

2017 ACCESSORIES & EQUIPMENT

Wipers and Washers - CT6

SPECIFICATIONS

FASTENER SPECIFICATIONS

Reusable Threaded Fastener Tightening Specifications

NOTE:

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

Application	Specification
	Metric (English)
Windshield Washer Solvent Container Nut	9 N.m (80 lb in)
Windshield Wiper Arm Nut	38 N.m (28 lb ft)
Windshield Wiper Motor Bolt	10 N.m (89 lb in)
Windshield Wiper Transmission Bolt	8 N.m (71 lb in)

SCHEMATIC WIRING DIAGRAMS

WIPER/WASHER WIRING SCHEMATICS

Wiper

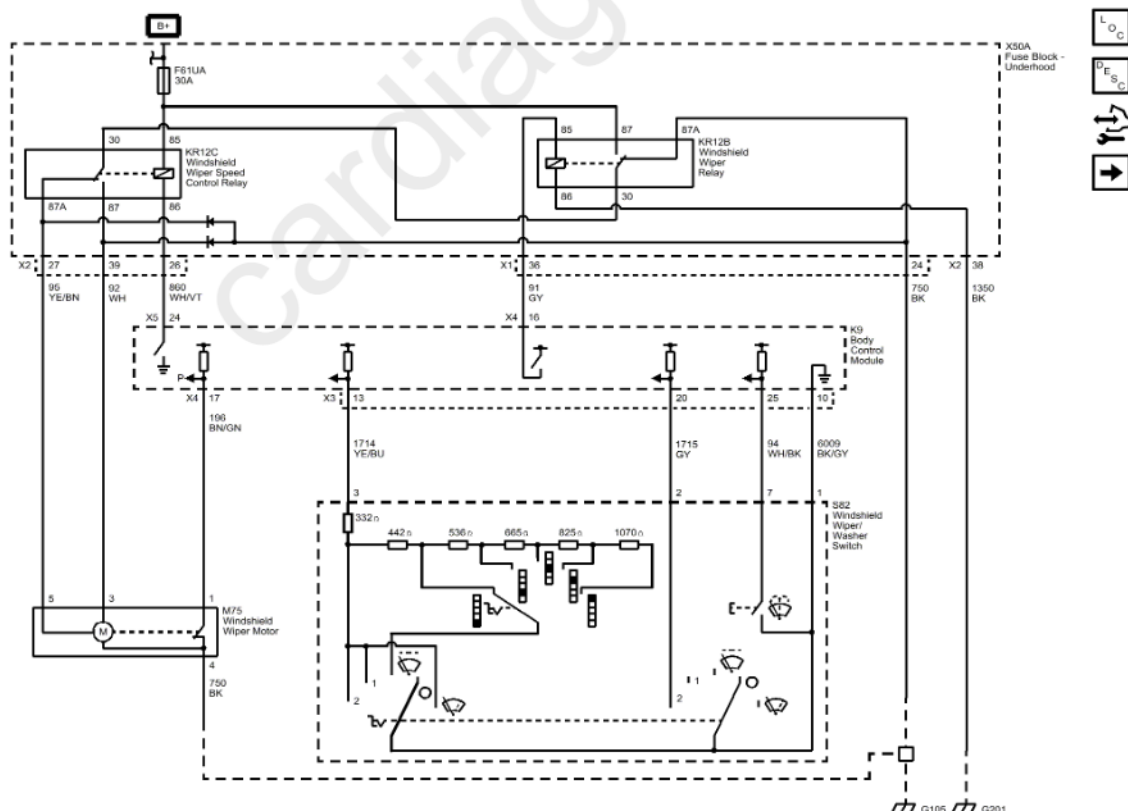


Fig. 1: Wiper

Courtesy of GENERAL MOTORS COMPANY

Windshield Washer Pump, Washer Fluid Level and Rain Sensor

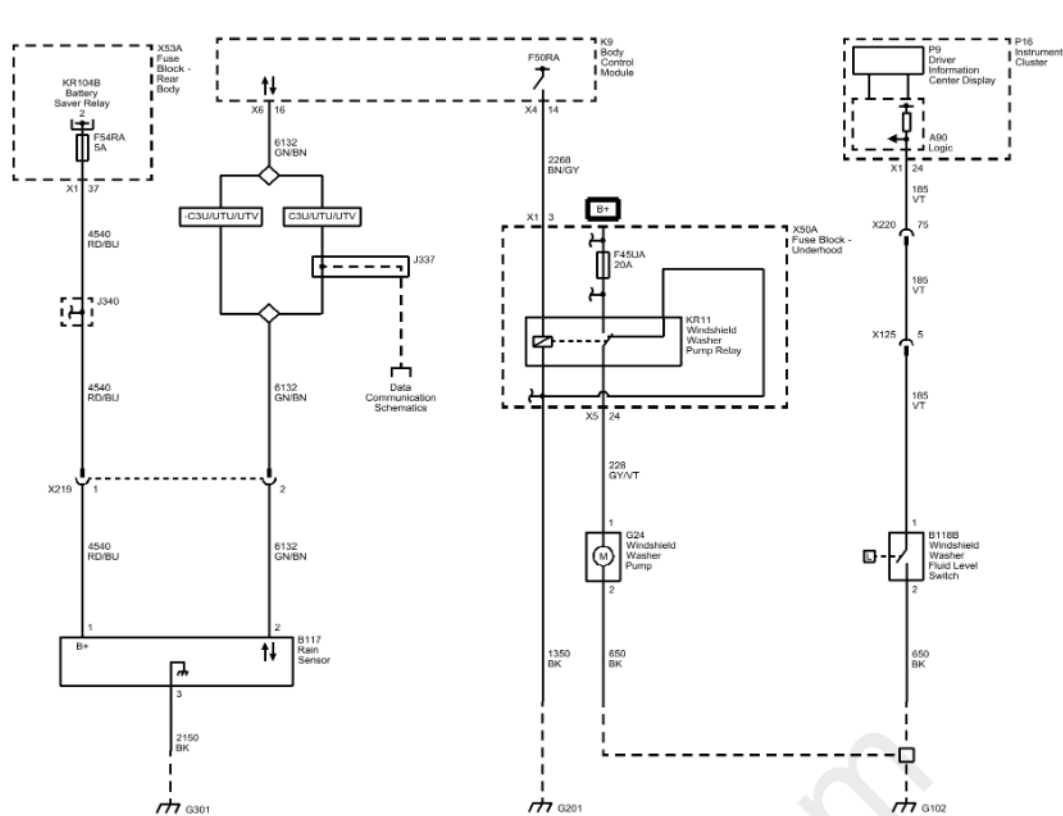


Fig. 2: Windshield Washer Pump, Washer Fluid Level and Rain Sensor
 Courtesy of GENERAL MOTORS COMPANY

Night Vision Camera Washer Pump (UV3)

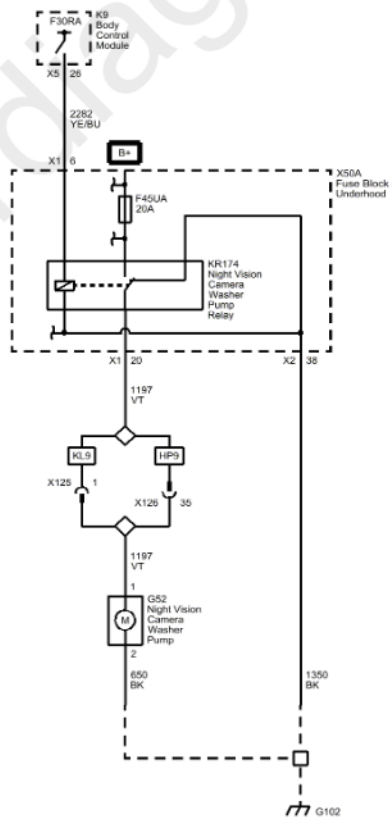


Fig. 3: Night Vision Camera Washer Pump (UV3)
 Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B370A: RAIN SENSOR

Diagnostic Instructions

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

DTC Descriptor

DTC B370A

Rain Sensor

For symptom byte information, refer to [Symptom Byte List](#) .

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U151A	U151A	-	-
Serial Data	U151A	U151A	U151A	-
Ground	-	U151A	-	-

Circuit/System Description

B+ and ground is supplied at all times to the rain sensor. The rain sensor communicates with the body control module (BCM) via serial data. When the ignition is in the ON or ACCESSORY position and the windshield wiper/washer switch is in the intermittent delay position, the BCM monitors the rain sensor data to determine the rain build up on the windshield. As rain builds up on the windshield, the BCM will command the wipers to activate. The sensitivity of the wiper frequency is controlled by the intermittent delay of the windshield wiper/washer switch. As the sensitivity is increased, the BCM will command more frequent wiper activation based on rain build up on the windshield.

Conditions for Running the DTC

- Ignition ON/Vehicle in Service Mode.
- The system voltage is between 9-16 V.

Conditions for Setting the DTC

Communication between the BCM and the rain sensor is interrupted.

Action Taken When the DTC Sets

- If the BCM loses communication with the rain sensor while operating with single wipes, the windshield wiper operation will default to intermittent operation with a fixed dwell time of 4 seconds.
- If the BCM loses communication with the rain sensor while operating at low speed, the windshield wiper operation will default to low speed.
- If the BCM loses communication with the rain sensor while operating at high speed, the windshield wiper operation will default to high speed.

Conditions for Clearing the DTC

The DTC will clear when communication is established between the BCM and rain sensor.

Reference Information

Schematic Reference

[Wiper/Washer Schematics](#)

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Wiper/Washer System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON/Vehicle in Service Mode.
2. Verify DTC U151A is not set.
 - **If the DTC is set**

Please Refer to **DTC U1500-U15FF**
 - **If the DTC is not set**
3. Place the S82 Windshield Wiper/Washer Switch in the intermittent delay setting and spray the outside of the windshield in the area of the B177 Rain Sensor with a water bottle. It may be necessary to increase the sensitivity of the intermittent delay to achieve windshield wiper operation.
4. Verify the windshield wipers operate at low speed.
 - **If the wipers are not operating at low speed**

Refer to Circuit/System Testing.
 - **If the wipers are operating at low speed**
5. All OK.

Circuit/System Testing

1. Ignition OFF, all vehicle systems OFF, disconnect the harness connector at the B117 Rain Sensor. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 3 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON/Vehicle in Service Mode, verify a test lamp illuminates between the B+ circuit terminal 1 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF/Vehicle OFF, remove the test lamp.
 2. Test for less than 2 Ω in the B+ circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.

- **If the test lamp does not illuminate and the circuit fuse is open**

1. Ignition OFF/Vehicle OFF, remove the test lamp.
2. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the B117 Rain Sensor.
- **If the test lamp illuminates**
4. Ignition OFF/Vehicle OFF, remove the test lamp, Ignition ON/Vehicle in Service Mode.
5. Test for 5.0-10.0 V between the serial data circuit terminal 2 and ground.
 - **If less than 5.0 V**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the serial data circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the serial data circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If greater than 10.0 V**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the K9 Body Control Module, Ignition ON/Vehicle in Service Mode.
 2. Test for less than 1 V between the serial data circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **If between 5.0-10.0 V**
6. Test or replace the B117 Rain Sensor.

Repair Instructions

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

Windshield Outside Moisture/Ambient Light and Humidity Sensor Replacement

Control Module References for body control module replacement, programming and setup.

DTC B3715 OR B3875: WINDSHIELD WIPER RELAY CIRCUIT

Diagnostic Instructions

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

DTC Descriptors

DTC B3715

Windshield Wiper Relay Circuit

DTC B3875

Windshield Wiper High Speed Relay Circuit

For symptom byte information, refer to [Symptom Byte List](#).

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	B3875 02, B3715 02	B3875 04, B3715 04	-	-
Windshield Wiper Relay Control	B3715 02	B3715 04	B3715 01	-
Windshield Wiper Speed Control Relay Control	B3875 02	B3875 04	-	-
Ground	-	B3715 04	-	-

Circuit/System Description

The windshield wiper motor is controlled by the body control module (BCM) through the windshield wiper relay and the windshield wiper speed control relay. When low speed windshield wiper operation is requested, the BCM will apply voltage to the windshield wiper relay control circuit. This will cause the contacts in the windshield wiper relay to close and apply B+ to the windshield wiper motor through the windshield wiper low speed control circuit, enabling low speed wiper operation. When high speed windshield wiper operation is requested, the BCM continues to apply voltage to the windshield wiper relay control circuit and also applies ground to the windshield wiper speed control relay control circuit. This will cause the contacts in the windshield wiper speed control relay to close and apply B+ to the windshield wiper motor through the windshield wiper high speed control circuit, enabling high speed wiper operation. When the windshield wiper request is no longer present, the BCM uses an algorithm to keep relays engaged to keep wiper motor going at the last required speed until it sees that the motor is in the park position and then it will remove the necessary control drivers to stop the motor.

Conditions for Running the DTC

- The DTC runs only when a wiper output is actively being requested by the BCM.
- The system voltage is between 9-16 V.

Conditions for Setting the DTC

B3715 01

A short to voltage is detected in the windshield wiper relay control circuit.

B3715 02

A short to ground is detected in the windshield wiper relay control circuit.

B3715 04

An open or high resistance is detected in the windshield wiper relay control circuit.

B3875 01

A short to voltage is detected in the windshield wiper high speed relay control circuit.

B3875 02

A short to ground is detected in the windshield wiper high speed relay control circuit.

B3875 04

An open or high resistance is detected in the windshield wiper high speed relay control circuit.

Action Taken When the DTC Sets

The BCM will not activate the wiper output.

Conditions for Clearing the DTC

- A current DTC will clear when the condition for setting the fault is no longer present.

- A history DTC will clear after 50 consecutive ignition cycles without a fault present.

Reference Information

Schematic Reference

Wiper/Washer Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Wiper/Washer System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

DTC B3715

1. Ignition OFF and all vehicle systems OFF, disconnect the KR12B Windshield Wiper Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 85 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON/Vehicle in Service Mode. Connect a test lamp between the control circuit terminal 86 and the ground circuit terminal 85.
4. Verify the test lamp turns ON and OFF when commanding the Windshield Wiper Motor Relay On and Off with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle OFF, remove the test lamp and disconnect the X4 harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF/Vehicle OFF, remove the test lamp and disconnect the X4 harness connector at the K9 Body Control Module, ignition ON/vehicle in Service Mode.
 2. Test for less than 1 V between the control circuit 16 X4 and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **If the test lamp turns ON and OFF**
5. Test or replace the KR12B Windshield Wiper Relay.

DTC B3875

1. Ignition OFF and all vehicle systems OFF, disconnect the KR12C Windshield Wiper Speed Control Relay.
2. Verify a test lamp illuminates between the B+ circuit terminal 85 and ground.
 - **If the test lamp does not illuminate**
Replace the X50A Fuse Block - Underhood.
 - **If the test lamp illuminates**
3. Ignition ON/Vehicle in Service Mode. Connect a test lamp between the control circuit terminal 86 and the B+ circuit terminal 85.
4. Verify the test lamp turns ON and OFF when commanding the Windshield Wiper Motor Relay High and Stop with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the X5 harness connector at the K9 Body Control Module, ignition ON/vehicle in Service Mode.
 2. Test for less than 1 V between the control circuit terminal 24 X5 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Ignition OFF/Vehicle OFF.
 4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the X5 harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit terminal 24 X5 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.
 - **If the test lamp turns ON and OFF**
5. Test or replace the KR12C Windshield Wiper Speed Control Relay.

Component Testing

Relay Test

1. Ignition OFF/Vehicle OFF, disconnect the appropriate relay.
2. Test for 60-200 Ω between terminals 85 and 86.
 - **If less than 60 or greater than 200**
Replace the relay.
 - **If between 60-200 Ω**
3. Test for infinite resistance between the terminals listed below:
 - 30 and 86
 - 30 and 87
 - 30 and 85
 - 85 and 87
 - **If less than infinite resistance**

Replace the relay.

- **If infinite resistance**

4. Test for less than 5 Ω between terminals 30 and 87A.

- **If 5 Ω or greater**

Replace the relay.

- **If less than 5 Ω**

5. Install a 10 A fused jumper wire between relay terminal 85 and 12 V. Install a jumper wire between relay terminal 86 and ground.

6. Test for less than 5 Ω between terminals 30 and 87.

- **If 5 Ω or greater**

Replace the relay.

- **If less than 5 Ω**

7. All OK

Repair Instructions

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

- [Relay Replacement \(Attached to Wire Harness\)](#) [Relay Replacement \(Within an Electrical Center\)](#)
- [Control Module References](#) for BCM replacement, setup and programming

DTC B3810: HEADLAMP WASHER RELAY CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

DTC B3810 02

Headlamp Washer Relay Circuit

For symptom byte information, refer to [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Headlamp Washer Pump Control	1	1	2	-
Headlamp Washer Relay Control	B3810 02	1	2	-
Headlamp Washer Pump Ground	-	1	1	-
Headlamp Washer Pump Relay Ground	-	1	-	-
1. Headlamp Washer Inoperative 2. Headlamp Washers Always ON				

Circuit/System Description

The headlamp washer pump is controlled by the body control module (BCM) via a printed circuit board (PCB) relay. If the headlamp lights are on, the BCM will activate the headlamp washer pump the first time the windshield washer pump is activated. After the initial headlamp washer activation, the BCM will only allow headlamp washer function every 5 windshield washer cycles. When the headlamp washer function is requested by the BCM's internal logic, it applies voltage through a control circuit to the headlamp washer pump relay. With the relay energized, battery voltage is applied through the switch contacts of the relay and the fused control circuit to activate the headlamp washer pump.

Conditions for Running the DTC

- Ignition ON/Vehicle in Service Mode.
- The system voltage is between 9-16 V.

Conditions for Setting the DTC

B3810 01

The body control module detects a short to B+ in the Headlamp Washer Relay Control circuit

B3810 02

The body control module detects a short to ground in the Headlamp Washer Relay Control circuit

B3810 04

The body control module detects an open or high resistance in the Headlamp Washer Relay Control circuit

Action Taken When the DTC Sets

Washer operation is suspended.

Conditions for Clearing the DTC

- A current DTC clears when the diagnostic runs and passes.
- A history DTC will clear after 50 consecutive ignition cycles without a fault present.

Diagnostic Aids

The headlamp wash feature will only be activated if the low or high beam headlamps are active as well.

Reference Information

Schematic Reference

Wiper/Washer Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Wiper/Washer System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Circuit/System Verification

1. Ignition ON/Vehicle in Service Mode.
2. Verify the scan tool Windshield Washer Switch parameter changes between Active and Inactive when pressing the windshield washer switch.
 - **If the parameter does not change**

Refer to **Washer Malfunction**.
 - **If the parameter changes**
3. Verify the headlamp washers turn ON and OFF when commanding the Headlamp Washer Relay Active and Inactive with a scan tool.
 - **If the Headlamp Washers do not turn ON and OFF**

Refer to Circuit/System Testing
 - **If the Headlamp Washers turn ON and OFF**
4. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF. Disconnect the harness connector at the G16 Headlamp Washer Pump. It may take up to 2 minutes for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 2 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Connect a test lamp between the control circuit terminal 1 and the ground circuit terminal 2, ignition ON/vehicle in Service Mode.
4. Verify the test lamp does NOT turn ON and OFF when commanding the Headlamp Washer Relay Active and Inactive with a scan tool.
 - **If the test lamp turns ON and OFF**

Test or replace the G16 Headlamp Washer Pump.
 - **If the test lamp does not turn ON and OFF**
5. Ignition OFF/Vehicle OFF, connect the harness connector at the G16 Headlamp Washer Pump. Disconnect the X2 harness connector at the X50A Fuse Block - Underhood, It may take up to 2 minutes for all vehicle systems to power down.
6. Test for less than 10 Ω between the ground circuit terminal 38 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
7. Ignition ON/Vehicle in Service Mode.
8. Verify the G16 Headlamp Washer Pump is not activated.
 - **If the G16 Headlamp Washer Pump is activated**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the G16 Headlamp Washer Pump, ignition ON/vehicle in Service Mode.

