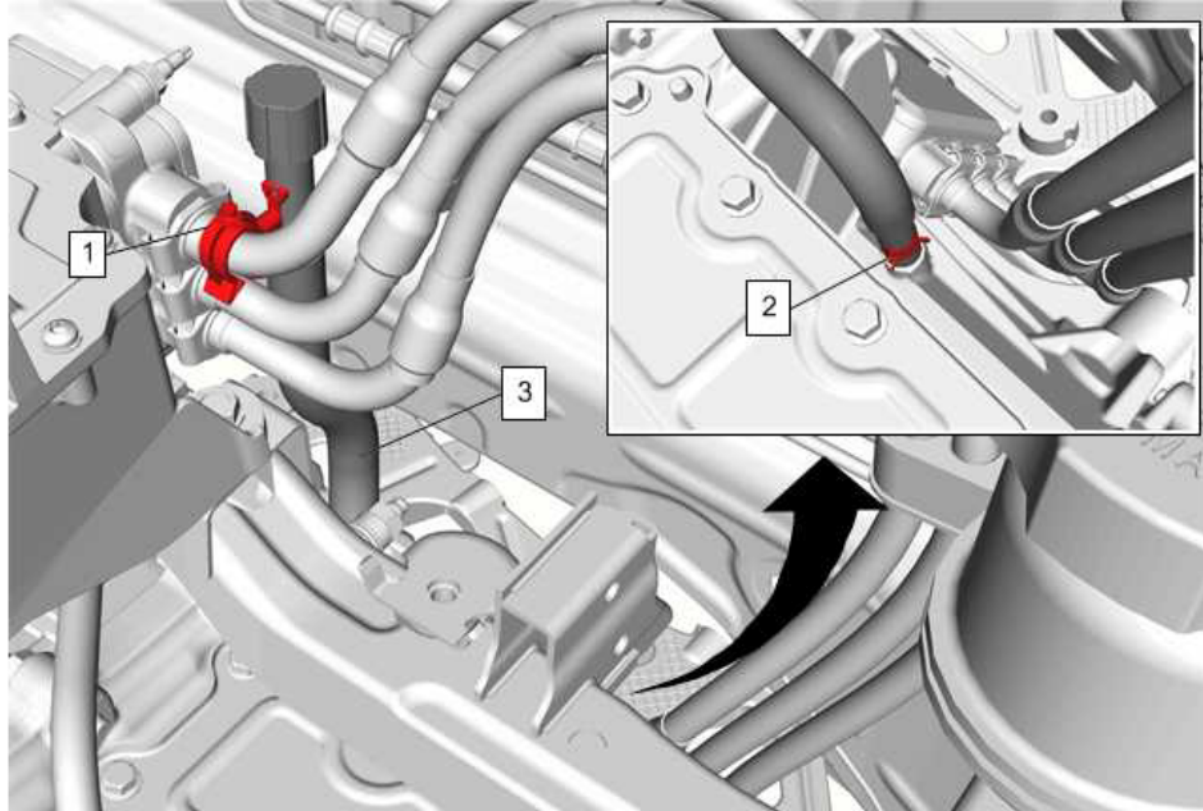


**Fig. 36: Range Selector Lever Link Adjustment Bolt**  
 Courtesy of GENERAL MOTORS COMPANY

8. With the link completely installed, and the park location verified on the actuator and transmission.
9. Install and tighten Range Selector Lever Link Adjustment Bolt (1) to 5 N.m (44 lb in)
10. Check the transmission range selector lever in all gear selections for proper operation.

## **VENT HOSE REPLACEMENT**



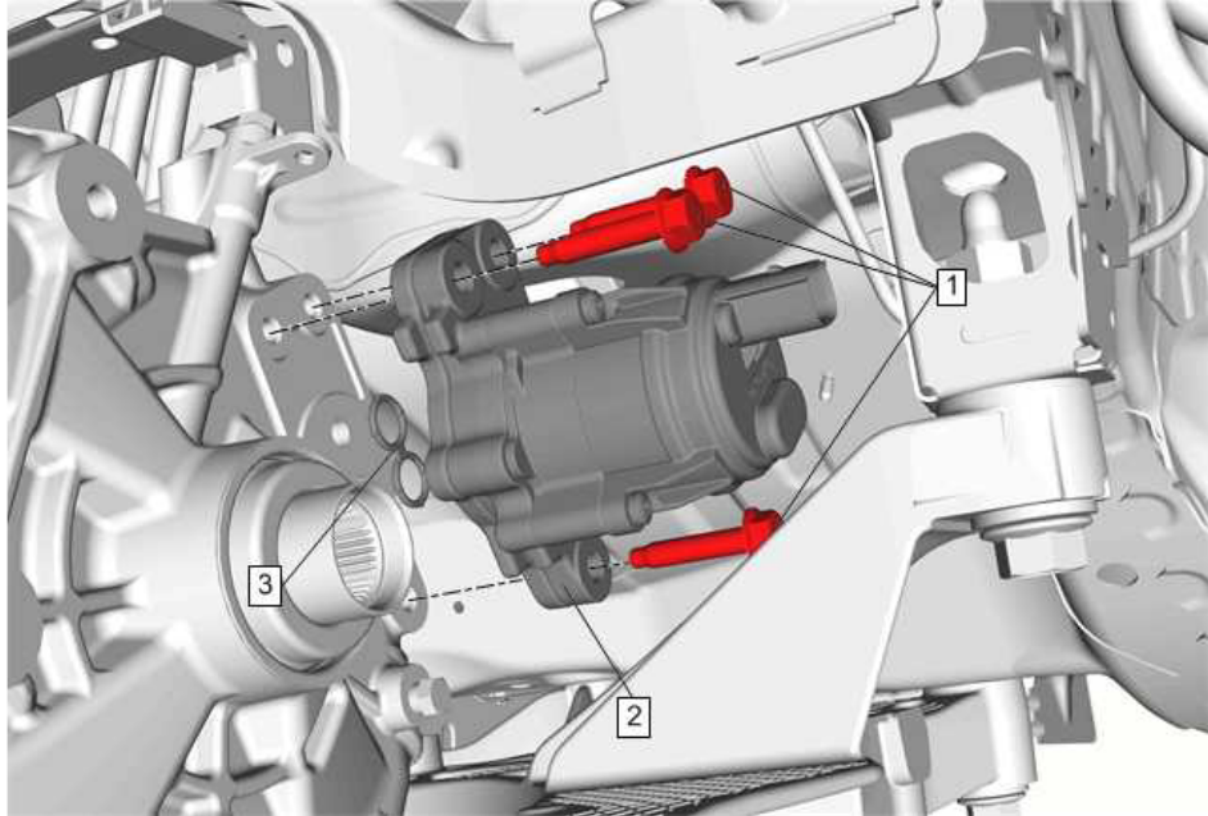


**Fig. 37: Vent Hose**

Courtesy of GENERAL MOTORS COMPANY

| Callout                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Component Name                                                                                                                           |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b> <ol style="list-style-type: none"> <li>1. Before performing this procedure, review the high voltage safety information. Refer to <a href="#">High Voltage Safety</a>.</li> <li>2. Disable the high voltage systems. Refer to <a href="#">High Voltage Disabling</a>.</li> <li>3. Remove Drive Motor Battery Charger. Refer to <a href="#">Drive Motor Battery Charger Replacement (Except Dubai)</a> <a href="#">Drive Motor Battery Charger Replacement (Dubai)</a>.</li> </ol> |                                                                                                                                          |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Transmission Vent Pipe Clip<br><b>Procedure</b><br>Unclip the transmission vent pipe clip from the 3 Phase Cable.                        |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Transmission Vent Hose Clamp<br><b>Procedure</b><br>Loosen the transmission vent hose clamp using hose clamp pliers.                     |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Transmission Vent Hose Assembly<br><b>Procedure</b><br>Enable the high voltage systems. Refer to <a href="#">High Voltage Enabling</a> . |

## TRANSMISSION FLUID PUMP REPLACEMENT



**Fig. 38: Transmission Fluid Pump**

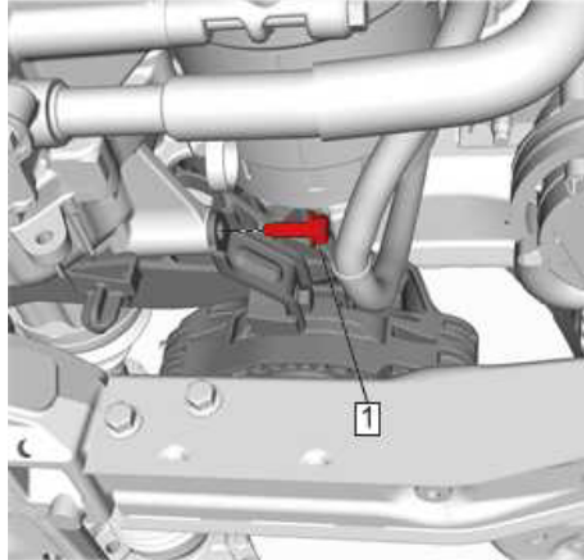
Courtesy of GENERAL MOTORS COMPANY

| Callout                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b> <ol style="list-style-type: none"> <li>1. Disconnect the battery negative cable. Refer to <a href="#">Battery Negative Cable Disconnection and Connection</a></li> <li>2. Raise and support the vehicle. Refer to <a href="#">Lifting and Jacking the Vehicle</a></li> <li>3. Remove the left front wheelhouse liner. Refer to <a href="#">Front Wheelhouse Liner Replacement</a></li> <li>4. Turn the steering wheel to full left.</li> </ol> |                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Automatic Transmission Fluid Pump Bolt (Qty: 3)<br><br><b>CAUTION:</b><br>Refer to <a href="#">Fastener Caution</a><br><br><b>Tighten</b><br>22 N.m (16 lb ft)                                                                                                                                                                                                                                                                          |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Automatic Transmission Fluid Pump Assembly<br><br><b>Procedure</b> <ol style="list-style-type: none"> <li>1. Disconnect the transmission fluid pump electrical connector.</li> <li>2. Connect the battery negative cable. Refer to <a href="#">Battery Negative Cable Disconnection and Connection</a></li> <li>3. Check the transmission fluid level. Refer to <a href="#">Transmission Fluid Level and Condition Check</a></li> </ol> |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Automatic Transmission Fluid Pump Seal<br><br><b>NOTE:</b><br><b>Install a NEW fluid pump seal.</b>                                                                                                                                                                                                                                                                                                                                     |

## DRIVE MOTOR MOUNT REPLACEMENT (LEFT SIDE)

### Removal Procedure

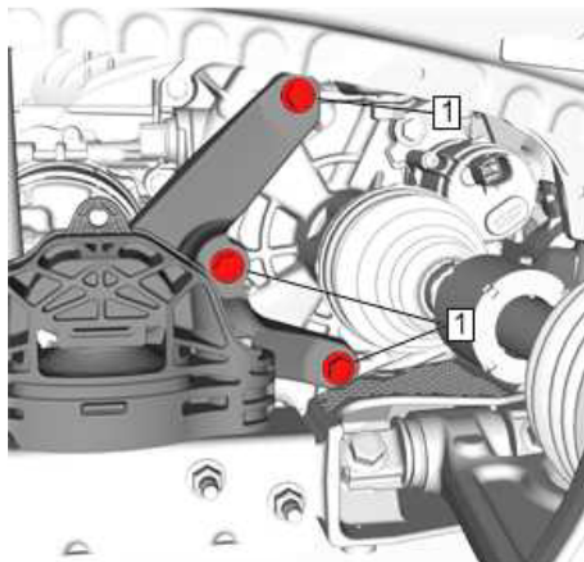
1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#)
2. Remove the front tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#)
3. Remove Front Compartment Air Deflector. Refer to [Front Compartment Air Deflector Replacement](#)
4. Remove Front Wheelhouse Liner. Refer to [Front Wheelhouse Liner Replacement](#)
5. Support the drive motor unit with a suitable jack stand.



**Fig. 39: Drive Motor Mount Drive Motor Side Bolt**

Courtesy of GENERAL MOTORS COMPANY

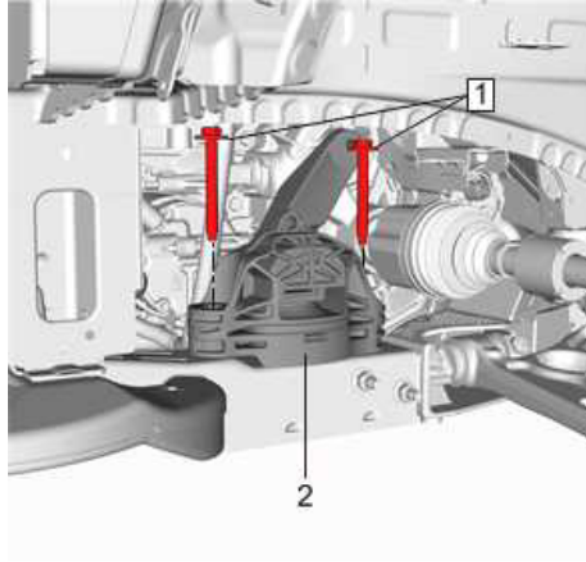
6. Remove Drive Motor Mount Drive Motor Side Bolt (1)



**Fig. 40: Drive Motor Mount Motor Side Bolts**

Courtesy of GENERAL MOTORS COMPANY

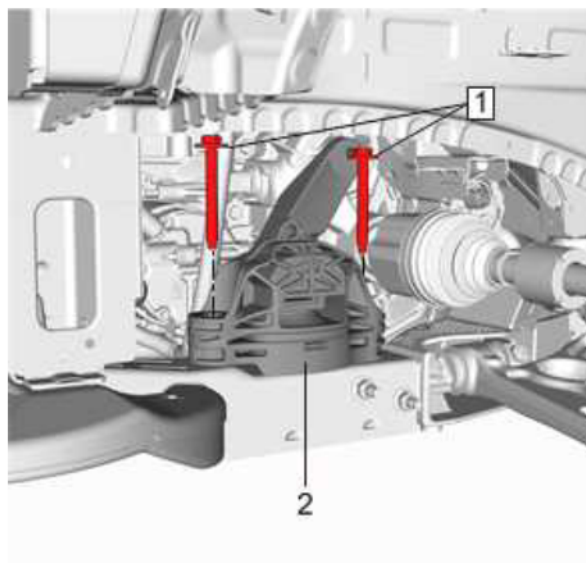
7. Remove and DISCARD Drive Motor Mount Motor Side Bolts (1) (Qty: 3)



**Fig. 41: Drive Motor Mount-Left Side And Bolts**  
**Courtesy of GENERAL MOTORS COMPANY**

8. Prior to removing the mount, mark the mount location on the frame using a paint pen or marker for correct positioning during installation.
9. Remove and DISCARD Drive Motor Mount Body Side Bolts (1) (Qty: 2)
10. Remove Drive Motor Mount-Left Side (2)

#### **Installation Procedure**



**Fig. 42: Drive Motor Mount-Left Side And Bolts**  
**Courtesy of GENERAL MOTORS COMPANY**

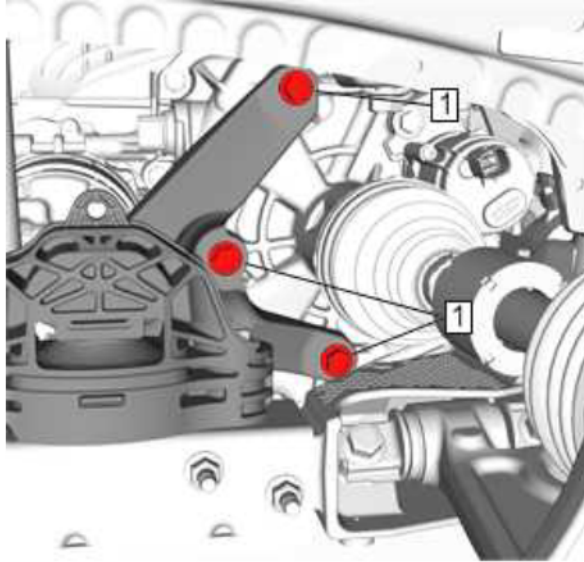
1. Install Drive Motor Mount-Left Side (2)

**CAUTION:** Refer to **Fastener Caution**

**CAUTION:** Refer to **Torque-to-Yield Fastener Caution** .

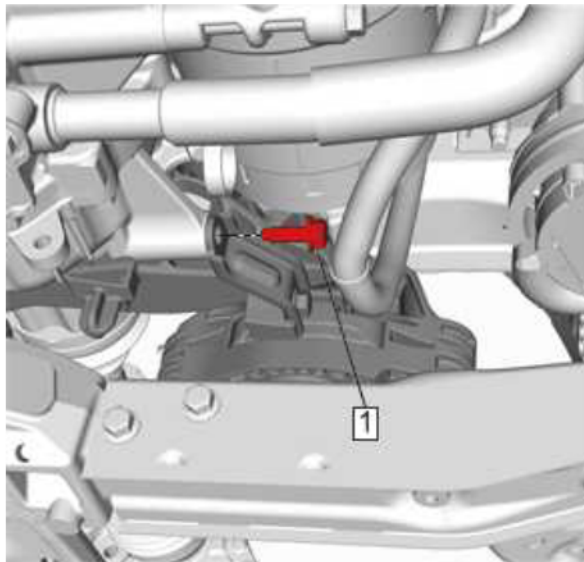
2. Install NEW Drive Motor Mount Body Side Bolts (1) (Qty: 2)
3. Align the drive motor mount to the previously made marks on the frame.
4. Tighten Drive Motor Mount Body Side Bolt (1) (Qty: 2)
  1. First Pass: 58 N.m (43 lb ft)
  2. Final Pass: 60 - 75 Degrees





**Fig. 43: Drive Motor Mount Motor Side Bolts**  
 Courtesy of GENERAL MOTORS COMPANY

5. Install NEW Drive Motor Mount Motor Side Bolts (1) (Qty: 3)
  1. First Pass: 58 N.m (43 lb ft)
  2. Final Pass: 60 - 75 Degrees



**Fig. 44: Drive Motor Mount Drive Motor Side Bolt**  
 Courtesy of GENERAL MOTORS COMPANY

6. Install and tighten Drive Motor Mount Drive Motor Side Bolt (1) to 22 N.m (16 lb ft)
7. Remove the jack stand.
8. Install Front Wheelhouse Liner. Refer to [Front Wheelhouse Liner Replacement](#)
9. Install Front Compartment Air Deflector. Refer to [Front Compartment Air Deflector Replacement](#)
10. Install the front tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#)
11. Lower the vehicle.

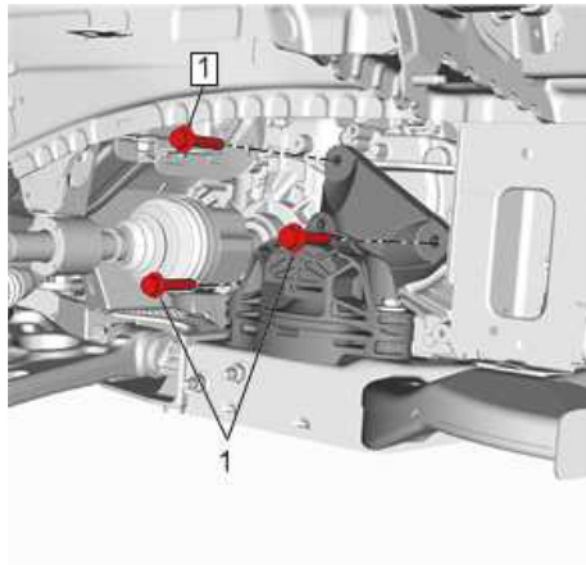
## **DRIVE MOTOR MOUNT REPLACEMENT (RIGHT SIDE)**

### **Removal Procedure**

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#)
2. Remove the front tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#)
3. Remove Front Compartment Air Deflector. Refer to [Front Compartment Air Deflector Replacement](#)
4. Remove Front Wheelhouse Liner. Refer to [Front Wheelhouse Liner Replacement](#)



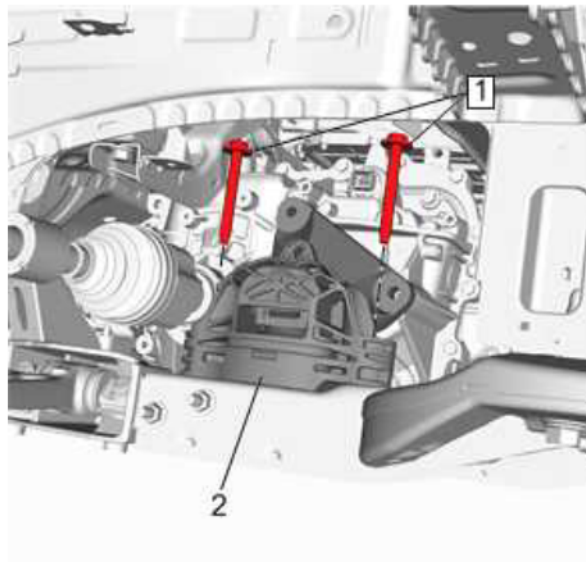
5. Support the drive motor unit with a suitable jack stand.



**Fig. 45: Drive Motor Mount Motor Side Bolts**

**Courtesy of GENERAL MOTORS COMPANY**

6. Remove and DISCARD Drive Motor Mount Motor Side Bolts (1) (Qty: 3)

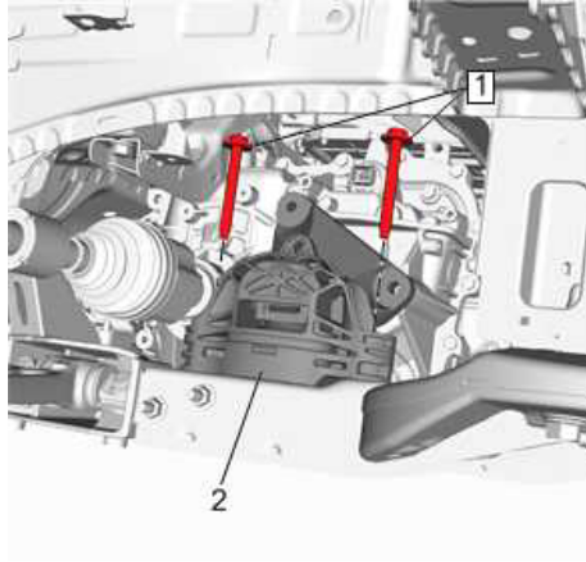


**Fig. 46: Drive Motor Mount-Right Side And Bolts**

**Courtesy of GENERAL MOTORS COMPANY**

7. Prior to removing the mount, mark the mount location on the frame using a paint pen or marker for correct positioning during installation.
8. Remove and DISCARD Drive Motor Mount Body Side Bolts (1) (Qty: 2)
9. Remove Drive Motor Mount-Right Side (2)

### **Installation Procedure**



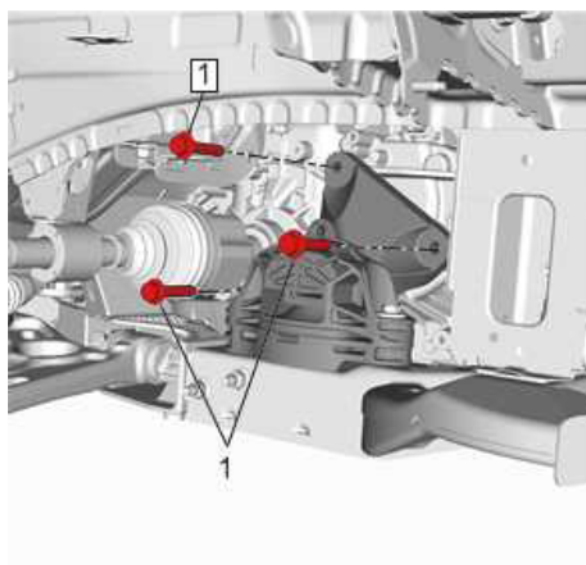
**Fig. 47: Drive Motor Mount-Right Side And Bolts**  
 Courtesy of GENERAL MOTORS COMPANY

1. Install Drive Motor Mount-Right Side (2)

**CAUTION:** Refer to [Fastener Caution](#)

**CAUTION:** Refer to [Torque-to-Yield Fastener Caution](#) .

2. Install NEW Drive Motor Mount Body Side Bolts (1) (Qty: 3)
3. Align the drive motor mount to the previously made marks on the frame.
4. Tighten Drive Motor Mount Body Side Bolts (1) (Qty: 2)
  1. First Pass: 58 N.m (43 lb ft)
  2. Final Pass: 60 - 75 Degrees



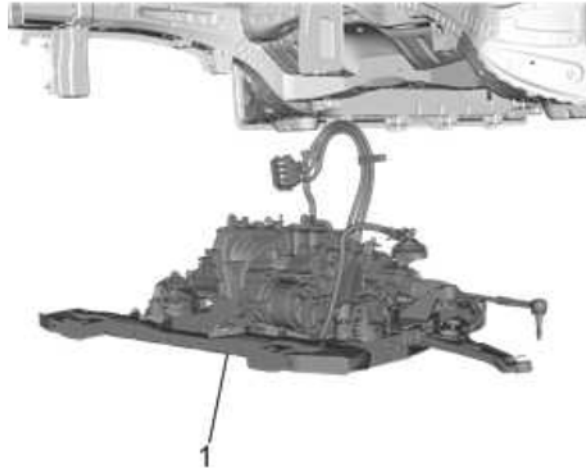
**Fig. 48: Drive Motor Mount Motor Side Bolts**  
 Courtesy of GENERAL MOTORS COMPANY

5. Install NEW Drive Motor Mount Motor Side Bolts (1) (Qty: 3)
  1. First Pass: 58 N.m (43 lb ft)
  2. Final Pass: 60 - 75 Degrees
6. Remove the jack stand.
7. Install Front Wheelhouse Liner. Refer to [Front Wheelhouse Liner Replacement](#)
8. Install Front Compartment Air Deflector. Refer to [Front Compartment Air Deflector Replacement](#)
9. Install the front tire and wheel assembly. Refer to [Tire and Wheel Removal and Installation](#)

10. Lower the vehicle.

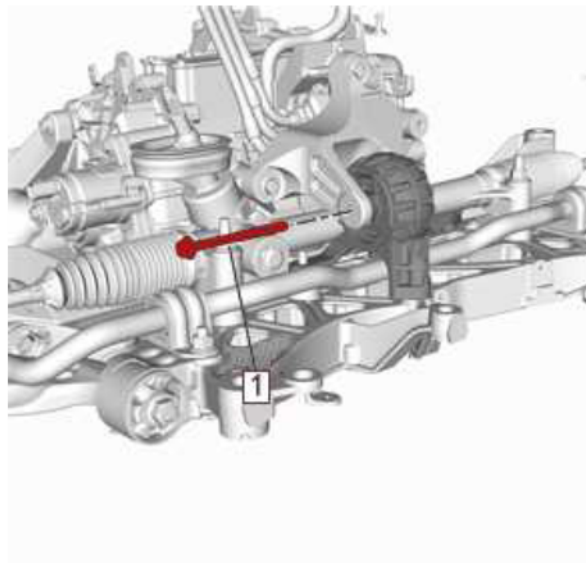
## **DRIVE MOTOR REAR MOUNT REPLACEMENT**

### **Removal Procedure**



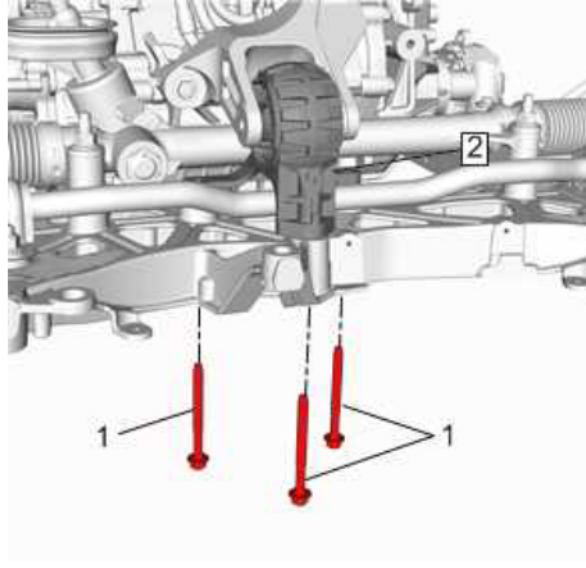
**Fig. 49: Automatic Transmission and Drivetrain and Front Suspension Frame Assembly**  
Courtesy of GENERAL MOTORS COMPANY

1. Remove Automatic Transmission and Drivetrain and Front Suspension Frame Assembly (1).  
Refer to **Drivetrain and Front Suspension Frame Removal and Installation**
2. Using an appropriate lift hook and engine hoist, raise the transmission slightly to remove weight from the rear mount.



**Fig. 50: Drive Motor Rear Mount Drive Motor Side Bolt**  
Courtesy of GENERAL MOTORS COMPANY

3. Remove and DISCARD Drive Motor Rear Mount Drive Motor Side Bolt (1)

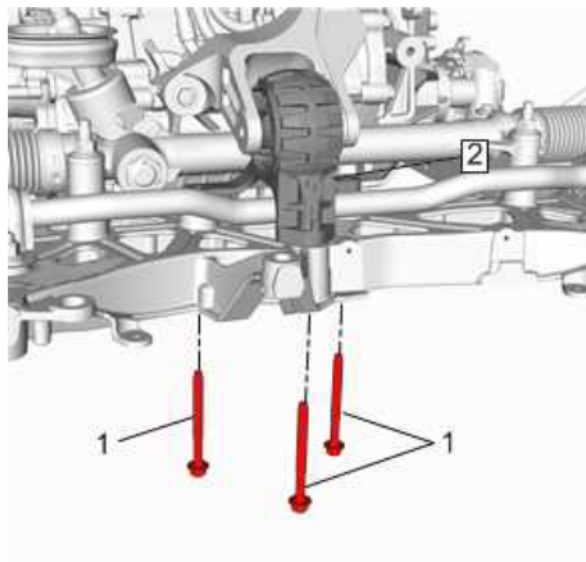


**Fig. 51: Drive Motor Rear Mount And Bolts**

Courtesy of GENERAL MOTORS COMPANY

4. Remove and DISCARD Drive Motor Rear Mount Drive Motor Side Bolts (1) (Qty: 3)
5. Remove Drive Motor Rear Mount (2)

#### Installation Procedure



**Fig. 52: Drive Motor Rear Mount And Bolts**

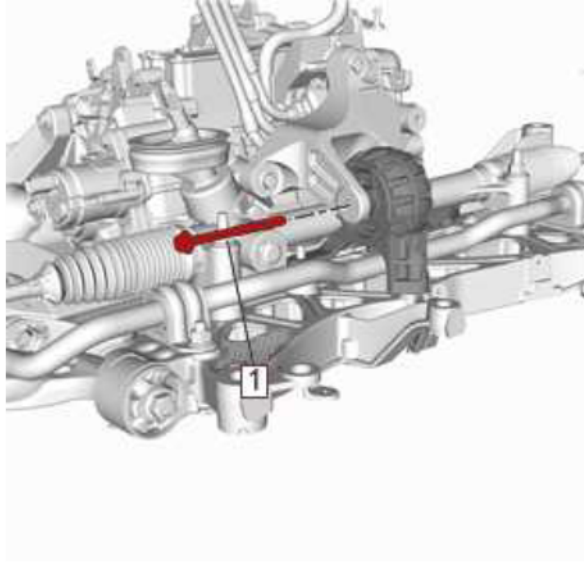
Courtesy of GENERAL MOTORS COMPANY

1. Install Drive Motor Rear Mount (2)

**CAUTION:** Refer to **Fastener Caution**

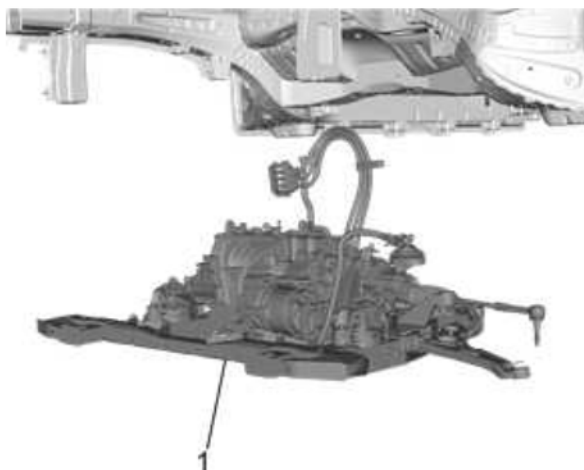
**CAUTION:** Refer to **Torque-to-Yield Fastener Caution** .

2. Install NEW Drive Motor Rear Mount Frame Side Bolts (1) (Qty: 3)
  1. First Pass: 58 N.m (43 lb ft)
  2. Final Pass: 60 - 75 Degrees
3. Lower the transmission down until the mount and bracket holes are aligned.



**Fig. 53: Drive Motor Rear Mount Drive Motor Side Bolt**  
 Courtesy of GENERAL MOTORS COMPANY

4. Install NEW Drive Motor Rear Mount Drive Motor Side Bolt (1)
  1. First Pass: 58 N.m (43 lb ft)
  2. Final Pass: 60 - 75 Degrees
5. Remove the engine hoist and lift hook.



