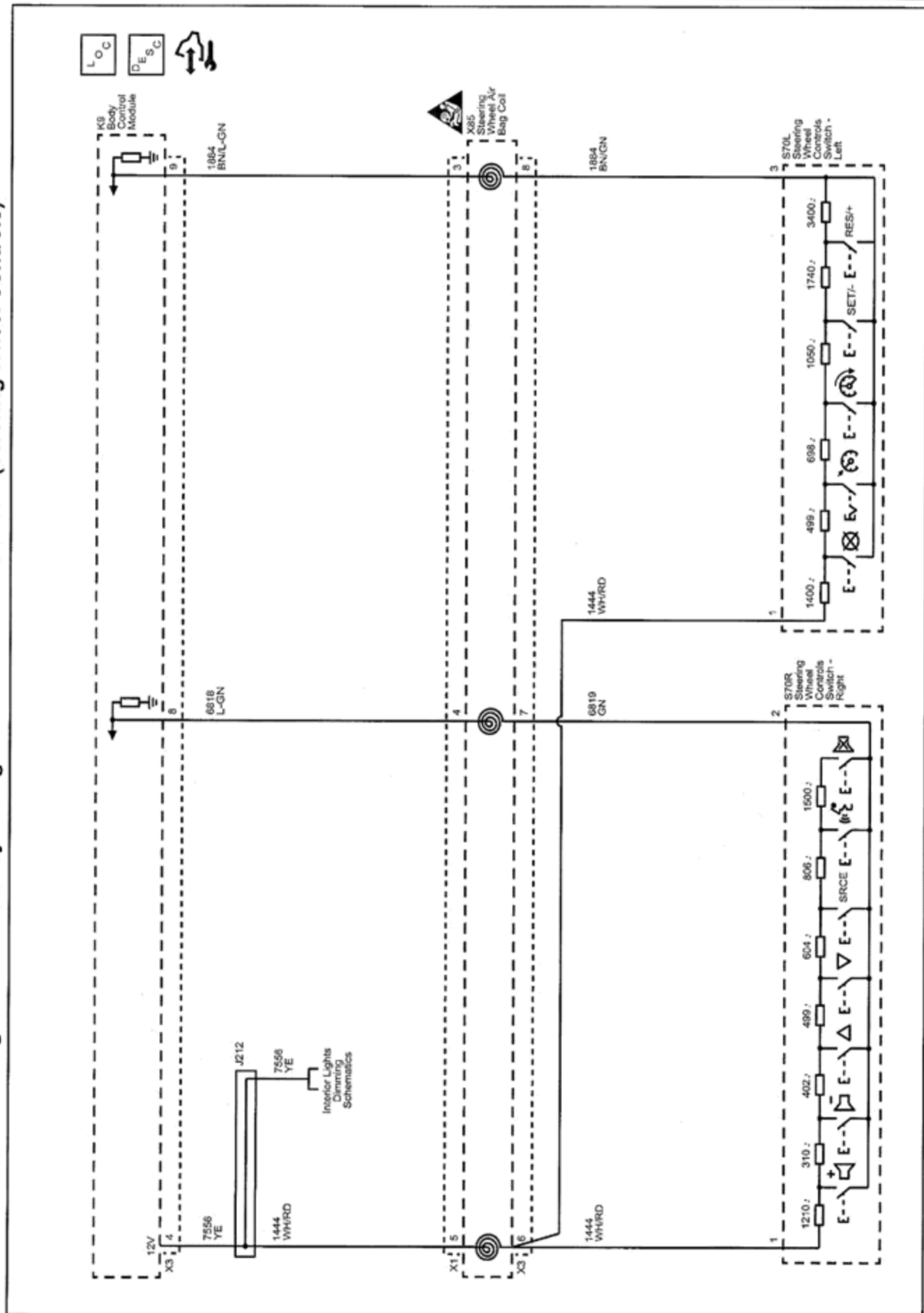


Secondary and Configurable Customer Controls

Schematic and Routing Diagrams

Steering Wheel Secondary/Configurable Control Schematics (Steering Wheel Controls)