2. Test for less than 1 V between the control circuit terminal 1 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the G16 Headlamp Washer Pump.
- **If the G16 Headlamp Washer Pump is not activated**
9. Connect a 20 A fused jumper wire between the control circuit terminal 26 and B+.
10. Verify the G16 Headlamp Washer Pump activates.
 - **If the G16 Headlamp Washer Pump does not activate**
 1. Ignition OFF/Vehicle OFF, remove the jumper wire, disconnect the harness connector at the G16 Headlamp Washer Pump.
 2. Test for infinite resistance between the control circuit and ground.
 - If less than Infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the G16 Headlamp Washer Pump.
 - **If the G16 Headlamp Washer Pump activates**
11. Ignition OFF/Vehicle OFF, connect the X2 harness connector at the X50A Fuse Block - Underhood. Disconnect the X5 harness connector at the K9 Body Control Module, ignition ON/vehicle in Service Mode.
12. Verify the G16 Headlamp Washer Pump is not activated.
 - **If the G16 Headlamp Washer Pump is activated**
 1. Ignition OFF/Vehicle OFF, disconnect the X1 harness connector at the X50A Fuse Block - Underhood, ignition ON/vehicle in Service Mode.
 2. Test for less than 1 V between the control circuit terminal 6 X1 and B+.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the X50A Fuse Block - Underhood.
 - **If the G16 Headlamp Washer Pump is not activated**
13. Connect a 10 A fused jumper wire between the control circuit terminal 26 and B+.
14. Verify the G16 Headlamp Washer Pump activates.
 - **If the G16 Headlamp Washer Pump does not activate**
 1. Ignition OFF/Vehicle OFF, remove the jumper wire, disconnect the X1 harness connector at the X50A Fuse Block - Underhood.
 2. Test for infinite resistance between the control circuit terminal 6 X1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If less than infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , test or replace the X50A Fuse Block - Underhood.
 - **If the G16 Headlamp Washer Pump activates**
15. Replace the K9 Body Control Module.

Repair Instructions

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

- [Windshield Wiper and Washer Switch Replacement](#)
- [Engine Wiring Harness Junction Block Replacement](#)
- [Control Module References](#) for BCM replacement, programming and setup.

DTC B3811: REAR WASHER RELAY CIRCUIT

Diagnostic Instructions

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

DTC Descriptor

DTC B3811

Rear Washer Relay Circuit

For symptom byte information, refer to [Symptom Byte List](#).

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Control	B3811 02	B3811 04	2	-
Ground	-	B3811 04	-	-
1. Night Vision Camera Washer Inoperative 2. Night Vision Camera Washer Always ON				

Circuit/System Description

The rear windshield washer pump is controlled by the body control module (BCM) via a printed circuit board (PCB) relay. The BCM monitors the rear windshield wiper/washer switch signal circuit and when rear washer activation is requested, the BCM applies voltage through the rear window washer pump relay control circuit. With the relay energized, fused battery voltage is applied through the switch contacts of the relay and the windshield washer pump control circuit to activate the windshield washer pump.

If the vehicle is equipped with the night vision camera washer pump, The night vision camera washer pump is controlled by the body control module (BCM) via a printed circuit board (PCB) relay. The BCM monitors the night vision camera washer switch signal circuit and when night vision camera washer activation is requested, the BCM applies voltage through the night vision camera washer pump relay control circuit. With the relay energized, fused battery voltage is applied through the switch contacts of the relay and the night vision camera washer pump control circuit to activate the night vision camera washer pump.

Conditions for Running the DTC

- Ignition ON.
- The system voltage is between 9-16 V.

Conditions for Setting the DTC

B3811 01

The body control module detects a short to B+ in the night vision camera washer pump relay control circuit/night vision camera washer pump relay control circuit.

B3811 02

The body control module detects a short to ground in the night vision camera washer pump relay control circuit/night vision camera washer pump relay control circuit.

B3811 04

The body control module detects an open or high resistance in the night vision camera washer pump relay control circuit or the ground circuit/night vision camera washer pump relay control circuit.

Action Taken When the DTC Sets

Washer operation is suspended.

Conditions for Clearing the DTC

- A current DTC clears when the diagnostic runs and passes.
- A history DTC will clear after 50 consecutive ignition cycles without a fault present.

Reference Information

Schematic Reference

Wiper/Washer Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Wiper/Washer System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Verification

1. Ignition ON.
2. Verify the G52 Night Vision Camera Washer Pump changes on and off when cycling the S82 Windshield Wiper/Washer Switch.

- **If the G52 Night Vision Camera Washer Pump does not turn ON and OFF**

Refer to Circuit/System Testing

- **If the G52 Night Vision Camera Washer Pump turns ON and OFF**

3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the X2 harness connector at the X50A Fuse Block - Underhood. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the X50A Fuse Block - Underhood ground circuit terminal 38 and ground.

- **If 10 Ω or greater**

1. Ignition OFF.

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

- If 2 Ω or greater, repair the open/high resistance in the circuit.
- If less than 2 Ω , repair the open/high resistance in the ground connection.

- **If less than 10 Ω**

3. Connect the X2 harness connector at the X50A Fuse Block - Underhood and disconnect the X5 harness connector at the K9 Body Control Module, ignition ON.
4. Verify the G52 Night Vision Camera Washer Pump is not activated.
 - **If the G52 Night Vision Camera Washer Pump is activated**

1. Ignition OFF, disconnect the X1 harness connector at the X50A Fuse Block - Underhood, ignition ON.
2. Test for less than 1 V between the X50 Fuse Block - Underhood control circuit terminal 6 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, test or replace the X50A Fuse Block - Underhood.
- **If the G52 Night Vision Camera Washer Pump is not activated**
5. Connect a 10 A fused jumper wire between the control circuit terminal 9 X5 and B+.
6. Verify the G52 Night Vision Camera Washer Pump activates.
 - **If the G52 Night Vision Camera Washer Pump does not activate**
 1. Ignition OFF, remove the jumper wire, disconnect the X1 harness connector at the X50A Fuse Block - Underhood.
 2. Test for infinite resistance between the X50A Fuse Block - Underhood control circuit terminal 6 X1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the X50A Fuse Block - Underhood.
 - **If the G52 Night Vision Camera Washer Pump activates**
7. Replace the K9 Body Control Module.

Repair Instructions

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

- [Battery Distribution Engine Compartment Fuse Block Replacement](#)
- [Control Module References](#) for BCM replacement, programming and setup.

DTC B3873: FRONT WASHER RELAY CIRCUIT

Diagnostic Instructions

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

DTC Descriptors

DTC B3873

Front Washer Relay Circuit

For symptom byte information, refer to [Symptom Byte List](#).

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	B3873 02	B3873 04	-	-
Windshield Washer Relay Control	B3873 02	B3873 04	B3873 01	-
Windshield Wiper Speed Control Relay Control	B3873 02	B3873 04	-	-
Ground	-	B3873 04	-	-

Circuit/System Description

The windshield washer pump is controlled by the body control module (BCM) via a removable relay. When the washer switch is depressed, the BCM monitors the signal circuit by the washer request circuit. The BCM then applies voltage through a control circuit to the removable windshield washer pump relay. With the relay energized, fused battery voltage is applied through the switch contacts of the relay and the control circuit to activate the windshield washer pump.

Conditions for Running the DTC

- Ignition ON/Vehicle in Service Mode.
- The system voltage is between 9-16 V.

Conditions for Setting the DTC

B3873 01

The body control module detects a short to B+ in the windshield washer pump relay control circuit.

B3873 02

The body control module detects a short to ground in the windshield washer pump relay control circuit.

B3873 04

The body control module detects an open or high resistance in the windshield washer pump relay control circuit.

Action Taken When the DTC Sets

Washer operation is suspended.

Conditions for Clearing the DTC

A current DTC clears when the diagnostic runs and passes.

Reference Information

Schematic Reference

Wiper/Washer Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Wiper/Washer System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

DTC B3873

1. Ignition OFF and all vehicle systems OFF, disconnect the KR11 Windshield Washer Pump Relay.
It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 87A and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON/Vehicle in Service Mode.
4. Verify a test lamp illuminates between the B+ circuit terminal 87 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is OK**
 1. Ignition OFF/Vehicle OFF, remove the test lamp.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is OK and there is voltage at the fuse.
 - **If the test lamp illuminates**
5. Ignition ON/Vehicle in Service Mode, connect a test lamp between the control circuit terminal 86 and the ground circuit terminal 85.
6. Verify the test lamp turns ON and OFF when commanding the Windshield Washer Relay Active and Inactive with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the X4 harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit terminal 14 X4 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
7. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If the test lamp is always ON**
 1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the X4 harness connector at the K9 Body Control Module, ignition ON/vehicle in Service Mode.
 2. Test for less than 1 V between the control circuit terminal 14 X4 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.
 - **If the test lamp turns ON and OFF**
8. Test or replace the KR11 Windshield Washer Pump Relay.

Repair Instructions

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

- [Relay Replacement \(Attached to Wire Harness\)](#) [Relay Replacement \(Within an Electrical Center\)](#)
- [Control Module References](#) for body control module replacement, programming and setup.

SYMPTOMS - WIPER/WASHER SYSTEMS

NOTE: The following steps must be completed before using the symptom tables:

1. Perform [Diagnostic System Check - Vehicle](#), in order to verify that all of the following conditions are true:

- No DTCs are set.
 - The control modules can communicate via the serial data link.
2. Refer to [Wiper/Washer System Description and Operation](#) in order to familiarize yourself with the system functions.

Visual/Physical Inspection

- Inspect for aftermarket devices which may affect the operation of the windshield wiper/washer system. Refer to [Checking Aftermarket Accessories](#).
- Inspect the easily accessible or visible system components for obvious damage or conditions which may cause the symptom.
- Inspect the washer fluid reservoir for the proper fluid level.

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:

- [Windshield Wiper System Malfunction](#)
- [Washer Malfunction](#)
- [Rain Sensor Malfunction](#)
- [Headlamp Washer Malfunction](#)
- [Low Washer Fluid Indicator Malfunction](#)

WINDSHIELD WIPER SYSTEM 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	1	1	-	-
Windshield Wiper Switch Signal Terminal 2	4	2	-	-
Windshield Wiper Switch Signal Terminal 3	1	1	1	-
Underhood Fuse Block Control Terminal 36 X1	B3715 02	B3715 04	B3715 01	-
Underhood Fuse Block Control Terminal 26 X2	B3875 02	B3875 04	B3875 01	-
Windshield Wiper Motor Control Terminal 5	1, 2	1	4	-
Windshield Wiper Motor Signal Terminal 1	4	3	-	-

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Windshield Wiper Motor Control Terminal 3	1, 2	2	4	-
Windshield Wiper Switch Low Reference Terminal 1	-	1, 2	-	-
Windshield Wiper Motor Ground Terminal 4	-	1, 2, 3	-	-
Underhood Fuse Block Ground Terminal 24 X1	-	B3715 04	-	-
Underhood Fuse Block Ground Terminal 38 X2	-	1, 2, 3	-	-
1. Delay or Low Speed Wipers Inoperative 2. High Speed Wipers Inoperative 3. Wipers Do Not Park 4. Wipers Always ON				

Circuit/System Description

The windshield wiper motor is controlled by the body control module (BCM) through the removable windshield wiper in conjunction with the removable windshield wiper speed control relay. When low speed windshield wiper operation is requested, the BCM will apply voltage to the windshield wiper relay control circuit. This will cause the contacts in the windshield wiper relay to close and apply B+ to the windshield wiper motor through the windshield wiper low speed control circuit, enabling low speed wiper operation. When high speed windshield wiper operation is requested, the BCM continues to apply voltage to the windshield wiper relay control circuit and also applies ground to the windshield wiper speed control relay control circuit. This will cause the contacts in the windshield wiper speed control relay to close and apply B+ to the windshield wiper motor through the windshield wiper high speed control circuit, enabling high speed wiper operation. When the windshield wiper request is no longer present, the contacts in the windshield wiper relay and windshield wiper speed control relay will open, removing B+ from the wiper motor control circuits.

Reference Information

Schematic Reference

Wiper/Washer Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Wiper/Washer System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON/Vehicle in Service Mode.
2. Verify the scan tool Windshield Wiper High Speed Switch parameter changes between Active and Inactive when activating the high speed windshield wipers.
 - **If the parameter does not change**
Refer to Circuit/System Testing - Windshield Wiper/Washer Switch Malfunction.
 - **If the parameter changes**
3. Verify the scan tool Windshield Wiper Switch parameter changes between Off and Low when activating the low speed windshield wipers.
 - **If the parameter does not change**
Refer to Circuit/System Testing - Windshield Wiper/Washer Switch Malfunction.
 - **If the parameter changes**
4. Verify the scan tool Windshield Wiper Switch parameter changes between Delay 1 and Delay 5 when cycling the intermittent speed windshield wipers.
 - **If the parameter does not change**
Test or replace the S82 Windshield Wiper/Washer Switch.
 - **If the parameter changes**
5. Verify the M75 Windshield Wiper Motor changes between Off, Low and High when cycling the S82 Windshield Wiper/Washer Switch between Off, Low and High.
 - **If the M75 Windshield Wiper Motor does not cycle between Off, Low and High**
Refer to Circuit/System Testing - Windshield Wiper Motor Malfunction
 - **If the M75 Windshield Wiper Motor cycles between Off, Low and High**
6. Ignition OFF/Vehicle OFF.
7. Verify the scan tool Windshield Wiper Park Switch parameter is Active.
 - **If the parameter does not change**
Refer to Circuit/System Testing - Windshield Wiper Motor Malfunction.
 - **If the parameter changes**
8. All OK.

Circuit/System Testing

Windshield Wiper/Washer Switch Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S82 Windshield Wiper/Washer Switch. It may take up to 11 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the low reference circuit terminal 1 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.
 2. Test for less than 2 Ω in the low reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If less than 10 Ω**
3. Ignition ON/Vehicle in Service Mode.
4. Verify the scan tool Windshield Wiper High Speed Switch parameter is Inactive.
 - **If not Inactive**

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.
2. Test for infinite resistance between the signal circuit terminal 2 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.
- **If Inactive**
5. Install a 3 A fused jumper wire between the signal circuit terminal 2 and the low reference circuit terminal 1.
6. Verify the scan tool Windshield Wiper High Speed Switch parameter is Active.
 - **If not Active**
 1. Ignition OFF/Vehicle OFF, remove the jumper wire, disconnect the harness connector at the K9 Body Control Module, ignition ON/vehicle in Service Mode.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If Active**
7. Test for greater than 8 V between the signal circuit terminal 3 and ground.
 - **If less than 8 V**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the signal circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If 8 V or greater**
8. Ignition OFF/Vehicle OFF, disconnect the X3 harness connector at the K9 Body Control Module, ignition ON/vehicle in Service Mode.
9. Test for less than 1 V between the S82 Windshield Wiper/Washer Switch signal circuit terminal 3 and ground.
 - **If 1 V or greater**

Repair the short to voltage on the circuit.
 - **If less than 1 V**
10. Test or replace the S82 Windshield Wiper/Washer Switch.

Windshield Wiper Motor Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the M75 Windshield Wiper Motor. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 4 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**

3. Ignition ON/Vehicle in Service Mode.
4. Verify the scan tool Windshield Wiper Park Switch parameter is Inactive.
 - **If not Inactive**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the signal circuit terminal 1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.
 - **If Inactive**
5. Install a 3 A fused jumper wire between the signal circuit terminal 1 and the ground circuit terminal 4.
6. Verify the scan tool Windshield Wiper Park Switch parameter is Active.
 - **If not Active**
 1. Ignition OFF/Vehicle OFF, remove the jumper wire, disconnect the harness connector at the K9 Body Control Module, ignition ON/vehicle in Service Mode.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If Active**
7. Ignition OFF and all vehicle systems OFF, disconnect the KR12B Windshield Wiper Relay. It may take up to 2 min for all vehicle systems to power down.
8. Test for less than 10 Ω between the ground circuit terminals listed below and ground.
 - terminal 85
 - terminal 87A
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
9. Ignition ON/Vehicle in Service Mode.
10. Verify a test lamp illuminates between the B+ circuit terminal 87 and the ground circuit terminal 87A.
 - **If the test lamp does not illuminate and the circuit fuse is good**

Replace the X50A Fuse Block - Underhood.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF/Vehicle OFF, remove the test lamp. Disconnect the KR12C Windshield Wiper Speed Control Relay.
 2. Test for infinite resistance between the control circuits listed below and ground.
 - Terminal 87A
 - Terminal 87
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the M75 Windshield Wiper Motor
 - **If the test lamp illuminates**
11. Connect a test lamp between the control circuit terminal 86 and the ground circuit terminal 85.

12. Verify the test lamp turns ON and OFF when commanding the Windshield Wiper Motor Relay Low and Off with a scan tool.

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

1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.

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

1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON/vehicle in Service Mode.
2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.

- **If the test lamp turns ON and OFF**

13. Ignition OFF/Vehicle OFF, connect the KR12B Windshield Wiper Relay and disconnect the KR12C Windshield Wiper Speed Control Relay, ignition ON/vehicle in Service Mode.

14. Test for less than 10 Ω between the control circuit terminal 30 and ground.

- **If 10 Ω or greater**

Test or replace the KR12B Windshield Wiper Relay.

- **If less than 10 Ω**

15. Connect a test lamp between the control circuit terminal 30 and ground.

16. Verify the test lamp turns ON and OFF when commanding the Windshield Wiper Motor Relay Low and Off with a scan tool.

- **If the test lamp does not turn ON and OFF**

Test or replace the KR12B Windshield Wiper Relay.

- **If the test lamp turns ON and OFF**

17. Verify a test lamp illuminates between the B+ circuit terminal 85 and ground.

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

Replace the X50A Fuse Block - Underhood.

- **If the test lamp illuminates**

18. Connect a test lamp between the B+ circuit terminal 85 and the control circuit terminal 86.

19. Verify the test lamp turns ON and OFF when commanding the Windshield Wiper High Speed Relay High and Off with a scan tool.

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

1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module, ignition ON/vehicle in Service Mode.
2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
3. Ignition OFF/Vehicle OFF.
4. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.

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

1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the harness connector at the K9 Body Control Module.
2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.

- **If the test lamp turns ON and OFF**

20. Ignition OFF/Vehicle OFF, connect the KR12C Windshield Wiper Speed Control Relay.

21. Connect a test lamp between the M75 Windshield Wiper Motor control circuit terminal 5 and ground circuit terminal 4, ignition ON.

22. Verify the test lamp turns ON and OFF when commanding the Windshield Wiper Motor Relay Low and Off with a scan tool.

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

1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the KR12C Windshield Wiper Speed Control Relay.
2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , test or replace the KR12C Windshield Wiper Speed Control Relay.

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

1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the KR12C Windshield Wiper Speed Control Relay, ignition ON/vehicle in Service Mode.
2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, test or replace the KR12C Windshield Wiper Speed Control Relay.

- **If the test lamp turns ON and OFF**

23. Connect a test lamp between the M75 Windshield Wiper Motor control circuit terminal 3 and ground circuit terminal 4, ignition ON/vehicle in Service Mode.

24. Verify the test lamp turns ON and OFF when commanding the Windshield Wiper High Speed Relay High and Off with a scan tool.

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

1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the KR12C Windshield Wiper Speed Control Relay.
2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , test or replace the KR12C Windshield Wiper Speed Control Relay.

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

1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the KR12C Windshield Wiper Speed Control Relay, ignition ON/vehicle in Service Mode.
2. Test for less than 1 V between the control circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, test or replace the KR12C Windshield Wiper Speed Control Relay.

- **If the test lamp turns ON and OFF**

25. Test or replace the M75 Windshield Wiper Motor.

Windshield Wiper/Washer Switch

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S82 Windshield Wiper/Washer Switch.
2. Test for infinite resistance between the signal terminal 2 and the low reference terminal 1 with the high speed switch in the open position.
 - **If less than infinite resistance**

Replace the S82 Windshield Wiper/Washer Switch.
 - **If infinite resistance**
3. Test for less than 2 Ω between the signal circuit terminal 2 and the low reference circuit terminal 1 with the high speed switch in the closed position.
 - **If 2 Ω or greater**

Replace the S82 Windshield Wiper/Washer Switch.
 - **If less than 2 Ω**
4. Test for infinite resistance between the signal terminal 3 and the low reference terminal 1 with the low speed switch in the open position.
 - **If less than infinite resistance**

Replace the S82 Windshield Wiper/Washer Switch.
 - **If infinite resistance**
5. Test for the resistance values listed below between the signal circuit terminal 3 and the low reference circuit terminal 1 by cycling the switch between Delay 1 and Delay 5.
 - Delay 1: 3.8 k Ω
 - Delay 2: 2.8 k Ω
 - Delay 3: 1.9 k Ω
 - Delay 4: 2.8 k Ω
 - Delay 5: 770 Ω
 - **If not within the resistance values listed**

Replace the S82 Windshield Wiper/Washer Switch.
 - **If within the resistance values listed**
6. All OK

Relay Test

1. Ignition OFF/Vehicle OFF, disconnect the appropriate relay.
2. Test for 60-200 Ω between terminals 85 and 86.
 - **If less than 60 or greater than 200**

Replace the relay.
 - **If between 60-200 Ω**
3. Test for infinite resistance between the terminals listed below:
 - 30 and 86
 - 30 and 87
 - 30 and 85
 - 85 and 87
 - **If less than infinite resistance**

Replace the relay.
 - **If infinite resistance**

4. Test for less than 5 Ω between terminals 30 and 87A.

- **If 5 Ω or greater**

Replace the relay.