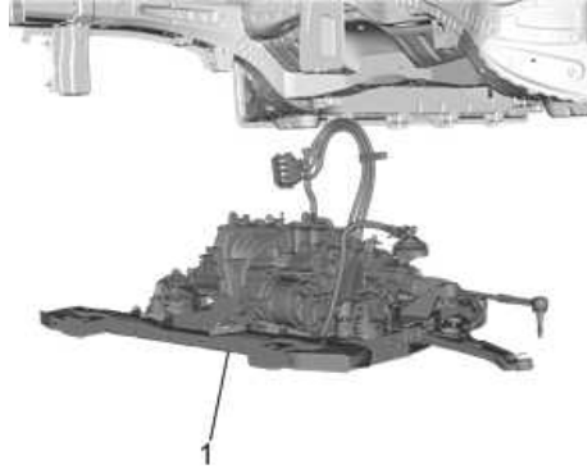
**Fig. 54: Automatic Transmission and Drivetrain and Front Suspension Frame Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

6. Install Automatic Transmission and Drivetrain and Front Suspension Frame Assembly (1). Refer to [Drivetrain and Front Suspension Frame Removal and Installation](#)

## **DRIVE MOTOR REAR MOUNT BRACKET REPLACEMENT**

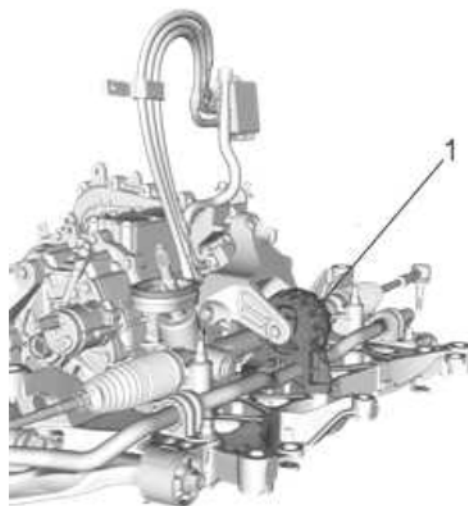
### **Removal Procedure**





**Fig. 55: Automatic Transmission and Drivetrain and Front Suspension Frame Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

1. Remove Automatic Transmission and Drivetrain and Front Suspension Frame Assembly (1). Refer to [Drivetrain and Front Suspension Frame Removal and Installation](#)

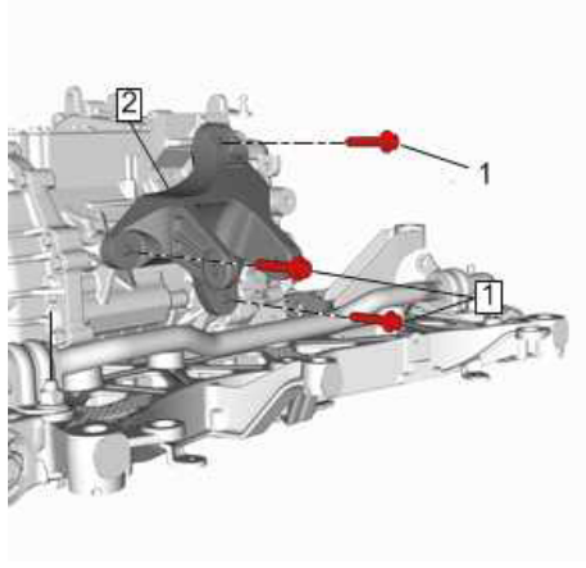


**Fig. 56: Drive Motor Rear Mount**  
 Courtesy of GENERAL MOTORS COMPANY

2. Remove Drive Motor Rear Mount (1). Refer to [Drive Motor Rear Mount Replacement](#)

**NOTE:** The lift and hook is already attached as part of the rear mount markup.

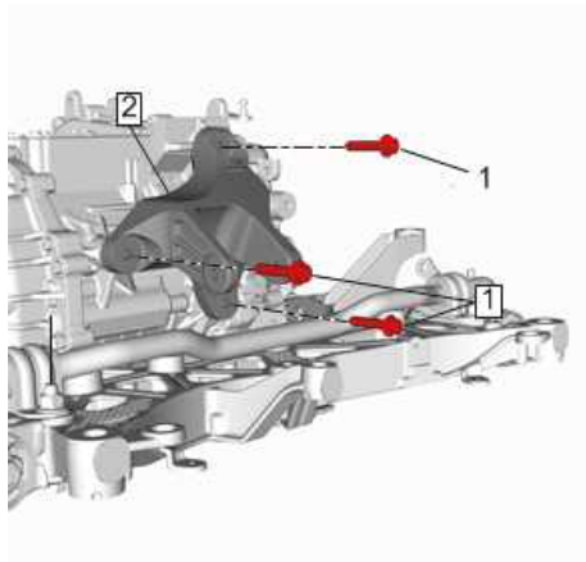
3. Raise the transmission with the engine lift, lift it high enough to gain access to the fasteners.



**Fig. 57: Drive Motor Rear Mount Bracket And Bolts**  
 Courtesy of GENERAL MOTORS COMPANY

4. Remove and DISCARD Drive Motor Rear Mount Bracket Drive Motor Side Bolts (1) (Qty: 3)
5. Remove Drive Motor Rear Mount Bracket (2)

#### Installation Procedure



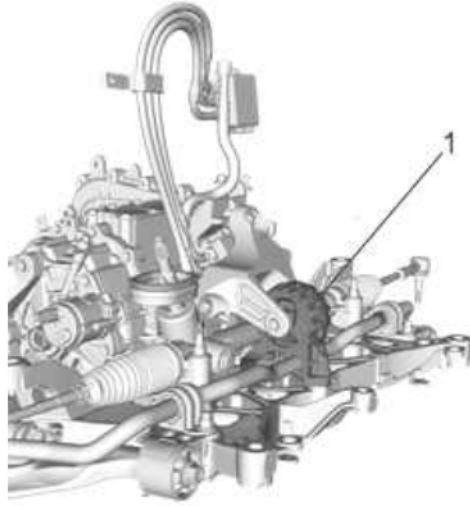
**Fig. 58: Drive Motor Rear Mount Bracket And Bolts**  
 Courtesy of GENERAL MOTORS COMPANY

1. Install Drive Motor Rear Mount Bracket (2)

**CAUTION:** Refer to **Fastener Caution**

**CAUTION:** Refer to **Torque-to-Yield Fastener Caution** .

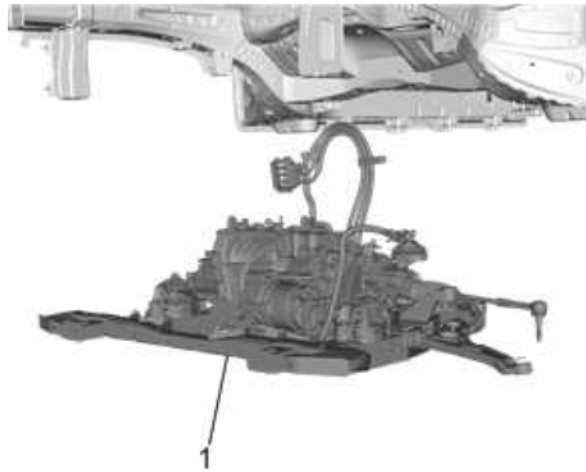
2. Install NEW Drive Motor Rear Mount Bracket Drive Motor Side Bolts (1) (Qty: 3)
  1. First Pass: 58 N.m (43 lb ft)
  2. Final Pass: 60 - 75 Degrees



**Fig. 59: Drive Motor Rear Mount**

Courtesy of GENERAL MOTORS COMPANY

3. Install Drive Motor Rear Mount (1). Refer to [\*\*Drive Motor Rear Mount Replacement\*\*](#)

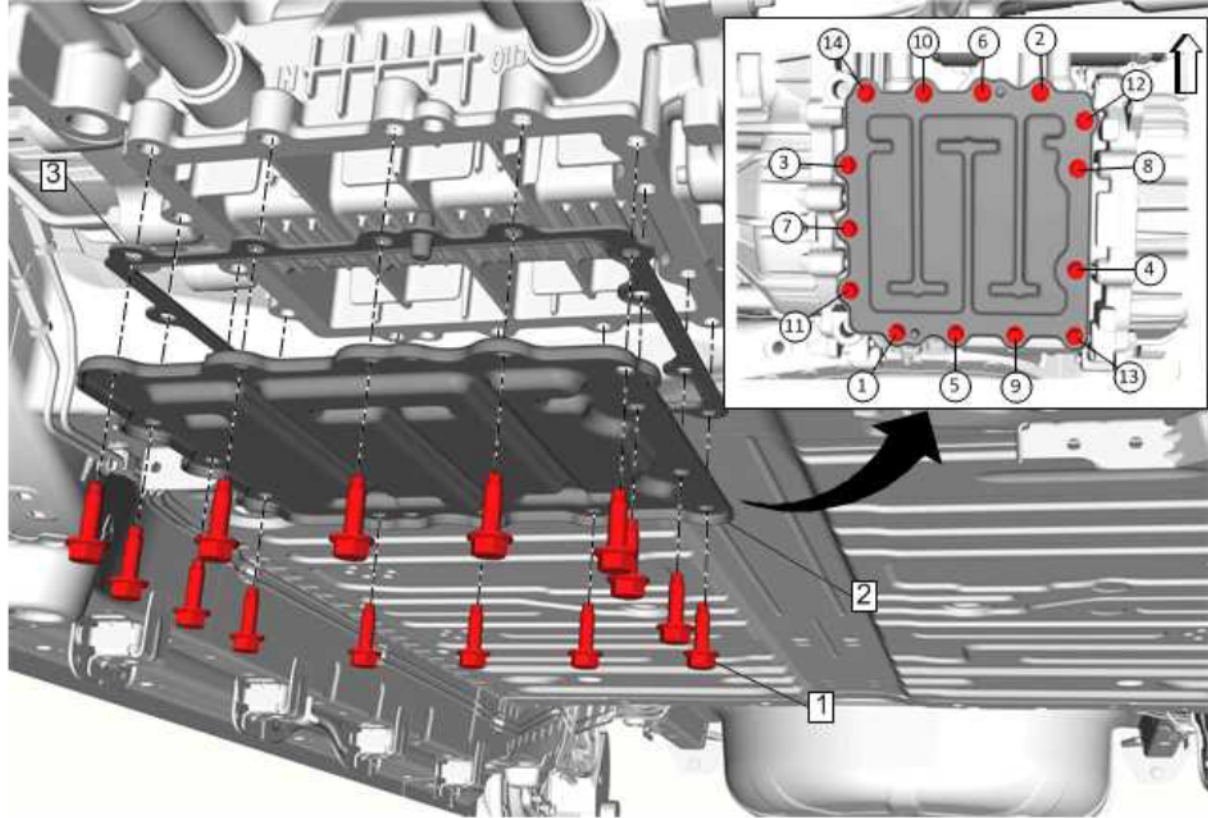


**Fig. 60: Automatic Transmission and Drivetrain and Front Suspension Frame Assembly**

Courtesy of GENERAL MOTORS COMPANY

4. Install Automatic Transmission and Drivetrain and Front Suspension Frame Assembly (1). Refer to [\*\*Drivetrain and Front Suspension Frame Removal and Installation\*\*](#)

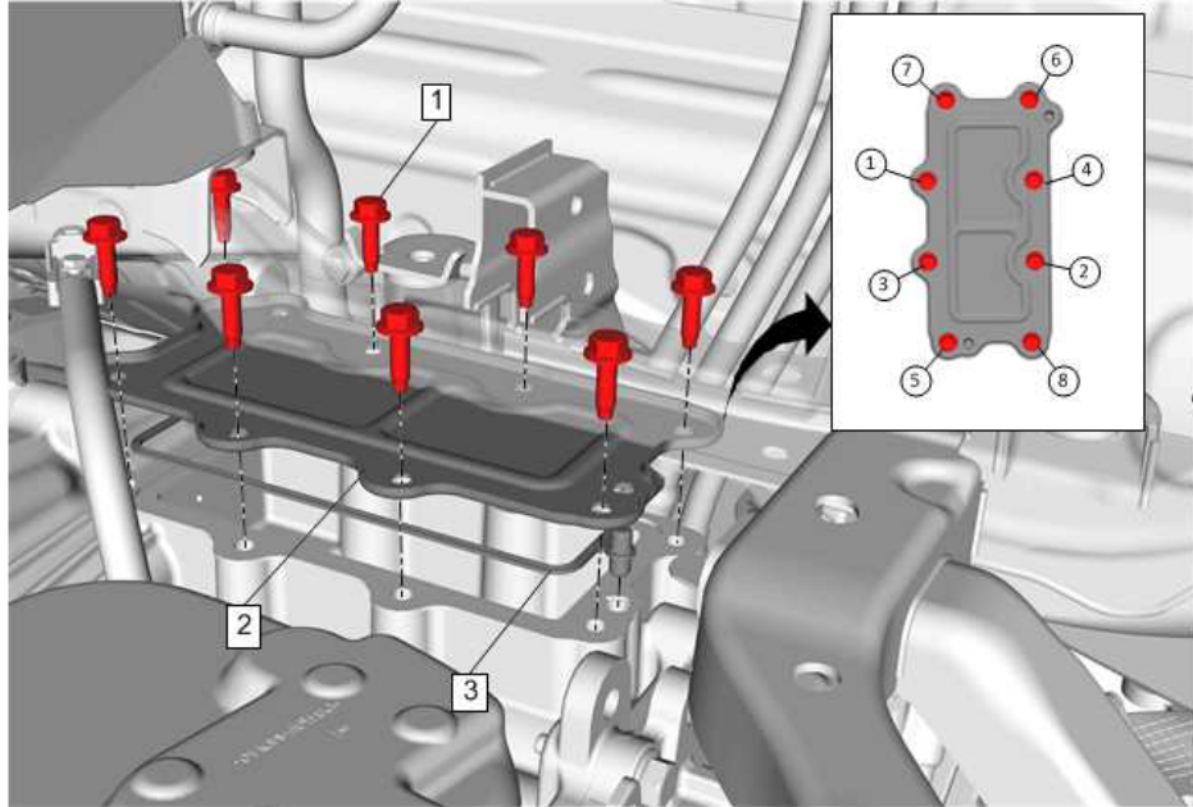
## **SHIFT SHAFT COVER REPLACEMENT (COOLANT SUMP)**



**Fig. 61: Shift Shaft Cover With Bolt Tightening Sequence (Coolant Sump)**

Courtesy of GENERAL MOTORS COMPANY

| Callout                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Component Name                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b> <ol style="list-style-type: none"> <li>1. Raise and support the vehicle. Refer to <a href="#">Lifting and Jacking the Vehicle</a></li> <li>2. Remove Front Compartment Air Deflector. Refer to <a href="#">Front Compartment Air Deflector Replacement</a></li> <li>3. Drain the drive motor generator power inverter module cooling system. Refer to <a href="#">Drive Motor Generator Power Inverter Module Cooling System Draining and Filling</a></li> <li>4. Place a drain pan beneath the transmission.</li> </ol> |                                                                                                                                                                                                                                                              |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Shift Shaft Cover Bolt (Qty: 14)<br><b>CAUTION:</b><br>Refer to <a href="#">Fastener Caution</a> .<br><br><b>NOTE:</b><br>Install all shift shaft cover bolts by hand then tighten all bolts in specified sequence<br><br><b>Tighten</b><br>9 N.m (80 lb in) |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Shift Shaft Cover<br><b>Procedure</b><br>Fill the drive motor generator power inverter module cooling system. Refer to <a href="#">Drive Motor Generator Power Inverter Module Cooling System Draining and Filling</a>                                       |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Shift Shaft Cover Gasket<br><br><b>NOTE:</b><br>Install a <b>NEW</b> gasket.                                                                                                                                                                                 |



**Fig. 62: Shift Shaft Cover With Bolt Tightening Sequence (Oil Sump)**

Courtesy of GENERAL MOTORS COMPANY

| Callout                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Component Name                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b> <ol style="list-style-type: none"> <li>1. Before performing this procedure, review the high voltage safety information. Refer to <a href="#">High Voltage Safety</a></li> <li>2. Disable the high voltage system. Refer to <a href="#">High Voltage Disabling</a></li> <li>3. Remove Drive Motor Battery Charger. Refer to <a href="#">Drive Motor Battery Charger Replacement (Except Dubai)</a> <a href="#">Drive Motor Battery Charger Replacement (Dubai)</a></li> </ol> |                                                                                                                                                                                                                                                                 |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Shift Shaft Cover Bolt (Qty: 8)<br><br><b>CAUTION:</b><br>Refer to <a href="#">Fastener Caution</a> .<br><br><b>NOTE:</b><br>Install all shift shaft cover bolts by hand then tighten all bolts in specified sequence<br><br><b>Tighten</b><br>9 N.m (80 lb in) |
| 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Shift Shaft Cover<br><b>Procedure</b><br>Enable the high voltage system. Refer to <a href="#">High Voltage Enabling</a>                                                                                                                                         |
| 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Shift Shaft Cover Gasket<br><br><b>NOTE:</b><br>Install a <b>NEW</b> gasket.                                                                                                                                                                                    |

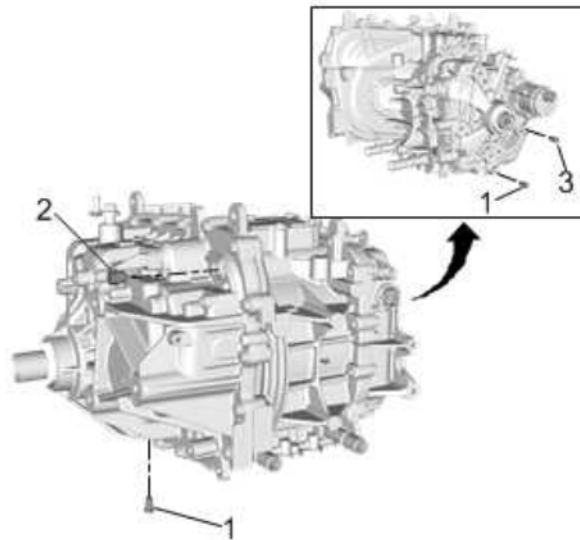
## TRANSMISSION FLUID DRAIN AND FILL

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1. Drive the vehicle until the normal fluid temperature 15 - 35°C (59 - 95°F) are reached.



2. Remove Front Wheelhouse Liner. Refer to [Front Wheelhouse Liner Replacement](#)
3. Remove Front Compartment Air Deflector. Refer to [Front Compartment Air Deflector Replacement](#)



**Fig. 63: Transmission Fluid Drain Plugs, Fill Plug And Fluid Level Check Plug**  
Courtesy of GENERAL MOTORS COMPANY

4. Remove and DISCARD Transmission Fluid Drain Plugs (1, 3) (Qty: 2)
5. Drain the transmission fluid into a suitable container.

**CAUTION:** Refer to [Fastener Caution](#) .

6. Install the 2 NEW transmission fluid drain plugs (1) and tighten to 12 N.m (106 lb in).
7. Remove the transmission fill plug (2).
8. Using a commercially available hand pump, add transmission fluid through the fill hole. Refer to [Adhesives, Fluids, Lubricants, and Sealers](#), and [Approximate Fluid Capacities](#) for fluid specifications and fluid capacity.
9. Install the NEW transmission fill plug (2) and tighten to 13 N.m (115 lb in).
10. Wait for 5 minutes until oil reaches to the bottom of transmission.
11. Vehicle in service mode with the transmission in Park (P).
12. Using the scan tool, command the transmission fluid pump speed to ON for 1 minute for circulation.
13. Install Front Compartment Air Deflector. Refer to [Front Compartment Air Deflector Replacement](#)
14. Install Front Wheelhouse Liner. Refer to [Front Wheelhouse Liner Replacement](#)

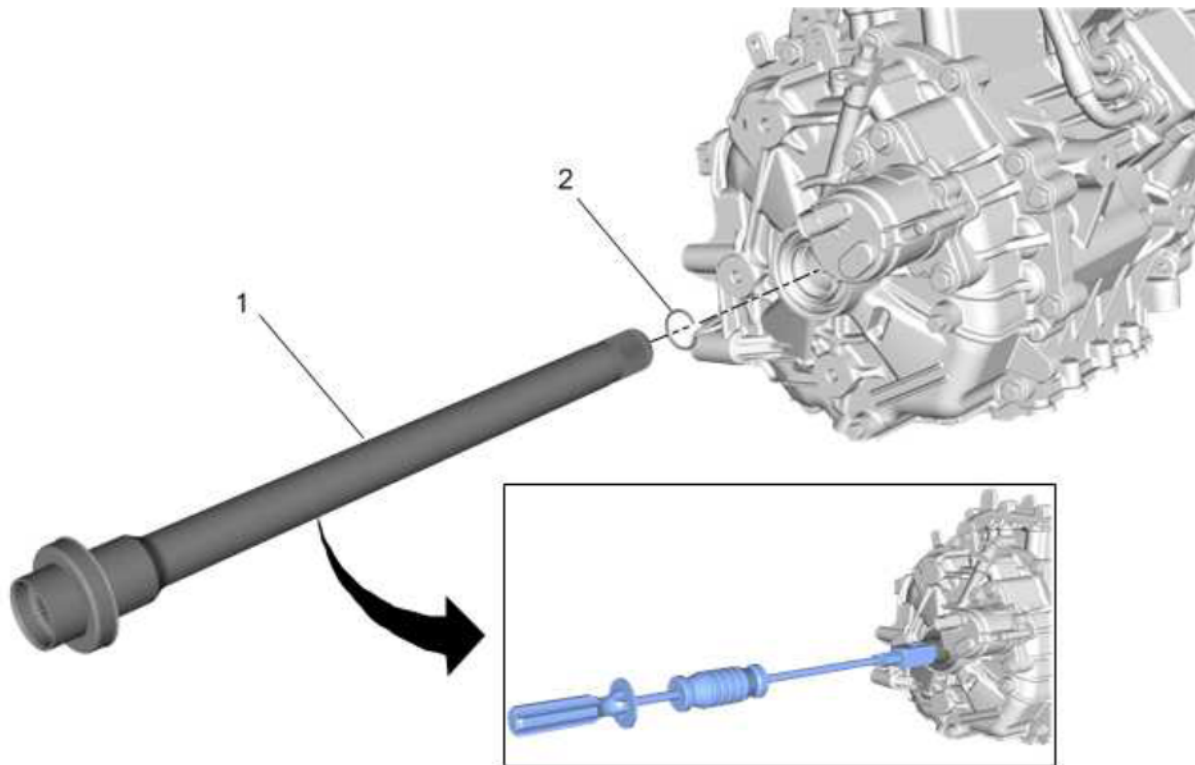
**NOTE:** Continue to monitor the transmission fluid temperature, if the fluid temperature falls below the specified range. Operate the vehicle again, until the transmission fluid temperature is reached.

15. Drive the vehicle until the normal fluid temperature 35Â°C (95Â°F) are reached.
16. Wait for 5 minutes until oil reaches to the bottom of transmission.
17. Remove Front Wheelhouse Liner. Refer to [Front Wheelhouse Liner Replacement](#)
18. Remove Front Compartment Air Deflector. Refer to [Front Compartment Air Deflector Replacement](#)
19. Remove the transmission oil level check plug (3) and verify a light drip of fluid comes out.

**NOTE:** 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.

20. Check the transmission fluid level. Refer to [Transmission Fluid Level and Condition Check](#)
21. Install the NEW transmission oil level check plug (3) and tighten to 12 N.m (106 lb in).
22. Install Front Compartment Air Deflector. Refer to [Front Compartment Air Deflector Replacement](#)
23. Install Front Wheelhouse Liner. Refer to [Front Wheelhouse Liner Replacement](#)
24. Perform the [Diagnostic Repair Verification](#) after completing the repair.

## OUTPUT SHAFT REPLACEMENT - LEFT SIDE

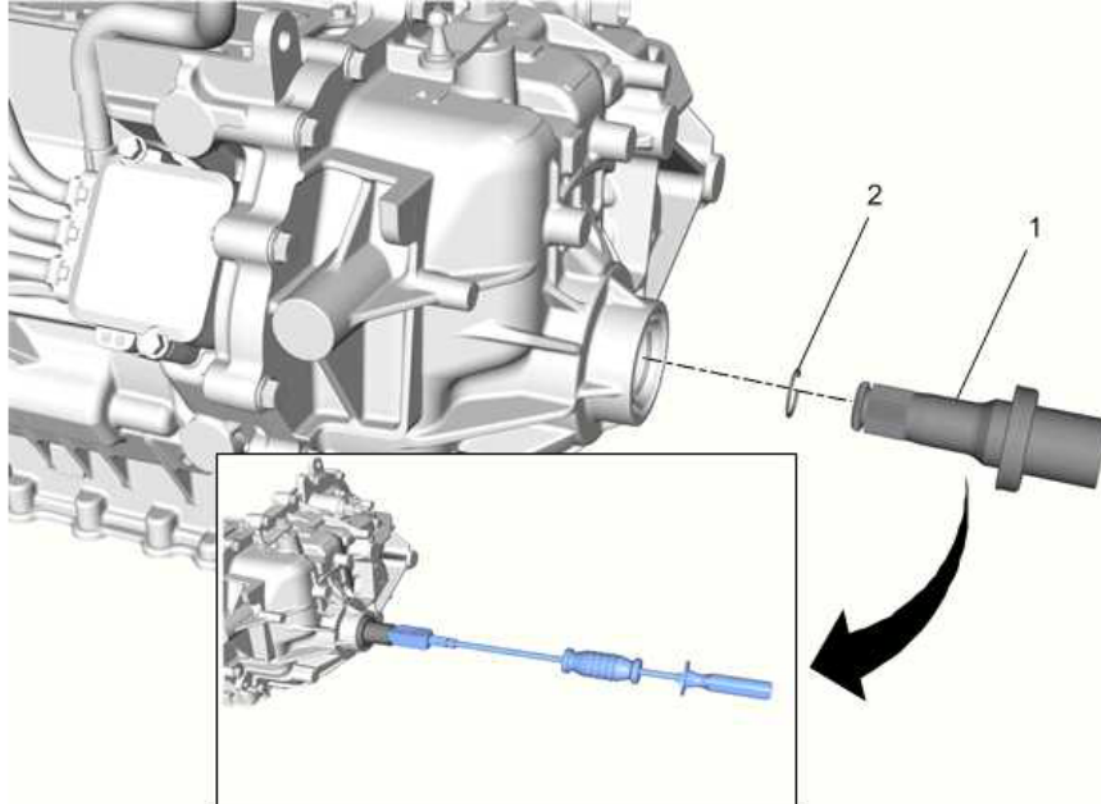


**Fig. 64: Output Shaft - Left Side**

Courtesy of GENERAL MOTORS COMPANY

| Callout                                                                                                                                                                                                                                                                                                 | Component Name                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b> <ol style="list-style-type: none"> <li>1. Raise and support the vehicle. Refer to <a href="#">Lifting and Jacking the Vehicle</a></li> <li>2. Remove Left Front Wheel Drive Shaft @ Transmission. Refer to <a href="#">Front Wheel Drive Shaft Replacement</a></li> </ol> |                                                                                                                                                                                                                   |
| 1                                                                                                                                                                                                                                                                                                       | Output Shaft<br><br><b>Special Tools</b> <ul style="list-style-type: none"> <li>• DT-6125-1B Slide Hammer</li> <li>• DT-23907 Bearing Adapter</li> </ul> Equivalent regional tools: <a href="#">Special Tools</a> |
| 2                                                                                                                                                                                                                                                                                                       | Output Shaft Retaining Ring<br><br><b>NOTE:</b><br>Install NEW output shaft retaining ring.                                                                                                                       |

## OUTPUT SHAFT REPLACEMENT - RIGHT SIDE

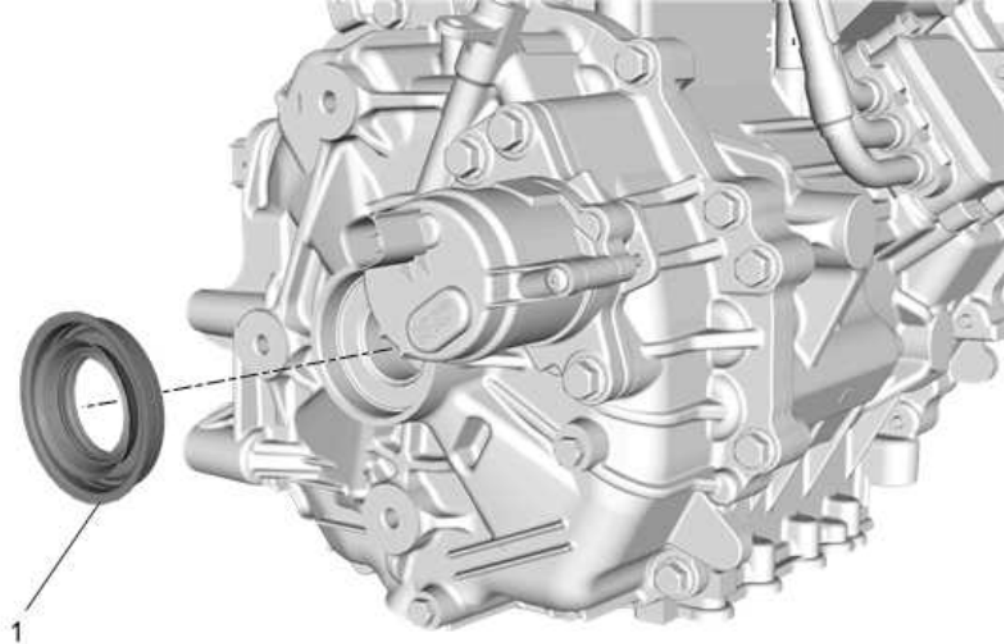


**Fig. 65: Output Shaft - Right Side**

Courtesy of GENERAL MOTORS COMPANY

| Callout                                                                                                                                                                                                                                                                                                  | Component Name                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b> <ol style="list-style-type: none"> <li>1. Raise and support the vehicle. Refer to <a href="#">Lifting and Jacking the Vehicle</a></li> <li>2. Remove Right Front Wheel Drive Shaft @ Transmission. Refer to <a href="#">Front Wheel Drive Shaft Replacement</a></li> </ol> |                                                                                                                                                                                                                   |
| 1                                                                                                                                                                                                                                                                                                        | Output Shaft<br><br><b>Special Tools</b> <ul style="list-style-type: none"> <li>• DT-6125-1B Slide Hammer</li> <li>• DT-23907 Bearing Adapter</li> </ul> Equivalent regional tools: <a href="#">Special Tools</a> |
| 2                                                                                                                                                                                                                                                                                                        | Output Shaft Retaining Ring<br><br><b>NOTE:</b><br>Install NEW output shaft retaining ring.                                                                                                                       |

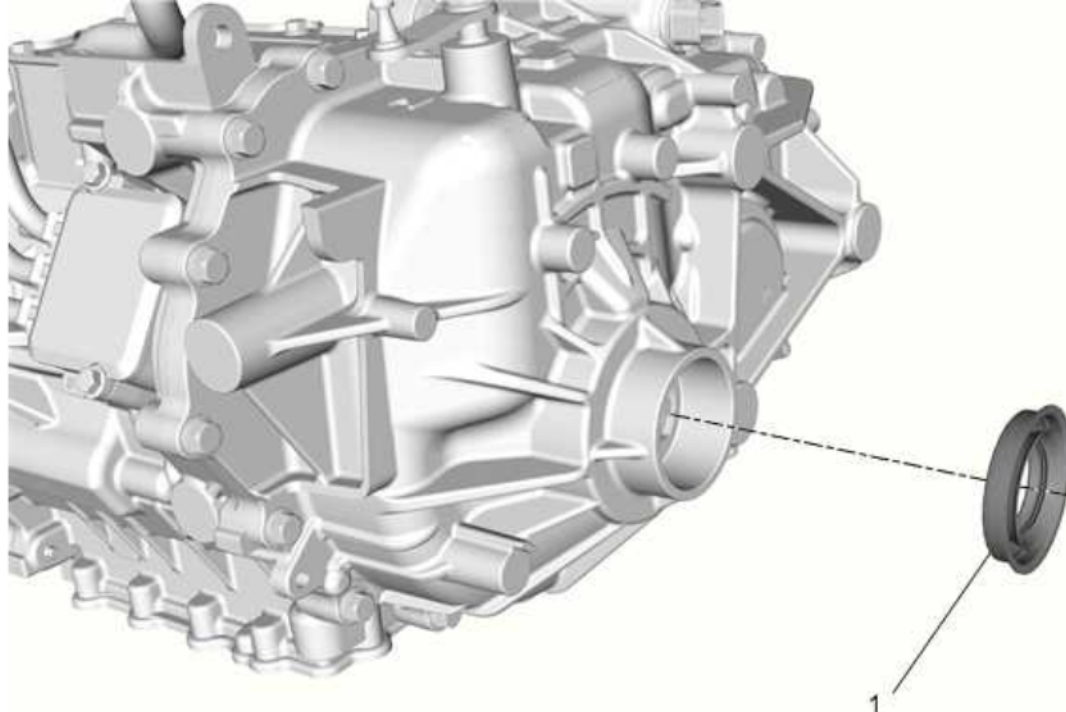
## FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - LEFT SIDE



**Fig. 66: Front Wheel Drive Shaft Seal - Left Side**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout                                                                                                                                                                                                                                                                                                                                                                                                            | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b> <ol style="list-style-type: none"> <li>1. Raise and support the vehicle. Refer to <a href="#">Lifting and Jacking the Vehicle</a></li> <li>2. Remove Left Front Wheel Drive Shaft @ Transmission. Refer to <a href="#">Front Wheel Drive Shaft Replacement</a></li> <li>3. Remove Output Shaft - Left Side. Refer to <a href="#">Output Shaft Replacement - Left Side</a></li> </ol> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                  | <p>Left Front Wheel Drive Shaft Oil Seal</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. For seal removal use <b>DT-6125-1B</b> slide hammer with <b>DT-23129</b> Universal Seal Remover.</li> <li>2. For seal installation use <b>DT-44809</b> seal installer.</li> </ol> <p><b>NOTE:</b><br/> <b>Use NEW oil seal.</b></p> <p><b>Special Tools</b></p> <ul style="list-style-type: none"> <li>• <b>DT-23129</b> Universal Seal Remover</li> <li>• <b>DT-6125-1B</b> Slide Hammer</li> <li>• <b>DT-44809</b> Seal Installer</li> </ul> <p>Equivalent regional tools: <a href="#">Special Tools</a></p> |

## FRONT WHEEL DRIVE SHAFT SEAL REPLACEMENT - RIGHT SIDE



**Fig. 67: Front Wheel Drive Shaft Seal - Right Side**

Courtesy of GENERAL MOTORS COMPANY

| Callout                                                                                                                                                                                                                                                                                                                                                                                                               | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Preliminary Procedures</b> <ol style="list-style-type: none"> <li>1. Raise and support the vehicle. Refer to <a href="#">Lifting and Jacking the Vehicle</a></li> <li>2. Remove Right Front Wheel Drive Shaft @ Transmission. Refer to <a href="#">Front Wheel Drive Shaft Replacement</a></li> <li>3. Remove Output Shaft - Right Side. Refer to <a href="#">Output Shaft Replacement - Right Side</a></li> </ol> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 1                                                                                                                                                                                                                                                                                                                                                                                                                     | Right Front Wheel Drive Shaft Oil Seal<br><br><b>Procedure</b> <ol style="list-style-type: none"> <li>1. For seal removal use <b>DT-6125-1B</b> slide hammer with <b>DT-23129</b> Universal Seal Remover.</li> <li>2. For seal installation use <b>DT-44809</b> seal installer.</li> </ol> <p><b>NOTE:</b><br/>Use <b>NEW</b> oil seal.</p> <p><b>Special Tools</b></p> <ul style="list-style-type: none"> <li>• <b>DT-23129</b> Universal Seal Remover</li> <li>• <b>DT-6125-1B</b> Slide Hammer</li> <li>• <b>DT-44809</b> Seal Installer</li> </ul> <p>Equivalent regional tools: <a href="#">Special Tools</a></p> |

## TRANSMISSION REPLACEMENT

### Special Tools

EN-36857 Engine Lift Bracket



## Removal Procedure

**WARNING:** Always perform the High Voltage Disabling procedure prior to servicing any High Voltage component or connection. Personal Protection Equipment (PPE) and proper procedures must be followed.

