

Fig. 1: Secondary and Configurable Customer Control System
Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC CODE INDEX

DIAGNOSTIC CODE INDEX

DTC	Description
<u>DTC B1529</u>	DTC B1529 03 Device Voltage Reference Output Circuit Voltage Below Threshold DTC B1529 07 Device Voltage Reference Output Circuit Voltage Above Threshold
<u>DTC B3622</u>	DTC B3622 07 Steering Wheel Controls Signal Circuit

DTC B1529: DEVICE VOLTAGE REFERENCE OUTPUT CIRCUIT VOLTAGE

Diagnostic Instructions

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

DTC Descriptors

DTC B1529 03

Device Voltage Reference Output Circuit Voltage Below Threshold

DTC B1529 07

Device Voltage Reference Output Circuit Voltage Above Threshold

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+ Voltage Reference	B1529 03	1	-	B1529 07
Steering Wheel Control Switch 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.

Conditions for Running the DTC

- Battery voltage is between 9-16 volts
- The ignition is ON.

Conditions for Setting the DTC

B1529 03

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

B1529 07

- The BCM detects a short to voltage in the B+ voltage 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

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

Description and Operation

Steering Wheel Controls 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

Ignition ON, observe the scan tool SWC Bank 1 status while pressing and releasing the switches. The reading should be SW1-SW10 identifying the switch pressed, and Idle when released.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the left and right steering wheel control switches.
2. Ignition ON, test for B+ between the voltage reference circuit terminal 1 and ground.
 - If less than the specified value, test the voltage reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the BCM.
3. Test for B+ between the voltage reference circuit terminal 1 and the signal circuit terminals listed below:
 - Steering wheel control switch signal circuit terminal 6 - left switch
 - Steering wheel control switch signal circuit terminal 2 - right switch
 - If less than the specified value, test the signal circuits for a short to voltage or an open/high resistance. If the circuits test normal, replace the BCM.
4. Ignition OFF, disconnect the X1 harness connector at the BCM.
5. Test for infinite resistance between ground and the signal circuit terminals listed below:
 - Steering wheel control switch signal circuit terminal 6 - left switch
 - Steering wheel control switch signal circuit terminal 2 - right switch
 - If less than the specified value, test the signal circuits for a short to ground.
6. Ignition ON, test for less than 1 volt between ground and the voltage reference circuit terminal 5 at the left steering wheel control switch.
 - If greater than the specified range, test the voltage reference circuit for a short to voltage.
7. Ignition ON, test for infinite resistance between ground and the voltage reference circuit terminal 5 at the left steering wheel control switch.
 - If not the specified value, test the voltage reference circuit for a short to ground.
8. Test for less than 1 ohm between the voltage reference circuit terminal 5 at the left steering wheel control switch and the voltage reference circuit terminal 5 at the right steering wheel control switch.
 - If greater than the specified range, test the voltage reference circuit for an open/high resistance.
9. If all circuits test normal, test or replace the left or right steering wheel control switch.

Component Testing

1. Disconnect the harness connector at the right or left steering wheel control switch.
2. Connect a DMM between terminal 5 and terminal 6 (left switch) or terminal 2 (right switch) of either the left or right steering wheel control switches.
 - If any of the resistance measurements for the individual switches are not within the specified resistance values, replace the left or right steering wheel control switch.

Left Steering Wheel Switch Resistance

Function Switch	Minimum Resistance Value	Maximum Resistance Value
Source	787 Ohms	987 Ohms
No Switch Pressed	O.L.	O.L.

Right Steering Wheel Switch Resistance

Function Switch	Minimum Resistance Value	Maximum Resistance Value
Previous	534 Ohms	734 Ohms
Next	898k Ohms	1.25k Ohms
Volume Up	1.3k Ohms	1.5k Ohms
Volume Down	1.6k Ohms	1.8k Ohms
Mute/Voice Recognition	2.6k Ohms	3.0k Ohms
No Switch Pressed	O.L.	O.L.

Repair Instructions

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

- **Steering Wheel Control Switch Assembly Replacement**
- **Control Module References** for BCM replacement, setup, and programming

DTC B3622: STEERING WHEEL CONTROLS SIGNAL 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 B3622 07

Steering Wheel Controls Signal Circuit

Diagnostic Fault Information

Circuit	Short to Ground	Open/High Resistance	Short to Voltage	Signal Performance
B+ Voltage Reference	B1529 03	1	-	B1529 07
Steering Wheel Control Switch 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 volts
- The ignition is ON.