- **If less than 5 Ω**

5. Install a 10 A fused jumper wire between relay terminal 85 and 12 V. Install a jumper wire between relay terminal 86 and ground.

6. Test for less than 5 Ω between terminals 30 and 87.

- **If 5 Ω or greater**

Replace the relay.

- **If less than 5 Ω**

7. All OK

Repair Instructions

Perform the **Diagnostic Repair Verification** after completing the diagnostic procedure.

- **Windshield Wiper Motor Replacement**
- **Relay Replacement (Attached to Wire Harness) Relay Replacement (Within an Electrical Center)**
- **Windshield Wiper and Washer Switch Replacement**
- **Control Module References** for BCM replacement, setup and programming.

LOW WASHER FLUID INDICATOR 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.
- **Diagnostic Procedure Instructions** provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Signal	2	1	-	-
Ground	-	1	-	-
1. Low washer fluid message always displayed 2. Low washer fluid message never displayed				

Circuit/System Description

The CHECK WASHER FLUID message is controlled by the instrument cluster using an input from the washer fluid level switch. The washer fluid level signal circuit is supplied voltage through a resistor then monitored within the instrument cluster. The washer fluid level switch is normally opened so the instrument cluster detects ignition voltage on the washer fluid level signal circuit whenever the washer fluid level is low. When the washer fluid reaches the point where the driver should be informed that the washer fluid is low, the washer fluid level switch closes. When the washer fluid level switch is closed, the washer fluid level signal circuit voltage is pulled high and the instrument cluster displays the CHECK WASHER FLUID message on the driver information center. In order to prevent the CHECK WASHER FLUID message from being displayed while sloshing is occurring in the washer fluid container, the instrument cluster is programmed with a 1 min delay before changing states of the CHECK WASHER FLUID message during an ignition cycle.

Reference Information

Schematic Reference

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Wiper/Washer System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

[Control Module References](#) for Scan Tool Information

Circuit/System Verification

1. Ignition ON/Vehicle in Service Mode.
2. Verify the scan tool Washer Fluid Level Switch parameter changes between ON and OFF, when filling and emptying the windshield water bottle.
 - **If the parameter does not change**
Refer to Circuit/System Testing.
 - **If the parameter changes**
3. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the B118B Windshield Washer Fluid Level Switch. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 2 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON/Vehicle in Service Mode.
4. Verify the scan tool Washer Fluid Level Switch parameter is Off
 - **If not Off**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the P16 Instrument Cluster.
 2. Test for infinite resistance between the signal circuit terminal 1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the P16 Instrument Cluster.
 - **If Off**
5. Install a 3 A fused jumper wire between the signal circuit terminal 1 and the ground circuit terminal 2.
6. Verify the scan tool Washer Fluid Level Switch parameter is On.
 - **If not On**

1. Ignition OFF/Vehicle OFF, remove the jumper wire, disconnect the harness connector at the P16 Instrument Cluster, ignition ON/vehicle in Service Mode.
2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the P16 Instrument Cluster.
- **If On**
7. Test or replace the B118B Windshield Washer Fluid Level Switch.

Repair Instructions

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

- **Windshield Washer Solvent Container Replacement**
- **Control Module References** for instrument cluster replacement, programming and setup.

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

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	2	2	-	-
Windshield Washer Switch Signal	1	1	1	-
Windshield Washer Pump Relay Control	B3873 02	B3873 04	B3873 01	-
Windshield Washer Pump Control	2	2	2	-
Underhood Fuse Block Ground	-	B3873 04	-	-
Windshield Washer Pump Ground	-	2	-	-
Windshield Wiper Switch Low Reference	-	2	-	-
1. Windshield Washer Pump Always ON 2. Windshield Washer Pump Inoperative				

Circuit/System Description

The windshield washer pump is controlled by the body control module (BCM) via a removable relay. When the washer switch is depressed, the BCM monitors the signal circuit by the washer request circuit. The BCM then applies voltage through a control circuit to the removable windshield washer pump relay. With the relay energized, fused battery voltage is applied through the switch contacts of the relay and the control circuit to activate the windshield washer pump.

Reference Information

Schematic Reference

Wiper/Washer Schematics

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Wiper/Washer System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Verification

1. Ignition ON/Vehicle in Service Mode.
2. Verify the scan tool Windshield Washer Switch parameter changes between Active and Inactive when pressing the windshield washer switch.
 - **If the parameter does not change**
Refer to Circuit/System Testing - Windshield Wiper/Washer Switch Malfunction.
 - **If the parameter changes**
3. Verify the Windshield Washers turn On when commanding the Windshield Washer Relay Active and Inactive with a scan tool.
 - **If the Windshield Washers do not turn ON**
Refer to Circuit/System Testing - Windshield Washer Pump Malfunction
 - **If the Windshield Washers turn ON**
4. All OK.

Circuit/System Testing

Windshield Wiper/Washer Switch Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S82 Windshield Wiper/Washer Switch. It may take up to 11 min for all vehicle systems to power down.
2. Test for less than 5 Ω between the low reference circuit terminal 1 and ground.
 - **If 5 Ω or greater**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the low reference circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If less than 5 Ω**
3. Ignition ON/Vehicle in Service Mode.
4. Verify the scan tool Windshield Washer Switch parameter is Inactive.
 - **If not Inactive**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.

2. Test for infinite resistance between the S82 Windshield Wiper/Washer Switch signal circuit terminal 7 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the K9 Body Control Module.
- **If Inactive**
5. Install a 3 A fused jumper wire between the signal circuit terminal 7 and the low reference circuit terminal 1.
6. Verify the scan tool Windshield Washer Switch parameter is Active.
 - **If not Active**
 1. Ignition OFF/Vehicle OFF, remove the jumper wire, disconnect the harness connector at the K9 Body Control Module, ignition ON/vehicle in Service Mode.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V
 3. Test for less than 2 Ω in the signal circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If Active**
7. Test or replace the S82 Windshield Wiper/Washer Switch.

Windshield Washer Pump Malfunction

1. Ignition OFF and all vehicle systems OFF, disconnect the KR11 Windshield Washer Pump Relay. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 87A and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON/Vehicle in Service Mode.
4. Verify a test lamp illuminates between the B+ circuit terminal 87 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is OK**
 1. Ignition OFF/Vehicle OFF, remove the test lamp.
 2. Test for less than 2 Ω in the ignition circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is OK and there is voltage at the fuse.
 - **If the test lamp illuminates**
5. Connect a test lamp between the control circuit terminal 86 and the ground circuit terminal 87A.
6. Verify the test lamp turns ON and OFF when commanding the Windshield Washer Relay Active and Inactive with a scan tool.
 - **If the test lamp is always OFF**
 1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the X4 harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the control circuit terminal 14 X4 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.

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

1. Ignition OFF/Vehicle OFF, remove the test lamp, disconnect the X4 harness connector at the K9 Body Control Module, ignition ON/Vehicle in Service Mode.
2. Test for less than 1 V between the control circuit terminal 14 X4 and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the K9 Body Control Module.

- **If the test lamp turns ON and OFF**

7. Verify that a test lamp does not illuminate between the control circuit terminal 30 and ground.

- **If the test lamp illuminates**

Repair the short to voltage on the control circuit

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

8. Ignition OFF and all vehicle systems OFF, disconnect the X5 harness connector at the G24 Windshield Washer Pump. It may take up to 2 min for all vehicle systems to power down.

9. Test for less than 10 Ω between the ground circuit terminal 2 and ground.

- **If 10 Ω or greater**

1. Ignition OFF/Vehicle OFF.
2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.

- **If less than 10 Ω**

10. Connect the harness connector at the G24 Windshield Washer Pump.

11. Ignition ON/Vehicle in Service Mode, connect a 20 A fused jumper wire between the B+ circuit terminal 87 and the control circuit terminal 30.

12. Verify the G24 Windshield Washer Pump is activated.

- **If the G24 Windshield Washer Pump does not activate**

1. Ignition OFF/Vehicle OFF, remove the jumper wire, disconnect the harness connector at the G24 Windshield Washer Pump.
2. Test for infinite resistance between the control circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the G24 Windshield Washer Pump.

- **If the G24 Windshield Washer Pump activates**

13. Test or replace the KR11 Windshield Washer Pump Relay.

Component Testing

Washer Switch

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S82 Windshield Wiper/Washer Switch.
2. Test for infinite resistance between the signal terminal 7 and the low reference terminal 1 with the switch in the open position.

- **If less than infinite resistance**

Replace the S82 Windshield Wiper/Washer Switch.

- **If infinite resistance**

3. Test for less than 2 Ω between the signal circuit terminal 7 and the low reference circuit terminal 1 with the switch in the closed position.

- **If 2 Ω or greater**

Replace the S82 Windshield Wiper/Washer Switch.

- **If less than 2 Ω**

4. Test for less than 2 Ω between the signal circuit terminal 7 and the Windshield Wiper Switch High Signal terminal 1 with the switch in the closed position.

- **If 2 Ω or greater**

Replace the S82 Windshield Wiper/Washer Switch.

- **If less than 2 Ω**

5. Test for infinite resistance between the signal terminal 7 and the Windshield Wiper Switch Low Signal terminal 3 with the switch in the open position.

- **If less than infinite resistance**

Replace the S82 Windshield Wiper/Washer Switch.

- **If infinite resistance**

6. Test for less than 2 Ω between the signal circuit terminal 7 and the Windshield Wiper Switch Low Signal terminal 3 with the switch in the closed position.

- **If 2 Ω or greater**

Replace the S82 Windshield Wiper/Washer Switch.

- **If less than 2 Ω**

7. All OK.

Repair Instructions

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

- [Windshield Washer Pump Replacement \(Windshield\)](#)[Windshield Washer Pump Replacement \(Night Vision Camera\)](#)
- [Windshield Wiper and Washer Switch Replacement](#)
- [Control Module References](#) for BCM replacement, programming and setup.

RAIN SENSOR 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B370A

Rain Sensor

For symptom byte information, refer to [Symptom Byte List](#).

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+	U151A	U151A	-	-
Serial Data	U151A	U151A	U151A	-
Ground	-	U151A	-	-

Circuit/System Description

B+ and ground is supplied at all times to the rain sensor. The rain sensor communicates with the body control module (BCM) via serial data. When the ignition is in the ON or ACCESSORY position and the windshield wiper/washer switch is in the intermittent delay position, the BCM monitors the rain sensor data to determine the rain build up on the windshield. As rain builds up on the windshield, the BCM will command the wipers to activate. The sensitivity of the wiper frequency is controlled by the intermittent delay of the windshield wiper/washer switch. As the sensitivity is increased, the BCM will command more frequent wiper activation based on rain build up on the windshield.

Conditions for Running the DTC

- Ignition ON/Vehicle in Service Mode.
- The system voltage is between 9-16 V.

Conditions for Setting the DTC

Communication between the BCM and the rain sensor is interrupted.

Action Taken When the DTC Sets

- If the BCM loses communication with the rain sensor while operating with single wipes, the windshield wiper operation will default to intermittent operation with a fixed dwell time of 4 seconds.
- If the BCM loses communication with the rain sensor while operating at low speed, the windshield wiper operation will default to low speed.
- If the BCM loses communication with the rain sensor while operating at high speed, the windshield wiper operation will default to high speed.

Conditions for Clearing the DTC

The DTC will clear when communication is established between the BCM and rain sensor.

Reference Information

Schematic Reference

Wiper/Washer Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Wiper/Washer System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

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

Circuit/System Verification

1. Ignition ON/Vehicle in Service Mode.
2. Verify DTC U151A is not set.
 - **If the DTC is set**

Please Refer to [DTC U1500-U15FF](#)

- **If the DTC is not set**
- 3. Place the S82 Windshield Wiper/Washer Switch in the intermittent delay setting and spray the outside of the windshield in the area of the B177 Rain Sensor with a water bottle. It may be necessary to increase the sensitivity of the intermittent delay to achieve windshield wiper operation.
- 4. Verify the windshield wipers operate at low speed.
 - **If the wipers are not operating at low speed**
Refer to Circuit/System Testing.
 - **If the wipers are operating at low speed**
- 5. All OK.

Circuit/System Testing

1. Ignition OFF, all vehicle systems OFF, disconnect the harness connector at the B117 Rain Sensor. It may take up to 2 min for all vehicle systems to power down.
2. Test for less than 10 Ω between the ground circuit terminal 3 and ground.
 - **If 10 Ω or greater**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the ground circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , repair the open/high resistance in the ground connection.
 - **If less than 10 Ω**
3. Ignition ON/Vehicle in Service Mode, verify a test lamp illuminates between the B+ circuit terminal 1 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF/Vehicle OFF, remove the test lamp.
 2. Test for less than 2 Ω in the B+ circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , verify the fuse is not open and there is voltage at the fuse.
 - **If the test lamp does not illuminate and the circuit fuse is open**
 1. Ignition OFF/Vehicle OFF, remove the test lamp.
 2. Test for infinite resistance between the B+ circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the B117 Rain Sensor.
 - **If the test lamp illuminates**
4. Ignition OFF/Vehicle OFF, remove the test lamp, Ignition ON/Vehicle in Service Mode.
5. Test for 5.0-10.0 V between the serial data circuit terminal 2 and ground.
 - **If less than 5.0 V**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the K9 Body Control Module.
 2. Test for infinite resistance between the serial data circuit and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for less than 2 Ω in the serial data circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the K9 Body Control Module.
 - **If greater than 10.0 V**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the K9 Body Control Module, Ignition ON/Vehicle in Service Mode.
 2. Test for less than 1 V between the serial data circuit and ground.

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the K9 Body Control Module.
- **If between 5.0-10.0 V**

6. Test or replace the B117 Rain Sensor.

Repair Instructions

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

Windshield Outside Moisture/Ambient Light and Humidity Sensor Replacement

[Control Module References](#) for body control module replacement, programming and setup.

HEADLAMP WASHER 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.
- [Diagnostic Procedure Instructions](#) provides an overview of each diagnostic category.

DTC Descriptor

DTC B3810 02

Headlamp Washer Relay Circuit

For symptom byte information, refer to [Symptom Byte List](#)

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
Headlamp Washer Pump Control	1	1	2	-
Headlamp Washer Relay Control	B3810 02	1	2	-
Headlamp Washer Pump Ground	-	1	1	-
Headlamp Washer Pump Relay Ground	-	1	-	-
1. Headlamp Washer Inoperative 2. Headlamp Washers Always ON				

Circuit/System Description

The headlamp washer pump is controlled by the body control module (BCM) via a printed circuit board (PCB) relay. If the headlamp lights are on, the BCM will activate the headlamp washer pump the first time the windshield washer pump is activated. After the initial headlamp washer activation, the BCM will only allow headlamp washer function every 5 windshield washer cycles. When the headlamp washer function is requested by the BCM's internal logic, it applies voltage through a control circuit to the headlamp washer pump relay. With the relay energized, battery voltage is applied through the switch contacts of the relay and the fused control circuit to activate the headlamp washer pump.

Conditions for Running the DTC

- Ignition ON/Vehicle in Service Mode.
- The system voltage is between 9-16 V.

Conditions for Setting the DTC

B3810 01

The body control module detects a short to B+ in the Headlamp Washer Relay Control circuit

B3810 02

The body control module detects a short to ground in the Headlamp Washer Relay Control circuit

B3810 04

The body control module detects an open or high resistance in the Headlamp Washer Relay Control circuit

Action Taken When the DTC Sets

Washer operation is suspended.

Conditions for Clearing the DTC

- A current DTC clears when the diagnostic runs and passes.
- A history DTC will clear after 50 consecutive ignition cycles without a fault present.

Diagnostic Aids

The headlamp wash feature will only be activated if the low or high beam headlamps are active as well.

Reference Information

Schematic Reference

Wiper/Washer Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Wiper/Washer System Description and Operation

Electrical Information Reference

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

Scan Tool Reference

Control Module References for scan tool information.

Circuit/System Verification

1. Ignition ON/Vehicle in Service Mode.
2. Verify the scan tool Windshield Washer Switch parameter changes between Active and Inactive when pressing the windshield washer switch.
 - **If the parameter does not change**
Refer to **Washer Malfunction**.
 - **If the parameter changes**
3. Verify the headlamp washers turn ON and OFF when commanding the Headlamp Washer Relay Active and Inactive with a scan tool.
 - **If the Headlamp Washers do not turn ON and OFF**

- **If the Headlamp Washers turn ON and OFF**

4. All OK.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF. Disconnect the harness connector at the G16 Headlamp Washer Pump. It may take up to 2 minutes for all vehicle systems to power down.

2. Test for less than 10 Ω between the ground circuit terminal 2 and ground.

- **If 10 Ω or greater**

1. Ignition OFF/Vehicle OFF.

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

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

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

- **If less than 10 Ω**

3. Connect a test lamp between the control circuit terminal 1 and the ground circuit terminal 2, ignition ON/vehicle in Service Mode.

4. Verify the test lamp does NOT turn ON and OFF when commanding the Headlamp Washer Relay Active and Inactive with a scan tool.

- **If the test lamp turns ON and OFF**

Test or replace the G16 Headlamp Washer Pump.

- **If the test lamp does not turn ON and OFF**

5. Ignition OFF/Vehicle OFF, connect the harness connector at the G16 Headlamp Washer Pump. Disconnect the X2 harness connector at the X50A Fuse Block - Underhood, It may take up to 2 minutes for all vehicle systems to power down.

6. Test for less than 10 Ω between the ground circuit terminal 38 and ground.

- **If 10 Ω or greater**

1. Ignition OFF/Vehicle OFF.

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

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

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

- **If less than 10 Ω**

7. Ignition ON/Vehicle in Service Mode.

8. Verify the G16 Headlamp Washer Pump is not activated.

- **If the G16 Headlamp Washer Pump is activated**

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the G16 Headlamp Washer Pump, ignition ON/vehicle in Service Mode.

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

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

- If less than 1 V, replace the G16 Headlamp Washer Pump.

- **If the G16 Headlamp Washer Pump is not activated**

9. Connect a 20 A fused jumper wire between the control circuit terminal 26 and B+.

10. Verify the G16 Headlamp Washer Pump activates.

- **If the G16 Headlamp Washer Pump does not activate**

1. Ignition OFF/Vehicle OFF, remove the jumper wire, disconnect the harness connector at the G16 Headlamp Washer Pump.

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

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

- If infinite resistance

3. Test for less than 2 Ω in the control circuit end to end.

- If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , replace the G16 Headlamp Washer Pump.
 - **If the G16 Headlamp Washer Pump activates**
11. Ignition OFF/Vehicle OFF, connect the X2 harness connector at the X50A Fuse Block - Underhood. Disconnect the X5 harness connector at the K9 Body Control Module, ignition ON/vehicle in Service Mode.
 12. Verify the G16 Headlamp Washer Pump is not activated.
 - **If the G16 Headlamp Washer Pump is activated**
 1. Ignition OFF/Vehicle OFF, disconnect the X1 harness connector at the X50A Fuse Block - Underhood, ignition ON/vehicle in Service Mode.
 2. Test for less than 1 V between the control circuit terminal 6 X1 and B+.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the X50A Fuse Block - Underhood.
 - **If the G16 Headlamp Washer Pump is not activated**
 13. Connect a 10 A fused jumper wire between the control circuit terminal 26 and B+.
 14. Verify the G16 Headlamp Washer Pump activates.
 - **If the G16 Headlamp Washer Pump does not activate**
 1. Ignition OFF/Vehicle OFF, remove the jumper wire, disconnect the X1 harness connector at the X50A Fuse Block - Underhood.
 2. Test for infinite resistance between the control circuit terminal 6 X1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If less than infinite resistance
 3. Test for less than 2 Ω in the control circuit end to end.
 - If 2 Ω or greater, repair the open/high resistance in the circuit.
 - If less than 2 Ω , test or replace the X50A Fuse Block - Underhood.
 - **If the G16 Headlamp Washer Pump activates**
 15. Replace the K9 Body Control Module.