The High Voltage Disabling procedure includes the following steps:

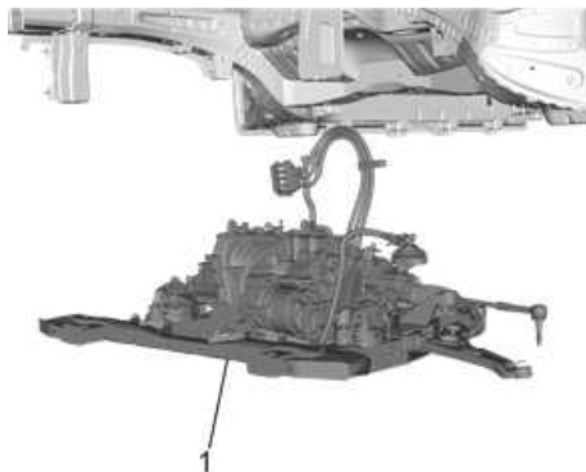
- Identify how to disable high voltage.
- Identify how to test for the presence of high voltage.
- Identify condition under which high voltage is always present and personal protection equipment (PPE) and proper procedures must be followed.

Before working on any high voltage system, be sure to wear the following Personal Protection Equipment:

- Safety glasses with appropriate side shields when within 15 meters (50 feet) of the vehicle, either indoors or outdoors.
- Certified and up-to-date Class "0" Insulation gloves rated at 1000V with leather protectors.
  - Visually and functionally inspect the gloves before use.
  - Wear the Insulation gloves with leather protectors at all times when working with the high voltage battery assembly, whether the system is energized or not.

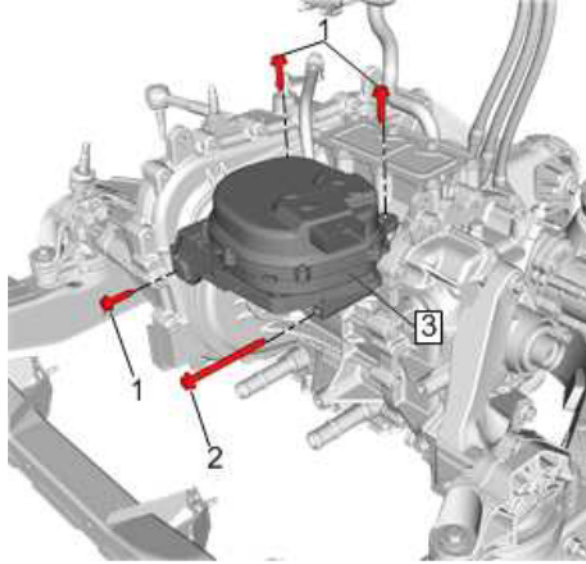
Failure to follow the procedures may result in serious injury or death.

1. Disable the high voltage system. Refer to [High Voltage Disabling](#)
2. Drain the transmission fluid. Refer to [Transmission Fluid Drain and Fill](#)



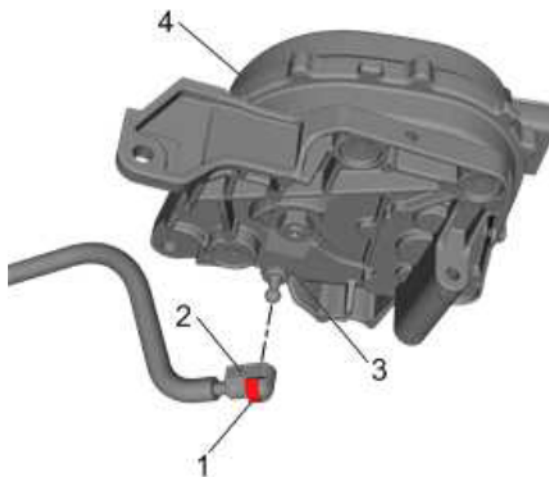
**Fig. 68: Automatic Transmission and Drivetrain and Front Suspension Frame Assembly**  
Courtesy of GENERAL MOTORS COMPANY

3. Remove the drivetrain and front suspension frame with the automatic transmission from the vehicle. Refer to [Drivetrain and Front Suspension Frame Removal and Installation](#)
4. Remove Air Conditioning and Drive Motor Battery Cooling Compressor @ Transmission. Refer to [Air Conditioning and Drive Motor Battery Cooling Compressor Replacement](#)



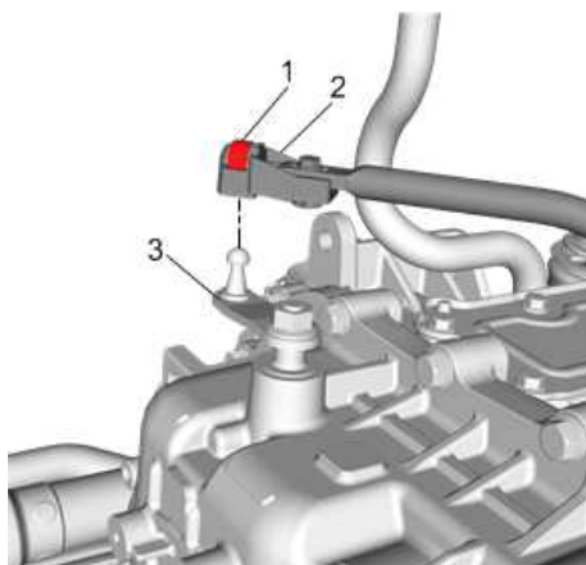
**Fig. 69: Range Selector Actuator Hardware Module Assembly Bolts**  
 Courtesy of GENERAL MOTORS COMPANY

5. Remove Range Selector Actuator Hardware Module Assembly Bolts (1, 2) (Qty: 4)



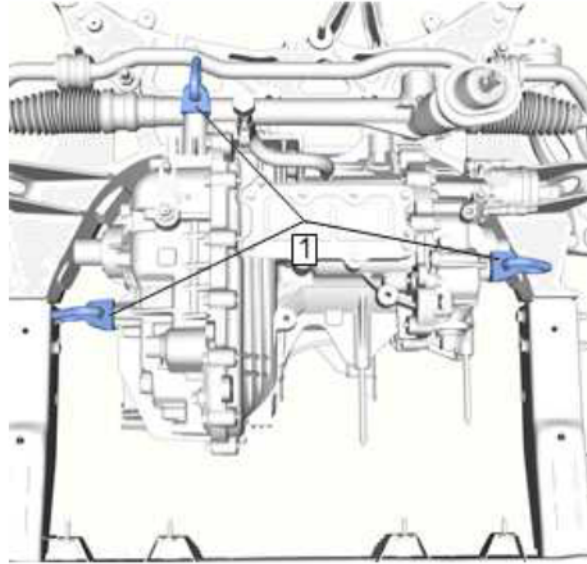
**Fig. 70: Transmission Range Selector Lever Link, Retainer And Range Selector Actuator Hardware Module**  
 Courtesy of GENERAL MOTORS COMPANY

6. Using a suitable tool, remove the transmission range selector lever link (2) while pulling the range selector lever link retainer (1).
7. Remove Range Selector Actuator Hardware Module Assembly (4)



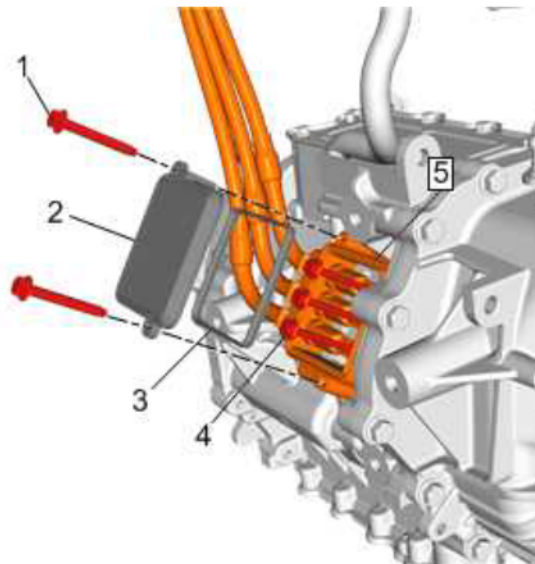
**Fig. 71: Transmission Range Selector Lever Link And Lever Link Retainer**  
Courtesy of GENERAL MOTORS COMPANY

8. Using a suitable tool, remove the transmission range selector lever link (2) while pulling the range selector lever link retainer (1).
9. Position wood blocks under the transmission in order to support the transmission.
10. Remove the left and right drive motor mount. Refer to [Drive Motor Mount Replacement \(Left Side\)](#)[Drive Motor Mount Replacement \(Right Side\)](#)
11. Remove the drive motor rear mount bracket. Refer to [Drive Motor Rear Mount Bracket Replacement](#)



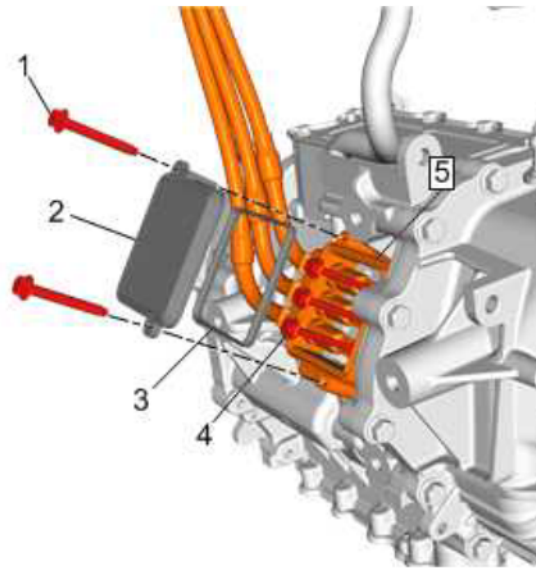
**Fig. 72: Engine Lift Brackets And Lift Hooks**  
Courtesy of GENERAL MOTORS COMPANY

12. Separate the transmission from the drivetrain and front suspension frame.
  1. Install the *EN-36857* engine lift brackets (1) and lift hooks to the bosses on the transmission and use the engine hoist to remove the transmission from the frame.



**Fig. 73: Drive Motor Power Inverter Module 3 Phase Cable Connector, Cover, Bolts And Seal**  
Courtesy of GENERAL MOTORS COMPANY

13. Remove Drive Motor Power Inverter Module 3 Phase Cable Cover Bolts (1) (Qty: 2)
14. Remove Drive Motor Power Inverter Module 3 Phase Cable Cover (2)
15. Remove and DISCARD Drive Motor Power Inverter Module 3 Phase Cable Connector Seal (3)
16. Remove Drive Motor Power Inverter Module 3 Phase Cable Connector Bolts (4) (Qty: 3)
17. Remove Drive Motor Power Inverter Module 3 Phase Cable Connector (5) @ Transmission



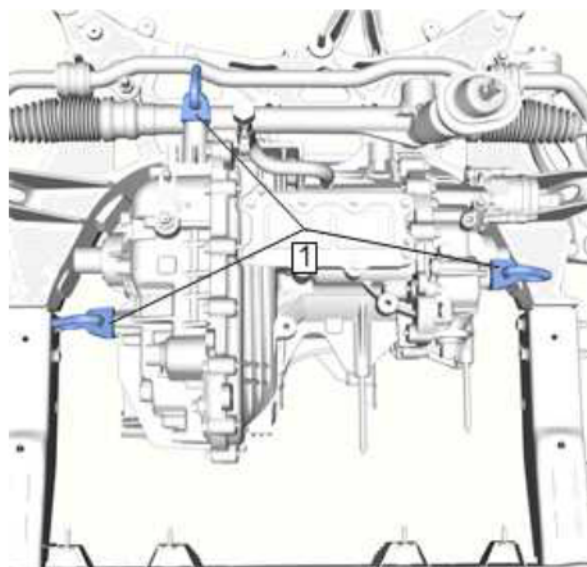
**Fig. 74: Drive Motor Power Inverter Module 3 Phase Cable Connector, Cover, Bolts And Seal**

Courtesy of GENERAL MOTORS COMPANY

1. Install Drive Motor Power Inverter Module 3 Phase Cable Connector (5) @ Transmission

**CAUTION:** Refer to [Fastener Caution](#) .

2. Install and tighten Drive Motor Power Inverter Module 3 Phase Cable Connector Bolts (4) (Qty: 3) to 9 N.m (80 lb in)
3. Install a NEW Drive Motor Power Inverter Module 3 Phase Cable Connector Seal (3).
4. Install Drive Motor Power Inverter Module 3 Phase Cable Cover (2)
5. Install and tighten Drive Motor Power Inverter Module 3 Phase Cable Cover Bolts (1) (Qty: 2) to 9 N.m (80 lb in)



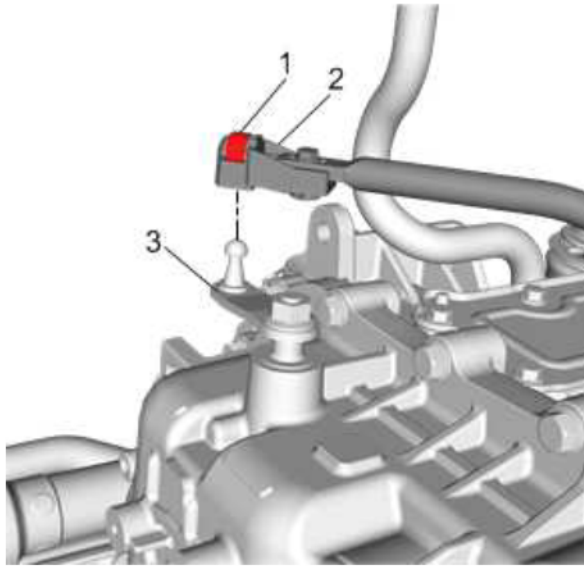
**Fig. 75: Engine Lift Brackets And Lift Hooks**

Courtesy of GENERAL MOTORS COMPANY

6. Position the transmission to the drivetrain and front suspension frame.
  1. Use the engine hoist to install the transmission to the frame.
  2. Position wood blocks under the transmission in order to support the transmission.
  3. Remove the EN-36857 engine lift brackets (1) and lift hooks from the transmission.
7. Install the drive motor rear mount bracket. Refer to [Drive Motor Rear Mount Bracket Replacement](#)

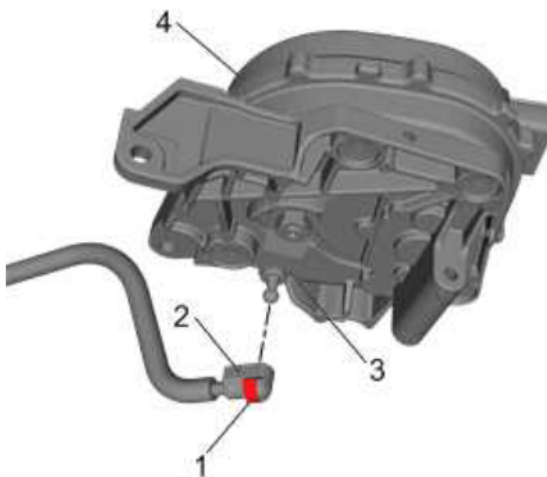


8. Install the left and right drive motor mount. Refer to [Drive Motor Mount Replacement \(Left Side\)](#)[Drive Motor Mount Replacement \(Right Side\)](#)



**Fig. 76: Transmission Range Selector Lever Link And Lever Link Retainer**  
Courtesy of GENERAL MOTORS COMPANY

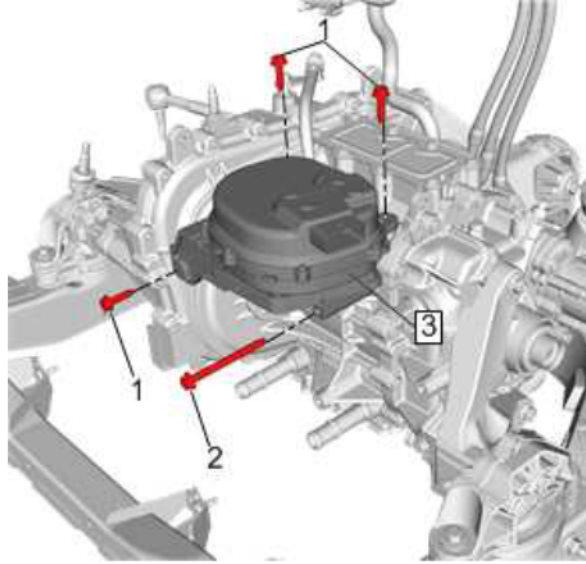
9. Verify the transmission range selector lever is in the park position.
10. Install Automatic Transmission Range Selector Lever Link (2) @ Transmission Range Selector Lever (3)



**Fig. 77: Transmission Range Selector Lever Link, Retainer And Range Selector Actuator Hardware Module**  
Courtesy of GENERAL MOTORS COMPANY

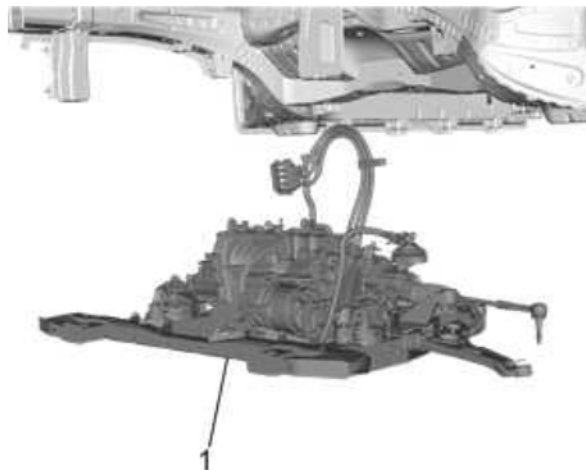
11. Verify the transmission range selector actuator hardware module lever is in the park position.
12. Install the transmission range selector lever link (2) to the range selector actuator hardware module lever (3).





**Fig. 78: Range Selector Actuator Hardware Module Assembly Bolts**  
 Courtesy of GENERAL MOTORS COMPANY

13. Install Range Selector Actuator Hardware Module Assembly (3) @ Transmission
14. Install and tighten Range Selector Actuator Hardware Module Assembly Bolts (1, 2) (Qty: 4) to 22 N.m (16 lb ft)
15. Check the range selector lever link adjustment. Refer to [Range Selector Lever Link Adjustment](#)
16. Install Air Conditioning and Drive Motor Battery Cooling Compressor @ Transmission. Refer to [Air Conditioning and Drive Motor Battery Cooling Compressor Replacement](#)

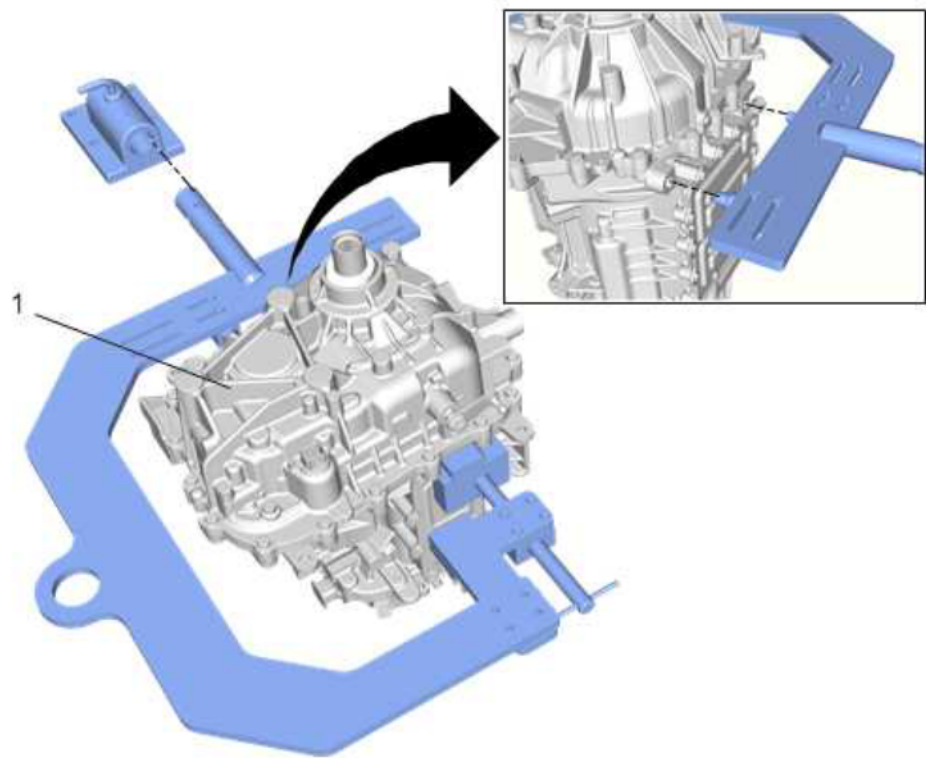


**Fig. 79: Automatic Transmission and Drivetrain and Front Suspension Frame Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

17. Install the drivetrain and front suspension frame with the automatic transmission to the vehicle. Refer to [Drivetrain and Front Suspension Frame Removal and Installation](#)
18. Enable the high voltage system. Refer to [High Voltage Enabling](#)
19. Fill the transmission with transmission fluid. Refer to [Transmission Fluid Drain and Fill](#)
20. Perform the transmission range control module range motor position learn. Refer to [Transmission Range Control Module Range Motor Position Learn](#)
21. Verify proper operation of the transmission.

## REPAIR INSTRUCTIONS - OFF VEHICLE

### HOLDING FIXTURE INSTALLATION

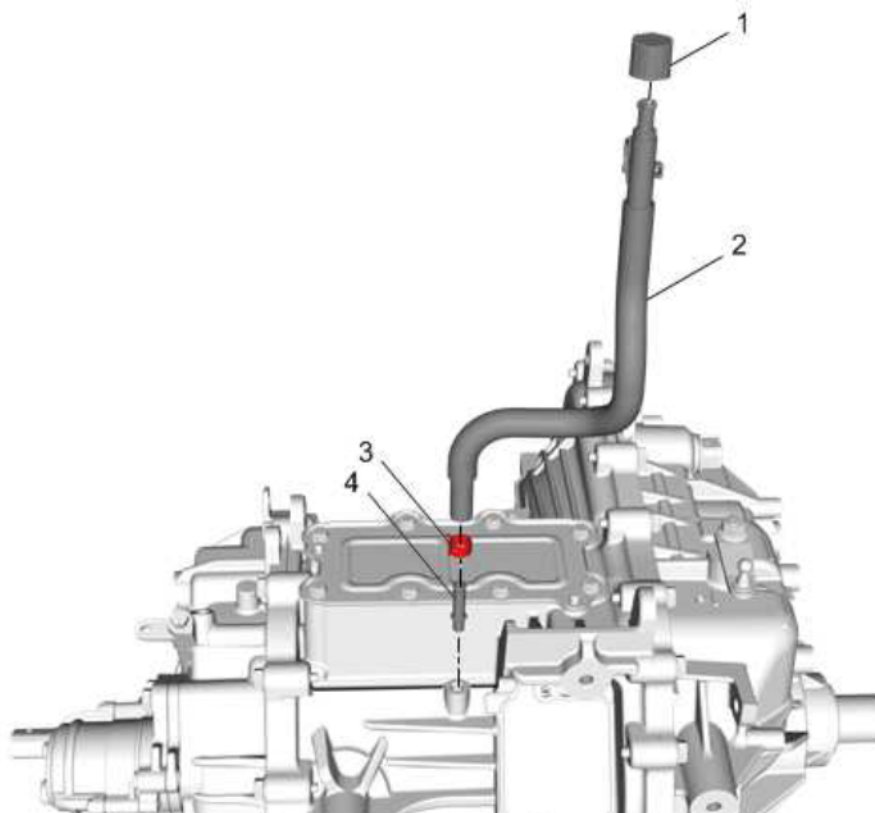


**Fig. 80: Holding Fixture**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>Automatic Transmission</p> <p><b>WARNING:</b><br/>Handle with care, the transmission assembly weighs over 83 Kg (183 lbs). Bodily injury could occur if not handled properly.</p> <p><b>CAUTION:</b><br/>Refer to <a href="#">Fastener Caution</a> .</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Use the supplied template to relocate holes on the fixture for mounting blocks.</li> <li>2. Adjust mounting blocks on holding fixture to match bosses on case and tighten.</li> </ol> <p><b>Tighten</b><br/>13 N.m (115 lb in)</p> <p><b>Special Tools</b></p> <ul style="list-style-type: none"> <li>• DT-3289-20 Holding Fixture Base Assembly</li> <li>• DT-46625 Holding Fixture</li> <li>• DT-52009 Holding Fixture Adapter</li> <li>• DT-46625-10 Holding Fixture Adapter</li> </ul> <p>Equivalent regional tools: <a href="#">Special Tools</a>.</p> |

## TRANSMISSION VENT PIPE REMOVAL

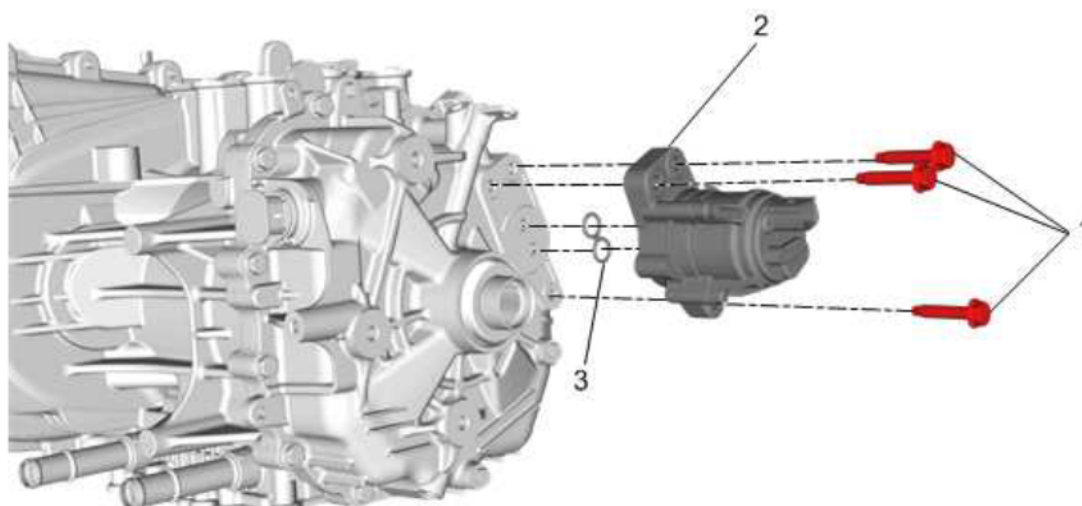


**Fig. 81: Transmission Vent Pipe**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                |
|---------|-----------------------------------------------|
| 1       | Transmission Vent Cap                         |
| 2       | Transmission Vent Hose                        |
| 3       | Transmission Vent Hose Clamp                  |
| 4       | Transmission Vent Pipe                        |
|         | <b>NOTE:</b><br><b>DISCARD</b> the vent pipe. |

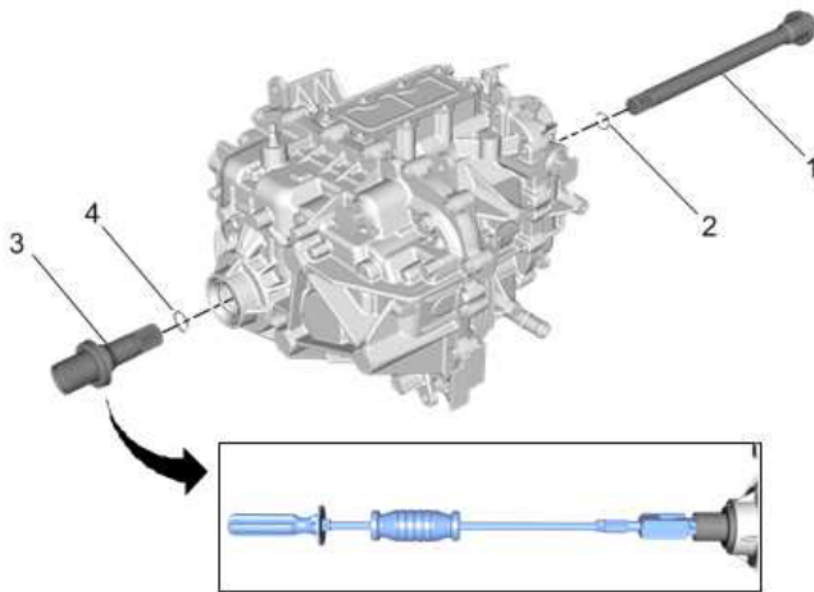
## TRANSMISSION FLUID PUMP REMOVAL



**Fig. 82: Transmission Fluid Pump**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                           |
|---------|--------------------------------------------------------------------------------------------------------------------------|
| 1       | Automatic Transmission Fluid Pump Bolt (Qty: 3)                                                                          |
| 2       | Automatic Transmission Fluid Pump                                                                                        |
| 3       | Automatic Transmission Fluid Pump Seal<br><br><b>NOTE:</b><br><b>DISCARD</b> the automatic transmission fluid pump seal. |

**OUTPUT SHAFT REMOVAL**

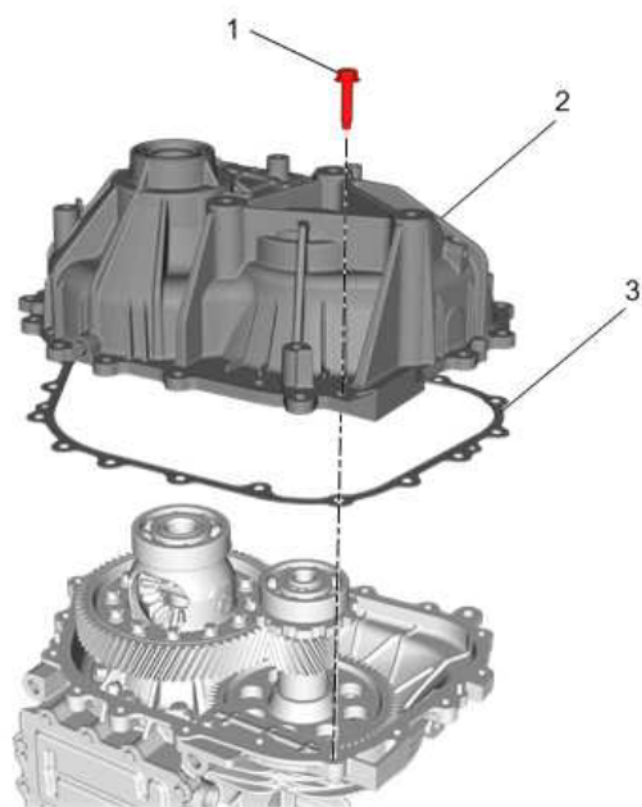


**Fig. 83: Output Shaft**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                                                                                                                              |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Output Shaft (LHS)<br><br><b>NOTE:</b><br><b>The output shaft is retained by an internal retaining ring.</b><br><br><b>Special Tools</b> <ul style="list-style-type: none"> <li>• <b>DT-6125-1B</b> Slide Hammer</li> <li>• <b>DT-23907</b> Bearing Adapter</li> </ul><br>Equivalent regional tools: <b>Special Tools</b> . |

| Callout | Component Name                                                                                                                                                                                                                                                                                         |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2       | Output Shaft Retaining Ring<br><br><b>NOTE:</b><br><b>DISCARD the output shaft retaining ring.</b>                                                                                                                                                                                                     |
| 3       | Output Shaft (RHS)<br><br><b>NOTE:</b><br><b>The output shaft is retained by an internal retaining ring.</b><br><br>Special Tools <ul style="list-style-type: none"> <li>• DT-6125-1B Slide Hammer</li> <li>• DT-23907 Bearing Adapter</li> </ul><br>Equivalent regional tools: <b>Special Tools</b> . |
| 4       | Output Shaft Retaining Ring<br><br><b>NOTE:</b><br><b>DISCARD the output shaft retaining ring.</b>                                                                                                                                                                                                     |

**AUTOMATIC TRANSMISSION CASE REMOVAL**



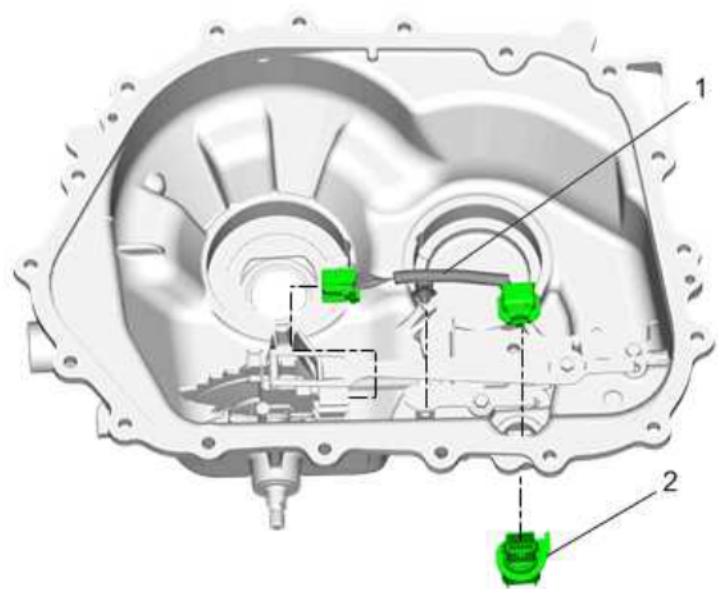
**Fig. 84: Automatic Transmission Case**  
Courtesy of GENERAL MOTORS COMPANY

| Callout                 | Component Name                             |
|-------------------------|--------------------------------------------|
| 1                       | Automatic Transmission Case Bolt (Qty: 18) |
| 2                       | Automatic Transmission Case                |
| <div>cardiagn.com</div> |                                            |



| Callout | Component Name                                                                                                   |
|---------|------------------------------------------------------------------------------------------------------------------|
| 3       | Automatic Transmission Case Gasket<br><br><b>NOTE:</b><br><b>DISCARD</b> the automatic transmission case gasket. |