Diagnostic Information and Procedures

DTC B1405

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

DTC Descriptors

DTC B1405 03: Control Module Voltage Reference Output 2 Circuit Low Voltage

DTC B1405 07: Control Module Voltage Reference Output 2 Circuit High Voltage

Diagnostic Fault Information

Electrical DTCs

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
12 V Reference	B1529 03, B1405 03	1	B1529 07	B1529 07
Signal	1	1	B3622 07	—
1. Steering Wheel Controls Inoperative				

Circuit/System Description

The body control module (BCM) monitors the system voltage to make sure that the voltage stays within the proper range. Damage to components and/or incorrect operation can occur when the voltage is out of range.

Conditions for Running the DTC

- Battery voltage is between 9–16 V.
- The ignition is ON.

Conditions for Setting the DTC

The BCM detects a low/high voltage on the control circuit.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 100 consecutive malfunction free ignition cycles have occurred.

Reference Information

Schematic Reference

Steering Wheel Secondary/Configurable Control Schematics on page 8-111

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Steering Wheel Controls Description and Operation on page 8-120

Electrical Information Reference

- *Circuit Testing* on page 11-526
- *Connector Repairs* on page 11-548
- *Testing for Intermittent Conditions and Poor Connections* on page 11-531
- *Wiring Repairs* on page 11-537

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Engine running, accessories OFF, measure and record the battery voltage at the battery terminals.
2. Verify the voltage measured at the battery terminals is between 12.6–15.0 V.
 - ⇒ **If not between 12.6–15.0 V**
Refer to *Charging System Test* on page 9-707.
 - ⇓ **If between 12.6–15.0 V**
3. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S70R Steering Wheel Controls Switch – Right, ignition ON.
2. Test for 11.8–12.2 V between the reference voltage circuit terminal 1 and ground.
 - ⇒ **If less than 11.8 V**
 - 2.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
 - 2.2. Test for infinite resistance between the reference voltage circuit and ground.
 - ⇒ If less than infinite resistance, repair the short to ground on the circuit.
 - ⇓ If infinite resistance
 - 2.3. Test for less than 2 Ω in the reference voltage 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 12.2 V**
 - 2.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module, ignition ON.
 - 2.2. Test for less than 1 V between the reference voltage 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 11.8–12.2 V**
3. Test for 11.8–12.2 V between the reference voltage circuit terminal 1 and signal circuit terminal 2.
 - ⇒ **If not between 11.8–12.2 V**
 - 3.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
 - 3.2. 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
 - 3.3. 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 between 11.8–12.2 V**
4. Test or replace the S70R Steering Wheel Controls Switch – Right.

Component Testing

1. Ignition OFF, disconnect the harness connector at the S70R Steering Wheel Controls Switch – Right.
2. Test the resistance between the signal terminal 2 and the reference voltage terminal 1 while pressing the appropriate steering wheel controls switch button listed below:
 - ⇒ **If not the specified value**
Replace the S70R Steering Wheel Controls Switch – Right.
 - ⇓ **If the specified value**
3. All OK

Function Switch	Minimum Resistance Value	Maximum Resistance Value
Hang Up-Mute	5.0 k Ω	5.5 k Ω
Telephone Switch	3.6 k Ω	4 k Ω
Source Switch	2.8 k Ω	3.1 k Ω
Arrow Down	2.2 k Ω	2.6 k Ω
Arrow Up	1.7 k Ω	2 k Ω
Volume Down	1.4 k Ω	1.6 k Ω
Volume Up	1.1 k Ω	1.3 k Ω
No Switch Pressed	Infinite	Infinite

Repair Instructions

Perform the *Diagnostic Repair Verification* on page 6-92 after completing the repair.

Control Module References on page 6-3 for BCM replacement, programming and setup.

DTC B1529**Diagnostic Instructions**

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

DTC Descriptors

DTC B1529 03: Control Module Voltage Reference Output 5 Circuit Low Voltage

DTC B1529 07: Control Module Voltage Reference Output 5 Circuit High Voltage

Diagnostic Fault Information**Electrical DTCs**

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
12 V Reference	B1529 03, B1405 03	1	B1529 07	B1529 07
Signal	1	1	B3622 07	—
1. Steering Wheel Controls Inoperative				

Circuit/System Description

The body control module (BCM) supplies voltage to the steering wheel control switches and monitors the return signal. Each switch state is associated to a set resistance value and when pressed a specific voltage drop occurs across the resistor unique to the switch. The BCM identifies the switch selection and activates the feature.