Repair Instructions

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

- **Windshield Wiper and Washer Switch Replacement**
- **Engine Wiring Harness Junction Block Replacement**
- **Control Module References** for BCM replacement, programming and setup.

REPAIR INSTRUCTIONS

WINDSHIELD WIPER AND WASHER SWITCH REPLACEMENT

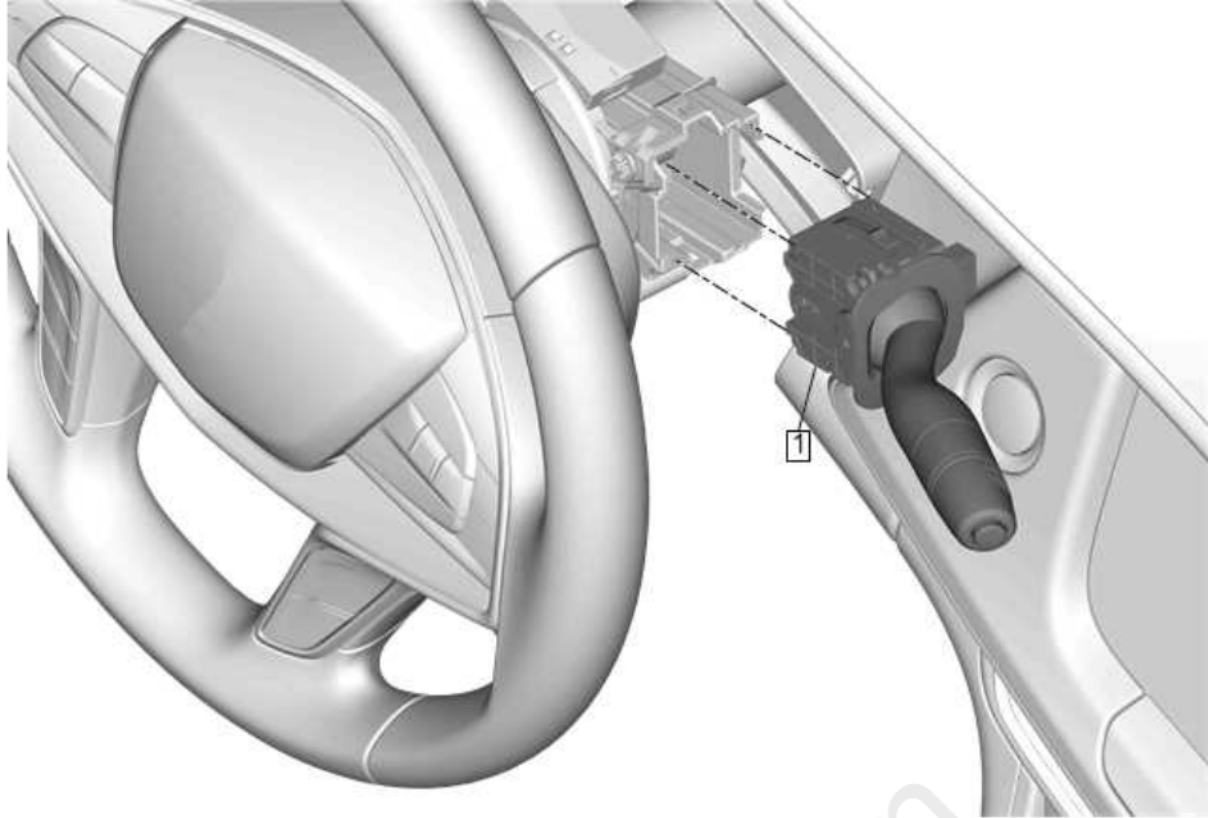


Fig. 4: Windshield Wiper and Washer Switch
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Steering Column Lower Trim Cover Replacement</u>	
1	Windshield Wiper and Washer Switch Procedure 1. Disconnect the electrical connector. 2. Release the retaining tabs and remove the windshield wiper and washer switch from the turn signal switch bracket.

WINDSHIELD WASHER NOZZLE HOSE REPLACEMENT

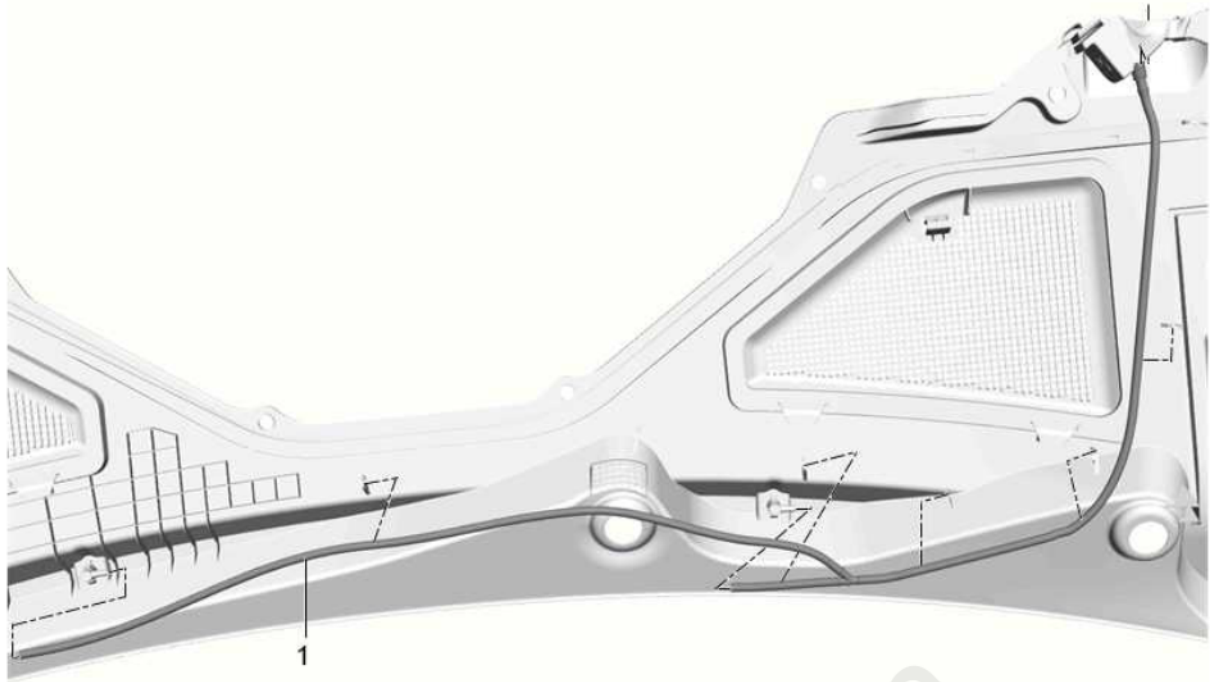


Fig. 5: Windshield Washer Nozzle Hose
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
<u>Air Inlet Grille Panel Replacement</u>	
1	Windshield Washer Nozzle Hose Procedure 1. Disconnect the windshield washer hose at both windshield washer nozzle spouts. 2. Remove the windshield washer hose from the air inlet grille panel retainers.

WINDSHIELD WASHER NOZZLE REPLACEMENT

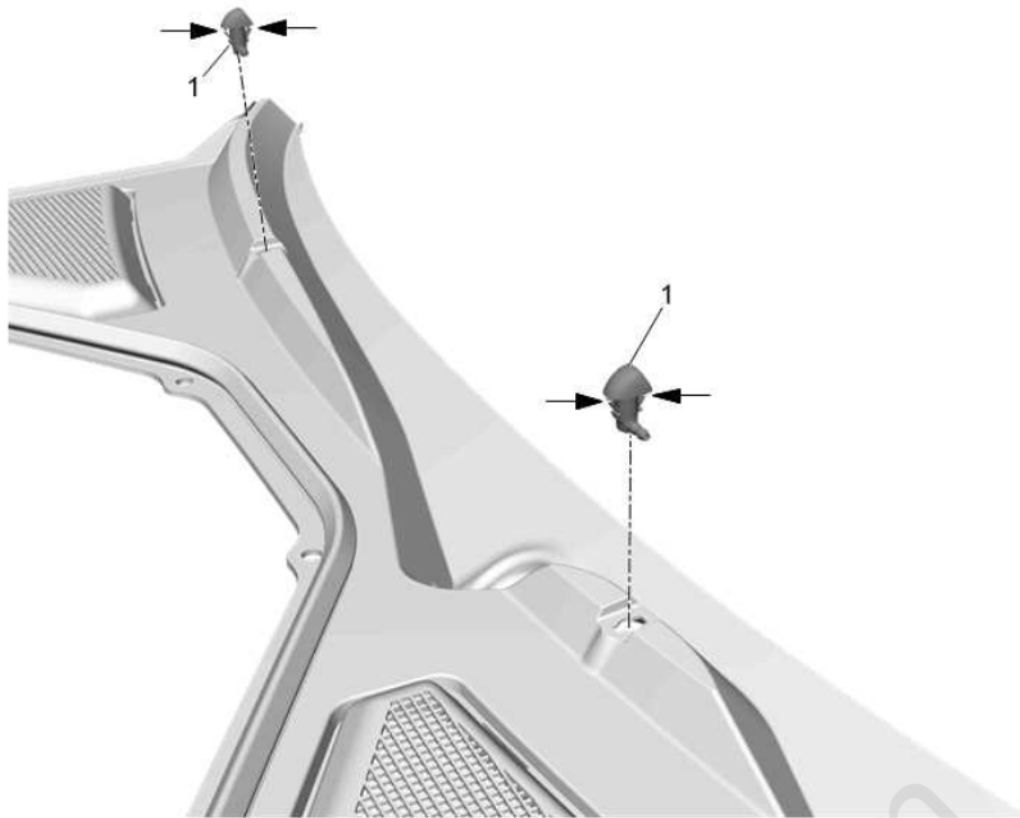


Fig. 6: Windshield Washer Nozzle

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Air Inlet Grille Panel Replacement	
1	Windshield Washer Nozzle Procedure 1. Disconnect the windshield washer nozzle hose at the windshield washer nozzle being serviced. 2. Compress the locking tabs on the windshield washer nozzle. 3. Push the windshield washer nozzle upward to remove from the air inlet grille panel.

WINDSHIELD WASHER PUMP HOSE REPLACEMENT (WINDSHIELD)

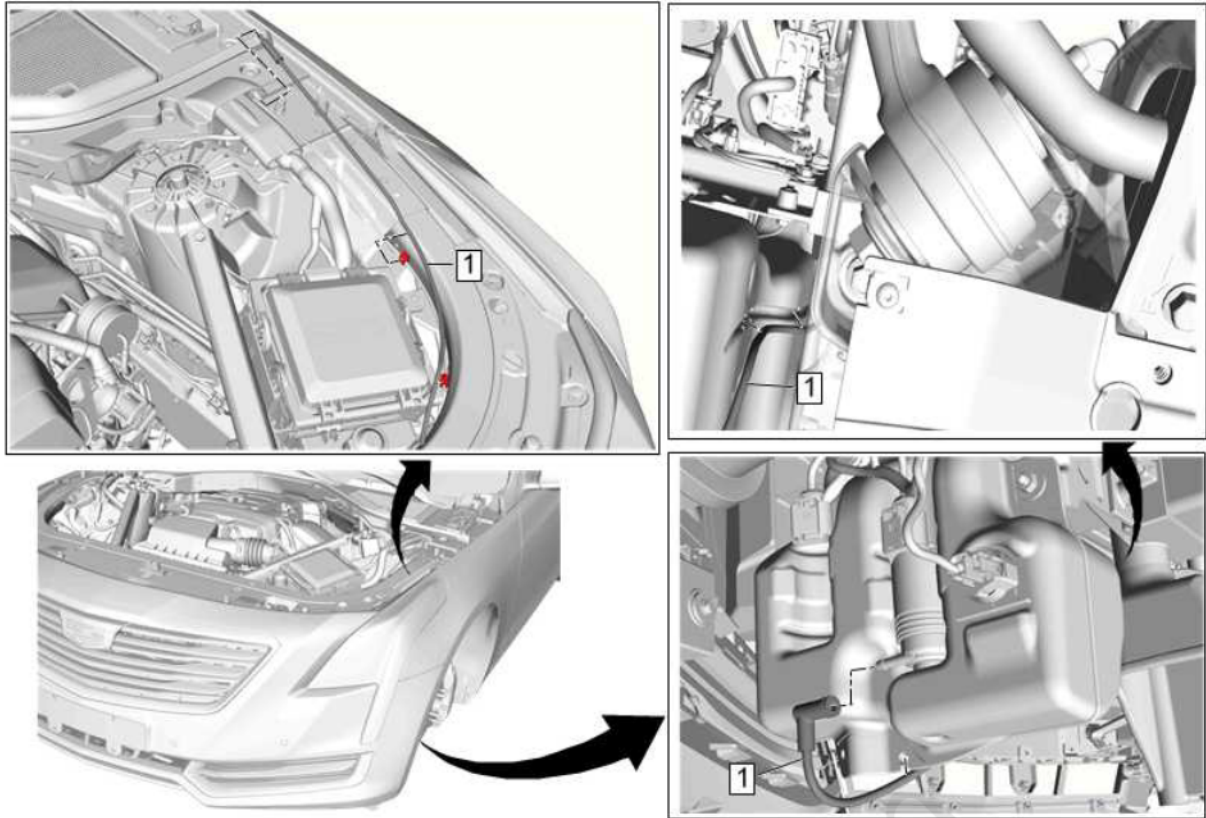


Fig. 7: Windshield Washer Pump Hose (Windshield)
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures <u>Front Tire Front Air Deflector Replacement</u> <u>Front Wheelhouse Liner Replacement</u>	
1	Windshield Washer Pump Hose Procedure 1. Disconnect the windshield washer pump hose from the windshield washer pump. 2. Disconnect the windshield washer pump hose from the windshield washer solvent container. 3. Release the windshield washer pump hose from the hood primary latch release cable clip. 4. Disconnect the windshield washer pump hose from the windshield washer nozzle hose. 5. Pull the windshield washer pump hose up through the front wheelhouse panel and remove from the vehicle.

WINDSHIELD WASHER PUMP HOSE REPLACEMENT (NIGHT VISION CAMERA)

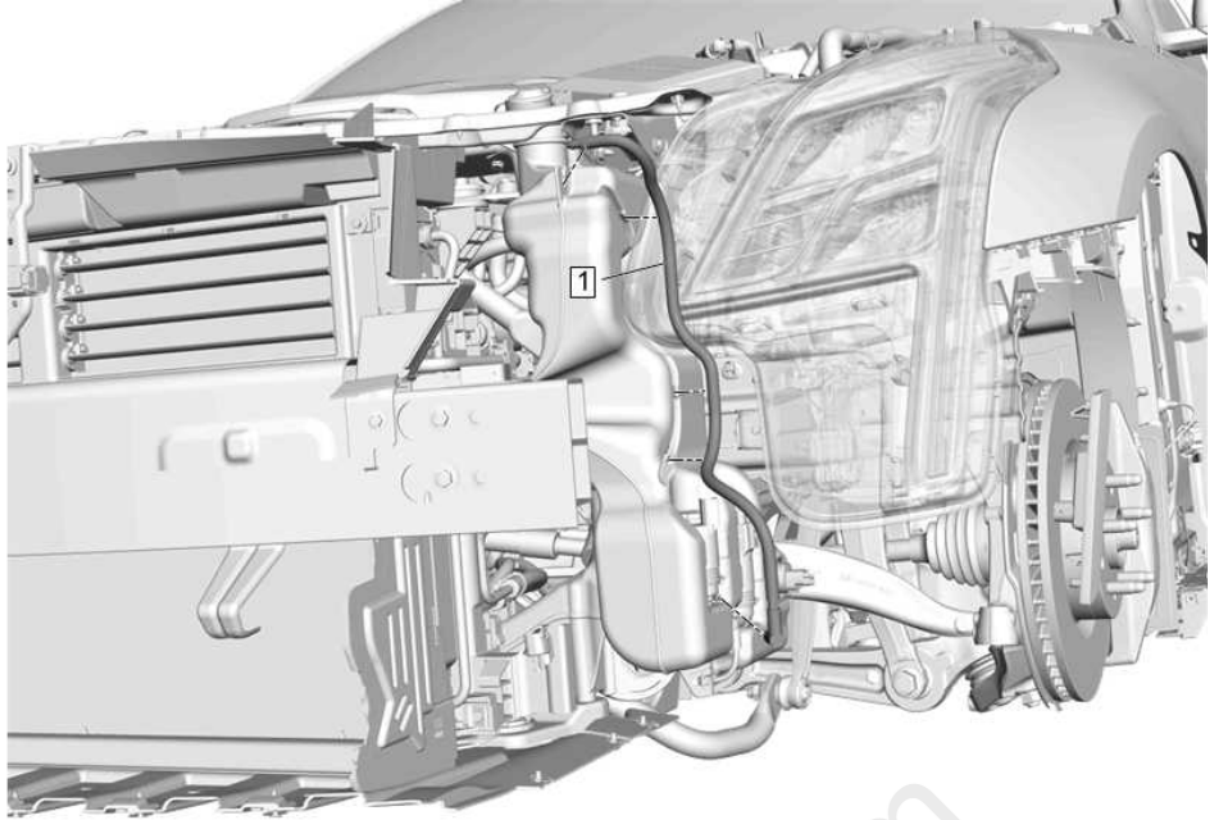


Fig. 8: Windshield Washer Pump Hose (Night Vision Camera)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Front Tire Front Air Deflector Replacement</u>	
1	Windshield Washer Pump Hose Procedure 1. Disconnect the windshield washer pump hose from the windshield washer pump. 2. Disconnect the windshield washer pump hose from the windshield washer solvent container. 3. Disconnect the windshield washer pump hose from the night vision camera cleaning hose. 4. Remove windshield washer pump hose from the vehicle.

WINDSHIELD WASHER SOLVENT CONTAINER REPLACEMENT

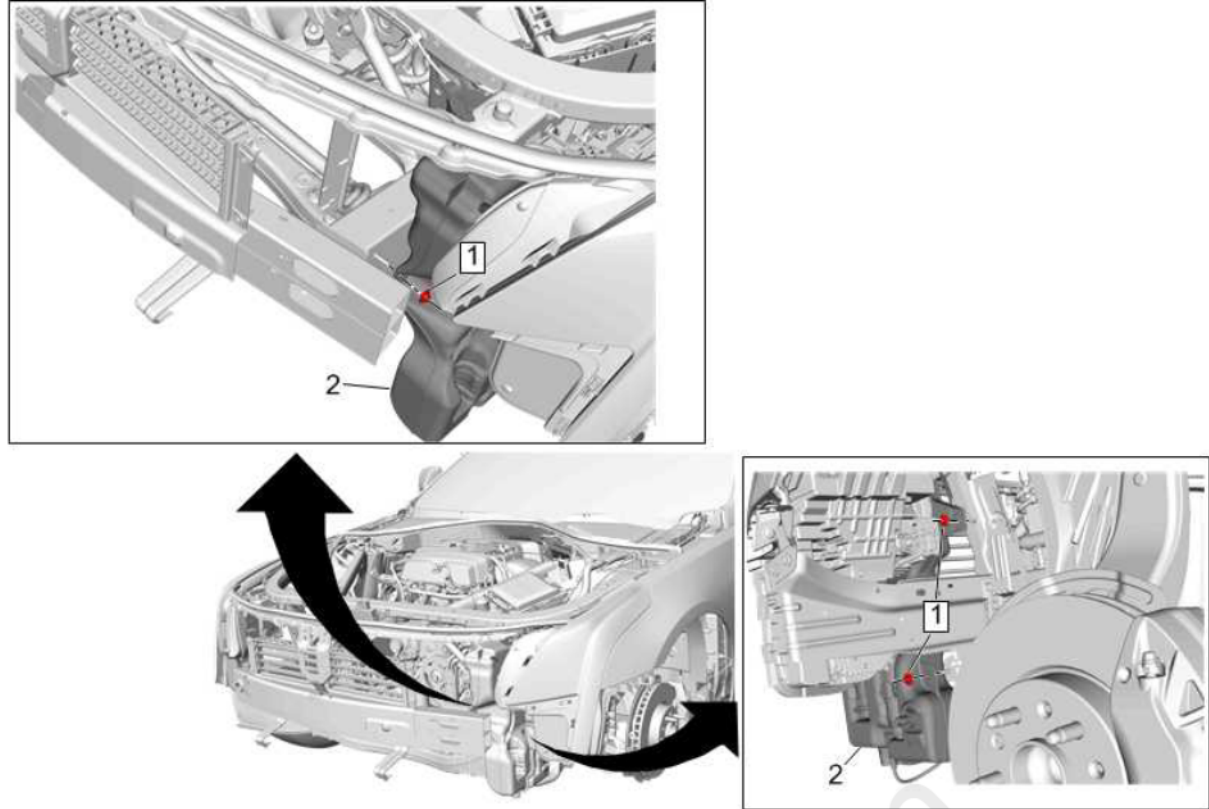


Fig. 9: Windshield Washer Solvent Container
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures <u>Front Bumper Fascia Replacement (Without UV3)</u> <u>Front Bumper Fascia Replacement (With UV3)</u> - Place a suitable drain pan under the windshield washer pump area to recover the windshield washer solvent when the windshield washer pump hose is disconnected. - Disconnect the electrical connectors. - Disconnect windshield washer pump hose from the windshield washer pump and windshield washer solvent container.	
1	Windshield Washer Solvent Container Nut [3x] CAUTION: Refer to <u>Fastener Caution</u> . Tighten 9 N.m (80 lb in)
2	Windshield Washer Solvent Container Procedure - Remove the windshield washer solvent container from the vehicle. - Drain the windshield washer solvent into a suitable clean container. - Transfer components as necessary.