### AUTOMATIC TRANSMISSION CONTROL WIRING HARNESS REMOVAL - TRANSMISSION CASE

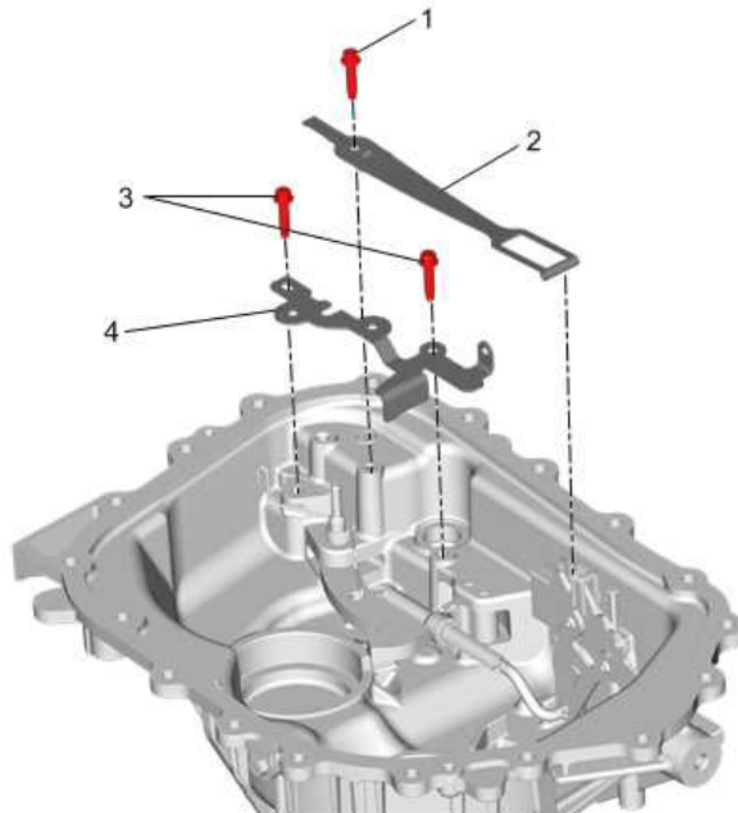


**Fig. 85: Automatic Transmission Control Wiring Harness - Transmission Case**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                     |
|---------|--------------------------------------------------------------------------------------------------------------------|
| 1       | Automatic Transmission Control Wiring Harness                                                                      |
| 2       | Wiring Harness Electrical Connector<br><br><b>NOTE:</b><br><b>DISCARD</b> the wiring harness electrical connector. |

### PARK PAWL AND MANUAL SHIFT SHAFT REMOVAL

#### Manual Shift Detent Lever Spring and Bracket Removal



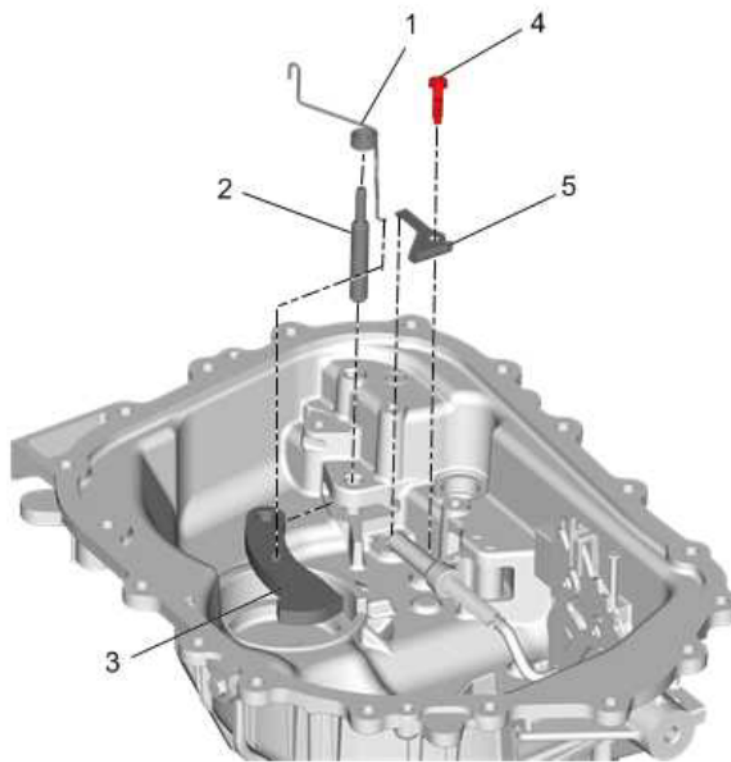
**Fig. 86: Manual Shift Detent Lever Spring and Bracket**

Courtesy of GENERAL MOTORS COMPANY

#### Manual Shift Detent Lever Spring and Bracket Removal

| Callout | Component Name                                                                                                        |
|---------|-----------------------------------------------------------------------------------------------------------------------|
| 1       | Manual Shift Detent Lever Spring Bolt<br><br><b>NOTE:</b><br><b>DISCARD the manual shift detent lever spring bolt</b> |
| 2       | Manual Shift Detent Lever Spring                                                                                      |
| 3       | Park Pawl Actuator Bracket Bolt (Qty: 2)                                                                              |
| 4       | Park Pawl Actuator Bracket                                                                                            |

#### Park Pawl, Shaft and Bracket Removal

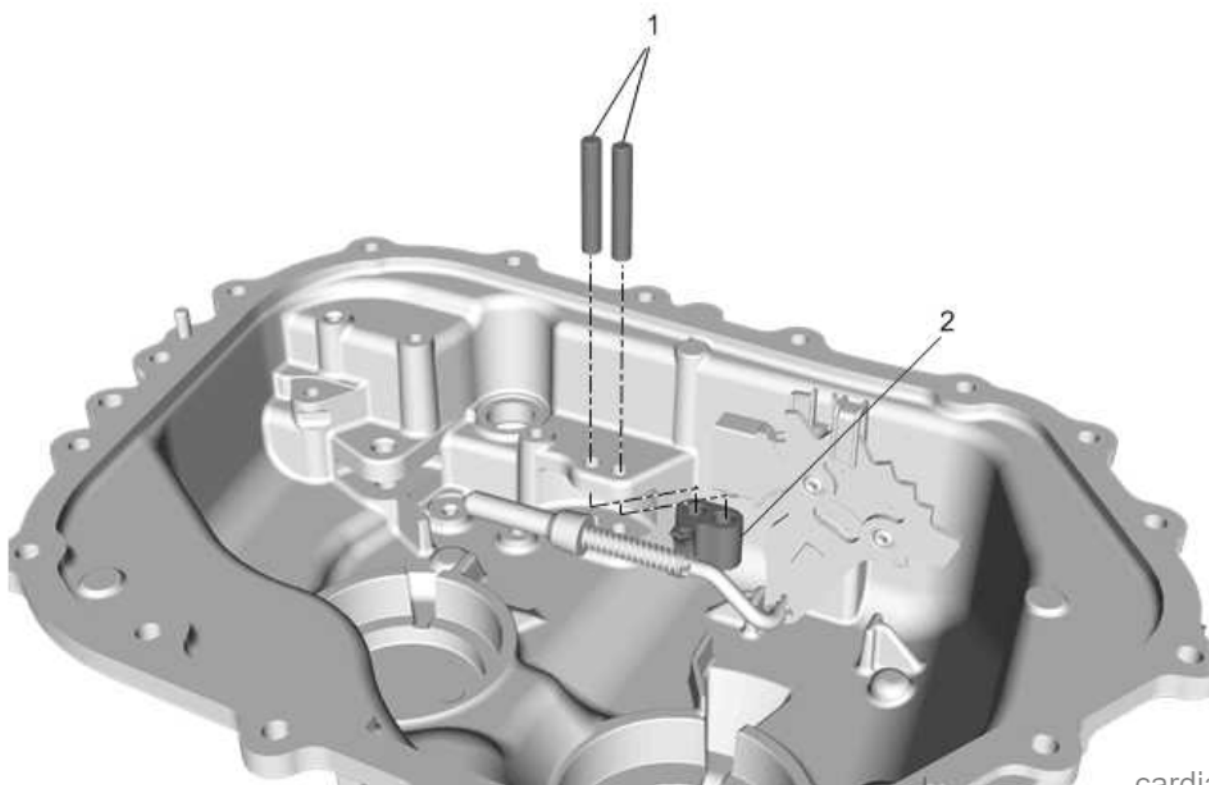


**Fig. 87: Park Pawl, Shaft and Bracket**  
 Courtesy of GENERAL MOTORS COMPANY

#### **Park Pawl, Shaft and Bracket Removal**

| Callout | Component Name                  |
|---------|---------------------------------|
| 1       | Park Pawl Spring                |
| 2       | Park Pawl Shaft                 |
| 3       | Park Pawl                       |
| 4       | Park Pawl Actuator Bracket Bolt |
| 5       | Park Pawl Actuator Bracket      |

#### **Park Pawl Actuator Guide Removal**

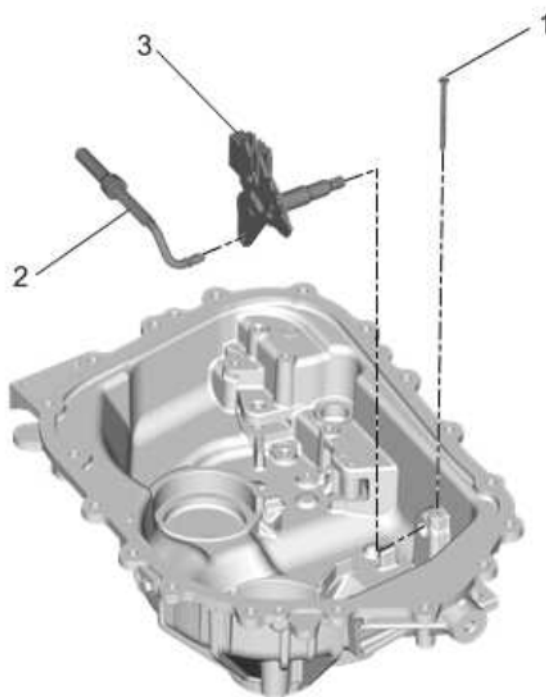


**Fig. 88: Park Pawl Actuator Guide**  
Courtesy of GENERAL MOTORS COMPANY

**Park Pawl Actuator Guide Removal**

| Callout | Component Name                        |
|---------|---------------------------------------|
| 1       | Park Pawl Actuator Guide Pin (Qty: 2) |
| 2       | Park Pawl Actuator Guide              |

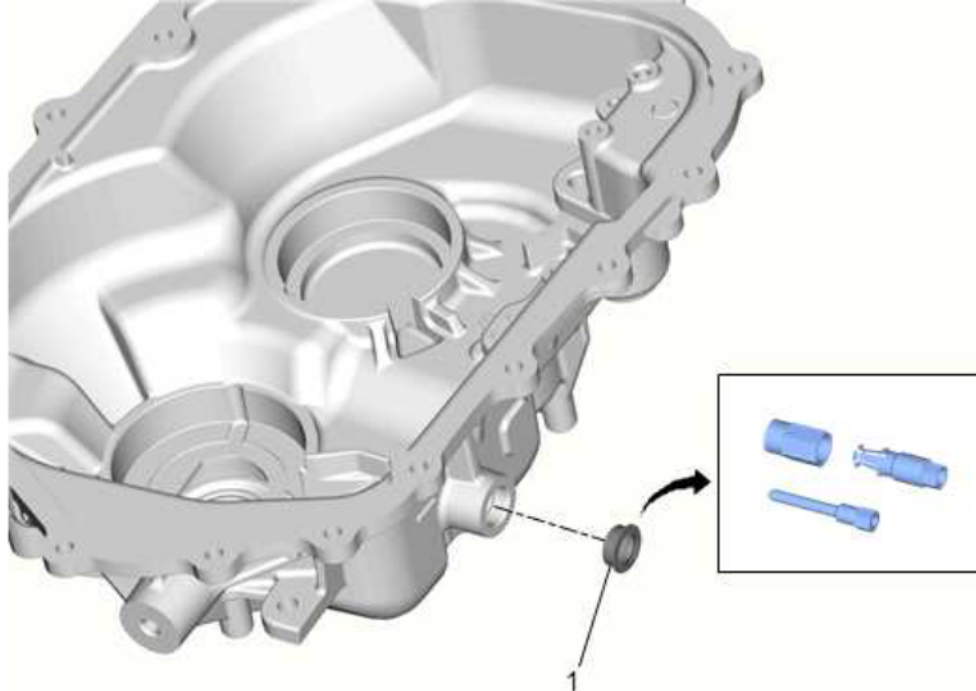
**MANUAL SHIFT SHAFT POSITION SWITCH REMOVAL**



**Fig. 89: Manual Shift Shaft Position Switch**  
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                       |
|---------|--------------------------------------------------------------------------------------|
| 1       | Manual Shift Shaft Pin<br><b>NOTE:</b><br><b>DISCARD the manual shift shaft pin.</b> |
| 2       | Park Pawl Actuator                                                                   |
| 3       | Manual Shift Shaft Position Switch                                                   |

**MANUAL SHIFT SHAFT SEAL REMOVAL**



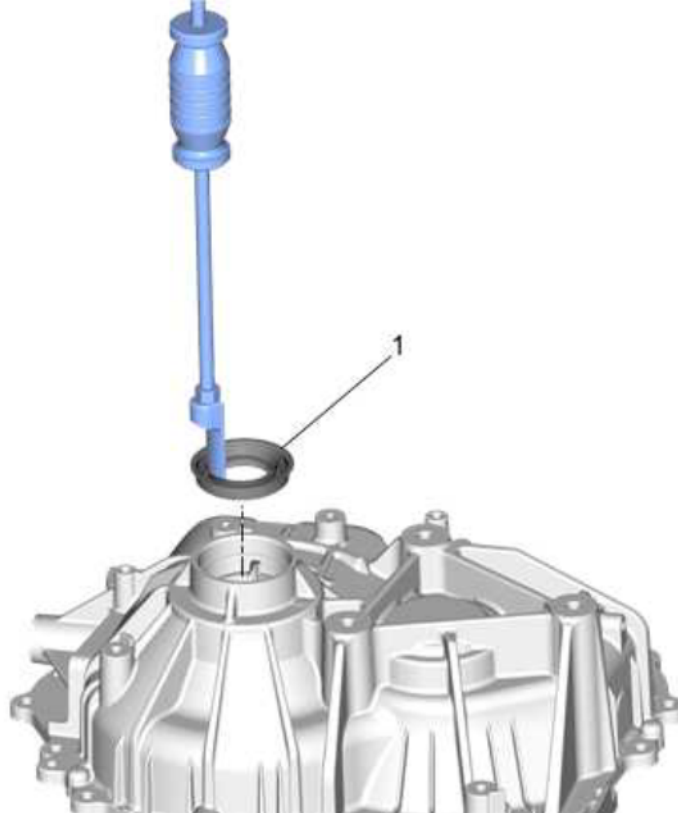
**Fig. 90: Manual Shift Shaft Seal**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                                                                                     |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>Manual Shift Shaft Seal</p> <p><b>NOTE:</b><br/><b>DISCARD</b> the manual shift shaft seal.</p> <p><b>Special Tools</b></p> <ul style="list-style-type: none"> <li>• <b>DT-45201</b> Shift Shaft Seal Remover</li> </ul> <p>Equivalent regional tools: <b>Special Tools</b></p> |

## FRONT WHEEL DRIVE SHAFT OIL SEAL REMOVAL - RIGHT SIDE



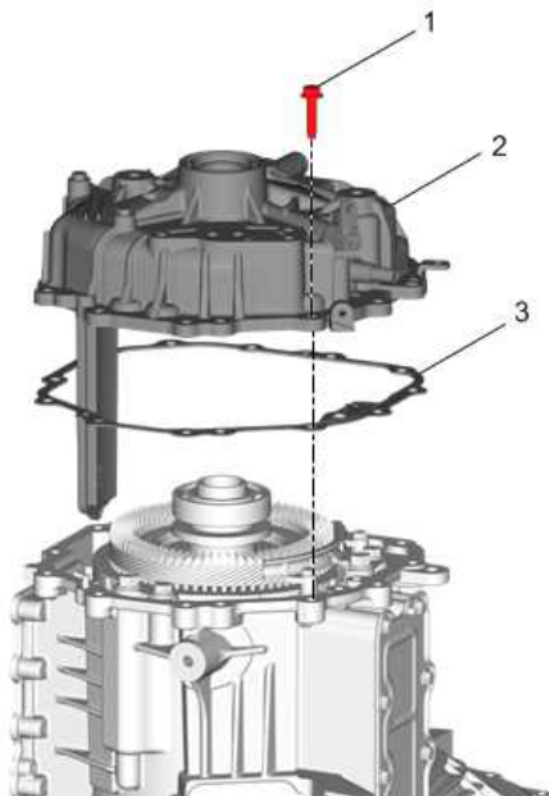


**Fig. 91: Front Wheel Drive Shaft Oil Seal - Right Side**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>Front Wheel Drive Shaft Oil Seal (RHS)</p> <p><b>NOTE:</b><br/><b>DISCARD</b> the front wheel drive shaft oil seal.</p> <p><b>Special Tools</b></p> <ul style="list-style-type: none"> <li>• DT-23129 Universal Seal Remover</li> <li>• DT-6125-1B Slide Hammer</li> </ul> <p>Equivalent regional tools: <a href="#">Special Tools</a></p> |

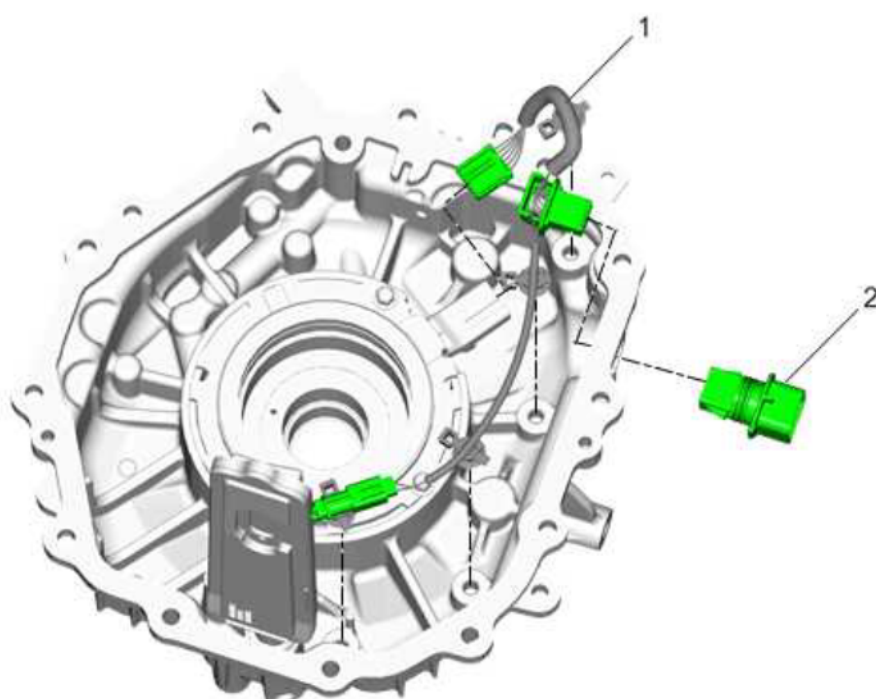
## **AUTOMATIC TRANSMISSION CASE COVER REMOVAL**



**Fig. 92: Automatic Transmission Case Cover**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                               |
|---------|------------------------------------------------------------------------------------------------------------------------------|
| 1       | Automatic Transmission Case Cover Bolt (Qty: 13)                                                                             |
| 2       | Automatic Transmission Case Cover                                                                                            |
| 3       | Automatic Transmission Case Cover Gasket<br><br><b>NOTE:</b><br><b>DISCARD</b> the automatic transmission case cover gasket. |

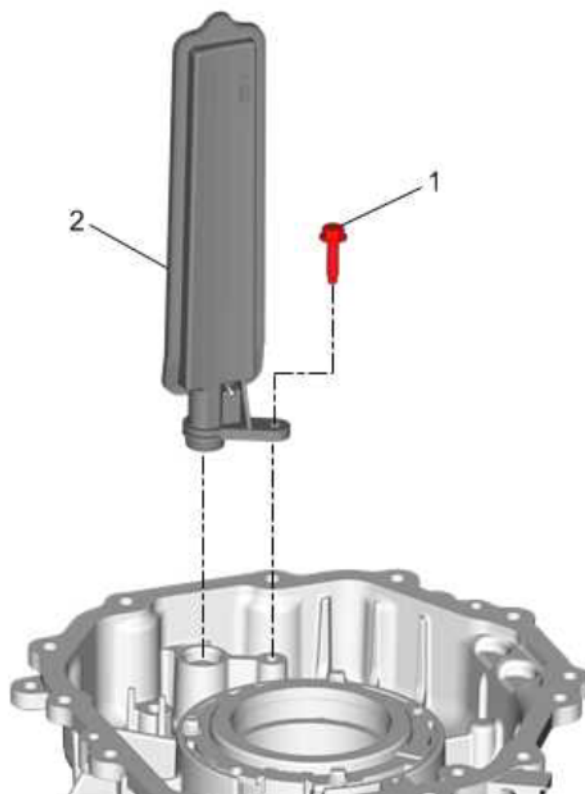
### **AUTOMATIC TRANSMISSION CONTROL WIRING HARNESS REMOVAL - TRANSMISSION CASE COVER**



**Fig. 93: Automatic Transmission Control Wiring Harness - Transmission Case Cover**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                     |
|---------|--------------------------------------------------------------------------------------------------------------------|
| 1       | Automatic Transmission Control Wiring Harness                                                                      |
| 2       | Wiring Harness Electrical Connector<br><br><b>NOTE:</b><br><b>DISCARD the wiring harness electrical connector.</b> |

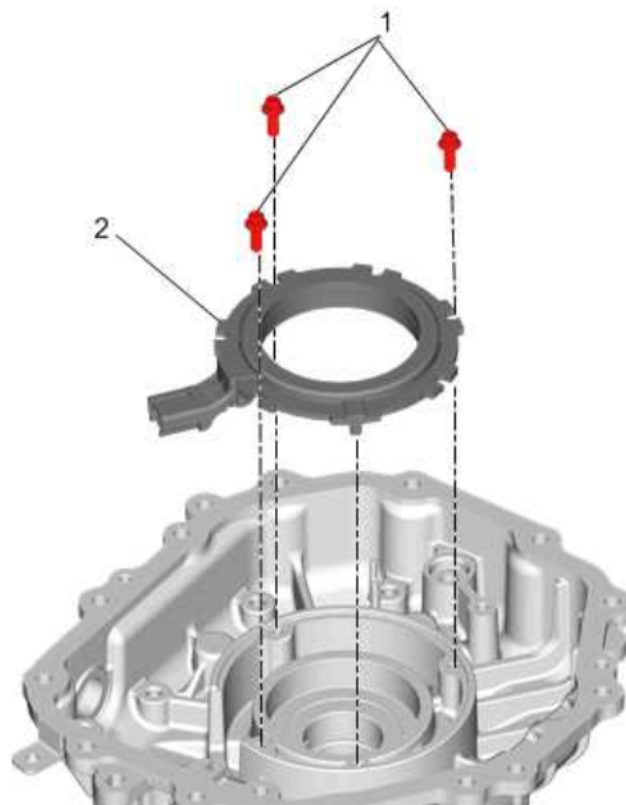
## **AUTOMATIC TRANSMISSION FLUID FILTER REMOVAL**



**Fig. 94: Automatic Transmission Fluid Filter**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                     |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Automatic Transmission Fluid Filter Bolt                                                                                                           |
| 2       | Automatic Transmission Fluid Filter<br><br><b>NOTE:</b><br><b>Discard the fluid filter. The fluid filter O-ring is not serviceable separately.</b> |

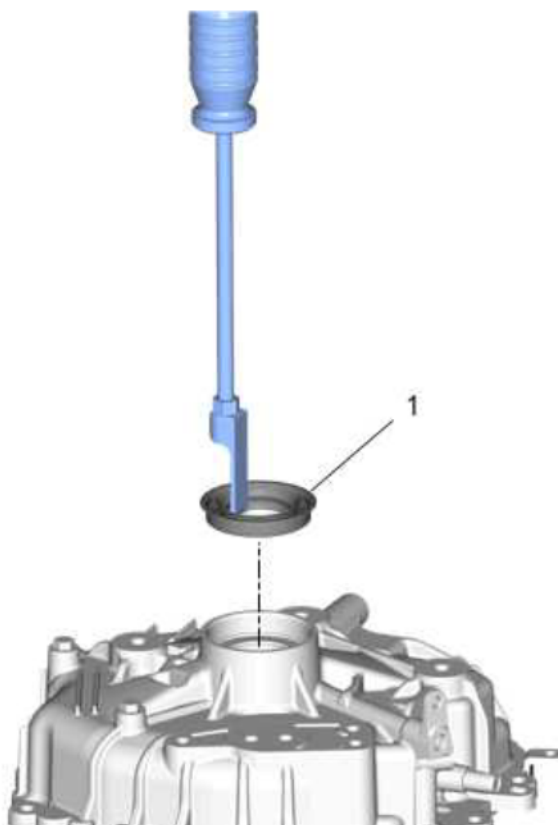
## **DRIVE MOTOR POSITION SENSOR STATOR REMOVAL**



**Fig. 95: Drive Motor Position Sensor Stator**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                       |
|---------|--------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Drive Motor Position Sensor Stator Bolt (Qty: 3)<br><br><b>NOTE:</b><br><b>DISCARD the drive motor position sensor stator bolts.</b> |
| 2       | Drive Motor Position Sensor Stator                                                                                                   |

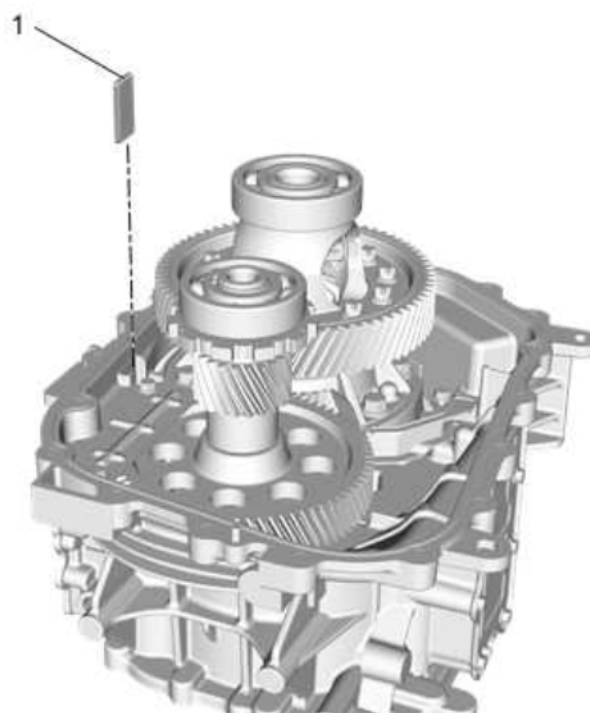
## FRONT WHEEL DRIVE SHAFT OIL SEAL REMOVAL - LEFT SIDE



**Fig. 96: Front Wheel Drive Shaft Oil Seal - Left Side**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                                                                                                                        |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Front Wheel Drive Shaft Oil Seal (LHS)<br><br><b>NOTE:</b><br><b>DISCARD the front wheel drive shaft oil seal.</b><br><br><b>Special Tools</b> <ul style="list-style-type: none"> <li>• DT-23129 Universal Seal Remover</li> <li>• DT-6125-1B Slide Hammer</li> </ul> Equivalent regional tools: <b>Special Tools</b> |

## **AUTOMATIC TRANSMISSION FLUID PAN MAGNET REMOVAL**

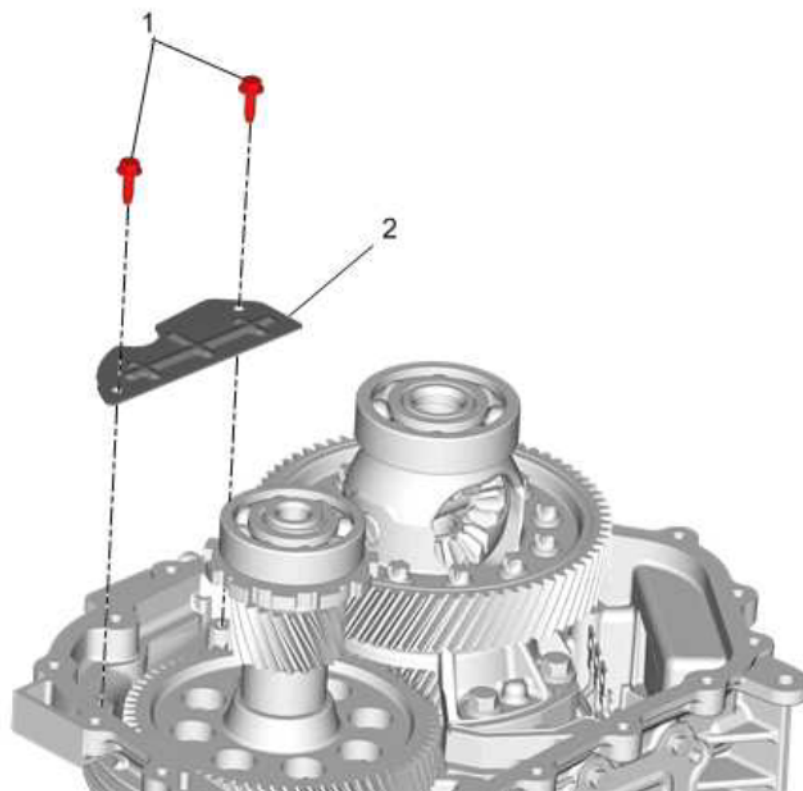


**Fig. 97: Automatic Transmission Fluid Pan Magnet**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                          |
|---------|-----------------------------------------|
| 1       | Automatic Transmission Fluid Pan Magnet |

## **OIL PAN BAFFLE REMOVAL**



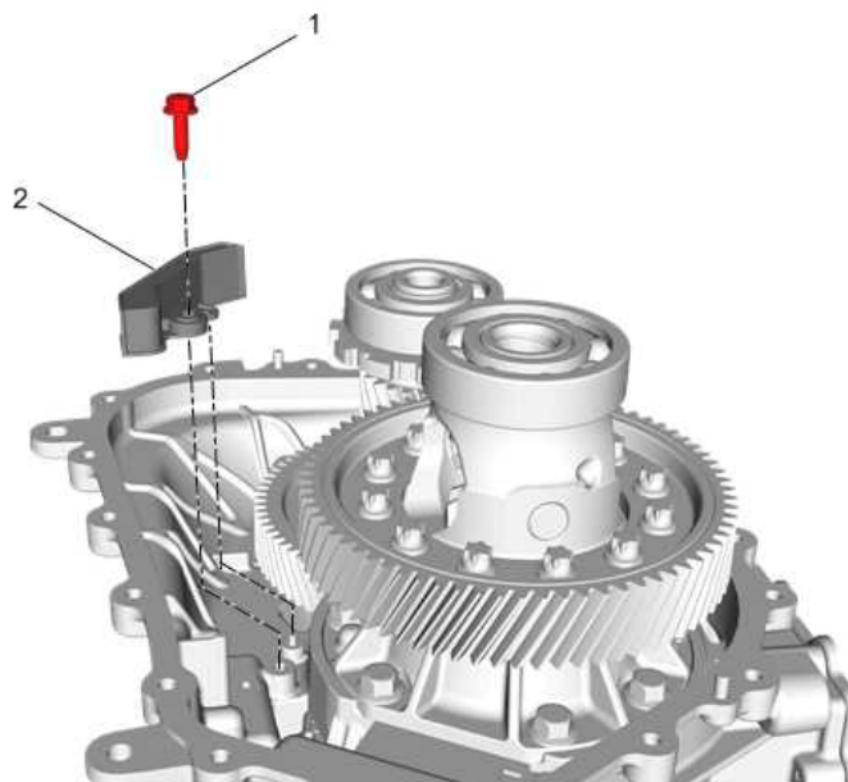


**Fig. 98: Oil Pan Baffle**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name               |
|---------|------------------------------|
| 1       | Oil Pan Baffle Bolt (Qty: 2) |
| 2       | Oil Pan Baffle               |

## MANUAL TRANSMISSION OIL TROUGH REMOVAL



**Fig. 99: Manual Transmission Oil Trough**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                      |
|---------|-------------------------------------|
| 1       | Manual Transmission Oil Trough Bolt |

| Callout | Component Name                 |
|---------|--------------------------------|
| 2       | Manual Transmission Oil Trough |

DRIVE MOTOR POWER INVERTER MODULE CABLE TERMINAL INSULATOR BLOCK REMOVAL

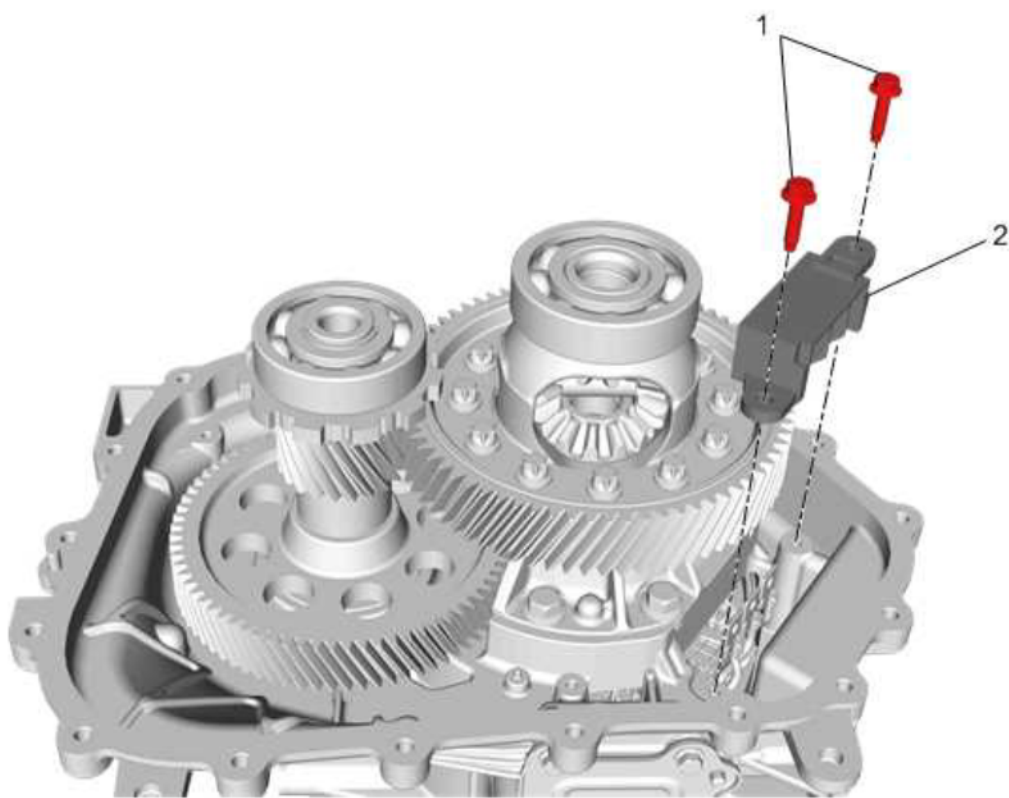
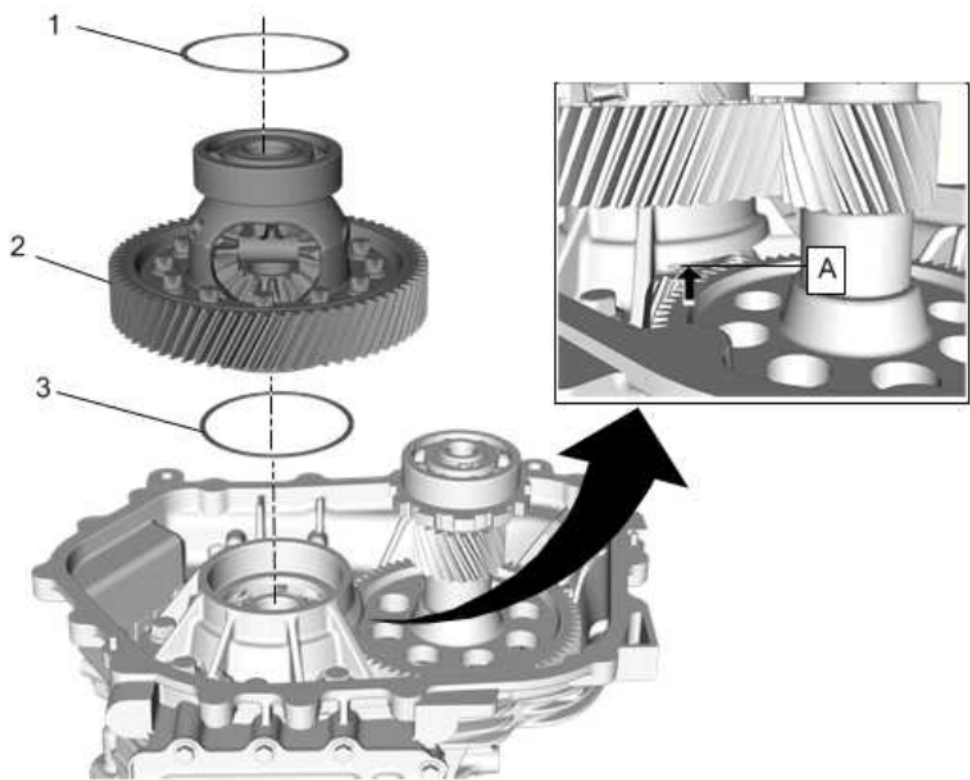