Conditions for Setting the DTC

The BCM detects a short to ground 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

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

Description and Operation

Steering Wheel Controls 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

Ignition ON, observe the scan tool SWC Bank 1 status while pressing and releasing the switches. The reading should be SW1-SW10 identifying the switch pressed, and Idle when released.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the left and right steering wheel control switches.
2. Ignition ON, test for B+ between the voltage reference circuit terminal 1 and ground.
 - If less than the specified value, test the voltage reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the BCM.
3. Test for B+ between the voltage reference circuit terminal 1 and the signal circuit terminals listed below:
 - Steering wheel control switch signal circuit terminal 6 - left switch
 - Steering wheel control switch signal circuit terminal 2 - right switch
 - If less than the specified value, test the signal circuits for a short to voltage or an open/high resistance. If the circuits test normal, replace the BCM.
4. Ignition OFF, disconnect the X1 harness connector at the BCM.
5. Test for infinite resistance between ground and the signal circuit terminals listed below:
 - Steering wheel control switch signal circuit terminal 6 - left switch
 - Steering wheel control switch signal circuit terminal 2 - right switch
 - If less than the specified value, test the signal circuits for a short to ground.
6. Ignition ON, test for less than 1 volt between ground and the voltage reference circuit terminal 5 at the left steering wheel control switch.
 - If greater than the specified range, test the voltage reference circuit for a short to voltage.
7. Ignition ON, test for infinite resistance between ground and the voltage reference circuit terminal 5 at the left steering wheel control switch.
 - If not the specified value, test the voltage reference circuit for a short to ground.
8. Test for less than 1 ohm between the voltage reference circuit terminal 5 at the left steering wheel control switch and the voltage reference circuit terminal 5 at the right steering wheel control switch.
 - If greater than the specified range, test the voltage reference circuit for a an open/high resistance.
9. If all circuits test normal, test or replace the left or right steering wheel control switch.

Component Testing

1. Disconnect the harness connector at the right or left steering wheel control switch.
2. Connect a DMM between terminal 5 and terminal 6 (left switch) or terminal 2 (right switch) of either the left or right steering wheel control switches.
 - If any of the resistance measurements for the individual switches are not within the specified resistance values, replace the left or right steering wheel control switch.

Left Steering Wheel Switch Resistance

Function Switch	Minimum Resistance Value	Maximum Resistance Value
Source	787 Ohms	987 Ohms
No Switch Pressed	O.L.	O.L.

Right Steering Wheel Switch Resistance

Function Switch	Minimum Resistance Value	Maximum Resistance Value
Previous	534 Ohms	734 Ohms
Next	898k Ohms	1.25k Ohms
Volume Up	1.3k Ohms	1.5k Ohms
Volume Down	1.6k Ohms	1.8k Ohms
Mute/Voice Recognition	2.6k Ohms	3.0k Ohms
No Switch Pressed	O.L.	O.L.

Repair Instructions

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

- **Steering Wheel Control Switch Assembly Replacement**
- **Control Module References** for BCM replacement, setup, and programming

SYMPTOMS - SECONDARY AND CONFIGURABLE CUSTOMER CONTROLS

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

1. Perform the **Diagnostic System Check - Vehicle** 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**.

Visual/Physical Inspection

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

Intermittent

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

Symptom List

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

Refer to **Steering Wheel Controls Malfunction** in order to diagnose the symptom.

STEERING WHEEL CONTROLS 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+ Voltage Reference	B1529 03	1	-	B1529 07
Steering Wheel Control Switch 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.

Diagnostic Aids

Before diagnosis of the steering wheel controls, ensure the primary controls of the associated component are functioning properly.

Reference Information

Schematic Reference

Steering Wheel Secondary/Configurable Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX - COUPE AND WAGON

Description and Operation

Steering Wheel Controls 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

Ignition ON, observe the scan tool SWC Bank 1 status while pressing and releasing the switches. The reading should be SW1-SW10 identifying the switch pressed, and Idle when released.

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the left and right steering wheel control switches.
2. Ignition ON, test for B+ between the voltage reference circuit terminal 1 and ground.
 - If less than the specified value, test the voltage reference circuit for a short to ground or an open/high resistance. If the circuit tests normal, replace the BCM.
3. Test for B+ between the voltage reference circuit terminal 1 and the signal circuit terminals listed below:
 - Steering wheel control switch signal circuit terminal 6 - left switch
 - Steering wheel control switch signal circuit terminal 2 - right switch
 - If less than the specified value, test the signal circuits for a short to voltage or an open/high resistance. If the circuits test normal, replace the BCM.
4. Ignition OFF, disconnect the X1 harness connector at the BCM.
5. Test for infinite resistance between ground and the signal circuit terminals listed below:
 - Steering wheel control switch signal circuit terminal 6 - left switch
 - Steering wheel control switch signal circuit terminal 2 - right switch
 - If less than the specified value, test the signal circuits for a short to ground.
6. Ignition ON, test for less than 1 volt between ground and the voltage reference circuit terminal 5 at the left steering wheel control switch.
 - If greater than the specified range, test the voltage reference circuit for a short to voltage.
7. Ignition ON, test for infinite resistance between ground and the voltage reference circuit terminal 5 at the left steering wheel control switch.
 - If not the specified value, test the voltage reference circuit for a short to ground.
8. Test for less than 1 ohm between the voltage reference circuit terminal 5 at the left steering wheel control switch and the voltage reference circuit terminal 5 at the right steering wheel control switch.
 - If greater than the specified range, test the voltage reference circuit for a an open/high resistance.
9. If all circuits test normal, test or replace the left or right steering wheel control switch.