Conditions for Running the DTC

- The system voltage is between 9–16 V.
- The ignition is ON.

Conditions for Setting the DTC**B1529 03**

- The BCM detects a short to ground in the 12 V reference circuit.
- The above condition is present for greater than 30 seconds.

B1529 07

- The BCM detects a short to voltage in the 12 V reference circuit.
- The above condition is present for greater than 30 seconds.

Action Taken When the DTC Sets

The BCM will ignore switch inputs.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 100 consecutive malfunction free ignition cycles have occurred.

Reference Information**Schematic Reference**

Steering Wheel Secondary/Configurable Control Schematics on page 8-111

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Steering Wheel Controls Description and Operation on page 8-120

Electrical Information Reference

- *Circuit Testing* on page 11-526
- *Connector Repairs* on page 11-548
- *Testing for Intermittent Conditions and Poor Connections* on page 11-531
- *Wiring Repairs* on page 11-537

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S70R Steering Wheel Controls Switch – Right, ignition ON.
2. Test for 11.8–12.2 V between the reference voltage circuit terminal 1 and ground.
 - ⇒ **If less than 11.8 V**
 - 2.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
 - 2.2. Test for infinite resistance between the reference voltage circuit and ground.
 - ⇒ If less than infinite resistance, repair the short to ground on the circuit.
 - ⇓ If infinite resistance
 - 2.3. Test for less than 2 Ω in the reference voltage 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 12.2 V**
 - 2.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module, ignition ON.
 - 2.2. Test for less than 1 V between the reference voltage 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 11.8–12.2 V**
3. Test for 11.8–12.2 V between the reference voltage circuit terminal 1 and signal circuit terminal 2.
 - ⇒ **If not between 11.8–12.2 V**
 - 3.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
 - 3.2. 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
 - 3.3. 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 between 11.8–12.2 V**
4. Test or replace the S70R Steering Wheel Controls Switch – Right.

Component Testing

1. Ignition OFF, disconnect the harness connector at the S70R Steering Wheel Controls Switch – Right.
2. Test the resistance between the signal terminal 2 and the reference voltage terminal 1 while pressing the appropriate steering wheel controls switch button listed below:
 - ⇒ **If not the specified value**
Replace the S70R Steering Wheel Controls Switch – Right.
 - ⇓ **If the specified value**
3. All OK

Function Switch	Minimum Resistance Value	Maximum Resistance Value
Hang Up-Mute	5.0 k Ω	5.5 k Ω
Telephone Switch	3.6 k Ω	4 k Ω
Source Switch	2.8 k Ω	3.1 k Ω
Arrow Down	2.2 k Ω	2.6 k Ω
Arrow Up	1.7 k Ω	2 k Ω
Volume Down	1.4 k Ω	1.6 k Ω
Volume Up	1.1 k Ω	1.3 k Ω
No Switch Pressed	Infinite	Infinite

Repair Instructions

Perform the *Diagnostic Repair Verification* on page 6-92 after completing the repair.

Control Module References on page 6-3 for BCM replacement, programming and setup.

DTC B3622

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

DTC Descriptor

DTC B3622 07: Steering Wheel Controls Signal Circuit High Voltage

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
12 V Reference	B1529 03, B1405 03	1	B1529 07	B1529 07
Signal	1	1	B3622 07	—
1. Steering Wheel Controls Inoperative				

Circuit/System Description

The body control module (BCM) monitors the steering wheel control signal circuit voltage. If the voltage level is too high, damage may result in the system. When a high voltage condition is detected, the BCM will ignore the switch command.

Conditions for Running the DTC

- Battery voltage is between 9–16 V.
- The ignition is ON.

Conditions for Setting the DTC

The BCM detects a short to voltage in the steering wheel control switch signal circuit.