Fig. 100: Drive Motor Power Inverter Module Cable Terminal Insulator Block  
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                 |
|---------|--------------------------------------------------------------------------------|
| 1       | Drive Motor Power Inverter Module Cable Terminal Insulator Block Bolt (Qty: 2) |
| 2       | Drive Motor Power Inverter Module Cable Terminal Insulator Block               |

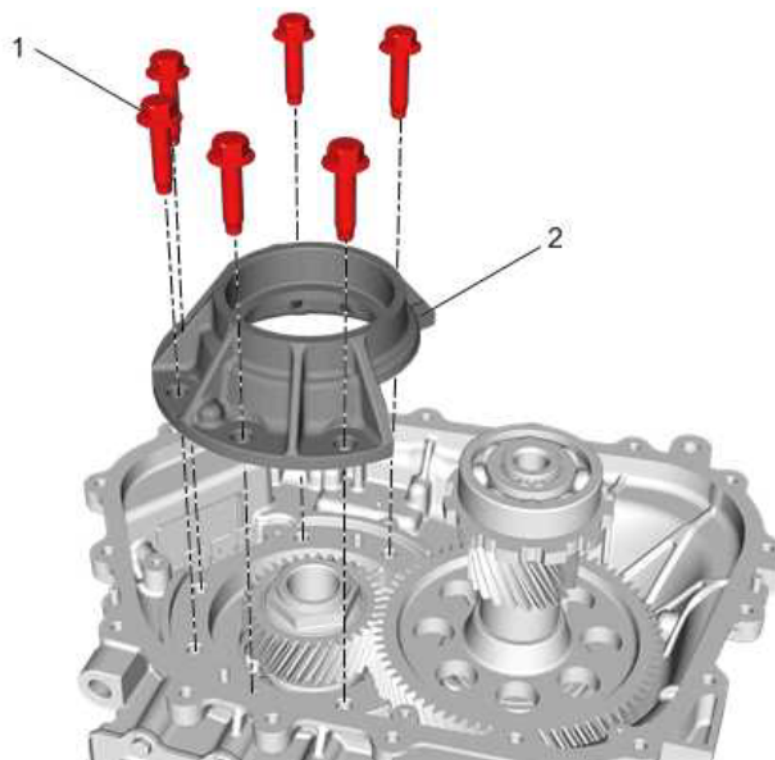
FRONT DIFFERENTIAL ASSEMBLY REMOVAL



**Fig. 101: Front Differential Assembly**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                          |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Front Differential Bearing Shim (RHS)<br><br><b>NOTE:</b><br><b>DISCARD the shim.</b>                                                                   |
| 2       | Front Differential<br><br><b>NOTE:</b><br><b>Raise the main shaft assembly until the A position in order to remove the front differential assembly.</b> |
| 3       | Front Differential Bearing Shim (LHS)<br><br><b>NOTE:</b><br><b>DISCARD the shim.</b>                                                                   |

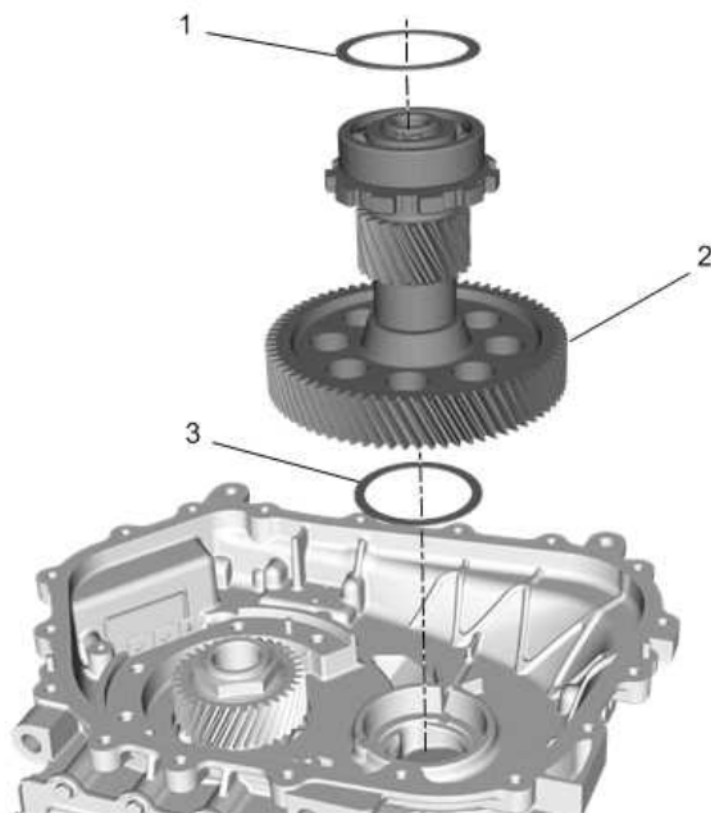
### CENTER SUPPORT REMOVAL



**Fig. 102: Center Support**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                               |
|---------|----------------------------------------------------------------------------------------------|
| 1       | Center Support Bolt (Qty: 6)<br><br><b>NOTE:</b><br><b>DISCARD the center support bolts.</b> |
| 2       | Center Support                                                                               |

### MAIN SHAFT ASSEMBLY REMOVAL

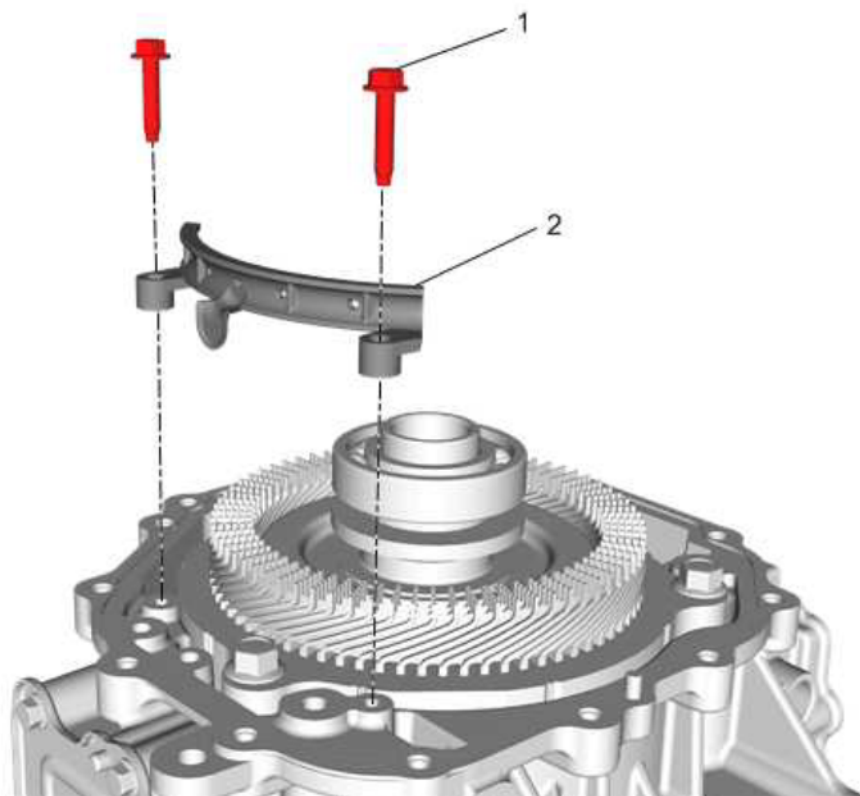


**Fig. 103: Main Shaft Assembly**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                |
|---------|-------------------------------------------------------------------------------|
| 1       | Main Shaft Bearing Shim (RHS)<br><br><b>NOTE:</b><br><b>DISCARD the shim.</b> |
| 2       | Main Shaft                                                                    |
| 3       | Main Shaft Bearing Shim (LHS)<br><br><b>NOTE:</b><br><b>DISCARD the shim.</b> |

## **DRIVE MOTOR STATOR COOLANT DISTRIBUTOR CHANNEL REMOVAL**

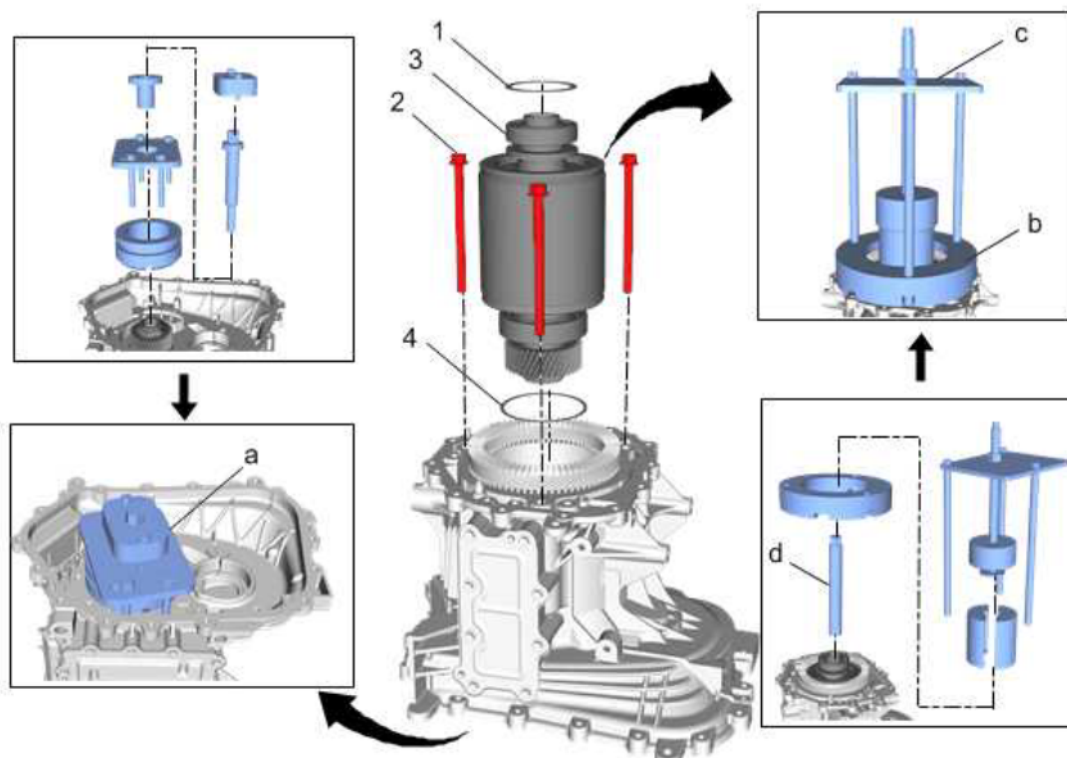


**Fig. 104: Drive Motor Stator Coolant Distributor Channel**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                               |
|---------|--------------------------------------------------------------|
| 1       | Drive Motor Stator Cooling Distributor Channel Bolt (Qty: 2) |
| 2       | Drive Motor Stator Cooling Distributor Channel               |

## DRIVE MOTOR ROTOR REMOVAL



**Fig. 105: Drive Motor Rotor**

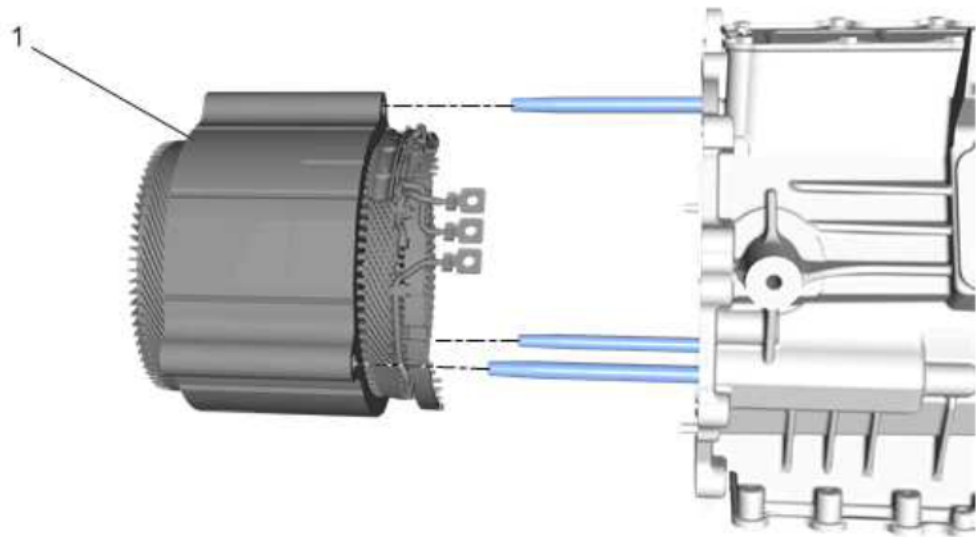
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name |
|---------|----------------|
|         |                |



| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>Drive Motor Rotor Bearing Shim (LHS)</p> <p><b>NOTE:</b><br/>Remove the shim to transmission case cover if there is no shim on drive motor rotor bearing.</p> <p><b>NOTE:</b><br/>DISCARD the shim.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 2       | <p>Drive Motor Stator Bolt (Qty: 3)</p> <p><b>NOTE:</b><br/>DISCARD the drive motor stator bolts.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 3       | <p>Drive Motor Rotor</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Install the <i>DT-52011</i> - 1 rotor fixing (a), <i>DT-52011</i> - 3 hair pin cover (b) and <i>DT-52011</i> - 2 rotor remover/installer (c).</li> <li>2. Remove the drive motor rotor by turning the nut on the <i>DT-52011</i> - 2 rotor remover/installer (c) clockwise.</li> </ol> <p><b>NOTE:</b><br/>The drive motor rotor is strongly magnetic. DO NOT place within 6 inches of ferrous metallic components.</p> <p><b>NOTE:</b><br/>Place the drive motor rotor on a lint free cloth to prevent metallic debris from adhering to the outer diameter. Metallic debris can be removed from the motor outer diameter by blotting with adhesive tape.</p> <p><b>Special Tools</b><br/> <b>DT-52011</b> Rotor Remover/Installer Kit<br/>           Equivalent regional tools: <b>Special Tools</b></p> |
| 4       | <p>Drive Motor Rotor Bearing Shim (RHS)</p> <p><b>NOTE:</b><br/>DISCARD the shim.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## DRIVE MOTOR STATOR REMOVAL

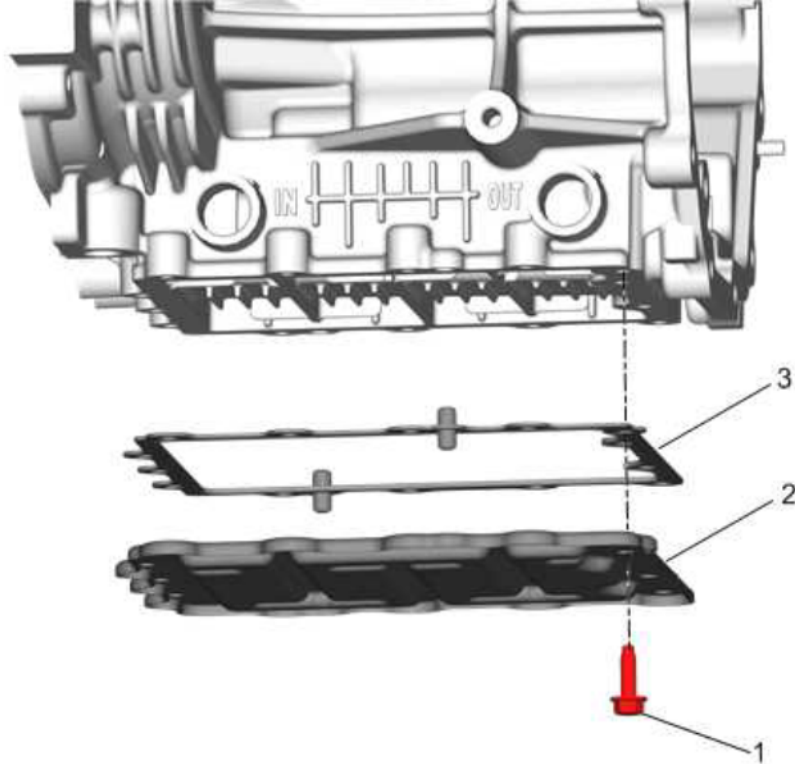


**Fig. 106: Drive Motor Stator**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>Drive Motor Stator</p> <p><b>CAUTION:</b><br/>DO NOT contact or rest the drive motor stator on the copper end coils. Damage to the copper end coils may cause a high voltage short during vehicle operation, resulting in component damage.</p> <p><b>NOTE:</b><br/>Place the drive motor stator on a lint free cloth over a piece of cardboard.</p> <p><b>Special Tools</b><br/>DT-52012 Stator Remover/Installer<br/>Equivalent regional tools: <b>Special Tools</b></p> |

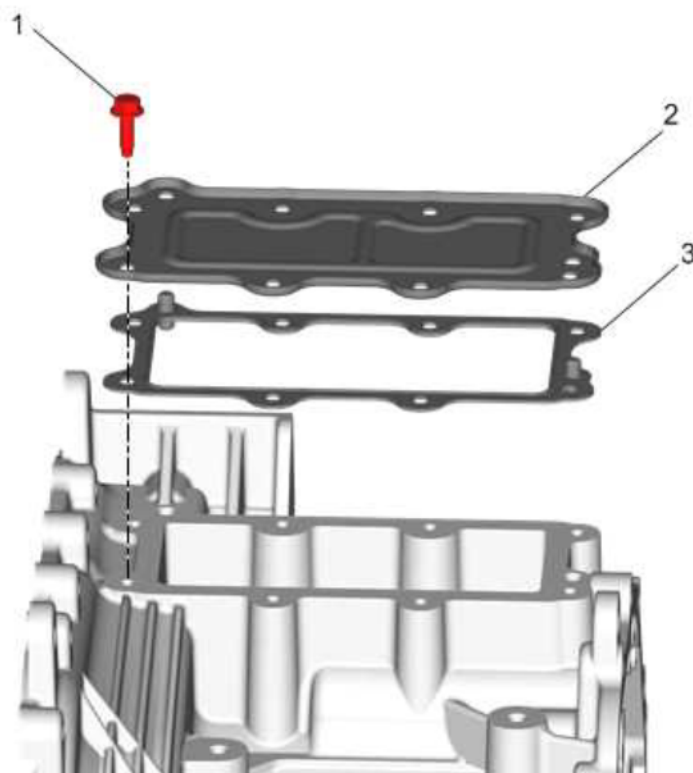
## SHIFT SHAFT COVER REMOVAL - COOLANT SUMP



**Fig. 107: Shift Shaft Cover - Coolant Sump**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                             |
|---------|----------------------------------------------------------------------------|
| 1       | Shift Shaft Cover Bolt (Qty: 14)                                           |
| 2       | Shift Shaft Cover                                                          |
| 3       | Shift Shaft Cover Gasket<br><br><b>NOTE:</b><br><b>DISCARD the gasket.</b> |

### SHIFT SHAFT COVER REMOVAL - OIL SUMP



**Fig. 108: Shift Shaft Cover - Oil Sump**  
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                             |
|---------|----------------------------------------------------------------------------|
| 1       | Shift Shaft Cover Bolt (Qty: 8)                                            |
| 2       | Shift Shaft Cover                                                          |
| 3       | Shift Shaft Cover Gasket<br><br><b>NOTE:</b><br><b>DISCARD the gasket.</b> |

## SHIMMING PROCEDURES

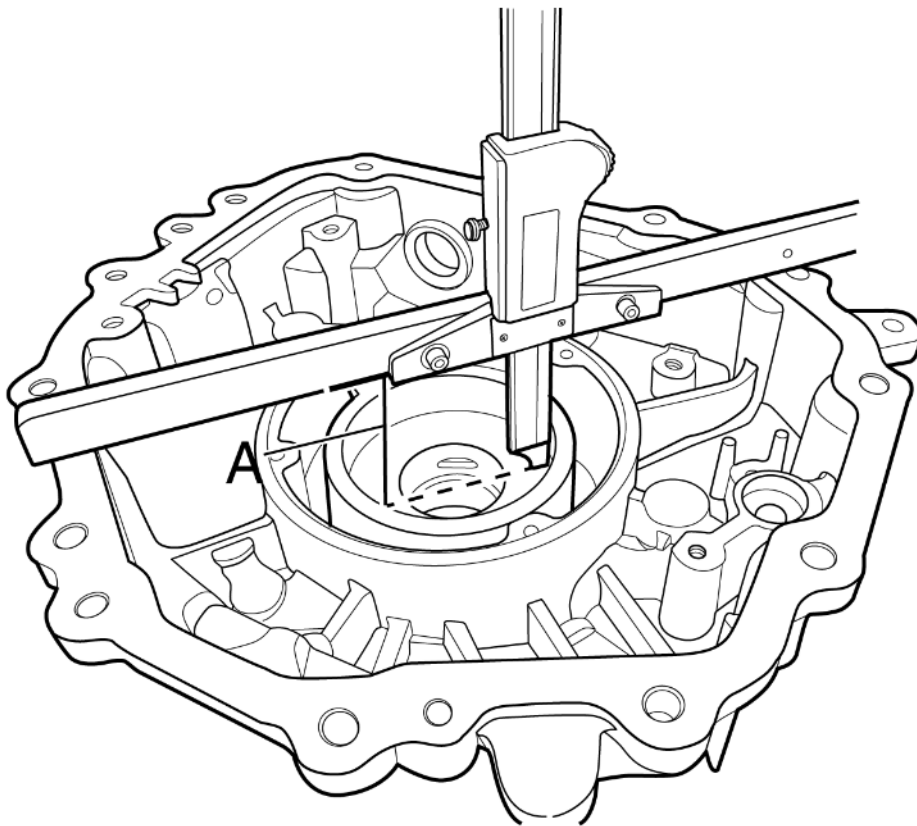
### Special Tools

**DT-48008** Pinion Bearing Installer

Equivalent regional tools: [Special Tools](#)

### Shimming Procedures

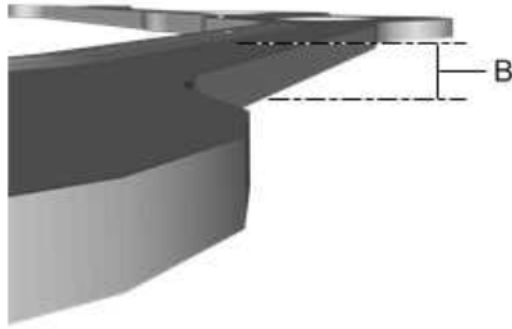
**NOTE:** The correct shim has to be selected using the following procedure.



**Fig. 109: Measuring Distance Between Transmission Case Cover Gasket Face And Drive Motor Rotor Bearing Pocket**

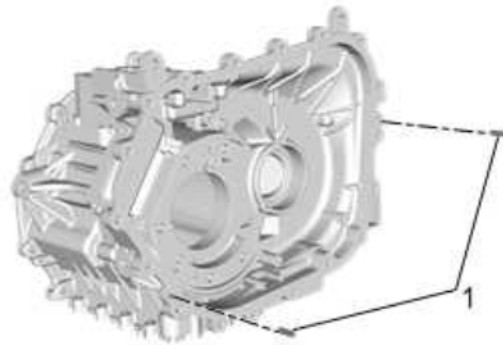
Courtesy of GENERAL MOTORS COMPANY

1. Clean the transmission case cover from debris, oil and grease.
2. Measure the distance between the transmission case cover gasket face and the drive motor rotor bearing pocket using the depth gauge (A).
  1. Measure on 3 points and use the average value.



**Fig. 110: Measure Transmission Case Cover Gasket Thickness**  
**Courtesy of GENERAL MOTORS COMPANY**

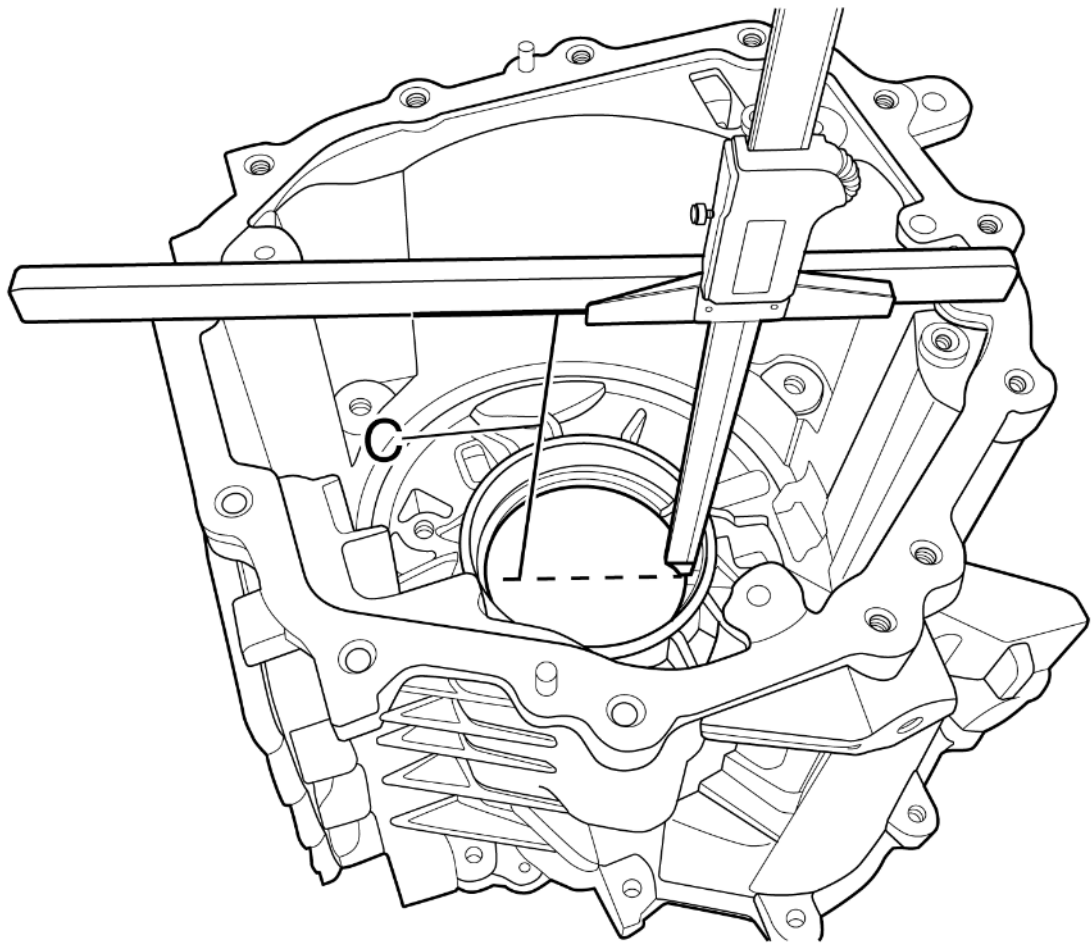
3. Measure the transmission case cover gasket thickness (B).
  1. Measure on 3 points and use the average value.



**Fig. 111: Dowel Pins**  
**Courtesy of GENERAL MOTORS COMPANY**

4. Remove and DISCARD the dowel pins (1) (Qty: 2) from the motor housing using pin punch and hammer.

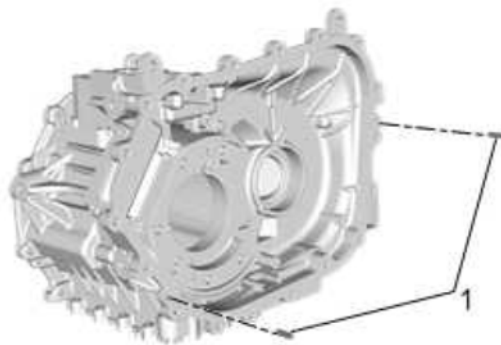




**Fig. 112: Measuring Distance Between Drive Motor Housing Gasket Face And Drive Motor Rotor Bearing Pocket**

Courtesy of GENERAL MOTORS COMPANY

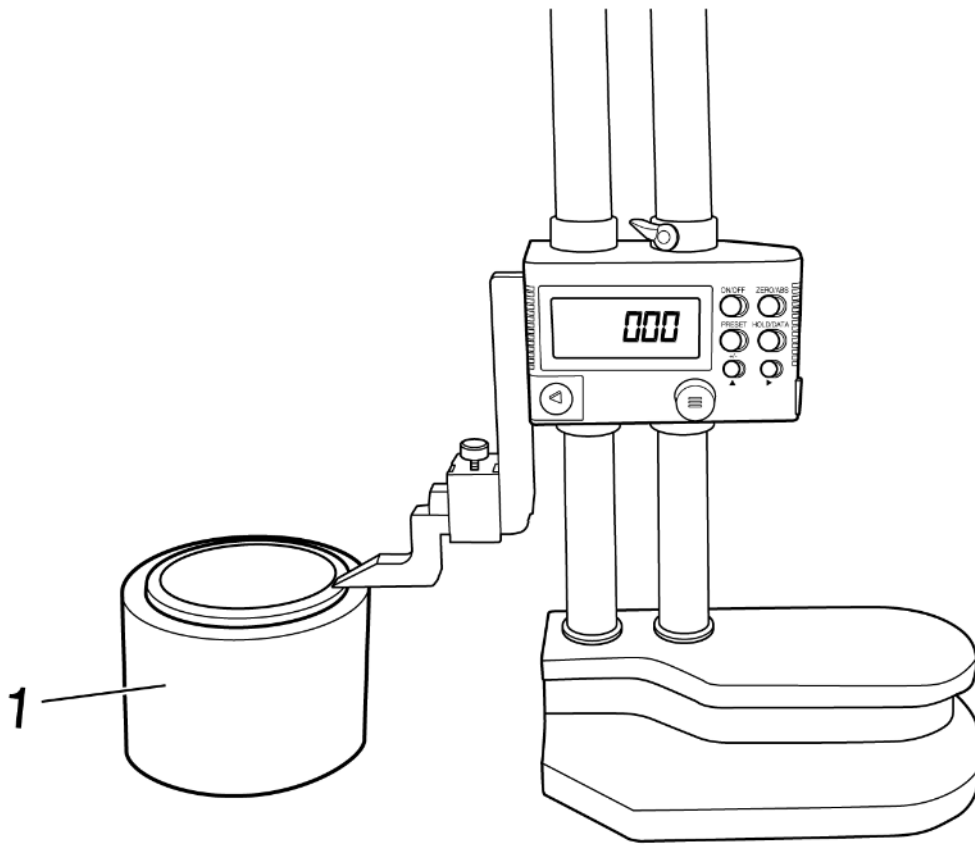
5. Clean the motor housing from debris, oil and grease.
6. Measure the distance between the drive motor housing gasket face and the drive motor rotor bearing pocket using the depth gauge (C).
  1. Measure on 3 points and use the average value.



**Fig. 113: Dowel Pins**

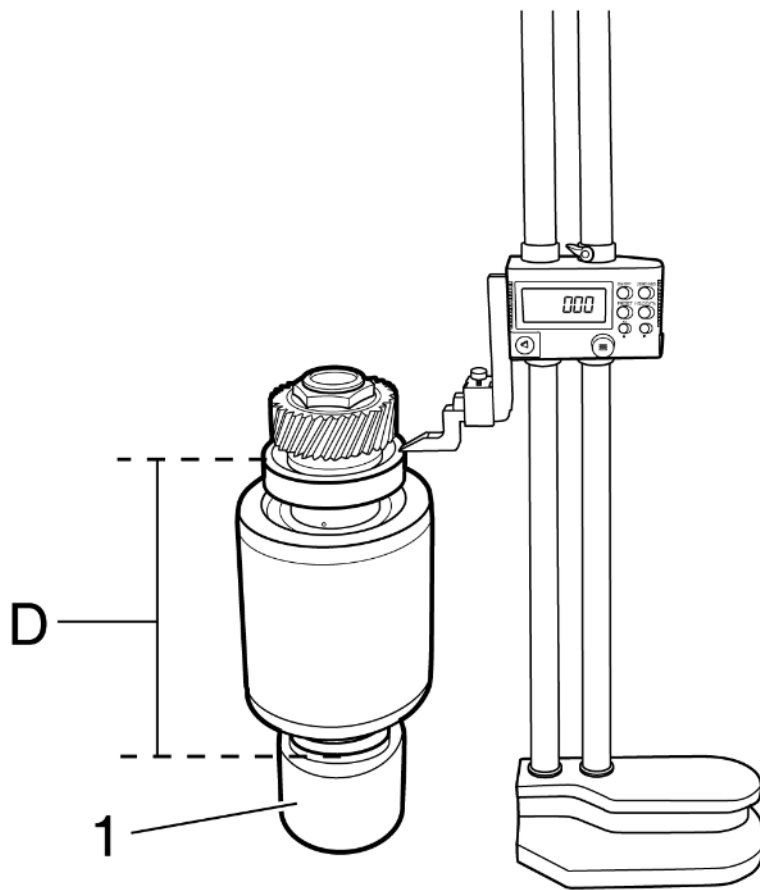
Courtesy of GENERAL MOTORS COMPANY

7. Install 2 NEW dowel pins (1) (Qty: 2) to the motor housing.



**Fig. 114: Adjust Zero Point Setting On Pinion Bearing Installer Using Height Gauge**  
Courtesy of GENERAL MOTORS COMPANY

8. Adjust the zero point setting on the *DT-48008* pinion bearing installer (1) using the height gauge.



**Fig. 115: Measure Distance Between Left Rotor Bearing And Right Rotor Bearing With Drive Motor Rotor Assembly On Pinion Bearing Installer**  
 Courtesy of GENERAL MOTORS COMPANY

9. Place the drive motor rotor assembly on the *DT-48008* pinion bearing installer (1).
10. Measure the distance between the left rotor bearing and the right rotor bearing using the height gauge (D).
  1. Measure on 3 points and use the average value.