Component Testing

1. Disconnect the harness connector at the right or left steering wheel control switch.
2. Connect a DMM between terminal 5 and terminal 6 (left switch) or terminal 2 (right switch) of either the left or right steering wheel control switches.
 - If any of the resistance measurements for the individual switches are not within the specified resistance values, replace the left or right steering wheel control switch.

Left Steering Wheel Switch Resistance

Function Switch	Minimum Resistance Value	Maximum Resistance Value
Source	787 Ohms	987 Ohms
No Switch Pressed	O.L.	O.L.

Right Steering Wheel Switch Resistance

Function Switch	Minimum Resistance Value	Maximum Resistance Value
Previous	534 Ohms	734 Ohms
Next	898k Ohms	1.25k Ohms
Volume Up	1.3k Ohms	1.5k Ohms
Volume Down	1.6k Ohms	1.8k Ohms
Mute/Voice Recognition	2.6k Ohms	3.0k Ohms
No Switch Pressed	O.L.	O.L.

Repair Instructions

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

- **Steering Wheel Control Switch Assembly Replacement**
- **Control Module References** for BCM replacement, setup, and programming

REPAIR INSTRUCTIONS

STEERING WHEEL CONTROL SWITCH ASSEMBLY REPLACEMENT

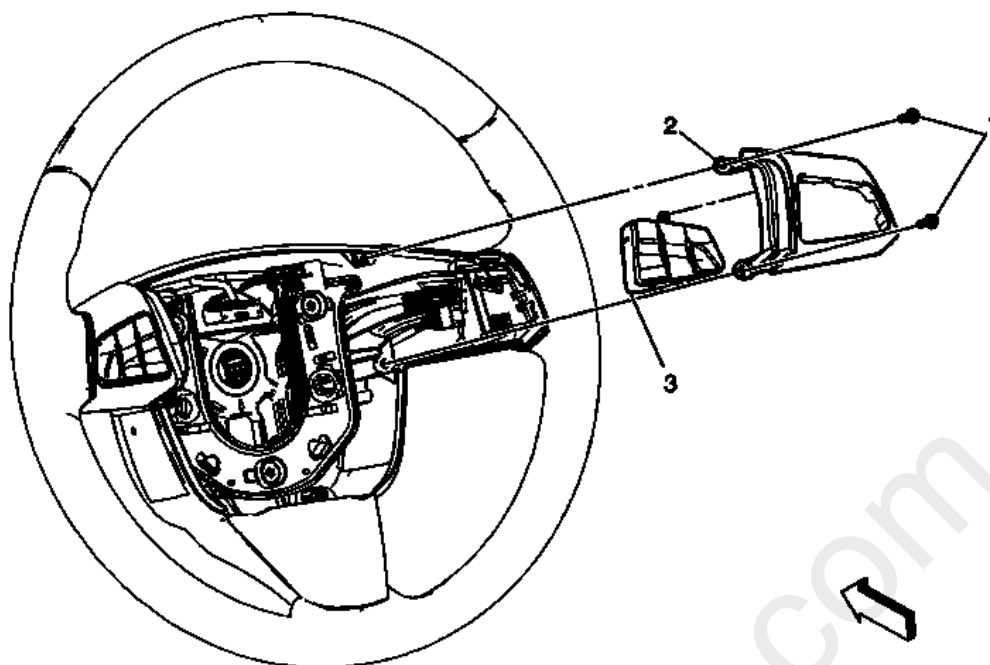


Fig. 2: View of Steering Wheel Control Switch
 Courtesy of GENERAL MOTORS COMPANY

Steering Wheel Control Switch Assembly Replacement

Callout	Component Name
WARNING: Refer to <u>SIR Warning</u> .	
Preliminary Procedure Remove the inflatable restraint steering wheel module. Refer to <u>Airbag Steering Wheel Module Replacement</u> .	
1	Steering Wheel Trim Cover Bolt (Qty: 4) CAUTION: Refer to <u>Fastener Caution</u> . Tighten 2 N.m (18 lb in)
2	Steering Wheel Trim Cover (Qty: 2) TIP: Remove switch and bezel straight out from steering wheel assembly, removing at an angle can cause damage to the foam behind the bezel.
	Steering Wheel Control Switch Assembly (Qty: 2) Procedure

3

1. Radio control switch assembly is shown. Cruise control switch assembly is similar.
2. Disconnect the electrical connectors.
3. Make sure the steering wheel control switches are properly seated to the steering wheel trim cover during installation.

DESCRIPTION AND OPERATION

STEERING WHEEL CONTROLS DESCRIPTION AND OPERATION

Steering Wheel Controls Block Diagram

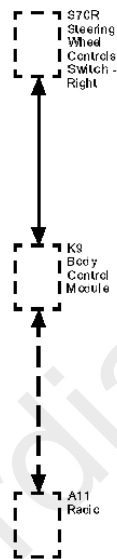


Fig. 3: Steering Wheel Controls Block Diagram
Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
DA	Serial Data
HW	Hard-Wired
S70R	S70R Steering Wheel Controls Switch - Right
K9	K9 Body Control Module
A11	A11 Radio

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.

cardiagn.com