Action Taken When the DTC Sets

The BCM will ignore switch inputs.

Conditions for Clearing the DTC

- The condition responsible for setting the DTC no longer exists.
- A history DTC will clear once 100 consecutive malfunction free ignition cycles have occurred.

Reference Information

Schematic Reference

Steering Wheel Secondary/Configurable Control Schematics on page 8-111

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Steering Wheel Controls Description and Operation on page 8-120

Electrical Information Reference

- *Circuit Testing* on page 11-526
- *Connector Repairs* on page 11-548
- *Testing for Intermittent Conditions and Poor Connections* on page 11-531
- *Wiring Repairs* on page 11-537

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S70R Steering Wheel Controls Switch – Right, ignition ON.
2. Test for 11.8–12.2 V between the reference voltage circuit terminal 1 and ground.
 - ⇒ **If less than 11.8 V**
 - 2.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
 - 2.2. Test for infinite resistance between the reference voltage circuit and ground.
 - ⇒ If less than infinite resistance, repair the short to ground on the circuit.
 - ⇓ If infinite resistance
 - 2.3. Test for less than 2 Ω in the reference voltage 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 12.2 V**

- 2.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module, Ignition ON.
- 2.2. Test for less than 1 V between the reference voltage 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 11.8–12.2 V**

3. Test for 11.8–12.2 V between the reference voltage circuit terminal 1 and signal circuit terminal 2.

⇒ **If not between 11.8–12.2 V**

- 3.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
- 3.2. 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

- 3.3. 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 between 11.8–12.2 V**

4. Test or replace the S70R Steering Wheel Controls Switch – Right.

Component Testing

1. Ignition OFF, disconnect the harness connector at the S70R Steering Wheel Controls Switch – Right.
2. Test the resistance between the signal terminal 2 and the reference voltage terminal 1 while pressing the appropriate steering wheel controls switch button listed below:

⇒ **If not the specified value**

Replace the S70R Steering Wheel Controls Switch – Right.

⇓ **If the specified value**

3. All OK

Function Switch	Minimum Resistance Value	Maximum Resistance Value
Hang Up-Mute	5.0 k Ω	5.5 k Ω
Telephone Switch	3.6 k Ω	4 k Ω
Source Switch	2.8 k Ω	3.1 k Ω
Arrow Down	2.2 k Ω	2.6 k Ω
Arrow Up	1.7 k Ω	2 k Ω
Volume Down	1.4 k Ω	1.6 k Ω
Volume Up	1.1 k Ω	1.3 k Ω
No Switch Pressed	Infinite	Infinite

Repair Instructions

Perform the *Diagnostic Repair Verification* on page 6-92 after completing the repair.

Control Module References on page 6-3 for BCM replacement, programming and setup.

Symptoms - Secondary and Configurable Customer Controls

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

1. Perform the *Diagnostic System Check - Vehicle* on page 6-66 before using the symptom tables in order to verify that all of the following are true:
 - There are no DTCs set.
 - The control modules can communicate via the serial data link.
2. Review the system description and operation in order to familiarize yourself with the system functions. Refer to *Steering Wheel Controls Description and Operation* on page 8-120.

Visual/Physical Inspection

- Inspect for aftermarket devices which could affect the operation of the steering wheel controls. Refer to *Checking Aftermarket Accessories* on page 11-525.
- Inspect the easily accessible or visible system components, for obvious damage or conditions, which could cause the symptom.

Intermittent

Faulty electrical connections or wiring may be the cause of intermittent conditions. Refer to *Testing for Intermittent Conditions and Poor Connections* on page 11-531.

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

Refer to *Steering Wheel Controls Malfunction* on page 8-118 in order to diagnose the symptom.

Steering Wheel Controls Malfunction

Diagnostic Instructions

- Perform the *Diagnostic System Check - Vehicle* on page 6-66 prior to using this diagnostic procedure.
- Review *Strategy Based Diagnosis* on page 6-58 for an overview of the diagnostic approach.
- *Diagnostic Procedure Instructions* on page 6-59 provides an overview of each diagnostic category.