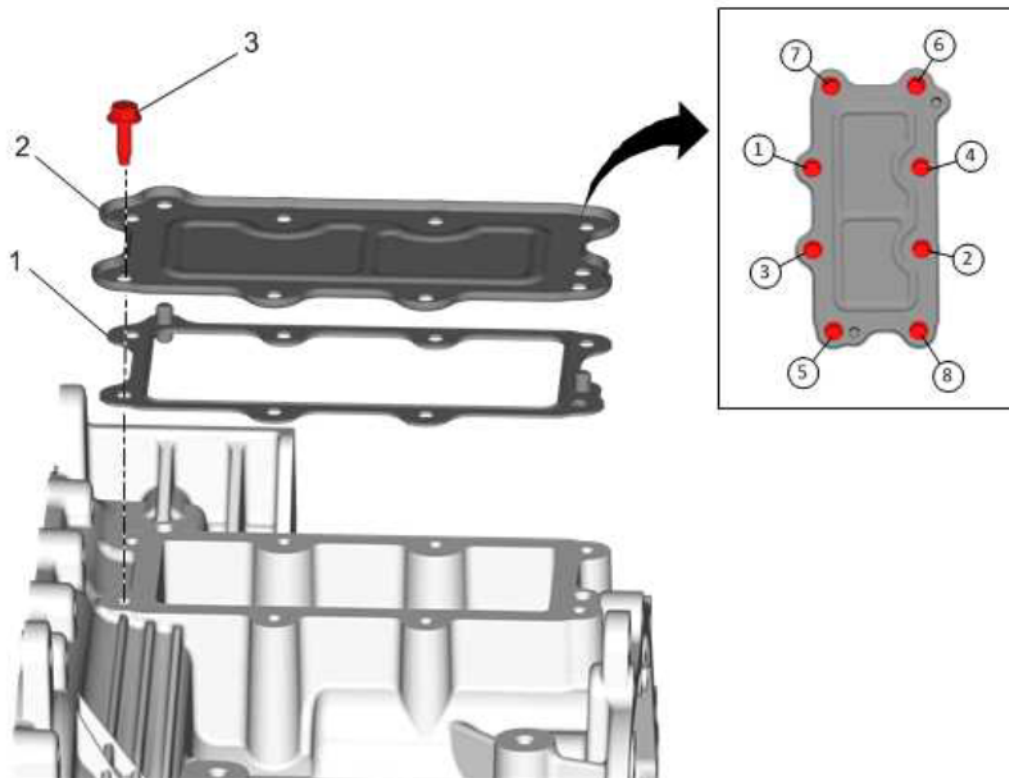


**Fig. 116: Measure Shim Thickness Of Left Rotor Bearing Side**  
 Courtesy of GENERAL MOTORS COMPANY

11. Measure the shim thickness of left rotor bearing side (E).
  1. Measure on 3 points and use the average value.
12. Measured clearance F ;  $F = A + B + C - D - E$

13. Select the 1st gear rotor bearing side shim to meet the measured clearance. Refer to [Shim Size Specifications](#)

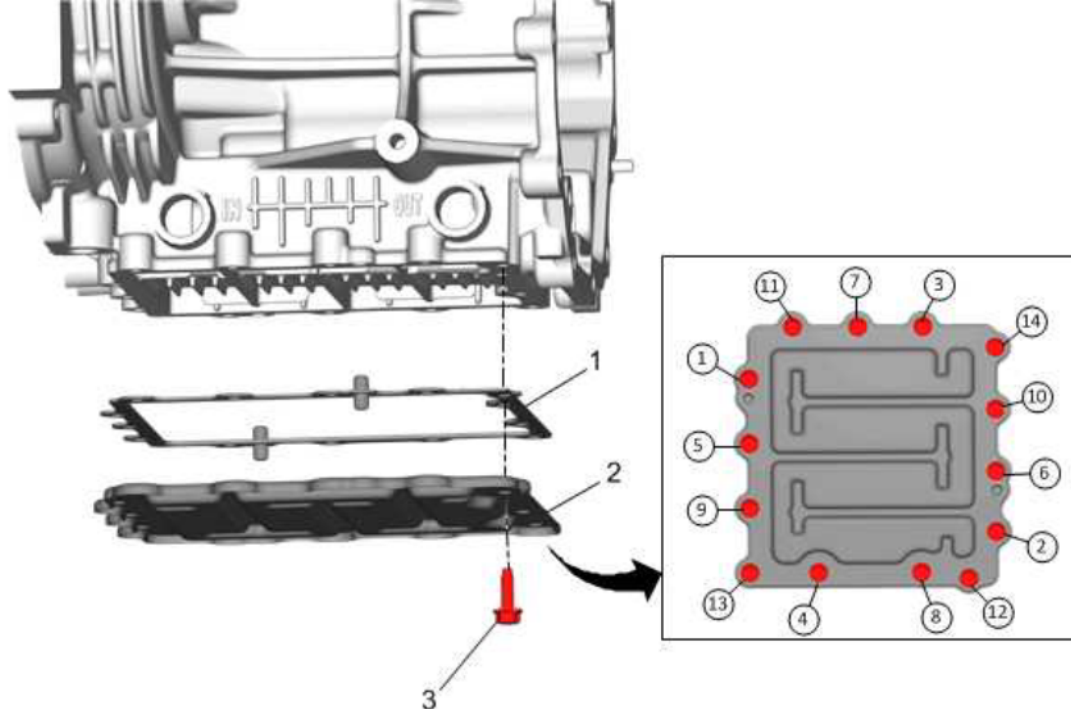
## SHIFT SHAFT COVER INSTALLATION - OIL SUMP



**Fig. 117: Shift Shaft Cover With Bolt Tightening Sequence - Oil Sump**  
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                           |
|---------|------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Shift Shaft Cover Gasket<br><br><b>NOTE:</b><br>Install NEW gasket. It is not reusable.                                                  |
| 2       | Shift Shaft Cover                                                                                                                        |
| 3       | Shift Shaft Cover Bolt (Qty: 8)<br><br><b>CAUTION:</b><br>Refer to <a href="#">Fastener Caution</a> .<br><br>Tighten<br>9 N.m (80 lb in) |

## SHIFT SHAFT COVER INSTALLATION - COOLANT SUMP

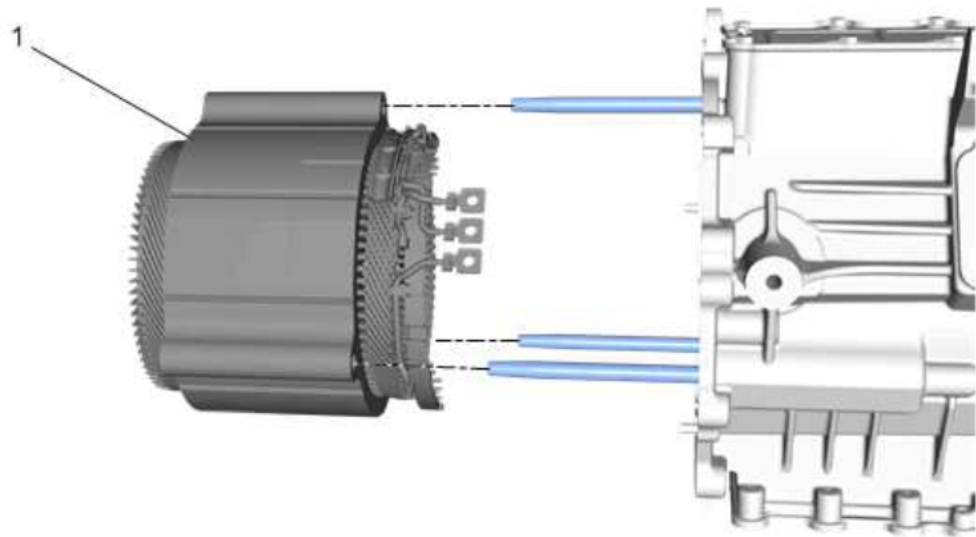


**Fig. 118: Shift Shaft Cover With Bolt Tightening Sequence - Coolant Sump**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                   |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Shift Shaft Cover Gasket<br><br><b>NOTE:</b><br>Install NEW gasket. It is not reusable.                                                          |
| 2       | Shift Shaft Cover                                                                                                                                |
| 3       | Shift Shaft Cover Bolt (Qty: 14)<br><br><b>CAUTION:</b><br>Refer to <a href="#">Fastener Caution</a> .<br><br><b>Tighten</b><br>9 N.m (80 lb in) |

## DRIVE MOTOR STATOR INSTALLATION



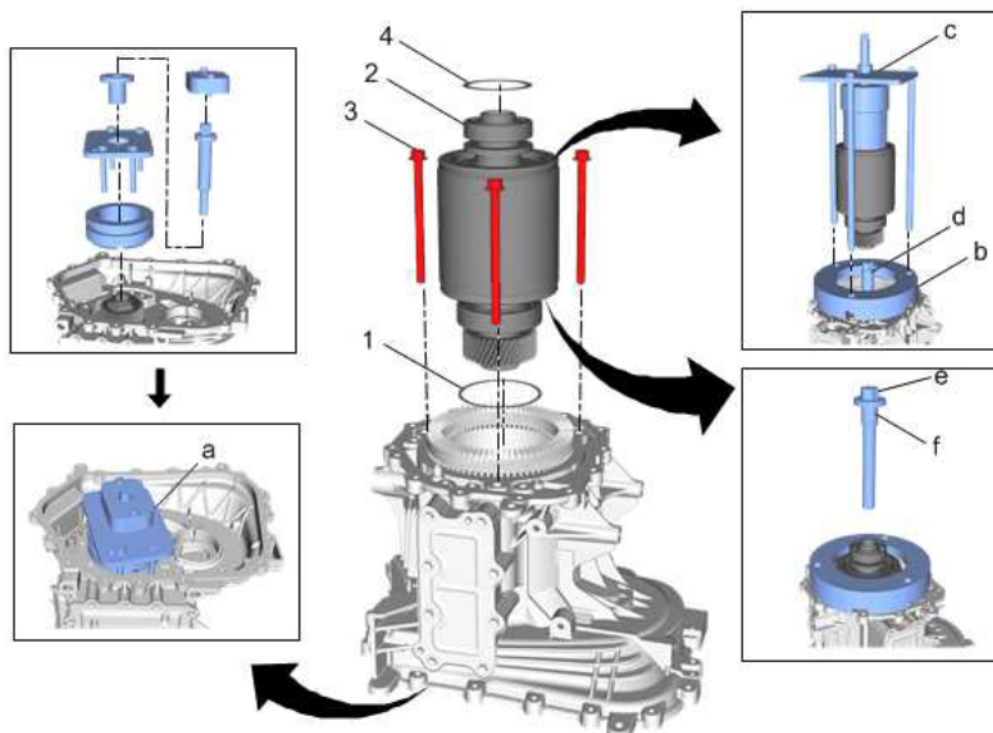


**Fig. 119: Drive Motor Stator**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                           |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>Drive Motor Stator</p> <p><b>CAUTION:</b><br/>DO NOT contact or rest the drive motor stator on the copper end coils. Damage to the copper end coils may cause a high voltage short during vehicle operation, resulting in component damage.</p> <p><b>Special Tools</b><br/>DT-52012 Stator Remover/Installer<br/>Equivalent regional tools: <b>Special Tools</b></p> |

## DRIVE MOTOR ROTOR INSTALLATION



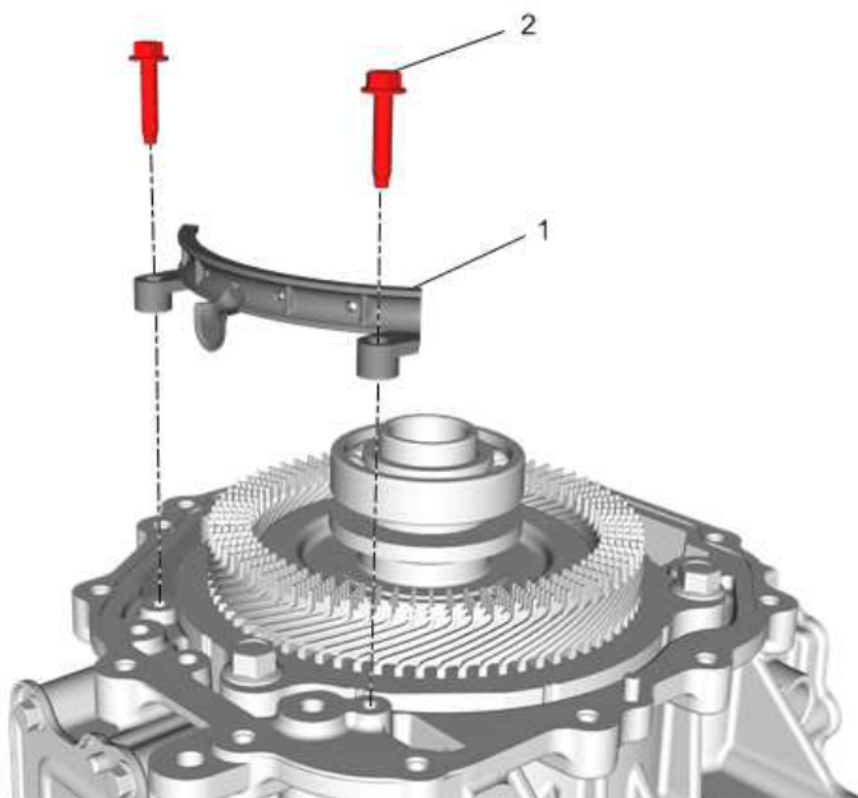
**Fig. 120: Drive Motor Rotor**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>Drive Motor Rotor Bearing Shim (RHS)</p> <p><b>Procedure</b><br/>Measure the drive motor rotor bearing shim before the drive motor stator installation. Refer to <a href="#">Shimming Procedures</a></p> <p><b>NOTE:</b><br/><b>Install NEW shim. It is not reusable.</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 2       | <p>Drive Motor Rotor</p> <p><b>Procedure</b></p> <ol style="list-style-type: none"> <li>1. Install the <i>DT-52011 - 1</i> rotor fixing (a) and <i>DT-52011 - 3</i> hair pin cover (b).</li> <li>2. Apply transmission fluid to the drive motor rotor.</li> <li>3. Install the drive motor rotor by turning the nut on the <i>DT-52011 - 2</i> rotor remover/installer (c) counterclockwise.</li> <li>4. Remove the <i>DT-52011 - 2</i> rotor remover/installer (c) and <i>DT-52011 - 1 - 7</i> remover guide (d) when the drive motor rotor assembly stops moving.</li> <li>5. Install the <i>DT-52011 - 1 - 1</i> installer guide (e) and <i>DT-52011 - 1 - 3</i> adapter (f).</li> <li>6. Install the drive motor rotor by turning the shaft on the <i>DT-52011 - 1 - 1</i> installer guide (e) completely.</li> </ol> <p><b>NOTE:</b><br/><b>The drive motor rotor is strongly magnetic. DO NOT place within 6 inches of ferrous metallic components. Metallic debris can be removed from the motor outer diameter by blotting with adhesive tape.</b></p> <p><b>Special Tools</b><br/><b>DT-52011</b> Rotor Remover/Installer Kit<br/>Equivalent regional tools: <a href="#">Special Tools</a></p> |

| Callout | Component Name                                                                                                                                                                                                |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3       | Drive Motor Stator Bolt (Qty: 3)<br><br><b>CAUTION:</b><br>Refer to <a href="#">Fastener Caution</a> .<br><br><b>NOTE:</b><br>Install NEW drive motor stator bolts<br><br><b>Tighten</b><br>58 N.m (43 lb ft) |
| 4       | Drive Motor Rotor Bearing Shim (LHS)<br><br><b>NOTE:</b><br>Install NEW shim. It is not reusable.                                                                                                             |

## DRIVE MOTOR STATOR COOLANT DISTRIBUTOR CHANNEL INSTALLATION

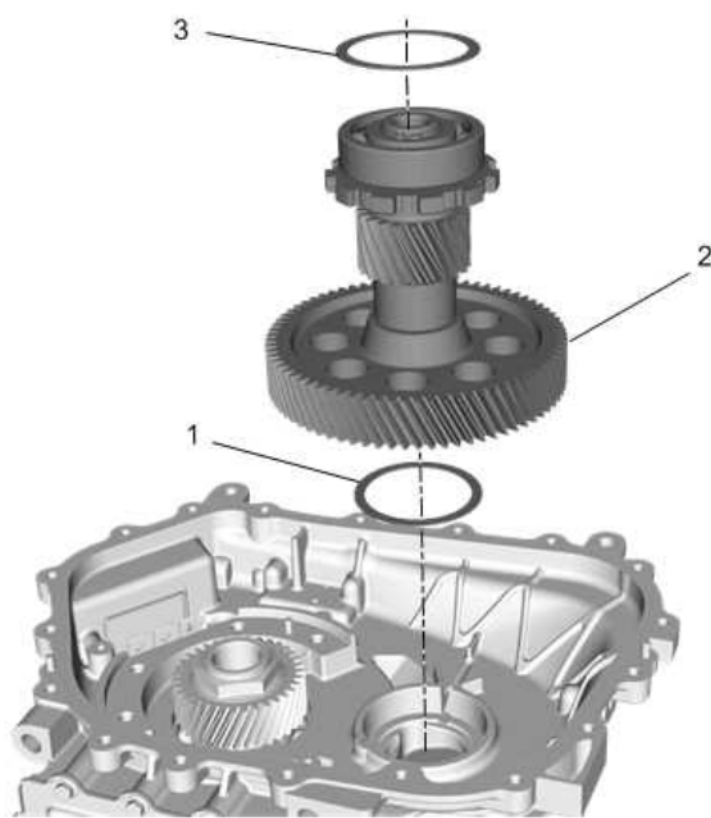


**Fig. 121: Drive Motor Stator Coolant Distributor Channel**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                               |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Drive Motor Stator Cooling Distributor Channel                                                                                                                               |
| 2       | Drive Motor Stator Cooling Distributor Channel Bolt (Qty: 2)<br><br><b>CAUTION:</b><br>Refer to <a href="#">Fastener Caution</a> .<br><br><b>Tighten</b><br>9 N.m (80 lb in) |

## MAIN SHAFT ASSEMBLY INSTALLATION

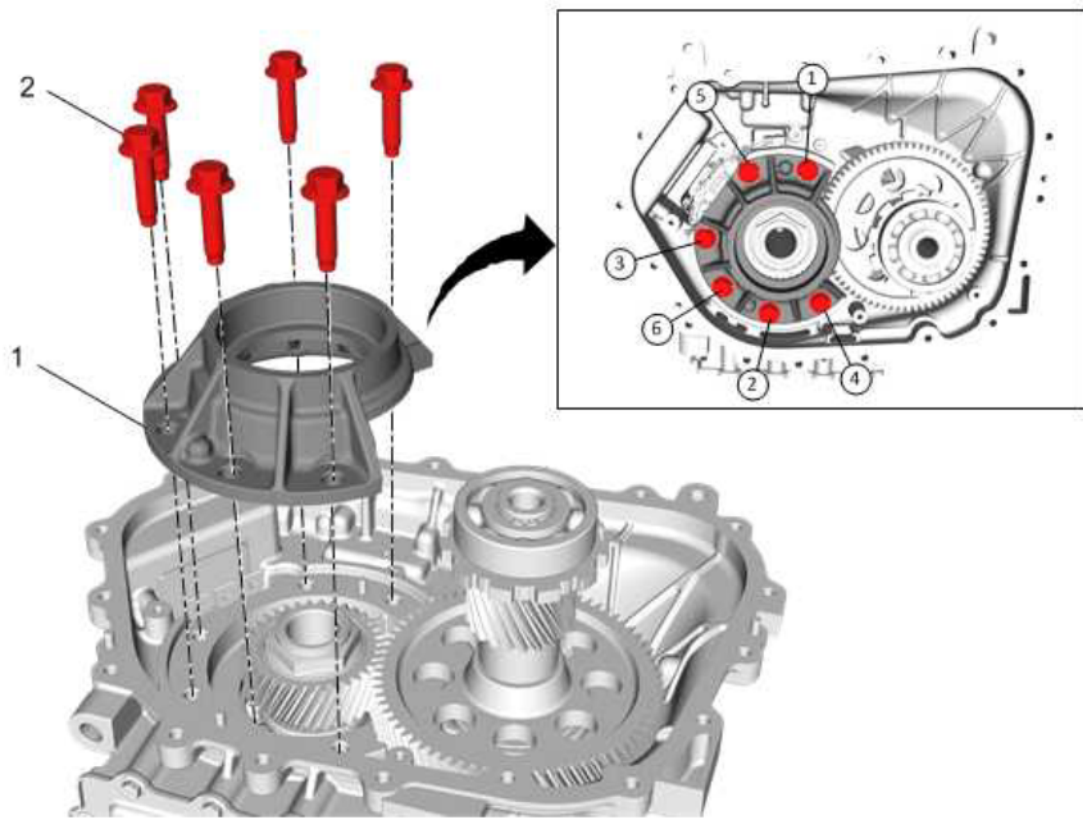


**Fig. 122: Main Shaft Assembly**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                             |
|---------|--------------------------------------------------------------------------------------------|
| 1       | Main Shaft Bearing Shim (LHS)<br><br><b>NOTE:</b><br>Install NEW shim. It is not reusable. |
| 2       | Main Shaft<br><br><b>NOTE:</b><br>Apply transmission fluid to the main shaft bearing.      |
| 3       | Main Shaft Bearing Shim (RHS)<br><br><b>NOTE:</b><br>Install NEW shim. It is not reusable. |

## **CENTER SUPPORT INSTALLATION**



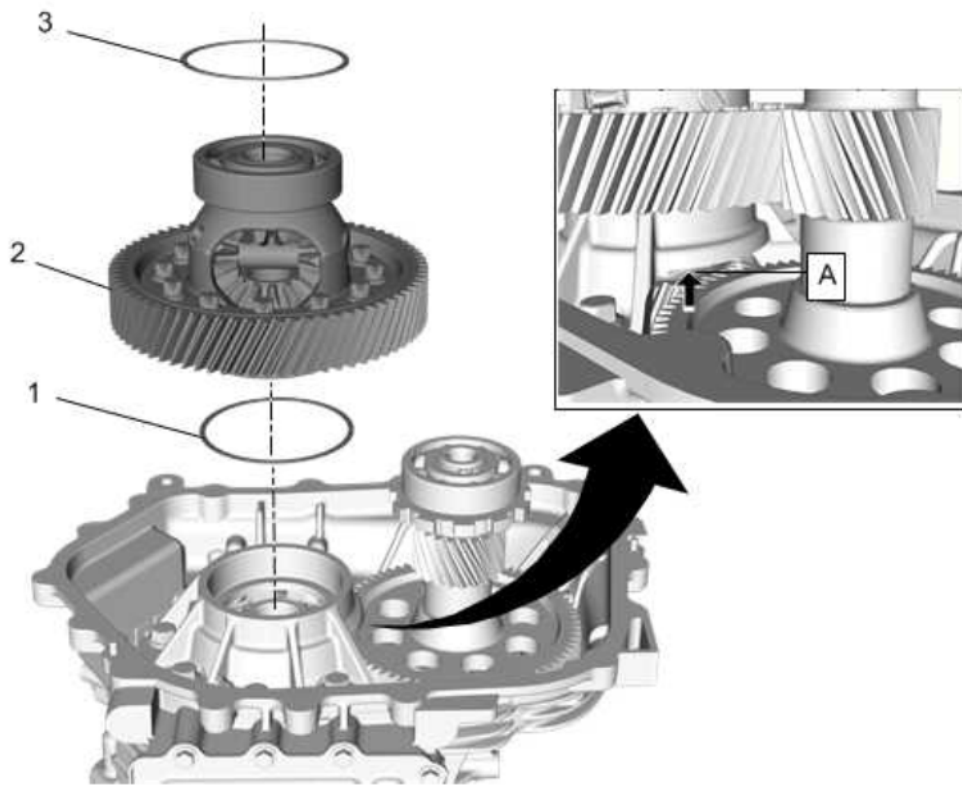
**Fig. 123: Center Support**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                          |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Center Support                                                                                                                                                                                                                                                                                                                                                                                          |
| 2       | <p>Center Support Bolt (Qty: 6)</p> <p><b>CAUTION:</b><br/>Refer to <a href="#">Fastener Caution</a> .</p> <p><b>CAUTION:</b><br/>Refer to <a href="#">Torque-to-Yield Fastener Caution</a> .</p> <p><b>NOTE:</b><br/>Install NEW center support bolts.</p> <p><b>Tighten</b></p> <ol style="list-style-type: none"> <li>1. First pass: 58 N.m (43 lb ft)</li> <li>2. Final pass: 30 degrees</li> </ol> |

## FRONT DIFFERENTIAL ASSEMBLY INSTALLATION



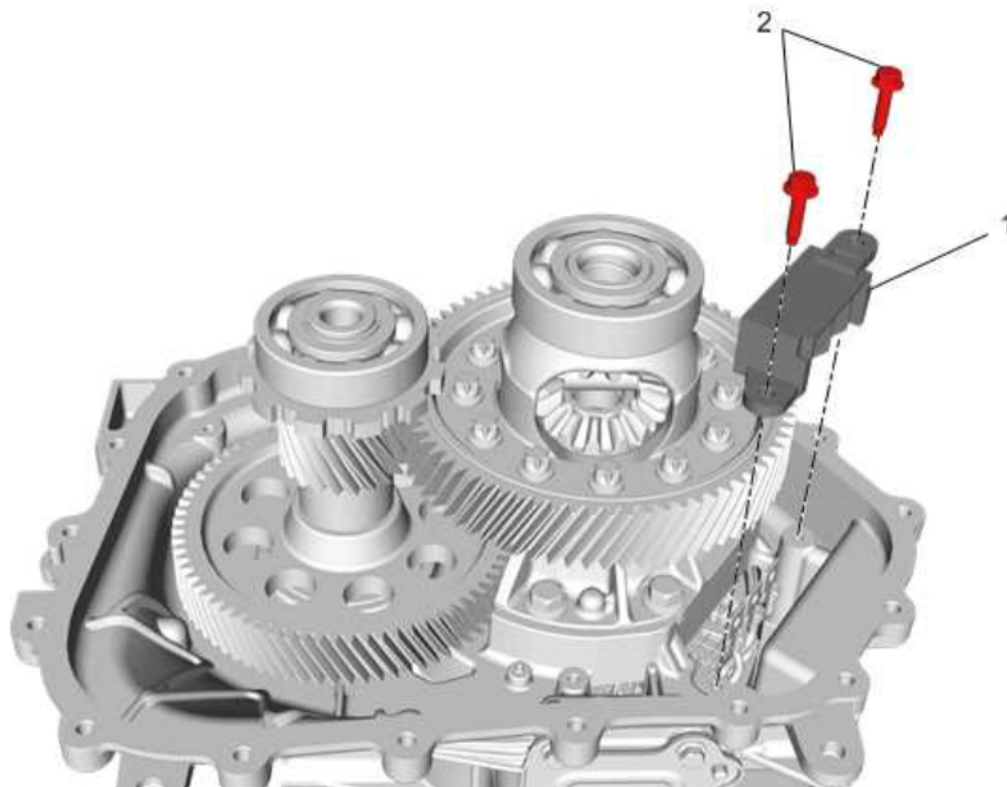


**Fig. 124: Front Differential Assembly**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                                       |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Front Differential Bearing Shim (LHS)<br><br><b>NOTE:</b><br>Install NEW shim. It is not reusable.                                                                                                                                   |
| 2       | Front Differential<br><br><b>NOTE:</b><br>Apply transmission fluid to the front differential bearing.<br><br><b>NOTE:</b><br>Raise the main shaft assembly until the A position in order to install the front differential assembly. |
| 3       | Front Differential Bearing Shim (RHS)<br><br><b>NOTE:</b><br>Install NEW shim. It is not reusable.                                                                                                                                   |

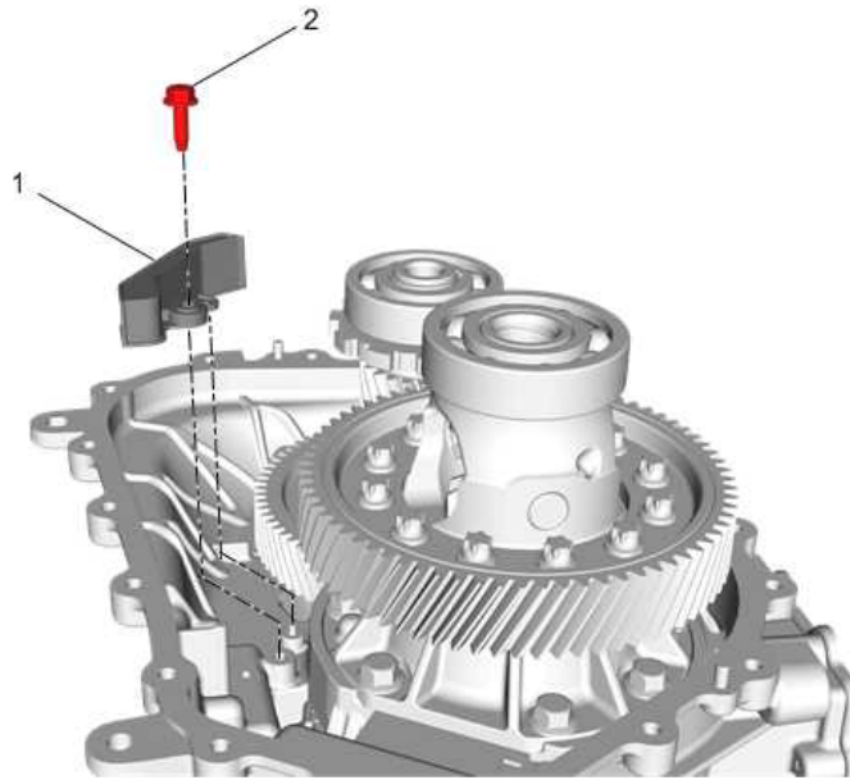
## DRIVE MOTOR POWER INVERTER MODULE CABLE TERMINAL INSULATOR BLOCK INSTALLATION



**Fig. 125: Drive Motor Power Inverter Module Cable Terminal Insulator Block**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                               |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Drive Motor Power Inverter Module Cable Terminal Insulator Block                                                                                                                             |
| 2       | Drive Motor Power Inverter Module Cable Terminal Insulator Block Bolt (Qty: 2)<br><br><b>CAUTION:</b><br>Refer to <b><u>Fastener Caution</u></b> .<br><br><b>Tighten</b><br>9 N.m (80 lb in) |

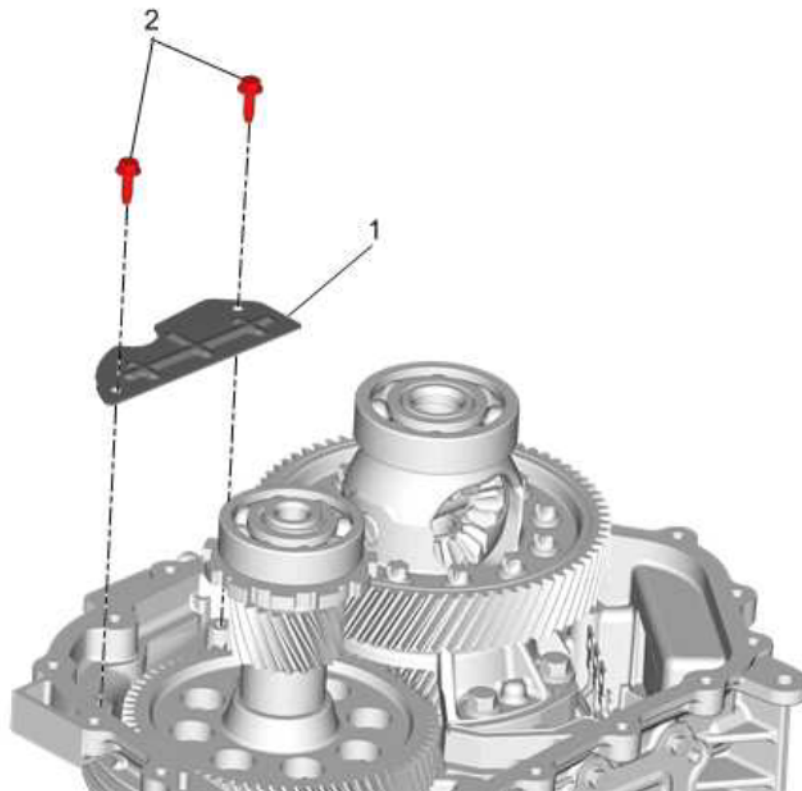
## MANUAL TRANSMISSION OIL TROUGH INSTALLATION



**Fig. 126: Manual Transmission Oil Trough**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                    |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Manual Transmission Oil Trough                                                                                                                    |
| 2       | Manual Transmission Oil Trough Bolt<br><br><b>CAUTION:</b><br><b>Refer to <u>Fastener Caution</u> .</b><br><br><b>Tighten</b><br>9 N.m (80 lb in) |

## **OIL PAN BAFFLE INSTALLATION**

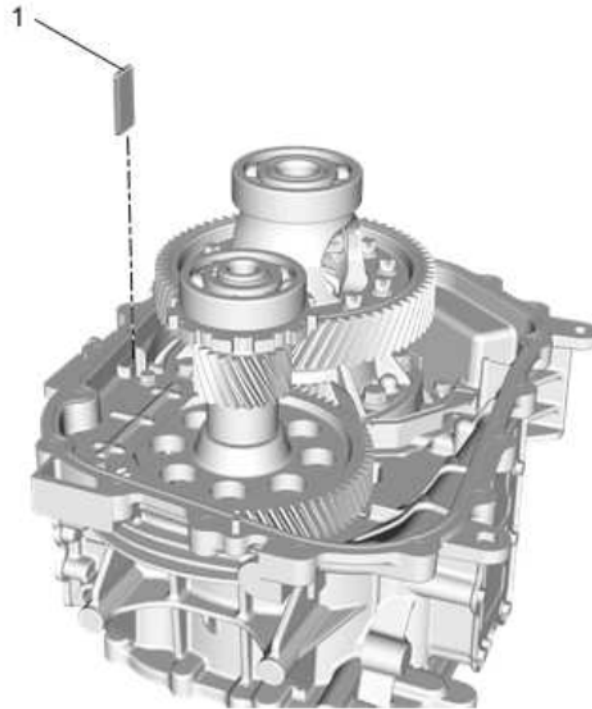


**Fig. 127: Oil Pan Baffle**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                         |
|---------|----------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Oil Pan Baffle                                                                                                                         |
| 2       | Oil Pan Baffle Bolt (Qty: 2)<br><b>CAUTION:</b><br>Refer to <b><u>Fastener Caution</u></b> .<br><br><b>Tighten</b><br>9 N.m (80 lb in) |