WINDSHIELD WASHER PUMP REPLACEMENT (WINDSHIELD)

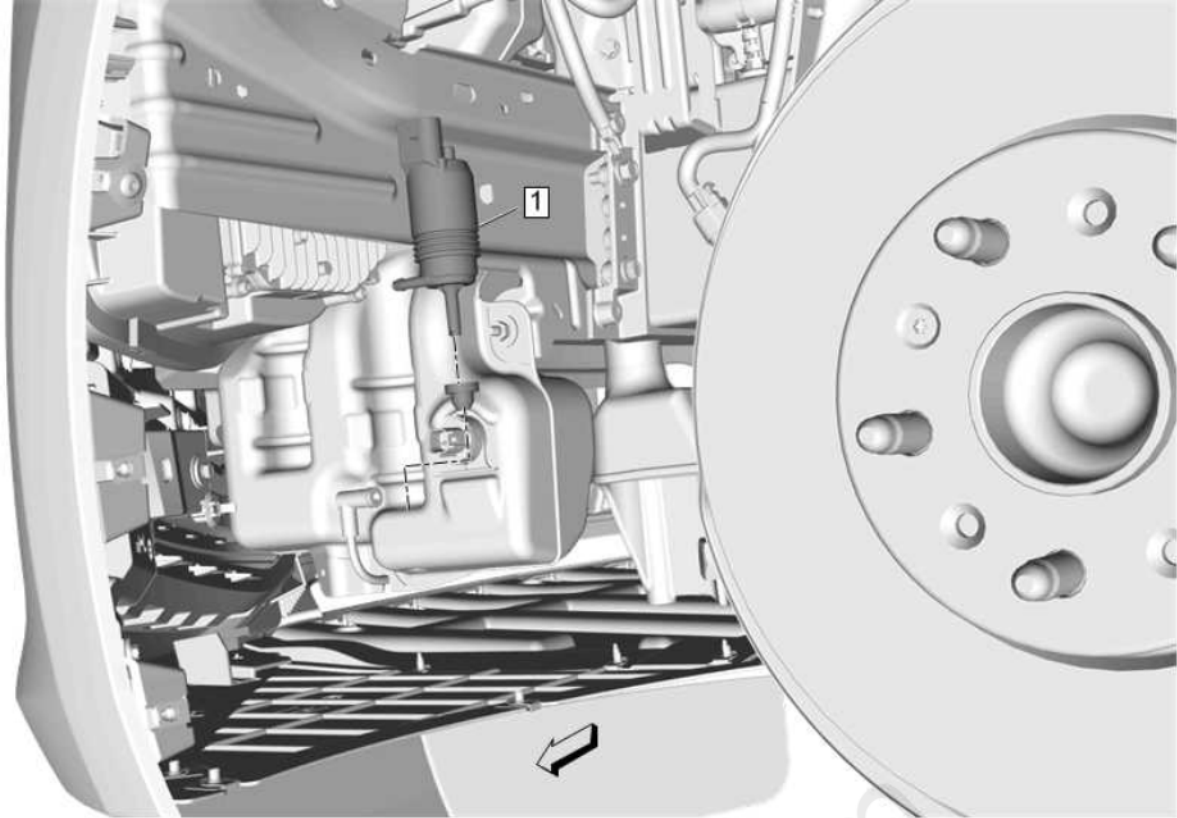


Fig. 10: Windshield Washer Pump (Windshield)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Front Wheelhouse Liner Replacement</u>	
1	Windshield Washer Pump Procedure 1. Disconnect the electrical connector. 2. Place a clean suitable drain pan under the windshield washer solvent container to secure the windshield washer solvent when the level sensor and seal are removed. 3. Disconnect the windshield washer pump hose from the windshield washer pump. 4. Using two flat-bladed tools, place the ends under each side of the windshield washer pump, twist and pry outward in opposite directions to disengage the pump from the washer solvent container and grommet. 5. Remove and Discard the windshield washer pump grommet and replace with a New grommet.

WINDSHIELD WASHER PUMP REPLACEMENT (NIGHT VISION CAMERA)

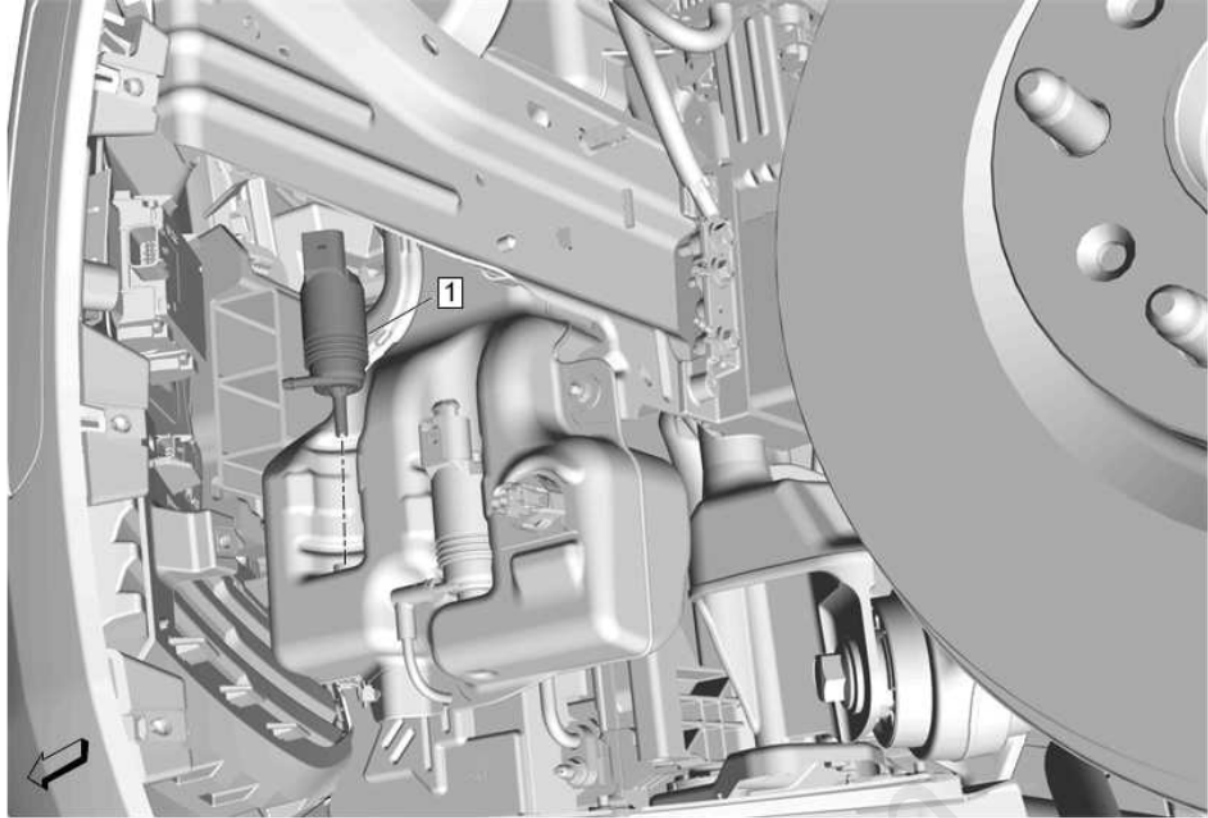


Fig. 11: Windshield Washer Pump (Night Vision Camera)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Front Wheelhouse Liner Replacement</u>	
1	Windshield Washer Pump Procedure 1. Disconnect the electrical connector. 2. Place a clean suitable drain pan under the windshield washer solvent container to secure the windshield washer solvent when the level sensor and seal are removed. 3. Disconnect the windshield washer pump hose from the windshield washer pump. 4. Using two flat-bladed tools, place the ends under each side of the windshield washer pump, twist and pry outward in opposite directions to disengage the pump from the washer solvent container and grommet. 5. Remove and Discard the windshield washer pump grommet and replace with a New grommet.

WINDSHIELD WASHER PUMP GROMMET REPLACEMENT (WINDSHIELD)

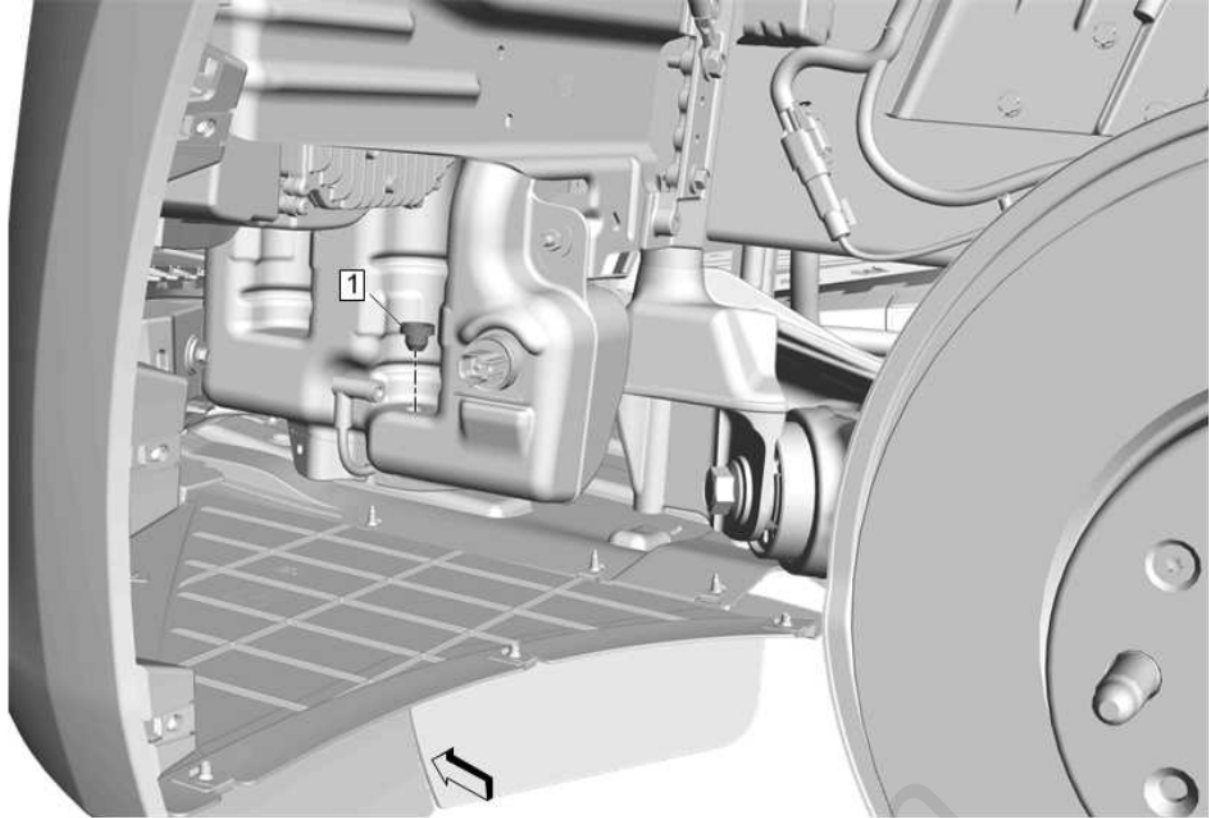


Fig. 12: Windshield Washer Pump Grommet (Windshield)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Windshield Washer Pump Replacement (Windshield)</u>	
1	Windshield Washer Pump Grommet Procedure 1. Remove and DISCARD the windshield washer pump grommet. 2. Lubricate the exterior of the New grommet with windshield washer solvent to assist with the installation of the grommet into the windshield washer solvent container. 3. Ensure the grommet is properly seated in the windshield washer solvent container.

WINDSHIELD WASHER PUMP GROMMET REPLACEMENT (NIGHT VISION CAMERA)

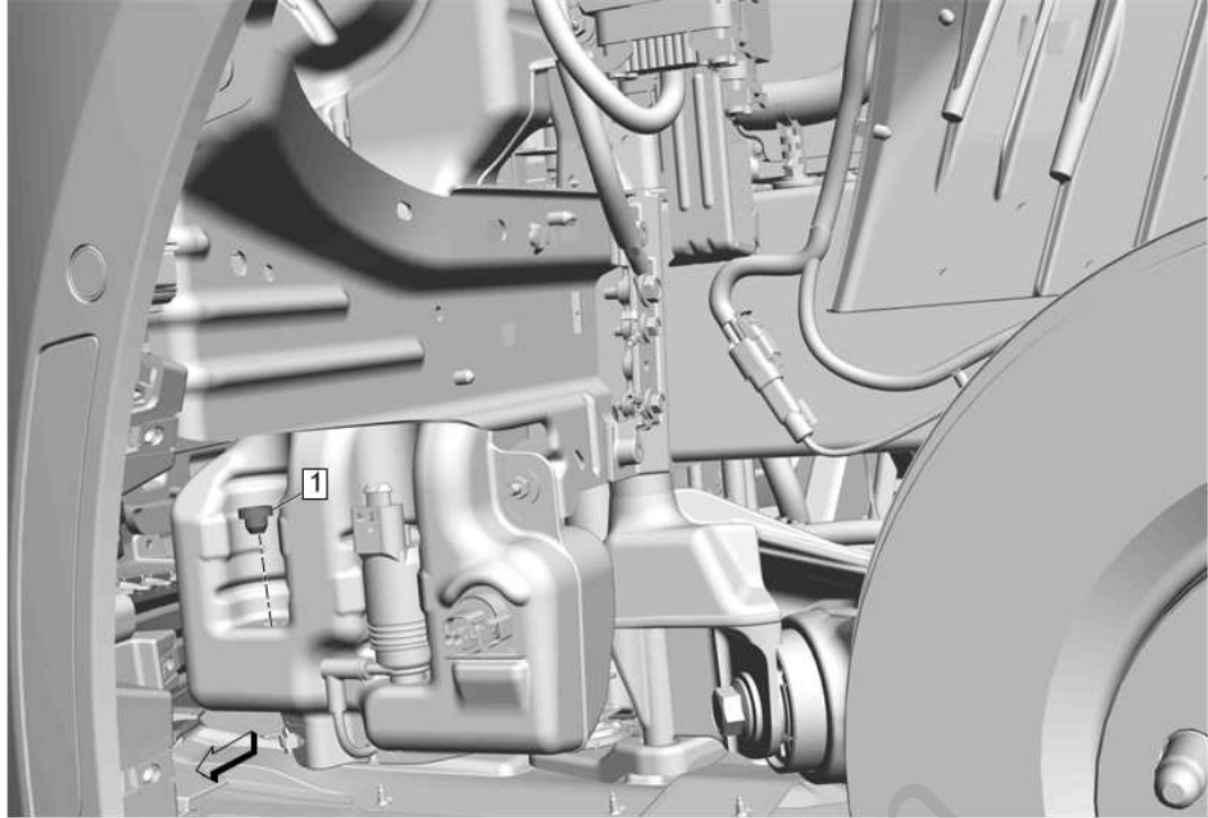


Fig. 13: Windshield Washer Pump Grommet (Night Vision Camera)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Windshield Washer Pump Replacement (Night Vision Camera)</u>	
1	Windshield Washer Pump Grommet Procedure 1. Remove and DISCARD the windshield washer pump grommet. 2. Lubricate the exterior of the New grommet with windshield washer solvent to assist with the installation of the grommet into the windshield washer solvent container. 3. Ensure the grommet is properly seated in the windshield washer solvent container.

WINDSHIELD WASHER SOLVENT CONTAINER LEVEL SENSOR REPLACEMENT

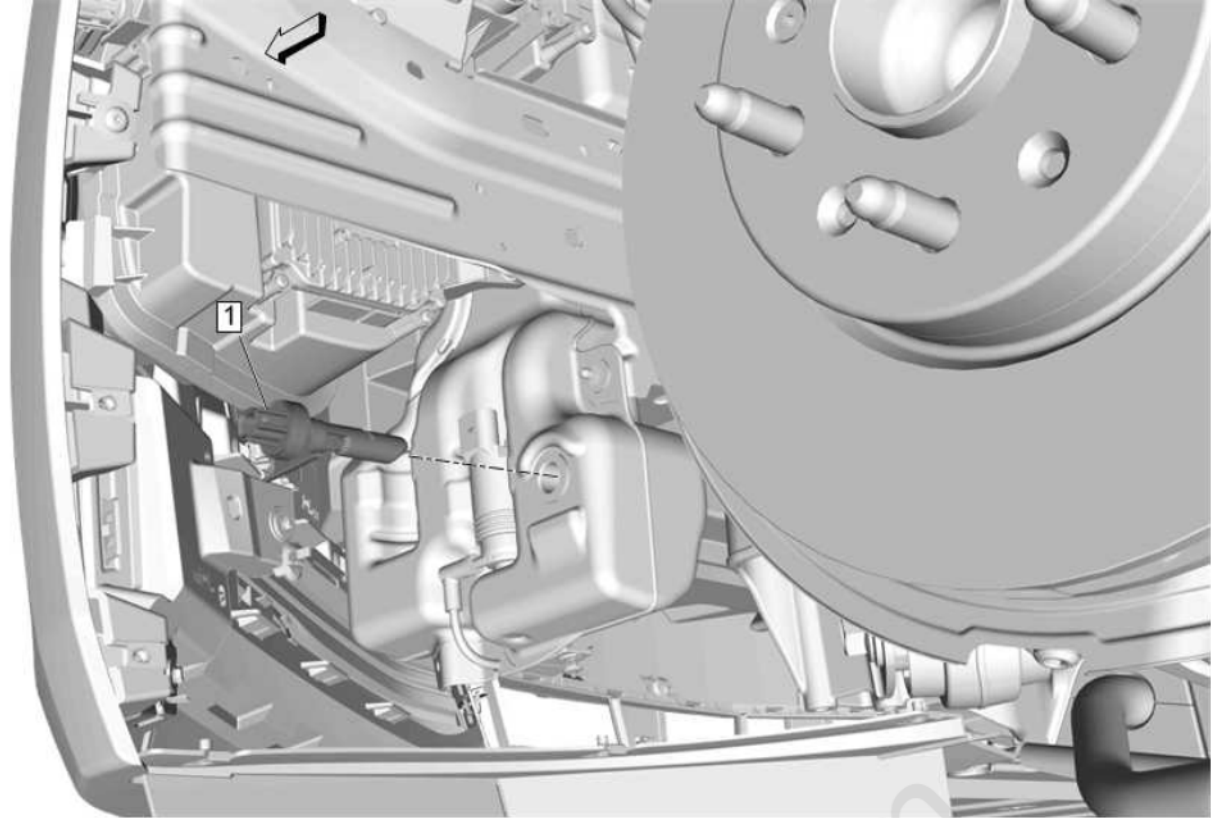


Fig. 14: Windshield Washer Solvent Container Level Sensor

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Front Wheelhouse Liner Replacement</u>	
1	Windshield Washer Solvent Container Level Sensor Procedure 1. Disconnect the electrical connector. 2. Place a clean suitable drain pan under the windshield washer solvent container to secure the windshield washer solvent when the level sensor and seal are removed. 3. Using two flat-bladed tools, place the ends under each side of the windshield washer solvent level sensor, twist and pry outward in opposite directions to disengage the level sensor from the washer solvent container and grommet. 4. Remove and Discard the windshield washer solvent container grommet and replace with a New grommet.