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
12 V Reference	B1529 03, B1405 03	1	B1529 07	B1529 07
Signal	1	1	B3622 07	—
1. Steering Wheel Controls Inoperative				

Circuit/System Description

The body control module (BCM) supplies voltage to the audio steering wheel control switches and monitors the return signal. Each switch state is associated to a set resistance value and when pressed a specific voltage drop occurs across the resistor unique to the switch. The BCM identifies the switch selection and activates the feature.

Reference Information

Schematic Reference

Steering Wheel Secondary/Configurable Control Schematics on page 8-111

Connector End View Reference

Component Connector End Views on page 11-269

Description and Operation

Steering Wheel Controls Description and Operation on page 8-120

Electrical Information Reference

- *Circuit Testing* on page 11-526
- *Connector Repairs* on page 11-548
- *Testing for Intermittent Conditions and Poor Connections* on page 11-531
- *Wiring Repairs* on page 11-537

Scan Tool Reference

Control Module References on page 6-3 for scan tool information

Circuit/System Verification

1. Ignition ON.
 2. Verify the primary controls of the associated component are functioning properly.
- ⇒ **If any of the primary controls do not function properly**
Refer to *Symptoms - Entertainment* on page 8-26
- ↓ **If all of the primary controls function properly**
3. Refer to Circuit/System Testing.

Circuit/System Testing

1. Ignition OFF and all vehicle systems OFF, disconnect the harness connector at the S70R Steering Wheel Controls Switch – Right, ignition ON.
 2. Test for 11.8–12.2 V between the reference voltage circuit terminal 1 and ground.
- ⇒ **If less than 11.8 V**
- 2.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
 - 2.2. Test for infinite resistance between the reference voltage circuit and ground.
- ⇒ If less than infinite resistance, repair the short to ground on the circuit.
- ↓ If infinite resistance
- 2.3. Test for less than 2 Ω in the reference voltage 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 12.2 V**

- 2.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module, ignition ON.
- 2.2. Test for less than 1 V between the reference voltage 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 11.8–12.2 V**

3. Test for 11.8–12.2 V between the reference voltage circuit terminal 1 and signal circuit terminal 2.

⇒ **If not between 11.8–12.2 V**

- 3.1. Ignition OFF, disconnect the harness connector at the K9 Body Control Module.
- 3.2. 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

- 3.3. 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 between 11.8–12.2 V**

4. Test or replace the S70R Steering Wheel Controls Switch – Right.

Component Testing

1. Ignition OFF, disconnect the harness connector at the S70R Steering Wheel Controls Switch – Right.
2. Test the resistance between the signal terminal 2 and the reference voltage terminal 1 while pressing the appropriate steering wheel controls switch button listed below:

⇒ **If not the specified value**

Replace the S70R Steering Wheel Controls Switch – Right.

↓ **If the specified value**

3. All OK

Function Switch	Minimum Resistance Value	Maximum Resistance Value
Hang Up-Mute	5.0 k Ω	5.5 k Ω
Telephone Switch	3.6 k Ω	4 k Ω
Source Switch	2.8 k Ω	3.1 k Ω
Arrow Down	2.2 k Ω	2.6 k Ω
Arrow Up	1.7 k Ω	2 k Ω
Volume Down	1.4 k Ω	1.6 k Ω
Volume Up	1.1 k Ω	1.3 k Ω
No Switch Pressed	Infinite	Infinite

Repair Instructions

Perform the *Diagnostic Repair Verification* on page 6-92 after completing the repair.

Control Module References on page 6-3 for BCM replacement, programming and setup.

Description and Operation

Steering Wheel Controls Description and Operation

The steering wheel control switches duplicate the function of the primary controls of the associated component, through a network of momentary contact switches and a series of resistors. The body control module (BCM) supplies voltage to the switches and

monitors the return signal. When a switch is pressed, a specific voltage drops across the resistor unique to that switch. The BCM identifies the switch selected and sends a serial data message to the component controlled by the switch, activating the feature.

This section is intended to diagnose the circuits between the BCM and the steering wheel control switches. If the primary control for the device is inoperative, refer to the appropriate section for the component the steering wheel control switch is used for.