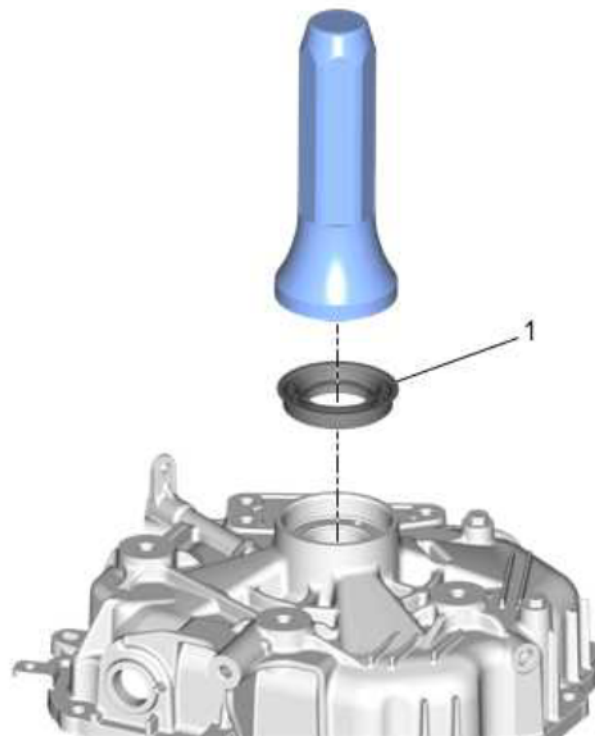
## **AUTOMATIC TRANSMISSION FLUID PAN MAGNET INSTALLATION**



**Fig. 128: Automatic Transmission Fluid Pan Magnet**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                          |
|---------|-----------------------------------------|
| 1       | Automatic Transmission Fluid Pan Magnet |

# **FRONT WHEEL DRIVE SHAFT OIL SEAL INSTALLATION - LEFT SIDE**



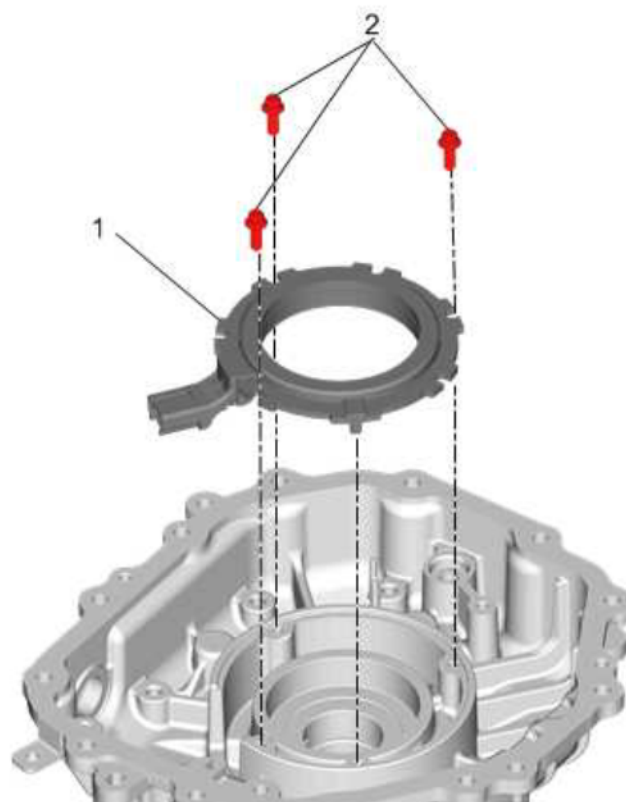
**Fig. 129: Front Wheel Drive Shaft Oil Seal - Left Side**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name |
|---------|----------------|
|         |                |



| Callout | Component Name                                                                                                                                                                                                         |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Front Wheel Drive Shaft Oil Seal (LHS)<br><br><b>NOTE:</b><br>Install NEW seal. It is not reusable.<br><br><b>Special Tools</b><br>DT-44809 Seal Installer<br>Equivalent regional tools: <a href="#">Special Tools</a> |

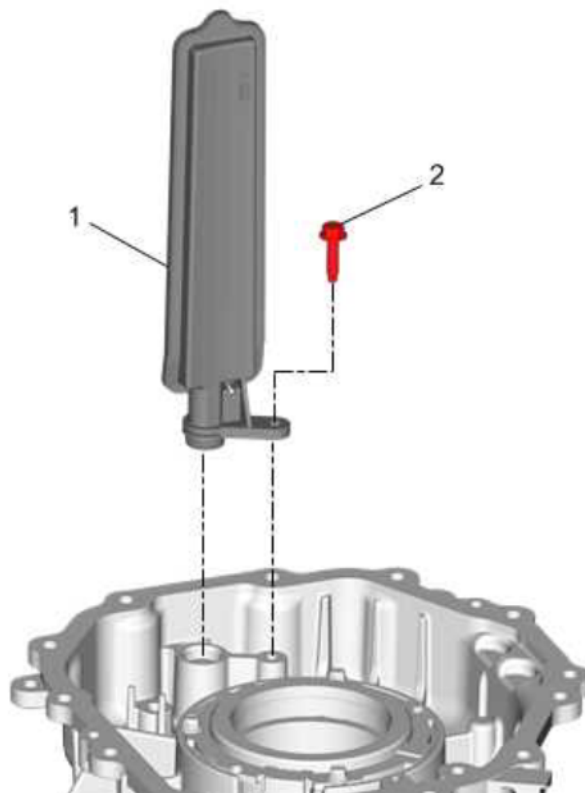
## DRIVE MOTOR POSITION SENSOR STATOR INSTALLATION



**Fig. 130: Drive Motor Position Sensor Stator**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                                                |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Drive Motor Position Sensor Stator                                                                                                                                                                                                            |
| 2       | Drive Motor Position Sensor Stator Bolt (Qty: 3)<br><br><b>CAUTION:</b><br>Refer to <a href="#">Fastener Caution</a> .<br><br><b>NOTE:</b><br>Install NEW drive motor position sensor stator bolts.<br><br><b>Tighten</b><br>9 N.m (80 lb in) |

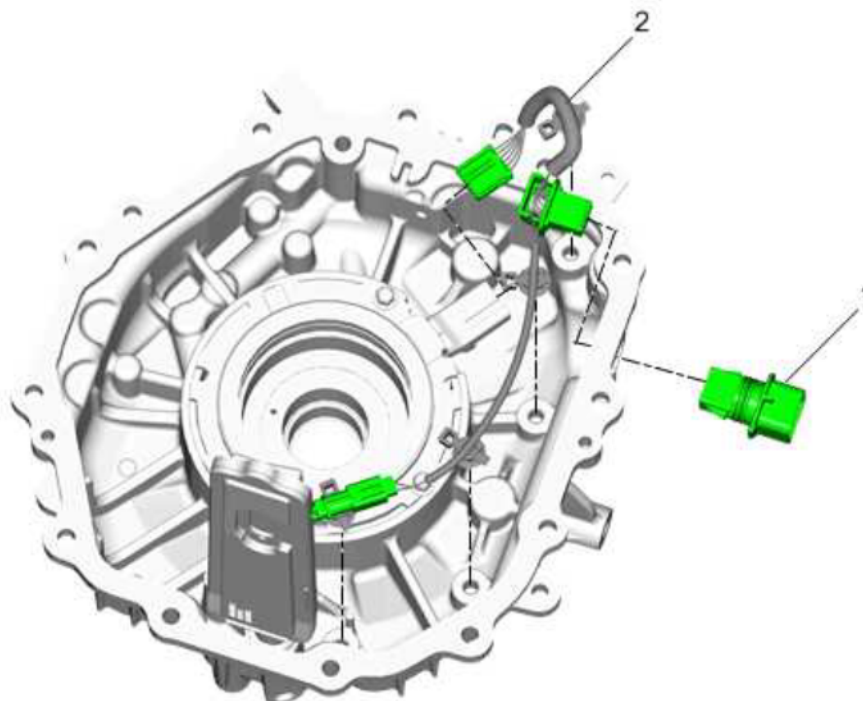
## AUTOMATIC TRANSMISSION FLUID FILTER INSTALLATION



**Fig. 131: Automatic Transmission Fluid Filter**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                         |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Automatic Transmission Fluid Filter<br><br><b>NOTE:</b><br>Install <b>NEW</b> fluid filter. The fluid filter O-ring is not serviceable separately.     |
| 2       | Automatic Transmission Fluid Filter Bolt<br><br><b>CAUTION:</b><br>Refer to <b><u>Fastener Caution</u></b> .<br><br><b>Tighten</b><br>9 N.m (80 lb in) |

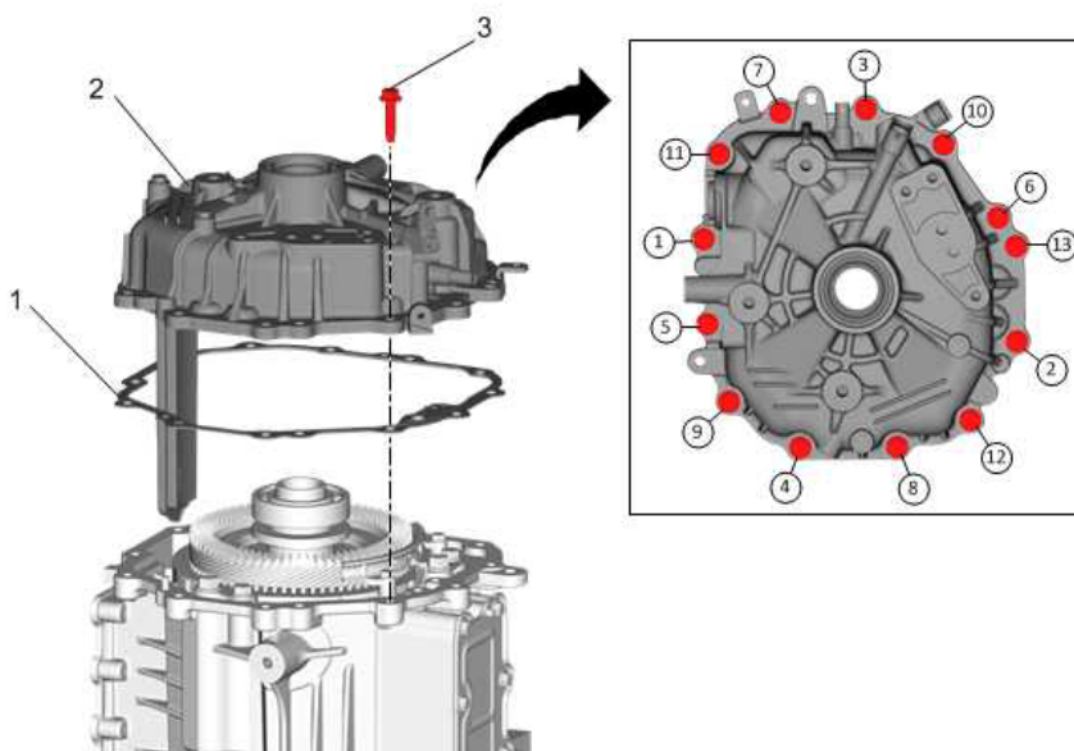
## **AUTOMATIC TRANSMISSION CONTROL WIRING HARNESS INSTALLATION - TRANSMISSION CASE COVER**



**Fig. 132: Automatic Transmission Control Wiring Harness - Transmission Case Cover**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                  |
|---------|---------------------------------------------------------------------------------------------------------------------------------|
| 1       | Wiring Harness Electrical Connector<br><br><b>NOTE:</b><br>Install NEW wiring harness electrical connector. It is not reusable. |
| 2       | Automatic Transmission Control Wiring Harness                                                                                   |

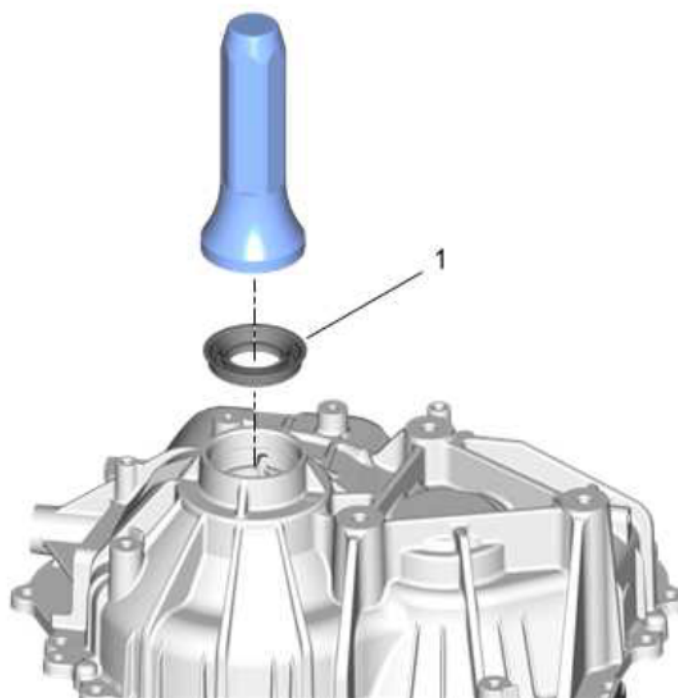
### **AUTOMATIC TRANSMISSION CASE COVER INSTALLATION**



**Fig. 133: Automatic Transmission Case Cover With Bolt Tightening Sequence**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                             |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Automatic Transmission Case Cover Gasket<br><br><b>NOTE:</b><br>Install NEW gasket. It is not reusable.                                                    |
| 2       | Automatic Transmission Case Cover                                                                                                                          |
| 3       | Automatic Transmission Case Cover Bolt (Qty: 13)<br><br><b>CAUTION:</b><br>Refer to <a href="#">Fastener Caution</a> .<br><br>Tighten<br>22 N.m (16 lb ft) |

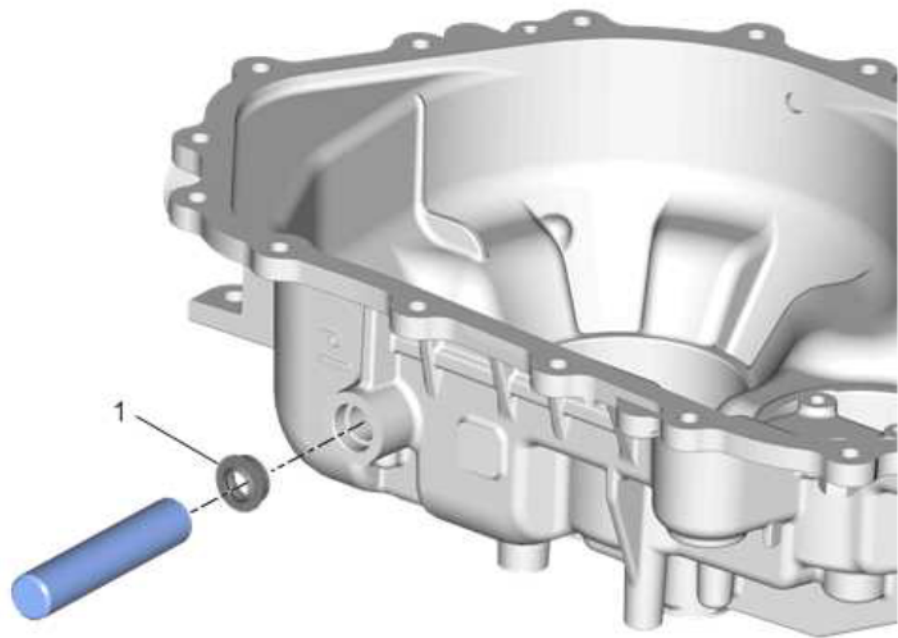
### FRONT WHEEL DRIVE SHAFT OIL SEAL INSTALLATION - RIGHT SIDE



**Fig. 134: Front Wheel Drive Shaft Oil Seal - Right Side**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                         |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Front Wheel Drive Shaft Oil Seal (RHS)<br><br><b>NOTE:</b><br>Install NEW seal. It is not reusable.<br><br><b>Special Tools</b><br>DT-44809 Seal Installer<br>Equivalent regional tools: <a href="#">Special Tools</a> |

### MANUAL SHIFT SHAFT SEAL INSTALLATION



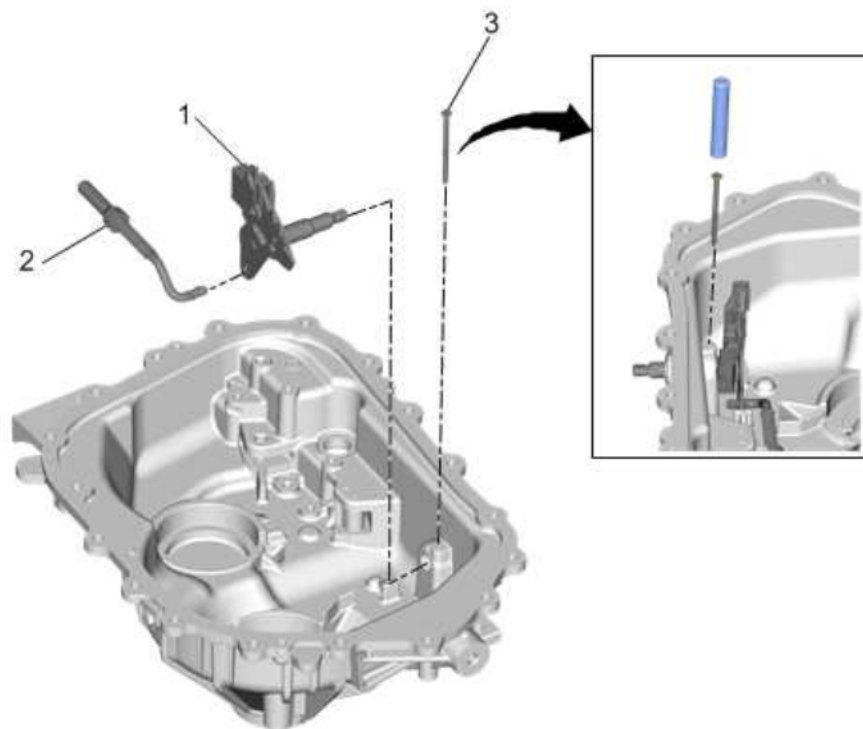
**Fig. 135: Manual Shift Shaft Seal**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                    |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Manual Shift Shaft Seal<br><br><b>NOTE:</b><br>Install NEW seal. It is not reusable.<br><br><b>Special Tools</b><br><b>DT-49101</b> Shift Shaft Seal Installer<br>Equivalent regional tools: <b>Special Tools</b> |

## MANUAL SHIFT SHAFT POSITION SWITCH INSTALLATION



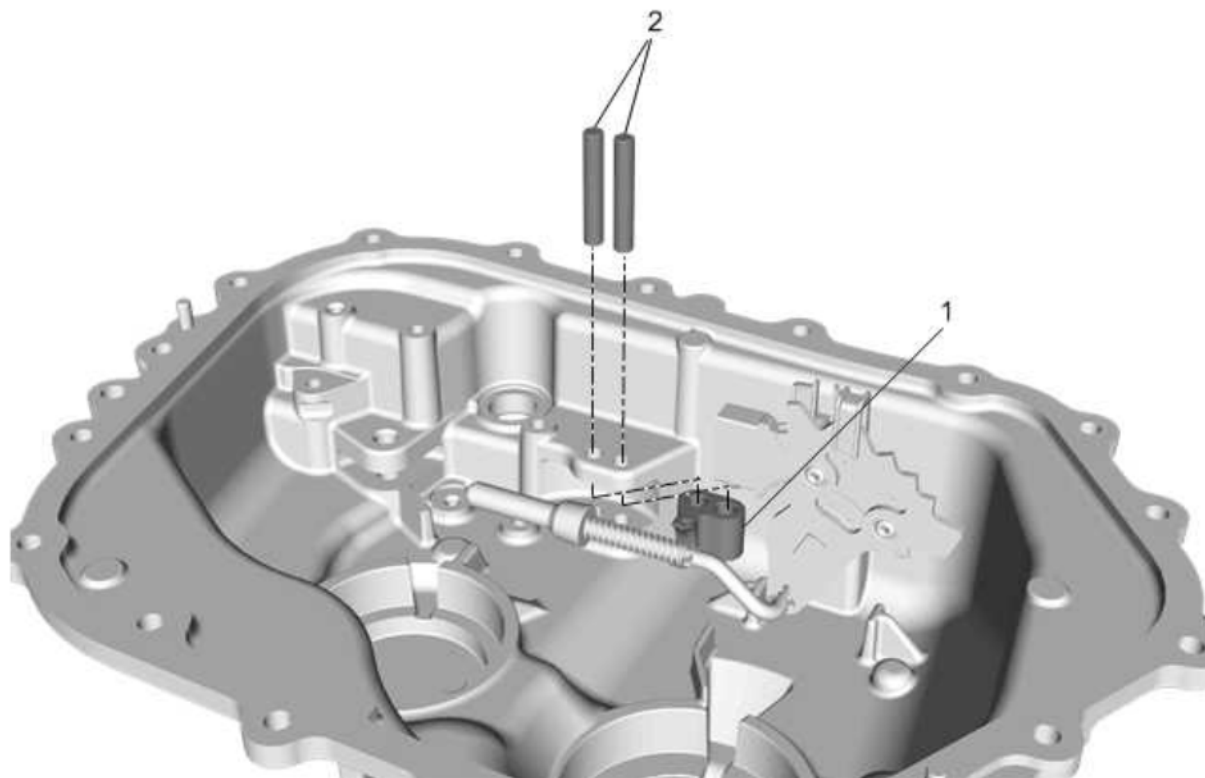


**Fig. 136: Manual Shift Shaft Position Switch**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                         |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Manual Shift Shaft Position Switch                                                                                                                                                                                     |
| 2       | Park Pawl Actuator                                                                                                                                                                                                     |
| 3       | Manual Shift Shaft Pin<br><br><b>NOTE:</b><br><b>Install NEW pin. It is not reusable.</b><br><br><b>Special Tools</b><br><b>DT-51436</b> Manual Shaft Pin Installer<br>Equivalent regional tools: <b>Special Tools</b> |

## **PARK PAWL AND MANUAL SHIFT SHAFT INSTALLATION**

### **Park Pawl Actuator Guide Installation**

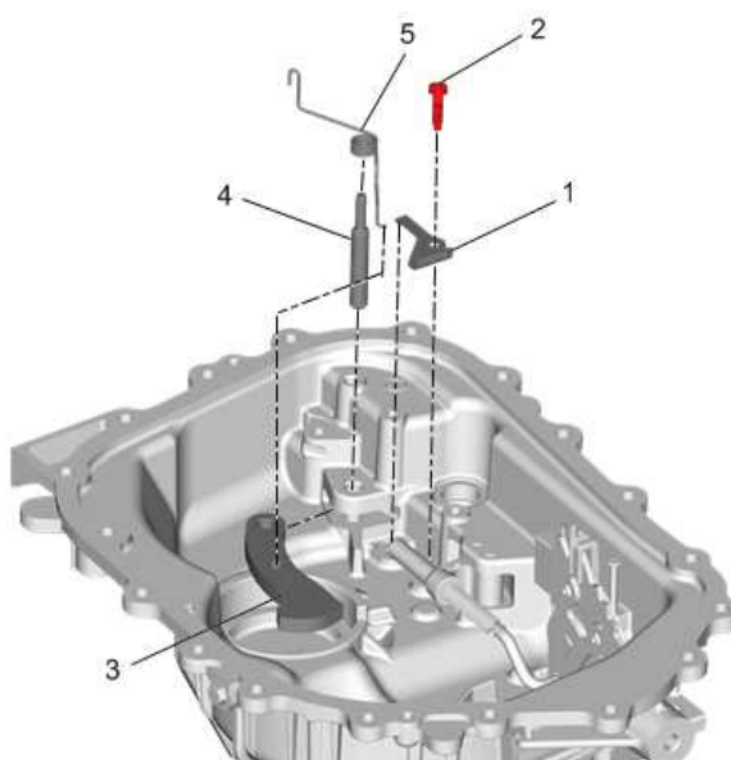


**Fig. 137: Park Pawl Actuator Guide**  
 Courtesy of GENERAL MOTORS COMPANY

#### Park Pawl Actuator Guide Installation

| Callout | Component Name                        |
|---------|---------------------------------------|
| 1       | Park Pawl Actuator Guide              |
| 2       | Park Pawl Actuator Guide Pin (Qty: 2) |

#### Park Pawl, Shaft and Bracket Installation

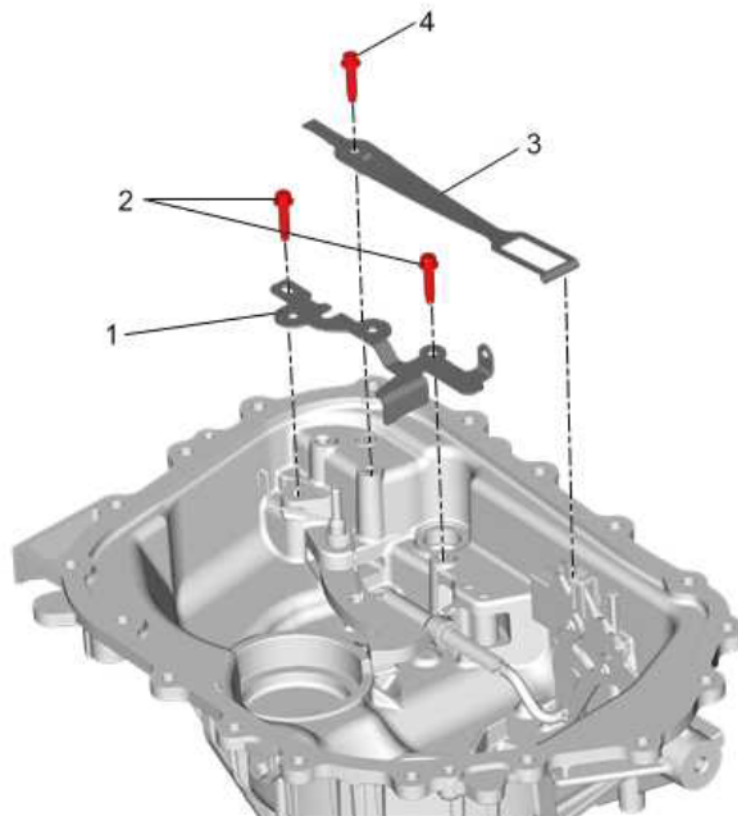


**Fig. 138: Park Pawl, Shaft and Bracket**  
 Courtesy of GENERAL MOTORS COMPANY

#### Park Pawl, Shaft and Bracket Installation

| Callout | Component Name                                                                                                                                  |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Park Pawl Actuator Bracket                                                                                                                      |
| 2       | Park Pawl Actuator Bracket Bolt<br><br><b>CAUTION:</b><br>Refer to <a href="#">Fastener Caution</a> .<br><br><b>Tighten</b><br>9 N.m (80 lb in) |
| 3       | Park Pawl                                                                                                                                       |
| 4       | Park Pawl Shaft                                                                                                                                 |
| 5       | Park Pawl Spring                                                                                                                                |

### Manual Shift Detent Lever Spring and Bracket Installation



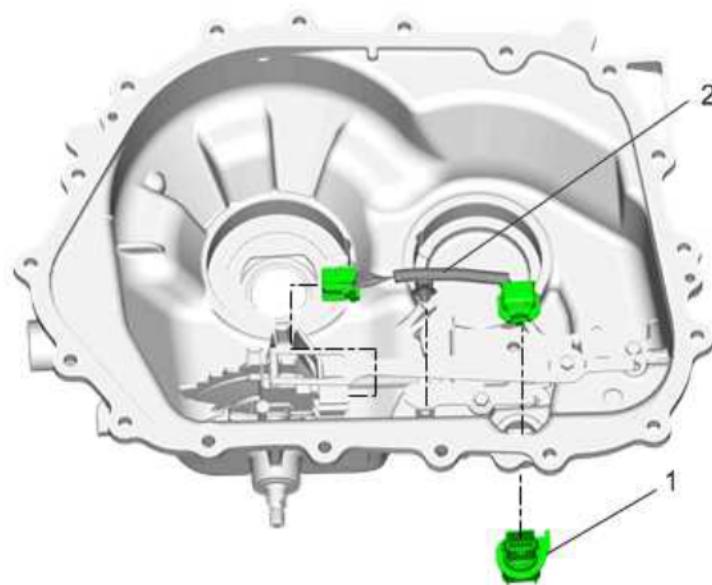
**Fig. 139: Manual Shift Detent Lever Spring and Bracket**

Courtesy of GENERAL MOTORS COMPANY

### Manual Shift Detent Lever Spring and Bracket Installation

| Callout | Component Name                                                                                                                                                  |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Park Pawl Actuator Bracket                                                                                                                                      |
| 2       | Park Pawl Actuator Bracket Bolt (Qty: 2)<br><b>Tighten</b><br>9 N.m (80 lb in)                                                                                  |
| 3       | Manual Shift Detent Lever Spring                                                                                                                                |
| 4       | Manual Shift Detent Lever Spring Bolt<br><br><b>NOTE:</b><br>Install <b>NEW</b> manual shift detent lever spring bolt<br><br><b>Tighten</b><br>9 N.m (80 lb in) |

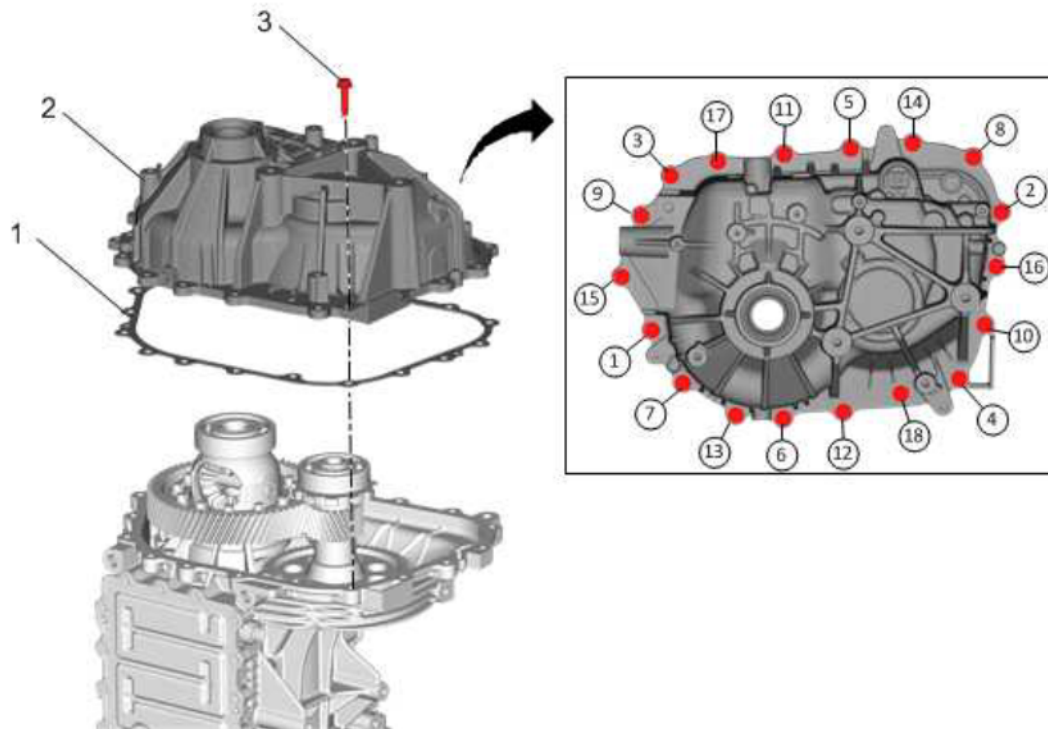
## AUTOMATIC TRANSMISSION CONTROL WIRING HARNESS INSTALLATION - TRANSMISSION CASE



**Fig. 140: Automatic Transmission Control Wiring Harness - Transmission Case**  
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                         |
|---------|----------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Wiring Harness Electrical Connector<br><br><b>NOTE:</b><br><b>Install NEW wiring harness electrical connector. It is not reusable.</b> |
| 2       | Automatic Transmission Control Wiring Harness                                                                                          |

## AUTOMATIC TRANSMISSION CASE INSTALLATION

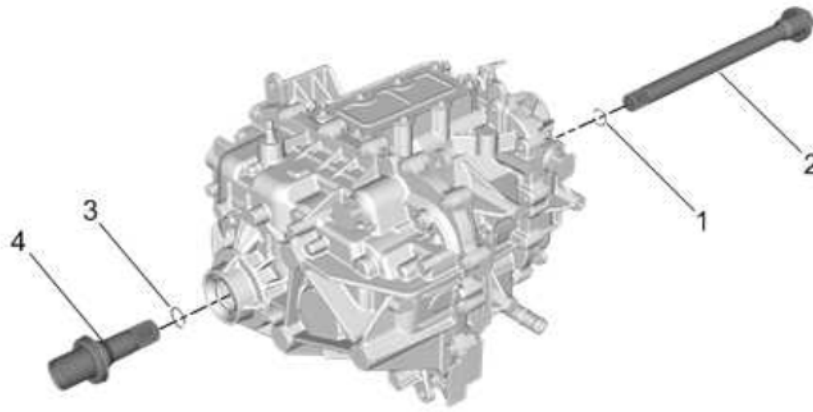


**Fig. 141: Automatic Transmission Case With Bolt Tightening Sequence**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                     |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Automatic Transmission Case Gasket<br><br><b>NOTE:</b><br>Install <b>NEW</b> gasket. It is not reusable.                                           |
| 2       | Automatic Transmission Case                                                                                                                        |
| 3       | Automatic Transmission Case Bolt (Qty: 18)<br><br><b>CAUTION:</b><br>Refer to <b>Fastener Caution</b> .<br><br><b>Tighten</b><br>22 N.m (16 lb ft) |