WINDSHIELD WASHER SOLVENT CONTAINER LEVEL SENSOR GROMMET REPLACEMENT

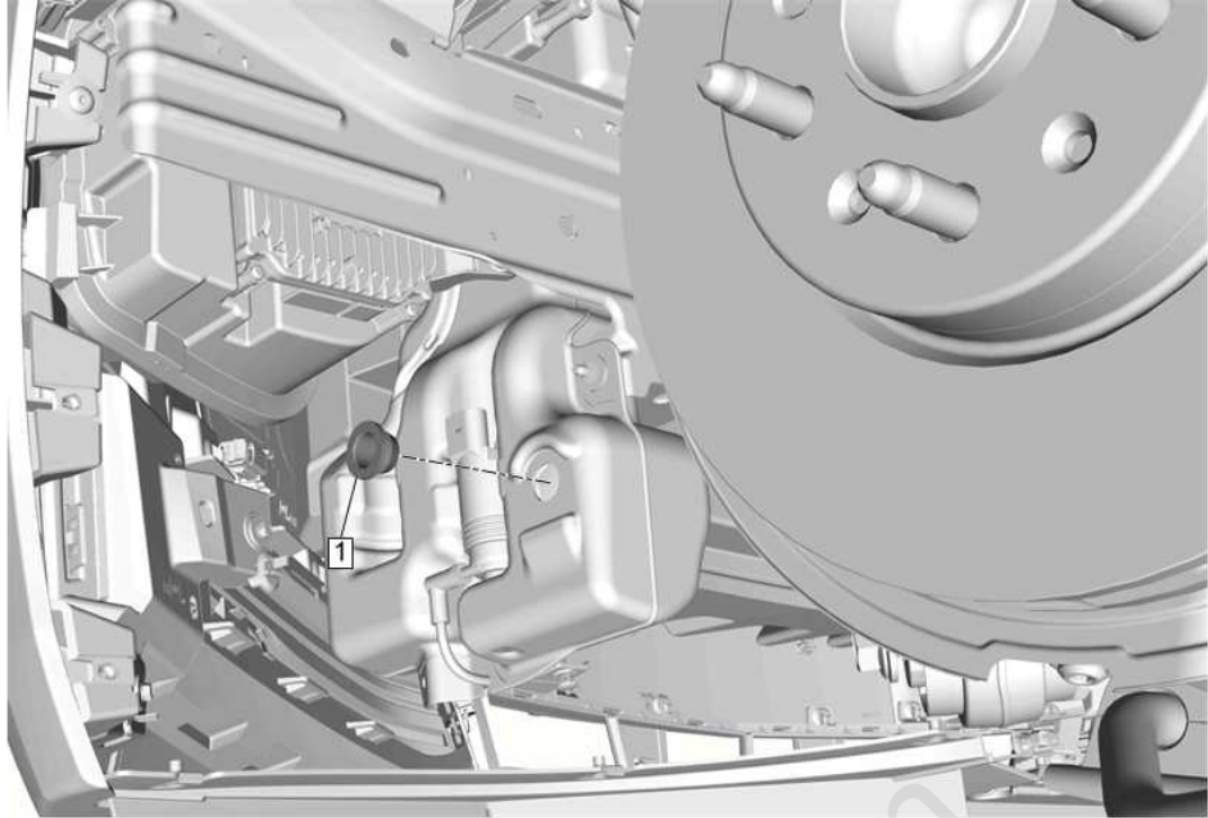


Fig. 15: Windshield Washer Solvent Container Level Sensor Grommet
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Windshield Washer Solvent Container Level Sensor Replacement</u>	
1	Windshield Washer Solvent Container Level Sensor Grommet Procedure 1. Remove and DISCARD the windshield washer solvent container level sensor grommet. 2. Lubricate the exterior of the New grommet with windshield washer solvent to assist with the installation of the grommet into the windshield washer solvent container. 3. Ensure the grommet is properly seated in the windshield washer solvent container.

AIR INLET GRILLE PANEL ACCESS HOLE COVER REPLACEMENT

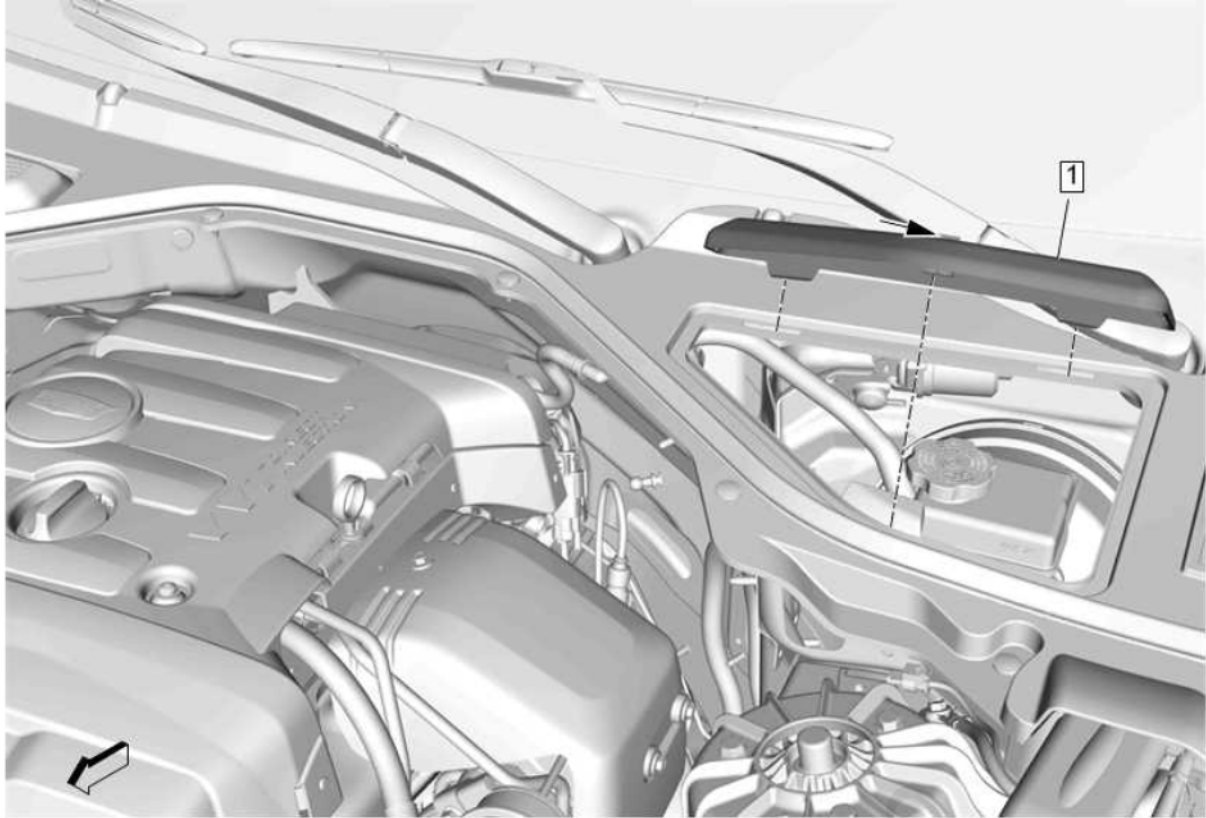


Fig. 16: Air Inlet Grille Panel Access Hole Cover
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Air Inlet Grille Panel Access Hole Cover Procedure Release the retaining tab.

AIR INLET GRILLE PANEL REPLACEMENT

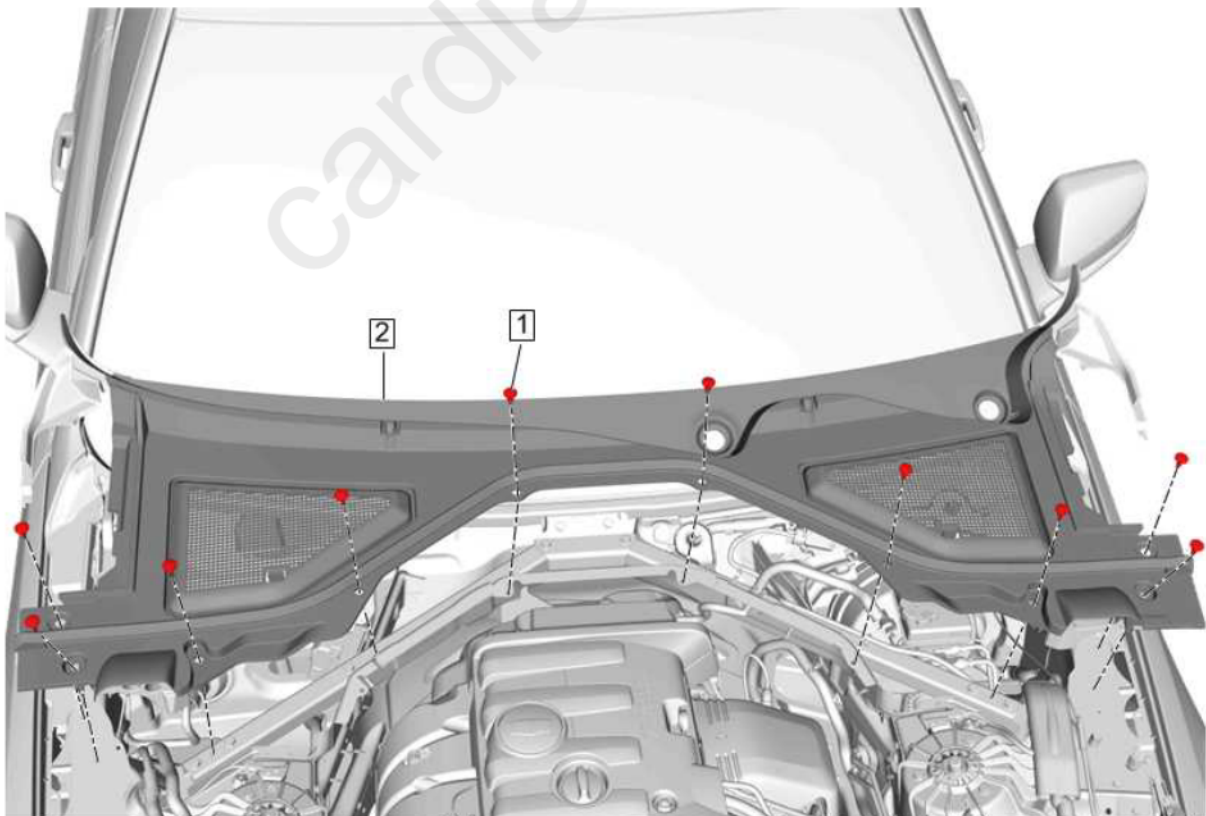


Fig. 17: Air Inlet Grille Panel
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
Preliminary Procedure Windshield Wiper Arm Replacement	
1	Air Inlet Grille Panel Retainer [10x]
2	Air Inlet Grille Panel Procedure 1. Using an appropriate tool, disengage the center air inlet grille panel retainer. 2. Using an appropriate tool, release the air inlet grille panel from the windshield lower molding. 3. Lift up the front edge of the air inlet grille panel, slide the grille panel forward from both hood hinges. 4. Disconnect the windshield washer nozzle hose from the windshield washer nozzle hose connector hose. 5. Transfer components as necessary.

AIR INLET GRILLE PANEL EXTENSION REPLACEMENT

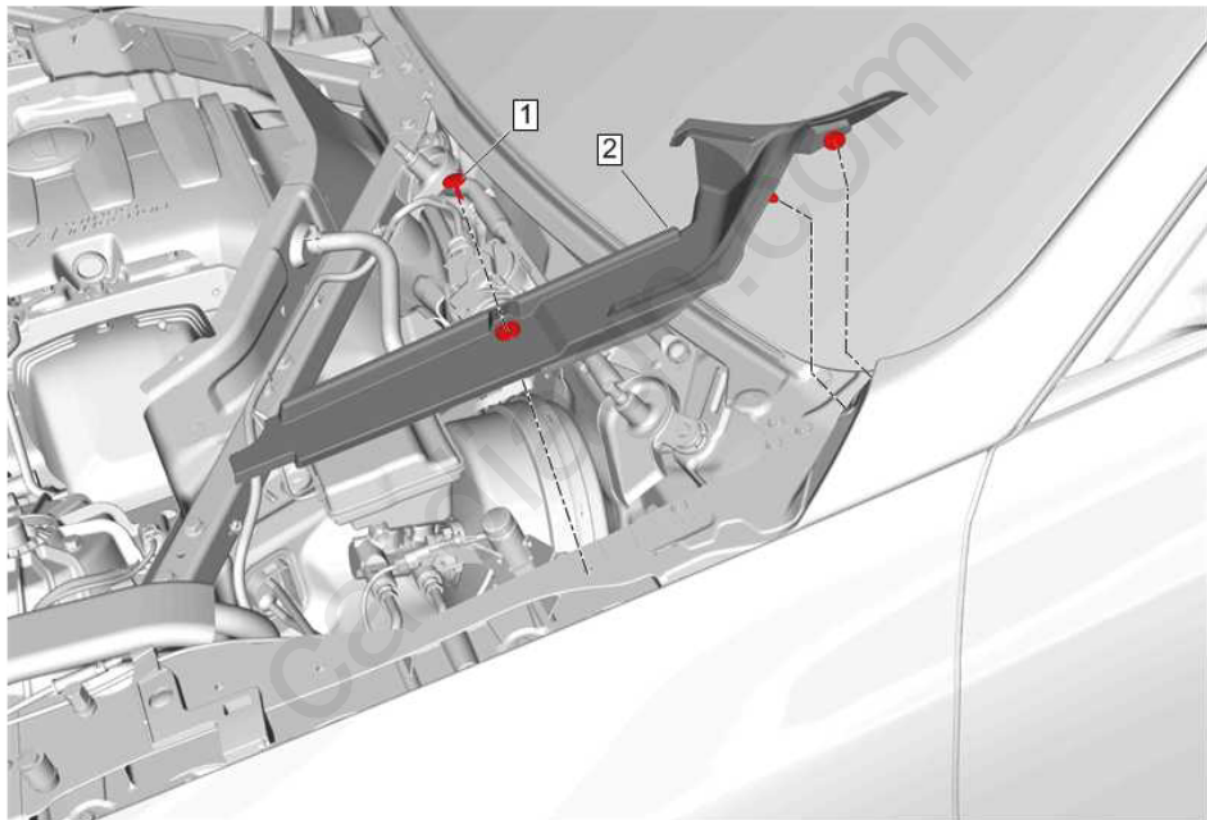


Fig. 18: Air Inlet Grille Panel Extension

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Air Inlet Grille Panel Retainer Procedure Using an appropriate tool, disengage the air inlet grille panel retainer.
2	Air Inlet Grille Panel Extension Procedure Grasp the air inlet grille panel extension and disengage the rear retainers from the top edge of the fender.

WINDSHIELD WIPER ARM REPLACEMENT

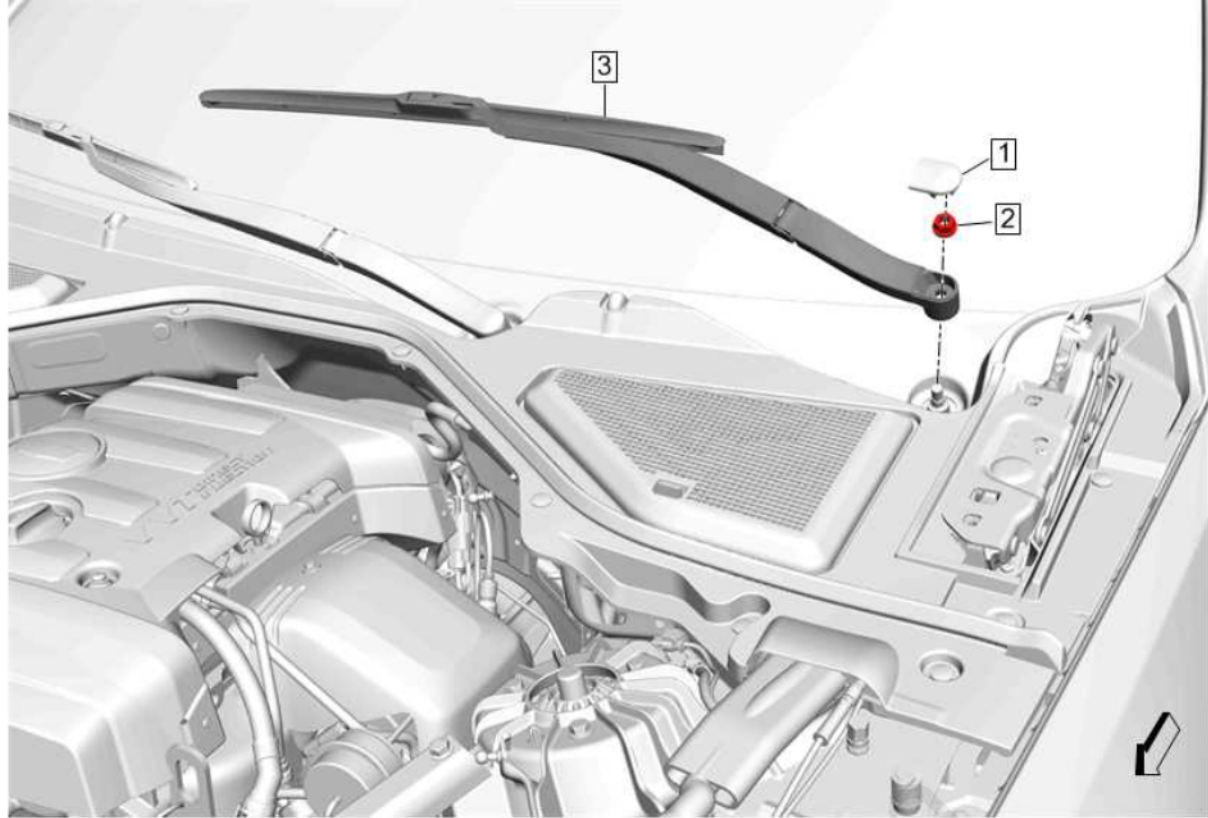


Fig. 19: Windshield Wiper Arm

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Open and support the hood.	
1	Windshield Wiper Arm Finish Cap Procedure Use a small flat-bladed tool to remove the finish cap.
2	Windshield Wiper Arm Nut CAUTION: Refer to Fastener Caution . Tighten 38 N.m (28 lb ft)
3	Windshield Wiper Arm Procedure 1. Gently rock the windshield wiper arm to remove it from the windshield wiper transmission pivot shaft. 2. Clean the pivot shaft knurls with a soft wire brush before installing a NEW windshield wiper arm. 3. Windshield Wiper Arm Adjustment

WINDSHIELD WIPER BLADE REPLACEMENT

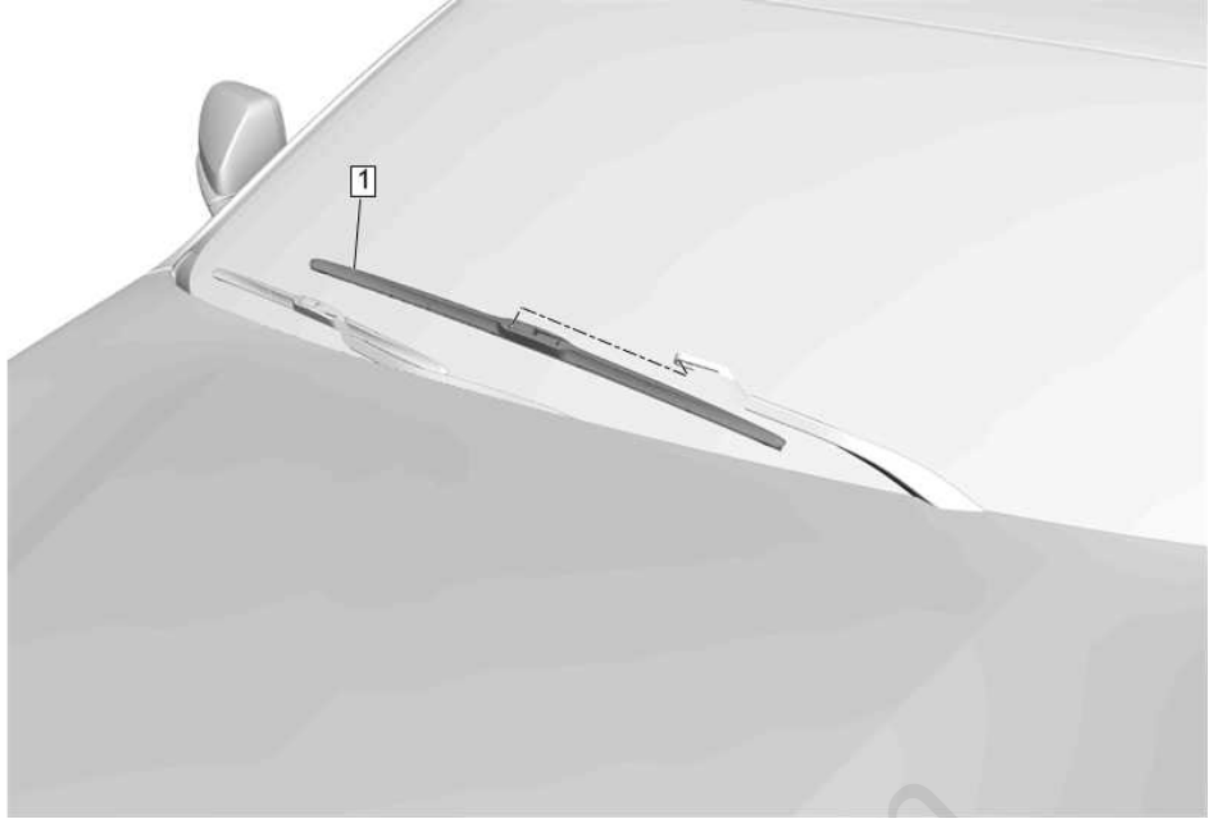


Fig. 20: Windshield Wiper Blade

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Windshield Wiper Blade Procedure 1. Lift the windshield wiper arm from the windshield. 2. Disengage the windshield wiper blade lock from the windshield wiper arm. 3. Release the retention tab securing the windshield wiper blade to the windshield wiper arm. 4. Pull the windshield wiper blade from the windshield wiper arm.