## OUTPUT SHAFT INSTALLATION



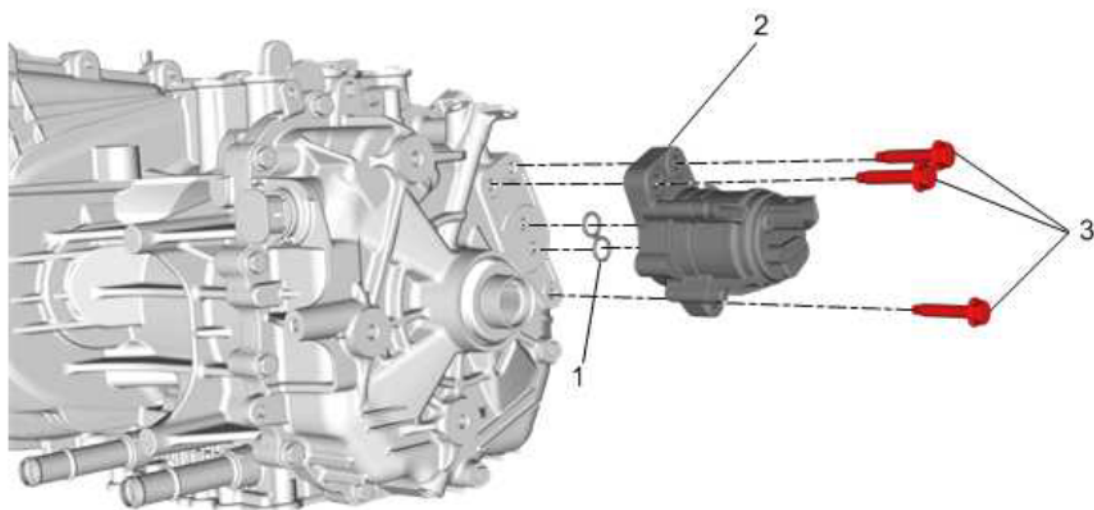


**Fig. 142: Output Shaft**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                            |
|---------|-------------------------------------------------------------------------------------------|
| 1       | Output Shaft Retaining Ring<br><b>NOTE:</b><br>Install a NEW output shaft retaining ring. |
| 2       | Output Shaft (LHS)                                                                        |
| 3       | Output Shaft Retaining Ring<br><b>NOTE:</b><br>Install a NEW output shaft retaining ring. |
| 4       | Output Shaft (RHS)                                                                        |

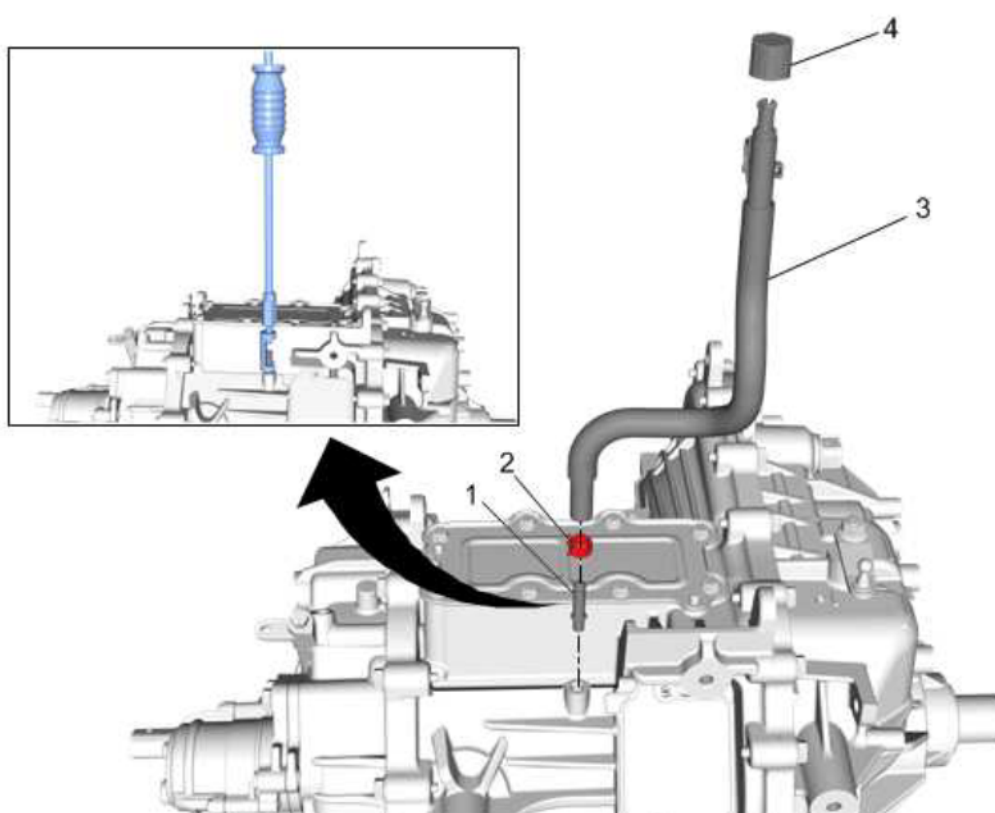
## AUTOMATIC TRANSMISSION FLUID PUMP INSTALLATION



**Fig. 143: Automatic Transmission Fluid Pump**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                          |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Automatic Transmission Fluid Pump Seal<br><br><b>NOTE:</b><br>Install NEW seal. It is not reusable.                                                     |
| 2       | Automatic Transmission Fluid Pump                                                                                                                       |
| 3       | Automatic Transmission Fluid Pump Bolt (Qty: 3)<br><br><b>CAUTION:</b><br>Refer to <b>Fastener Caution</b> .<br><br><b>Tighten</b><br>22 N.m (16 lb ft) |

## TRANSMISSION VENT PIPE INSTALLATION

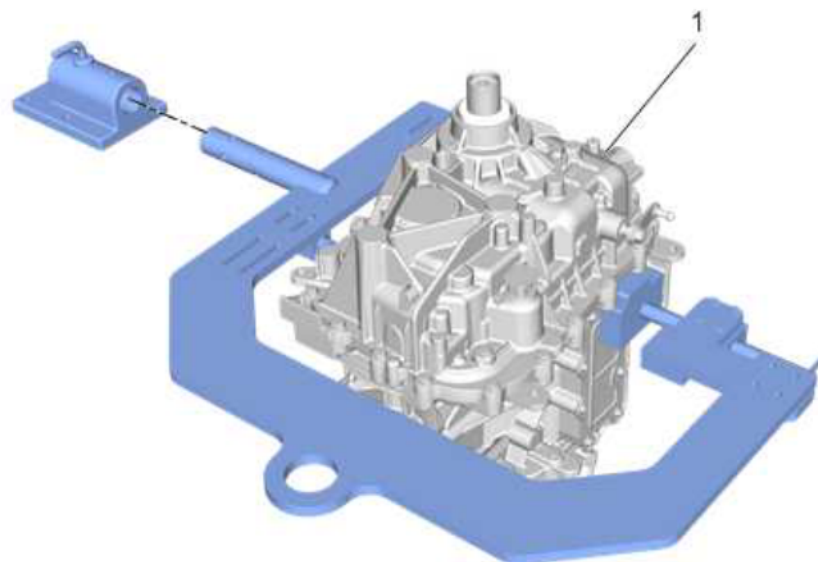


**Fig. 144: Transmission Vent Pipe**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                                                                                                                                     |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>Transmission Vent Pipe</p> <p><b>NOTE:</b><br/>Install <b>NEW</b> vent pipe. It is not reusable.</p> <p><b>Special Tools</b></p> <ul style="list-style-type: none"> <li>• <b>DT-6125-1B</b> Slide Hammer</li> <li>• <b>DT-52017</b> Vent Hose Pipe Installer</li> </ul> <p>Equivalent regional tools: <b>Special Tools</b>.</p> |
| 2       | Transmission Vent Hose Clamp                                                                                                                                                                                                                                                                                                       |
| 3       | Transmission Vent Hose                                                                                                                                                                                                                                                                                                             |
| 4       | Transmission Vent Cap                                                                                                                                                                                                                                                                                                              |

## HOLDING FIXTURE REMOVAL



**Fig. 145: Holding Fixture**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | <p>Automatic Transmission</p> <p><b>WARNING:</b><br/>Handle with care, the transmission assembly weighs over 83 Kg (183 lbs). Bodily injury could occur if not handled properly.</p> <p>Special Tools</p> <ul style="list-style-type: none"> <li>• DT-3289-20 Holding Fixture Base Assembly</li> <li>• DT-46625 Holding Fixture</li> <li>• DT-52009 Holding Fixture Adapter</li> <li>• DT-46625-10 Holding Fixture Adapter</li> </ul> <p>Equivalent regional tools: <a href="#">Special Tools</a>.</p> |

## DESCRIPTION AND OPERATION

### DEFINITIONS AND ABBREVIATIONS

#### Propulsion Condition Definitions

##### Chuggle/Cogging

A bucking or jerking condition.

##### Shudder

A repeating jerking condition similar to Chuggle/Cogging but more severe and rapid. This condition may be most noticeable during certain ranges of vehicle speed.

##### Surge

A repeating condition of acceleration and deceleration that is less intense than Chuggle/Cogging.

## Noise Conditions

### Propulsion System Noise

A whine or growl that increases or fades with vehicle speed, and is most noticeable under a light acceleration. It may also be noticeable in PARK or NEUTRAL operating ranges with the vehicle stationary.

### Final Drive Noise

A hum related to vehicle speed which is most noticeable under a light acceleration.

### Pump Noise

A high pitched whine or growl that is noticeable only when the auxiliary transmission fluid pump is ON. This condition may also be noticeable in all operating ranges with the vehicle moving.

## Transmission Abbreviations

### AC

Alternating Current

### DC

Direct Current

### DLC

Diagnostic Link Connector

### DMM

Digital Multimeter

### DTC

Diagnostic Trouble Code

### EBCM

Electronic Brake Control Module

### EMI

Electromagnetic Interference

### MIL

Malfunction Indicator Lamp

### OBD

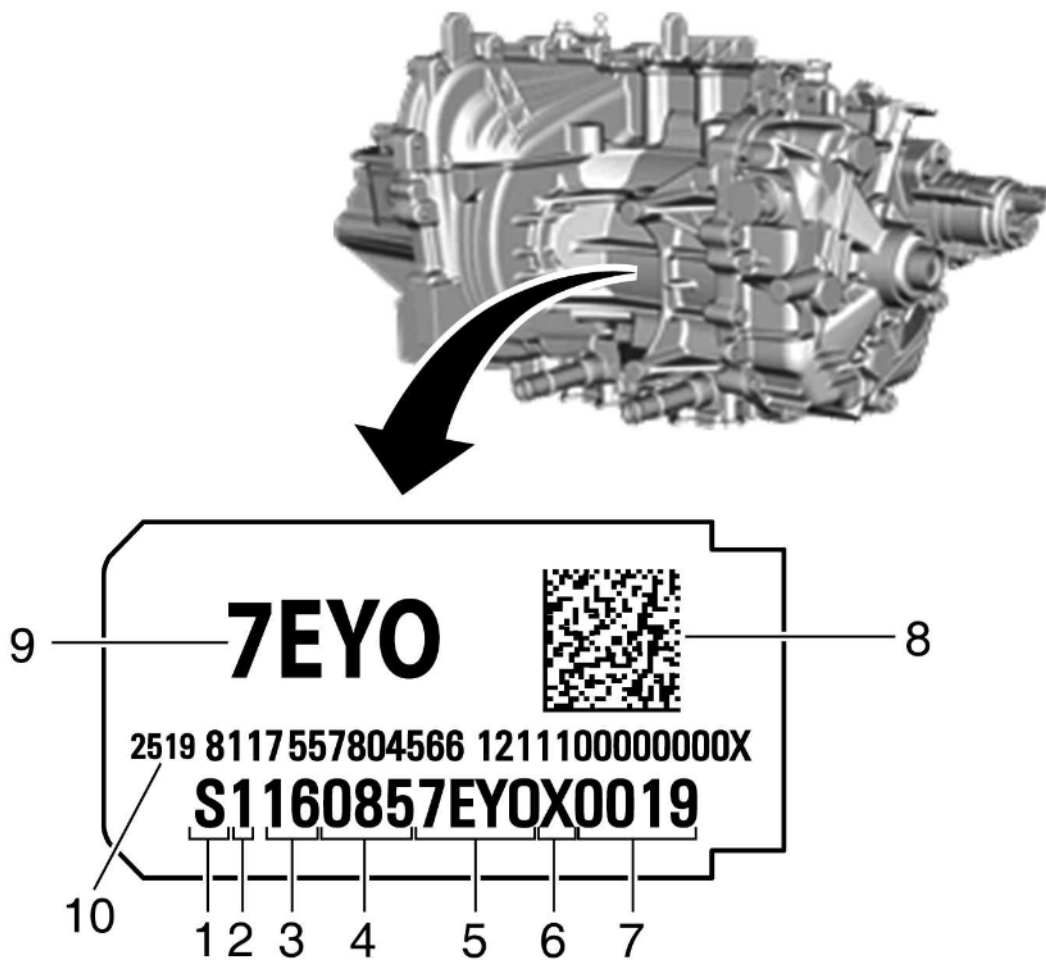
On Board Diagnostic

### VSS

Vehicle Speed Sensor

## TRANSMISSION IDENTIFICATION INFORMATION





**Fig. 146: Identifying Transmission Identification Label**

Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name          |
|---------|-------------------------|
| 1       | Line ID                 |
| 2       | Shift ID                |
| 3       | Build Year              |
| 4       | Julian Date             |
| 5       | Broadcast Code          |
| 6       | Reserved Use            |
| 7       | Sequence Number         |
| 8       | Machine Readable Matrix |
| 9       | Broadcast Code          |
| 10      | GM Part Number          |

## TRANSMISSION GENERAL DESCRIPTION

The Chevrolet Bolt EV is a fully electric vehicle. The propulsion of the vehicle is achieved by an electric drive Transmission. The Transmission is a fully automatic, front wheel drive transaxle, variable-speed, electronic-controlled transmission. It consists primarily of an 150kW drive motor, 1 differential/Offset gear set, high voltage electric auxiliary transmission fluid pump and housing, and 2 axles.

The Differential/Offset gear set provides the fixed forward and reverse ratio. Changing speed and torque is fully automatic and is accomplished through the use of a drive motor generator power inverter control module located under hood. The drive motor generator power inverter control module receives and monitors various electronic sensor inputs and uses this information to vary the torque output to the drive axles based on throttle position.

The Lubrication system uses an electric auxiliary fluid pump motor assembly located outside of the transmission for lubrication of rotating components. This is a gerotor-type pump, electric 12V DC

Voltage motor, electric harness, and control module. The control module is located inside of the drive motor generator power inverter module under the hood. The transmission fluid pump operates under low pressure and will only run when out of park or neutral and vehicle speed is detected.

The transmission fluid temperature sensor is internal to the transmission and is located near the transmission fluid oil filter. The transmission fluid temperature sensor is connected to the ECM. The ECM sends the fluid temperature data to the drive motor power inverter module for drive motor torque.

Power delivery is controlled by first Electronic Precision Shift system. This shift and Park-by-wire system sends electronic signals to the Bolt EV's drive unit to manage precise feel and delivery of power and torque, based on drive mode selection and accelerator inputs. A by-wire shifter requires less packaging space than a traditional mechanical shifter, resulting in more interior space and improved interior layout.

The transmission may be operated in any of the following gear ranges:

### **PARK (P)**

This position locks the wheels and prevents the vehicle from rolling either forward or backward. PARK is the best position to use when starting the propulsion system for the vehicle. Because the transmission utilizes a shift lock control system, it is necessary to fully depress the brake pedal before shifting out of PARK. For safety reasons, use the parking brake in addition to the PARK position.

### **REVERSE (R)**

This position allows the vehicle to be operated in a rearward direction by reversing the rotation of the electric drive motor.

### **NEUTRAL (N)**

This position allows the vehicle to be moved without the park pawl engaged.

### **DRIVE (D)**

Drive range should be used for all normal driving conditions for maximum efficiency and range economy. Drive range allows the drive unit to operate in a forward direction by electrically varying the output torque and speed of the electric drive motor.

### **Low (L)**

This position is used for the "feel" of engine braking and can be used for the slowing of the vehicle once the throttle is lifted. While in the position the vehicle will slow quicker and use the motor to more aggressively collect energy during a regenerative braking event.

## **TRANSMISSION COMPONENT AND SYSTEM DESCRIPTION**

The mechanical components of the Bolt EV MMF 1ET25 are as follows:

- Gerotor type fluid pump
- Drive motor housing
- Drive motor 150 kW
- Transmission case
- Front differential carrier
- Counter shaft
- Center support
- Output shaft (LHS)
- Output shaft (RHS)
- Park pawl

The electrical components of the Bolt EV MMF 1ET25 are as follows:

- Drive Motor, 150 kW
- Manual Shift Shaft Position Sensor is also referred to as the Transmission Internal Mode Switch.
- Electric Auxiliary Fluid Pump Motor
- Transmission Fluid Temperature Sensor
- Drive Motor Position Sensor
- Transmission Control Wiring Harness

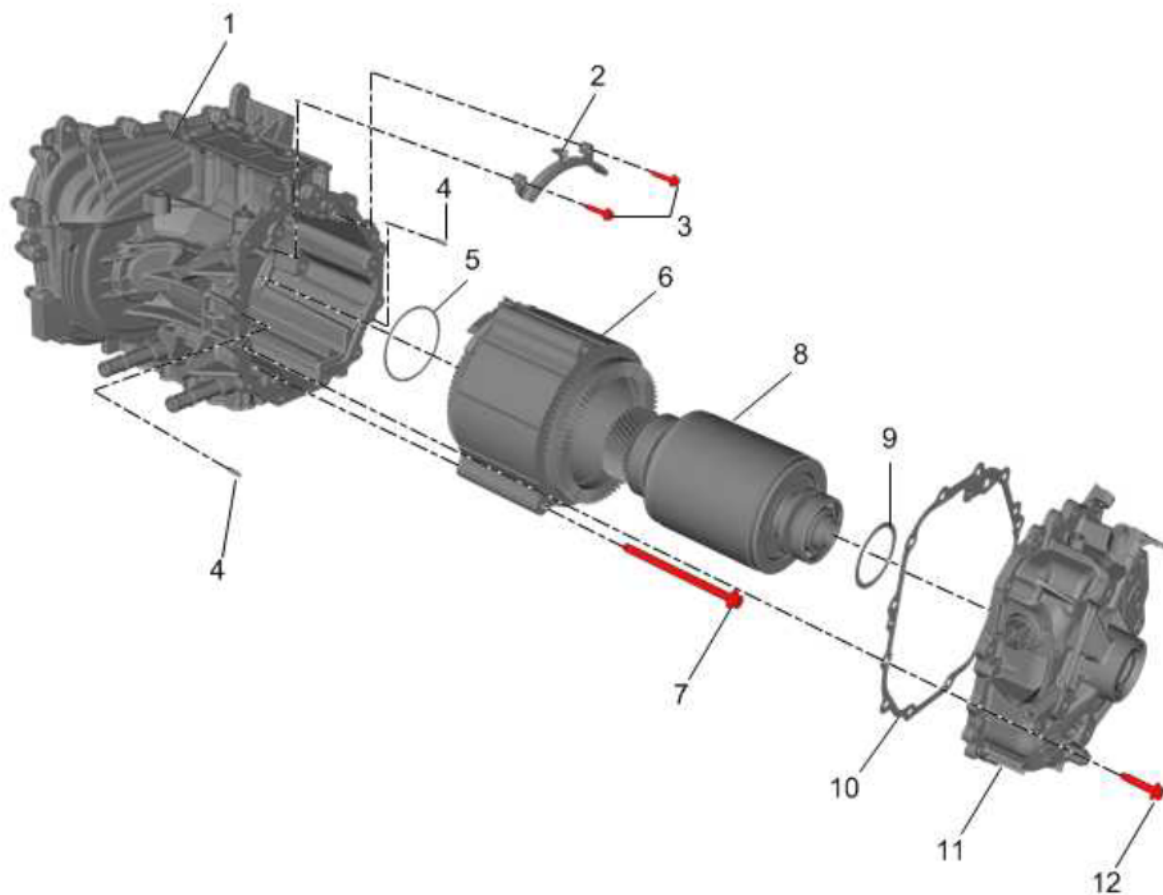
## TRANSMISSION INDICATORS AND MESSAGES

No transmission-related indicators or messages are displayed on the instrument panel cluster (IPC). For a complete listing and description of all vehicle indicators and messages, refer to [Indicator/Warning Message Description and Operation](#).

## ELECTRONIC COMPONENT DESCRIPTION

### Drive Motor

#### Drive Motor Housing Assembly (2 of 2)



**Fig. 147: Drive Motor Housing Assembly (2 of 2)**

Courtesy of GENERAL MOTORS COMPANY

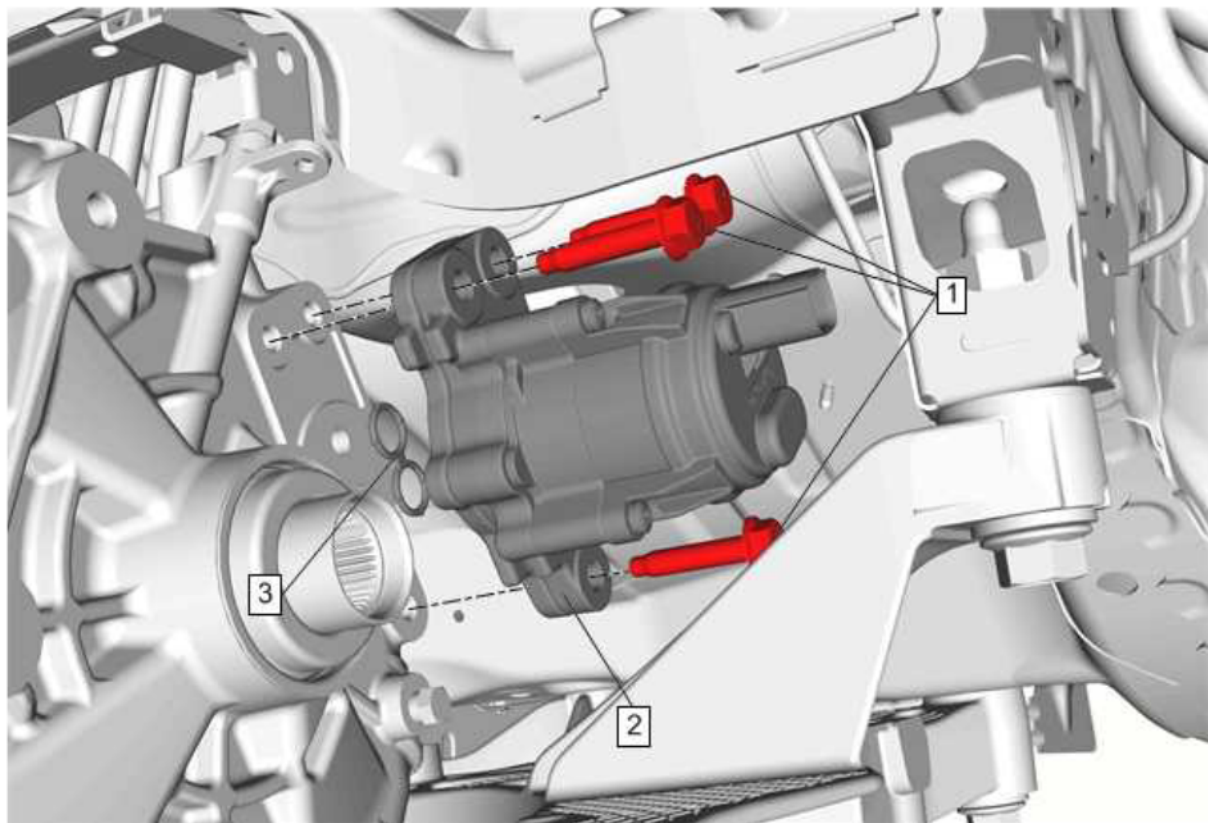
| Callout | Component Name                                               |
|---------|--------------------------------------------------------------|
| 1       | Drive Motor Housing                                          |
| 2       | Drive Motor Stator Coolant Distributor Channel               |
| 3       | Drive Motor Stator Coolant Distributor Channel Bolt (Qty: 2) |
| 4       | Pin (Qty: 2)                                                 |
| 5       | Drive Motor Rotor Bearing Shim (Right Side)                  |
| 6       | Drive Motor Stator                                           |



| Callout | Component Name                                   |
|---------|--------------------------------------------------|
| 7       | Drive Motor Stator Bolt (Qty: 3)                 |
| 8       | Drive Motor Rotor                                |
| 9       | Drive Motor Rotor Bearing Shim (Left Side)       |
| 10      | Automatic Transmission Case Cover Gasket         |
| 11      | Automatic Transmission Case Cover                |
| 12      | Automatic Transmission Case Cover Bolt (Qty: 13) |

The drive motor (1) is a permanent magnet 150 Kw peak power electric machine and is controlled by the power inverter module, often referred to as the drive motor generator power inverter module, in order to provide torque for vehicle propulsion and regenerative braking. Drive motor speed is controlled and monitored by a resolver-type position sensor. The drive motor position sensor is monitored by the drive motor generator power inverter module. The drive motor generator power inverter module monitors the angular position, speed and direction of the drive motor based upon the signals the position sensor outputs to the drive motor generator power inverter module. The drive motor position sensor, or resolver, contains a drive coil, 2 driven coils and an irregular shaped metallic rotor. The metallic rotor is mechanically attached to the shaft of the drive motor generator. When the vehicle is ON, the drive motor generator power inverter module outputs an AC excitation signal to the drive coil. The drive coil excitation signal creates a magnetic field surrounding the 2 driven coils and the irregular shaped rotor. The drive motor generator power inverter module then monitors the 2 driven coil circuits for a return signal. The position of the irregular shaped metallic rotor causes the magnetically-induced return signals of the driven coils to vary in size and shape. A comparison of the 2 driven coils signals allows the motor control module to determine the exact angle, speed and direction of the drive motor. For more information, refer to [Drive Motor Power Inverter Module Description and Operation](#) .

#### Electric Auxiliary Transmission Fluid Pump Motor



**Fig. 148: Transmission Fluid Pump**

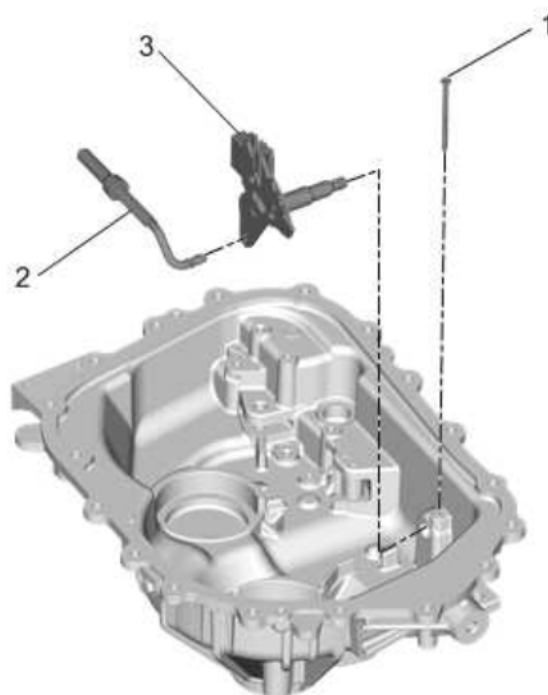
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                                  |
|---------|-------------------------------------------------|
| 1       | Automatic Transmission Fluid Pump Bolt (Qty: 3) |
| 2       | Automatic Transmission Fluid Pump Assembly      |
| 3       | Automatic Transmission Fluid Pump Seal          |

The electric auxiliary transmission fluid pump motor assembly is driven by 12V pulse width modulated (PWM) direct current which is controlled by the power inverter module. The purpose of the electric

auxiliary transmission fluid pump motor assembly is to supply oil to the transmission for lubrication and cooling during vehicle operation.

### Transmission Internal Mode Switch



**Fig. 149: Transmission Internal Mode**

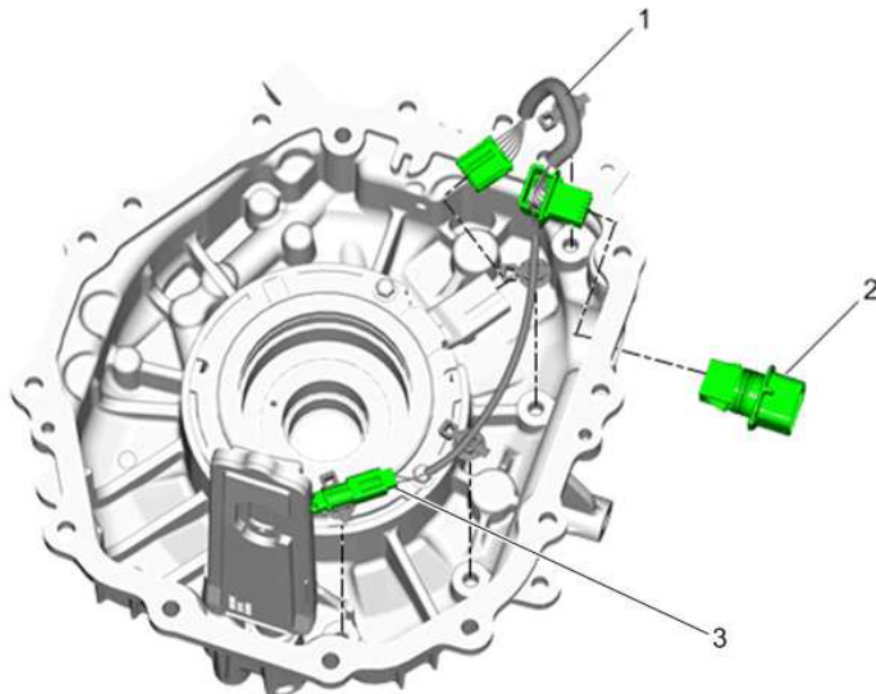
Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name                              |
|---------|---------------------------------------------|
| 1       | Manual Shift Shaft Pin                      |
| 2       | Park Pawl Actuator                          |
| 3       | Manual Shift Shaft Position Switch Assembly |

The 5 electronic switches are called the transmission range switches and are used to indicate the gear position the vehicle operator has selected. The 5 outputs (A, B, C, P, S) are range selection inputs to the hybrid/EV powertrain control module 1, through the Automatic Transmission Wiring Harness - Shift Shaft Position Switch. The manual shift detent lever assembly is mounted on the interior front of the transmission case above the control valve body assembly. The internal mode switch indicates to the hybrid/EV powertrain control module 1 which gear position the vehicle operator has selected. The Internal Mode Switch consists of 5 separate hall effect switches. Each hall effect switch is supplied a 9 V reference circuit, and a signal circuit from the hybrid/EV powertrain control module 1. Each signal circuit for each gear selector position will have either a voltage reading of 0.70 - 0.96 V indicating ON or 1.68 - 2.38 V indicating OFF. The voltage values on each Internal Mode Switch circuit will change and are dependent on the position of the gear selector. The state of each Internal Mode Switch A/B/C/P/S circuit is displayed on the scan tool.

### Transmission Fluid Temperature Sensor





**Fig. 150: Transmission Fluid Temperature Sensor**  
 Courtesy of GENERAL MOTORS COMPANY

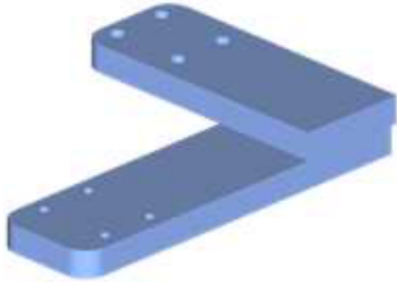
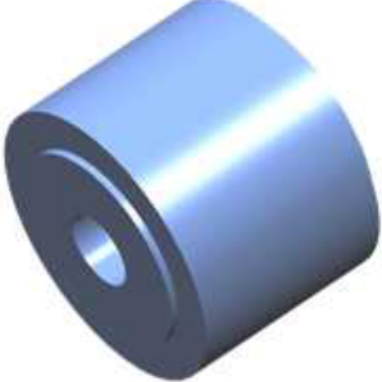
| Callout | Component Name                                |
|---------|-----------------------------------------------|
| 1       | Automatic Transmission Control Wiring Harness |
| 2       | Wiring Harness Electrical Connector           |
| 3       | Transmission Fluid Temperature Sensor         |

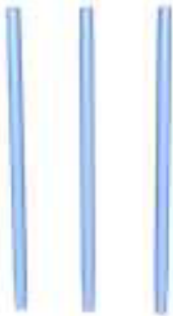
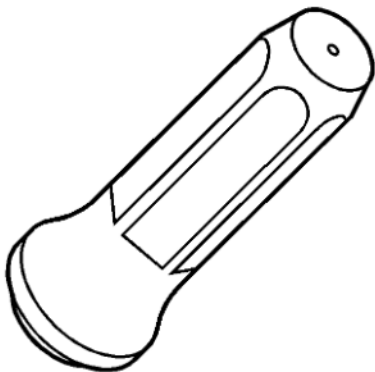
The transmission fluid temperature sensor is part of the A/Trans Control Wiring Harness Assembly and can be serviced separately. The transmission fluid temperature sensor is connected to the ECM. The ECM sends the fluid temperature data to the power inverter module for drive motor torque.

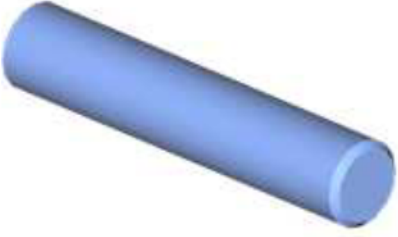
## SPECIAL TOOLS AND EQUIPMENT

### SPECIAL TOOLS

| Illustration                                                                        | Tool Number/Description                                                |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------|
|  | DT-3289-20<br>J-3289-20<br>KM 113-2-A<br>Holding Fixture Base Assembly |

| Illustration                                                                        | Tool Number/Description                                       |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------|
|     | <p>DT-46625<br/>J-46625<br/>Holding Fixture</p>               |
|    | <p>DT-46625-10<br/>J-46625-10<br/>Holding Fixture Adapter</p> |
|   | <p>DT-52009<br/>Holding Fixture Adapter</p>                   |
|  | <p>DT-48008<br/>Pinion Bearing Installer</p>                  |
|  | <p>DT-52011<br/>Rotor Remover/Installer Kit</p>               |

| Illustration                                                                        | Tool Number/Description                                                      |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
|     | <p>DT-52012<br/>Stator Remover/Installer</p>                                 |
|    | <p>DT-52017<br/>Vent Hose Pipe Installer</p>                                 |
|   | <p>DT-51436<br/>Manual Shaft Pin Installer</p>                               |
|  | <p>DT-44809<br/>J-44809<br/>Seal Installer</p>                               |
|  | <p>DT-6125-1B<br/>GE-6125-1B<br/>J-6125-1B<br/>Slide Hammer with Adapter</p> |

| Illustration                                                                        | Tool Number/Description                                |
|-------------------------------------------------------------------------------------|--------------------------------------------------------|
|     | <p>DT-23129<br/>J-23129<br/>Universal Seal Remover</p> |
|    | <p>DT-45201<br/>J-45201<br/>Seal Remover</p>           |
|   | <p>DT-23907<br/>J-23907<br/>Bearing Adapter</p>        |
|  | <p>DT-49101<br/>Seal Installer</p>                     |
|  | <p>EN-36857<br/>J-36857<br/>Engine Lift Bracket</p>    |