WINDSHIELD WIPER MOTOR REPLACEMENT

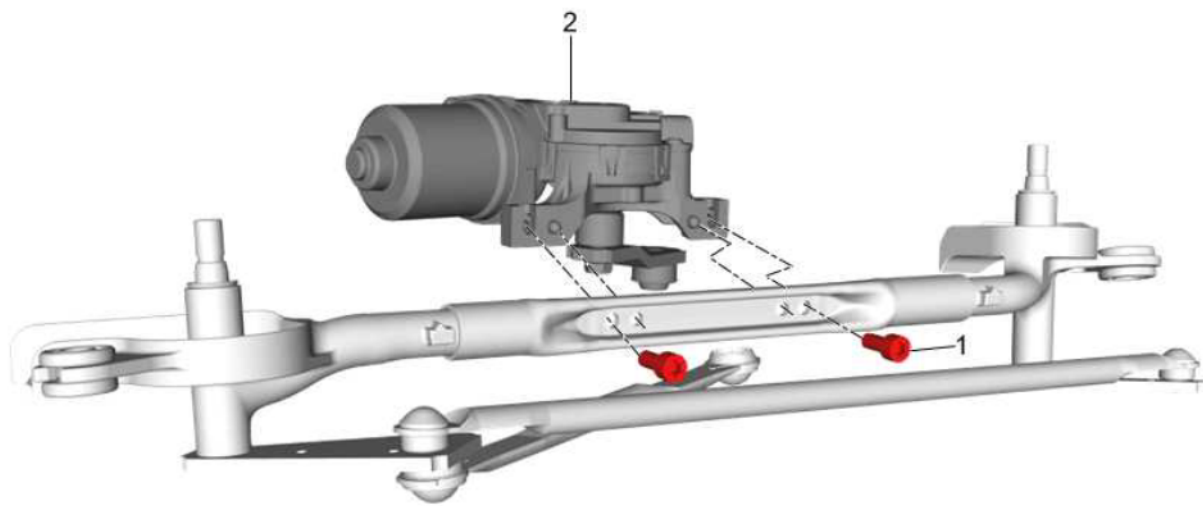


Fig. 21: Windshield Wiper Motor
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure Windshield Wiper Transmission Replacement	
1	Windshield Wiper Motor Bolt [2x] CAUTION: Refer to Fastener Caution . Tighten 10 N.m (89 lb in)
2	Windshield Wiper Motor Procedure 1. Using the J 39232 separator remove the windshield wiper motor crank arm from the transmission link. 2. Remove the windshield wiper motor from the windshield wiper transmission. 3. Position the new windshield wiper motor to the windshield wiper transmission. 4. Align the transmission links to the windshield wiper motor crank arm. 5. Using the J 39529 installer secure the windshield wiper motor crank arm ball to the transmission link ball socket. Tools Required • J 39232 Wiper Linkage Separator • J 39529 Wiper Linkage Installer For equivalent regional tools, refer to Special Tools .

WINDSHIELD WIPER TRANSMISSION REPLACEMENT

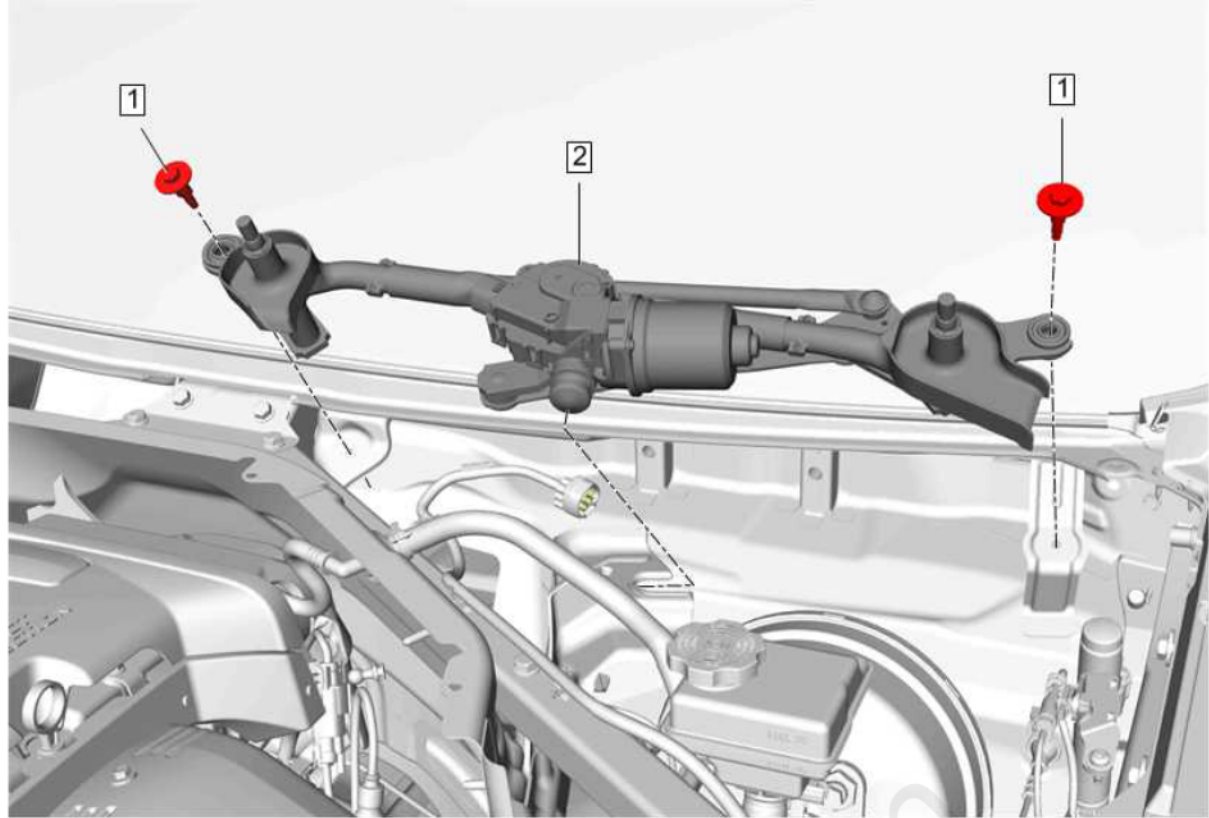


Fig. 22: Windshield Wiper Transmission
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures Air Inlet Grille Panel Replacement - Disconnect the electrical connector.	
1	Windshield Wiper Transmission Bolt [2x] CAUTION: Refer to Fastener Caution . Tighten 8 N.m (71 lb in)
2	Windshield Wiper Transmission Procedure - Remove the windshield wiper transmission by sliding it towards the driver side of the vehicle. - Transfer components as necessary. - Carefully install the alignment grommet on the back of the wiper module into the brace. If the transmission is not installed correctly, the wiper arms may rub and scrape on the windshield acting like the wiper linkage is bent. Windshield Wiper Arm Adjustment

WINDSHIELD MULTIFUNCTION SENSOR MOUNT BRACKET COVER REPLACEMENT (WITHOUT UEU)

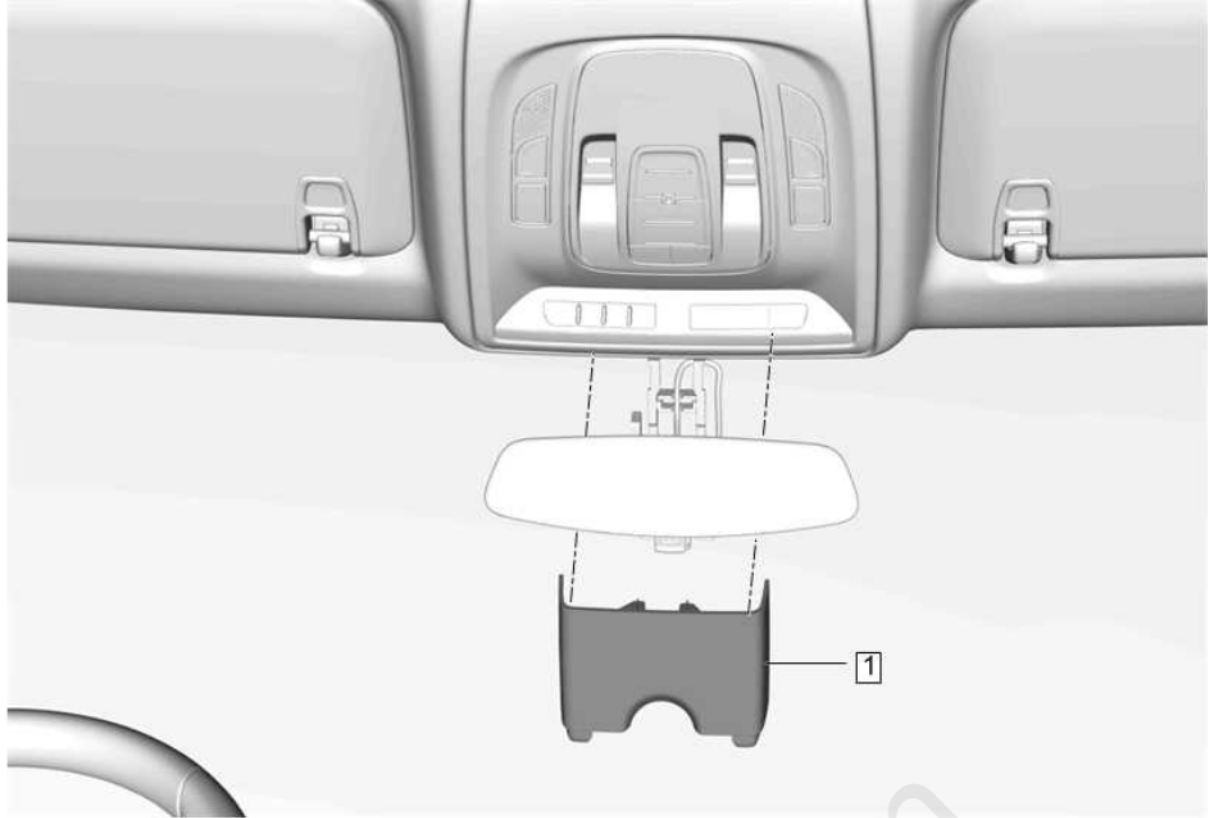


Fig. 23: Windshield Multifunction Sensor Mount Bracket Cover (without UEU)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure	
Windshield Multifunction Sensor Mount Bracket Lower Cover Replacement (without UEU)	
1	Windshield Multifunction Sensor Mount Bracket Cover Procedure Remove the bracket cover from the inside rearview mirror.

WINDSHIELD MULTIFUNCTION SENSOR MOUNT BRACKET COVER REPLACEMENT (WITH UEU)

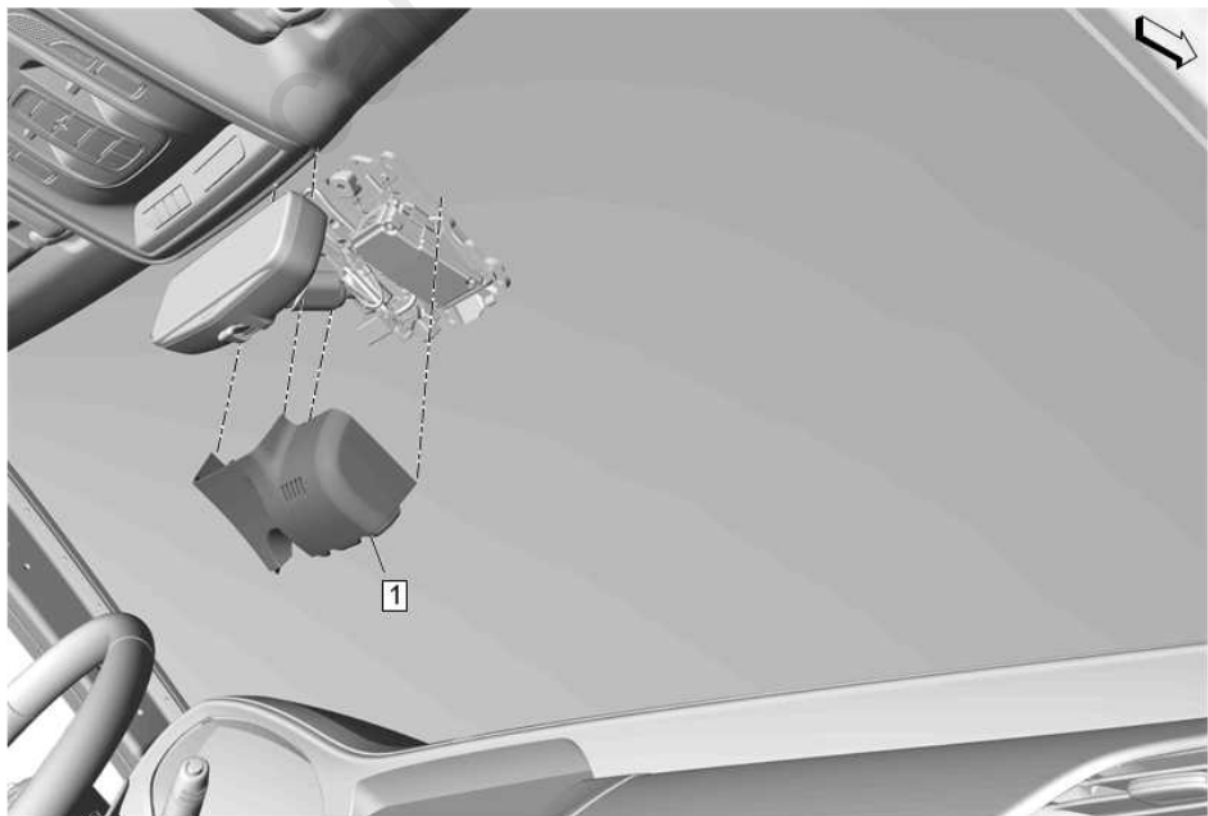


Fig. 24: Windshield Multifunction Sensor Mount Bracket Cover (with UEU)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedure <u>Windshield Multifunction Sensor Mount Bracket Lower Cover Replacement (with UEU)</u>	
1	Windshield Multifunction Sensor Mount Bracket Cover Procedure Grasp the cover on both sides and gently slide downward.

WINDSHIELD MULTIFUNCTION SENSOR MOUNT BRACKET LOWER COVER REPLACEMENT (WITHOUT UEU)

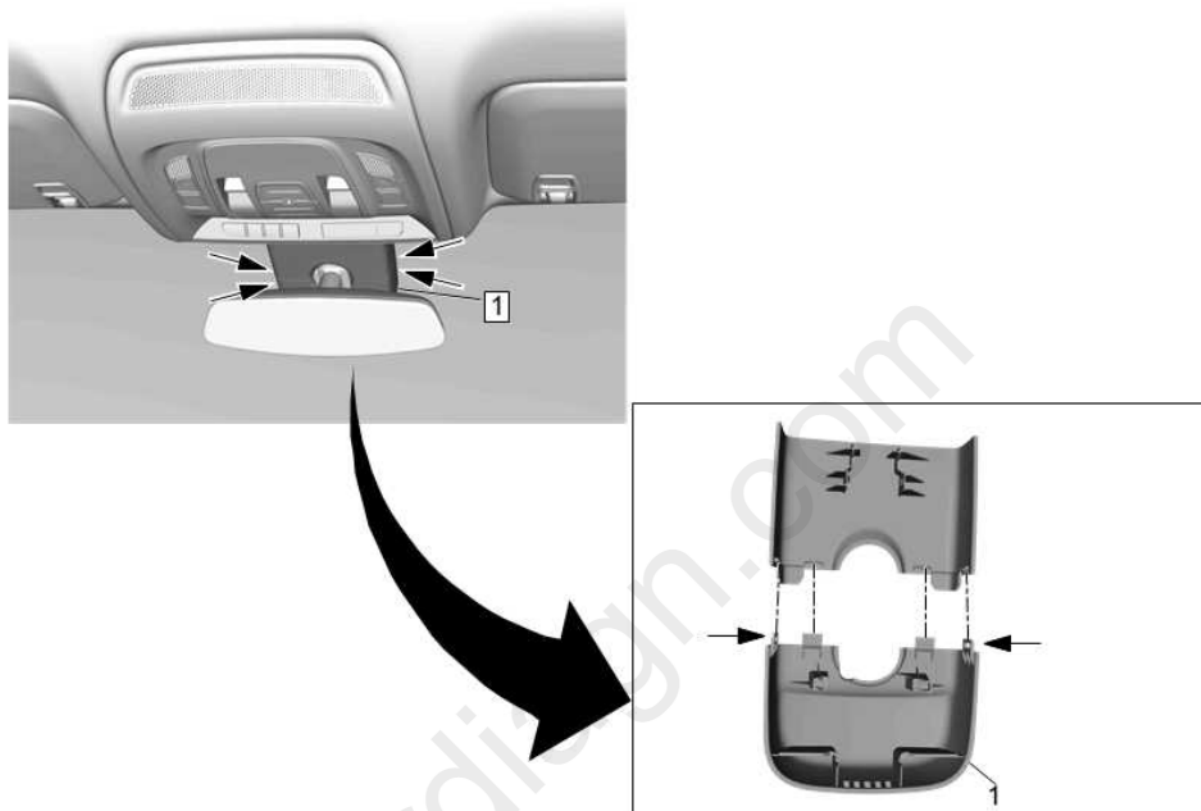


Fig. 25: Windshield Multifunction Sensor Mount Bracket Lower Cover (without UEU)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Windshield Multifunction Sensor Mount Bracket Lower Cover Procedure 1. Disengage the cover from the sides of the bracket by lifting on the sides of the cover next to the glass surface. 2. With the bracket cover loose, unlock the top and bottom covers by flexing the top cover at the outboard locking tab and flex the bottom cover at the inboard tab disengaging the locking tabs on each side to separate the top and bottom halves of the cover. 3. Remove the bracket lower cover from the bracket cover.

WINDSHIELD MULTIFUNCTION SENSOR MOUNT BRACKET LOWER COVER REPLACEMENT (WITH UEU)

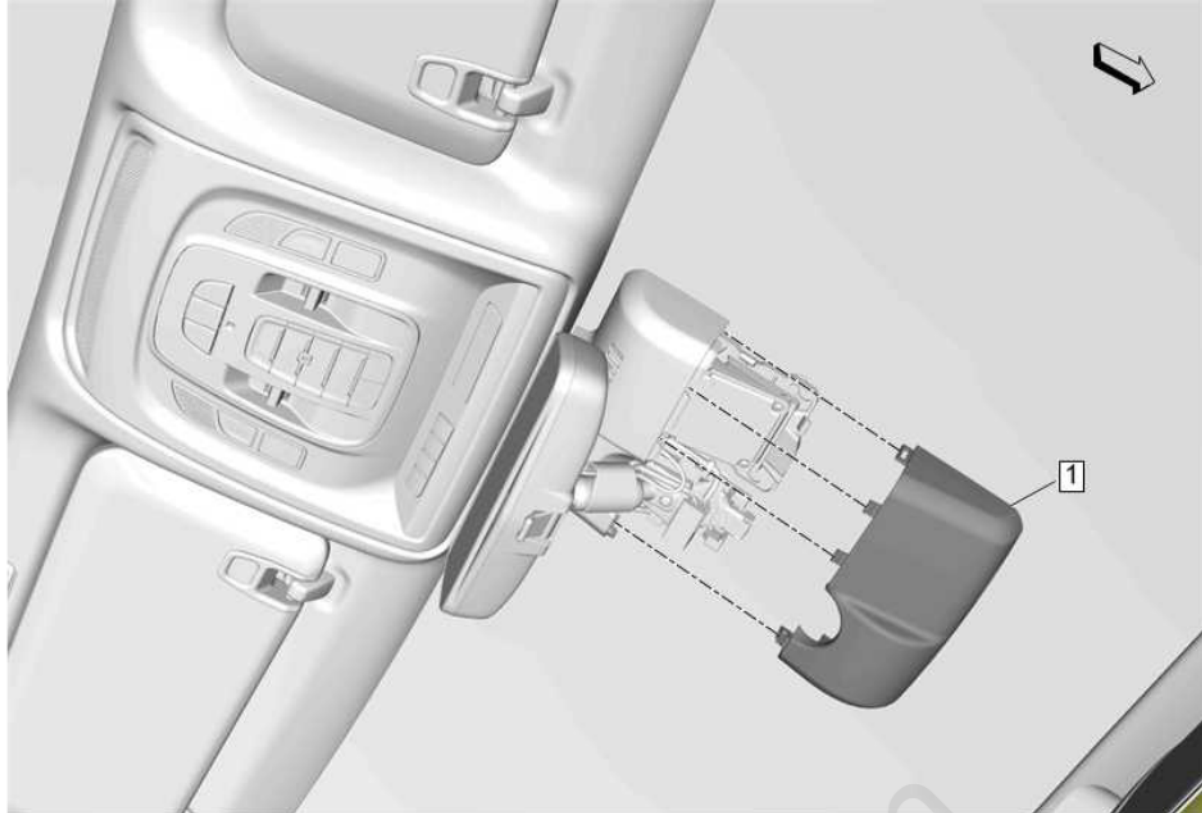


Fig. 26: Windshield Multifunction Sensor Mount Bracket Lower Cover (with UEU)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Windshield Multifunction Sensor Mount Bracket Lower Cover Procedure Grasp the cover on both sides and gently slide downward.

WINDSHIELD GLASS CLEANING

Exterior

Clean the windshield with windshield cleaner or equivalent. The cleaner should not harm the paint finish or scratch the glass. The glass is clean when the water no longer beads, but sheets across the entire glass surface. Refer to the Electronic Parts Catalog (EPC).

Interior

The interior glass should be cleaned with plain water only applied with a clean terry cloth towel. Water only eliminates any film or haze on the window and helps prevent fogging.

WIPER BLADE ELEMENT CLEANING

Lift each blade assembly off of the windshield and clean the element with a cloth saturated with full strength washer solvent. Hold the blade in one hand and wipe the element with the saturated cloth until the black residue disappears. Then rinse the blade assembly elements with clean drinkable water.

WIPER CHATTER REPAIR

Some vehicles may exhibit a condition where the windshield wipers chatter and/or wipe unevenly. Several items may contribute to this condition. To completely repair this condition, ALL of the items listed should be inspected and corrected as necessary.

1. Inspect the wiper blade elements and replace as needed. Refer to [Windshield Wiper Blade Replacement](#).
2. Clean the wiper blade elements. Refer to [Wiper Blade Element Cleaning](#).
3. Clean the windshield. Refer to [Windshield Glass Cleaning](#).

WINDSHIELD WIPER ARM ADJUSTMENT

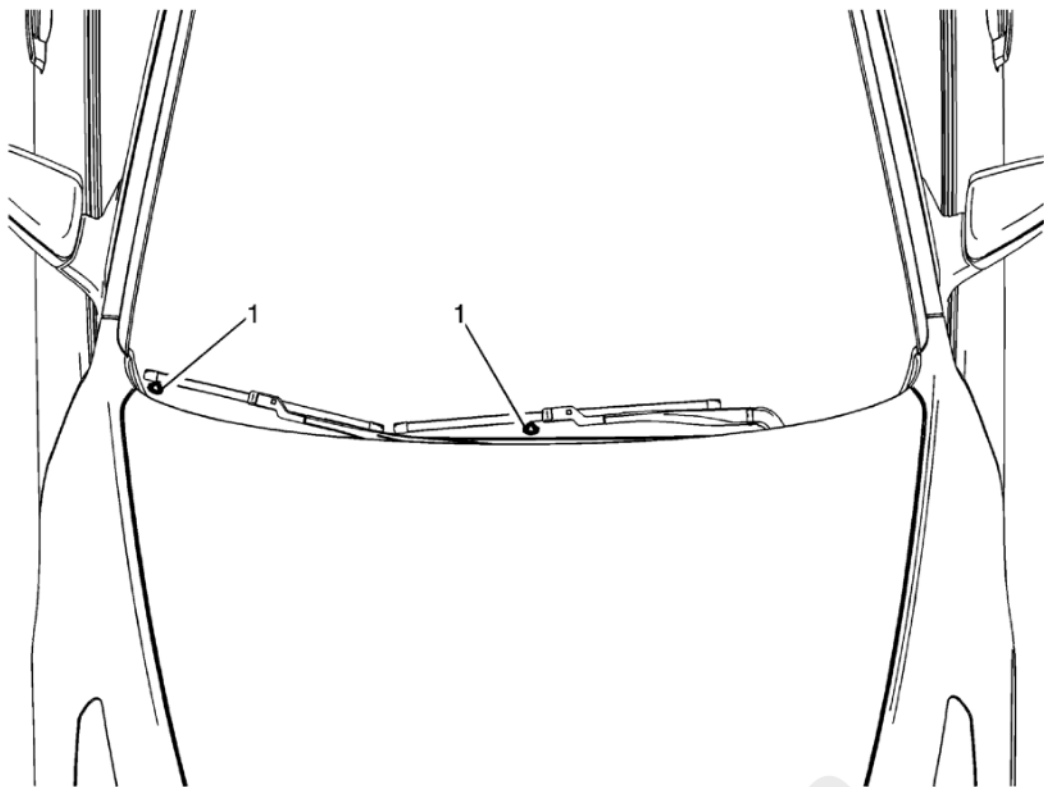


Fig. 27: Windshield Wiper Arm Adjustment
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
1	Windshield Wiper Arm Procedure 1. Lubricate the windshield with washer fluid. 2. Run the windshield wipers and turn off the windshield wipers. 3. Ensure the windshield wipers are in the full park position. 4. Inspect the windshield wipers for proper position to the circle on the windshield. 5. Realign the windshield wiper arm to the circle if required. Refer to Windshield Wiper Arm Replacement.

DESCRIPTION AND OPERATION

WIPER/WASHER SYSTEM DESCRIPTION AND OPERATION

Wiper/Washer System Components

The wiper/washer system consists of the following electrical components:

- Windshield Wiper Relay
- Windshield Wiper Speed Control Relay
- Windshield Washer Pump
- Windshield Washer Pump Relay
- Windshield Wiper Motor
- Windshield Wiper/Washer Switch
- Body Control Module (BCM)
- Windshield Washer Fluid Level Switch
- Instrument Cluster
- Headlamp Washer Pump Relay (CE4)

- Headlamp Washer Pump (CE4)
- Rain Sensor
- Underhood Fuse Block (Contains Windshield Wiper/Washer Removable Relays)

Windshield Wiper System

The body control module (BCM) determines the front wiper/wash system mode of operation by monitoring several signals from the front wiper/wash switch as indicated in the wiper switch.

The front wiper/wash switch receives a reference ground signal from the BCM. Each input of the BCM provides a switched battery pull-up for each front wiper/washer switch output signal it receives. All the BCM inputs are recognized as active when the wiper switch provides a path to the referenced ground signal. The first signal received by the BCM is the result of 6 resistors in the front wiper switch configured as a resistor ladder network. This signal is connected to a BCM analog to digital input. Depending on the function selected (High, Low, Intermittent 1 thru 5, Mist, Off), the front wiper control switch connects a different set of resistors into the circuit resulting in different voltages appearing on the BCM A/D input. By monitoring this voltage, the BCM determines how to control the wiper motor On/Off Relay. It should be noted that High, Low and Mist all have the same value on this signal circuit. The second signal received from the front wiper switch is active only when the front wiper switch is in the high speed wiper position. When the wiper switch is not in the high speed position, the switch is open and the signal circuit is pulled to battery by the BCM. When the wiper switch is in the high speed position, the switch pulls the circuit low. The BCM determines how to control the Wiper high/low speed relay from this input. The third signal received from the front wiper switch is from the momentary windshield wash control switch. When the washer switch is not active the switch is open and the signal circuit is pulled to battery by the BCM. When the washer switch is active, the switch pulls the circuit low. The BCM controls the windshield wash and windshield wash activated wiper operation based on this input.

The BCM controls front wiper motor operation through two output signals and the monitoring of one input signal. The two outputs (one high side drive, one low side drive) are used to control two external wiper motor relays: front wiper motor on/off relay: which provides the wiper motor with battery power when it is activated by the high side drive signal (switched battery) from the BCM. When left deactivated, the normally closed contacts provide a ground to the wiper motor. Wiper high/low speed relay: when activated by a low side drive signal (ground) from the BCM, it switches the power supplied by the wiper motor's on/off relay to the motor's high speed input. When left deactivated, the normally closed contacts connect the power supplied by the wiper motor's on/off relay to the motor's low speed input. The input used by the BCM is from the park switch located in the wiper motor assembly. When the wiper blades are not in the park position, the wiper park switch is open and the circuit is pulled up to battery by the BCM. When the wiper blades are in the park position at the bottom of the glass, the wiper park switch closes to ground pulling the park signal circuit low.

To initiate low speed operation, the BCM only energizes the front wiper motor on/off relay. This allows battery voltage from the wiper fuse to be applied through the switched contacts of the wiper motor on/off relay, through the normally closed contacts of the wiper high/low speed relay, to the low speed control circuit of the windshield wiper motor.

Redundant high speed switch pass through. The BCM provides redundant circuitry which places battery power on its wiper motor on/off relay output with activation of its low assertion high speed wiper switch input. The BCM shall be capable of doing this, even if the module has lost all microprocessor control. This redundant circuit shall supply power while in the RUN and CRANK power modes. however; while in the CRANK power mode, the pass through shall only be active if the BCM is NOT in a computer operating properly state.

To initiate high speed operation, the BCM energizes both the front wiper motor on/off relay and the wiper high/low speed relay. This allows battery voltage from the wiper fuse to be applied through the switched contacts of the wiper motor on/off relay, through the switched contacts of the wiper high/low speed relay, to the high speed control circuit of the windshield wiper motor.

Parking the wiper motor. In order to perform an accurate read of the park switch and to ensure the wipers will come to rest while still in the park position, parking of the wipers only occurs while in a low speed wiper mode. This requires that if the wipers are performing a high speed wiper operation at the time they are required to park, the BCM shall transition the Wipers to low speed by deactivating the

wiper high/low relay before attempting to park. In order to park the wipers, the BCM monitors the park circuit until the park switch pulls the park circuit to ground. At this time, the BCM will immediately deactivate the wiper motor on/off relay. The relay contacts will switch back to their normally closed position and will apply ground to the wiper motor power inputs through the normally closed contacts of the wiper high/low relay. This deactivates and dynamically brakes the wiper motor in the park position. When the wiper switch is turned to the OFF position while the wiper motor is somewhere in mid-cycle, the BCM will continue to operate the motor until the wipers reach the park position. If the BCM is running the wiper motor and does not see a state transition of the park switch after 8 s, the wipers will stop immediately when the wiper switch is turned to OFF. If the ignition is turned OFF while the wipers are in mid-cycle, the wipers will stop immediately, regardless of position. The BCM will park the wipers next time the ignition is turned ON.

The windshield wiper system MIST operation is identical to LOW speed operation, except that the MIST switch is a press and release type switch. When the wiper switch is moved to the MIST position and released, low speed wiper motor operation is started and will continue until 1 cycle is complete. If the wiper switch is moved to the MIST position and held, the wiper motor will operate in the LOW speed mode until the switch is released.

Windshield wiper intermittent operation is a low speed wiper motor function with a variable delay interval between the wiper motor cycles. The duration of the delay is controlled by the front wiper control switch's intermittent 1 thru intermittent 5 settings. The wiper operation is as follows

1. The BCM will initiate a single wipe by activating its front wiper ON/OFF relay output.
2. At the completion of a single wipe, the BCM will park the wipers as described above.
3. The BCM will then pause the wipers in their park position for the time duration associated with intermittent delay switch setting.
4. When the delay time expires repeat Steps 1 and 3 until the system is turned off or taken out of intermittent mode. If the wiper switch is moved from a longer delay interval to a shorter delay interval, the BCM will command an immediate wipe cycle and reset the delay timer to the shorter delay interval.

Intermittent wiper operation may be vehicle speed sensitive. When enabled, the speed compensated intermittent feature causes the intermittent wiper delay intervals to become shorter as a function of increased speed. As vehicle speed is reduced the intervals will become closer to the predetermined

Front Wiper Block Diagram

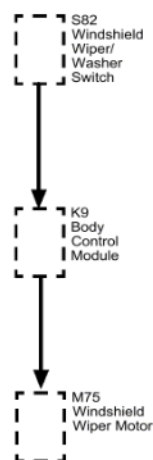


Fig. 28: Windshield Wiper System Block Diagram
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
S82	S82 Windshield Wiper/Washer Switch
K9	K9 Body Control Module
M75	M75 Windshield Wiper Motor

Windshield Washer System

The windshield washer system contains a windshield washer pump, a windshield washer pump relay, windshield wiper/washer switch. the windshield washer pump is controlled by the body control module (BCM) via a removable relay. When the washer switch is depressed, the BCM monitors the signal circuit by the washer request circuit. The BCM then applies voltage through a control circuit to the removable windshield washer pump relay. With the relay energized, fused battery voltage is applied through the switch contacts of the relay and the control circuit to activate the windshield washer pump.

Washers System Block Diagram

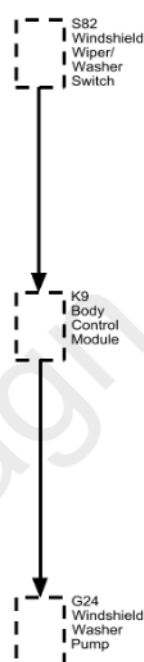


Fig. 29: Windshield Washer System Block Diagram
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
S82	S82 Windshield Wiper/Washer Switch
K9	K9 Body Control Module
G24	G24 Windshield Washer Pump

Rain Sense Mode and Rain Sense Indicator

The rain sensor communicates with the body control module (BCM) via serial data. When the ignition is in the ON or ACCESSORY position and the windshield wiper/washer switch is in the intermittent delay position, the BCM monitors the rain sensor data to determine the rain build up on the windshield. As rain builds up on the windshield, the BCM will command the wipers to activate. The sensitivity of the wiper frequency is controlled by the intermittent delay of the windshield wiper/washer switch. As the sensitivity is increased, the BCM will command more frequent wiper activation based on rain build up on the windshield.

Rain Sensor Block Diagram

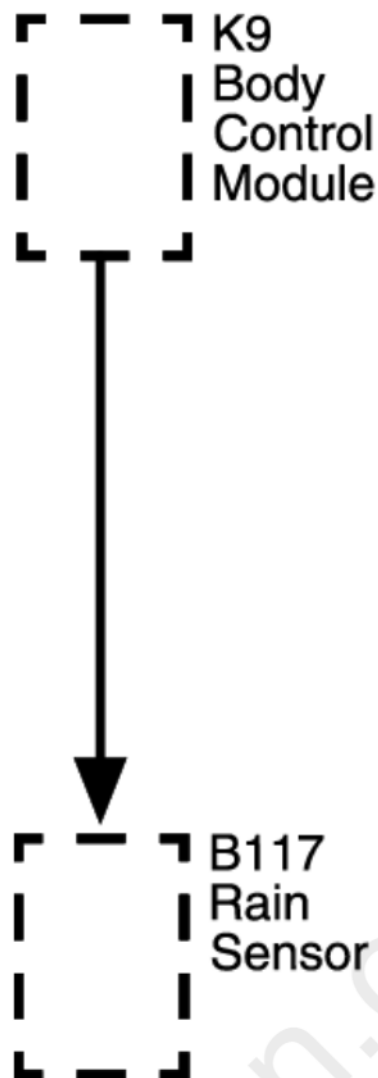


Fig. 30: Rain Sensor Indicator Block Diagram
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
K9	K9 Body Control Module
B117	B117 Rain Sensor

Washer Fluid Level Indicator

The check washer fluid message is controlled by the instrument cluster using signal from the Windshield Washer Fluid level Sensor. The washer fluid level signal circuit is supplied voltage through a resistor then monitored within the instrument cluster. The Windshield Washer Fluid level Sensor is normally close so the instrument cluster detects voltage on the Windshield Washer Fluid level Sensor signal circuit whenever the washer fluid level sensor is not low. When the washer fluid reaches the point where the driver should be informed that the washer fluid is low, the washer fluid level sensor opens. When the washer fluid level sensor is closed the washer fluid level signal circuit voltage is pulled low and the instrument cluster displays the LOW WASHER FLUID INDICATOR message on the driver information center. In order to prevent the LOW WASHER FLUID INDICATOR message from being displayed while sloshing is occurring in the washer fluid container, the instrument cluster is programed with a 1 min delay before changing states of the check washer fluid message during an ignition cycle.

Washer Fluid Level Block Diagram

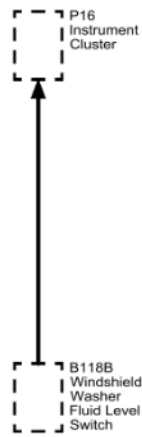


Fig. 31: Washer Fluid Level Block Diagram
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
P16	P16 Instrument Cluster
B118B	B118B Windshield Washer Fluid Level Switch

Headlamp Washer System

The headlamp washer pump is controlled by the body control module (BCM) via a printed circuit board (PCB) relay. If the headlamp lights are on, the BCM will activate the headlamp washer pump the first time the windshield washer pump is activated. After the initial headlamp washer activation, the BCM will only allow headlamp washer function every 5 windshield washer cycles. When the headlamp washer function is requested by the BCM's internal logic, it applies voltage through a control circuit to the headlamp washer pump relay. With the relay energized, battery voltage is applied through the switch contacts of the relay and the fused control circuit to activate the headlamp washer pump.

Headlamp Washer Block Diagram

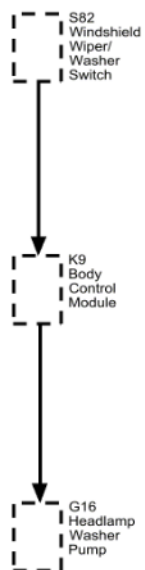


Fig. 32: Headlamp Washer System Diagram
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
S82	S82 Windshield Wiper/Washer Switch
K9	K9 Body Control Module
G16	G16 Headlamp Washer Pump

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Illustration	Tool Number/Description
	J 39232 Wiper Linkage Separator
	J 39529 Wiper Linkage Installer

cardiagn.com