

Secondary and Configurable Customer Controls - CT6

SCHEMATIC WIRING DIAGRAMS

STEERING WHEEL SECONDARY/CONFIGURABLE CONTROL WIRING SCHEMATICS

Steering Wheel Controls

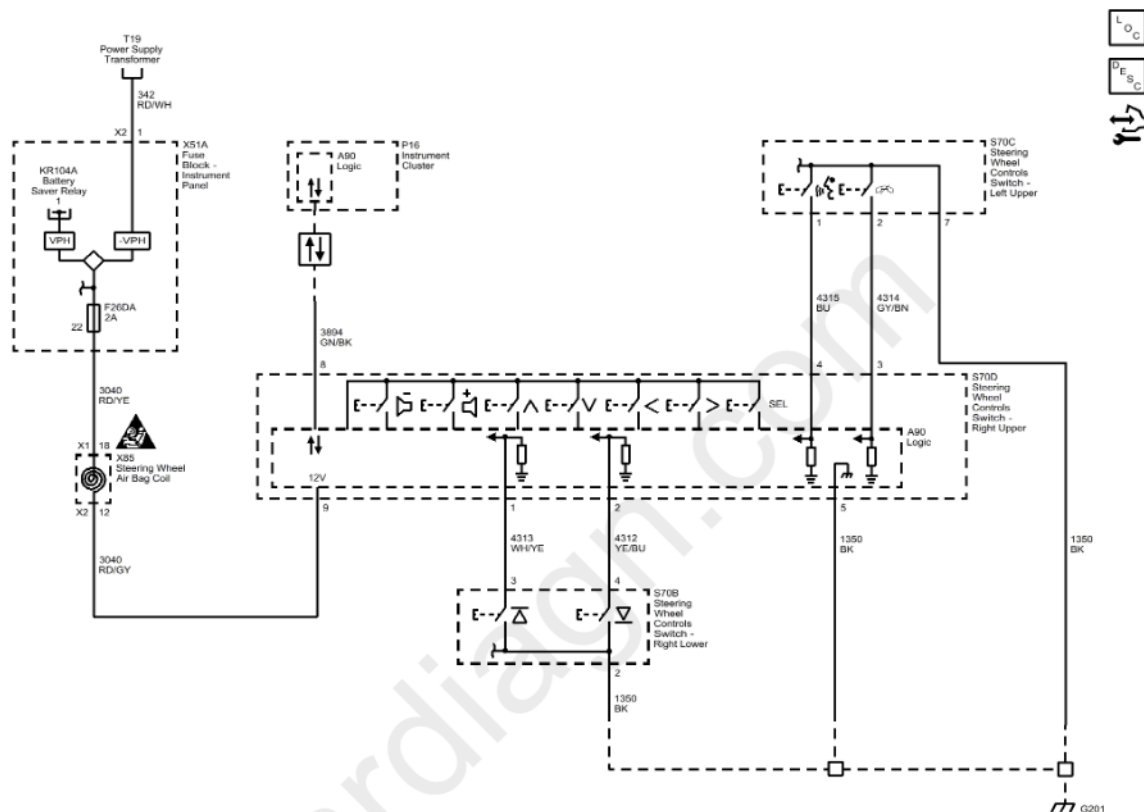


Fig. 1: Steering Wheel Controls

Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B3622: STEERING WHEEL CONTROLS

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 B3622

Steering Wheel Controls

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+	U1510 00, 1	U1510 00, 1	-	-
Favorite Up Signal	B3622 39, B3622 59	1	1	-
Favorite Down Signal	B3622 39, B3622 59	1	1	-
Talk Signal	B3622 39, B3622 59	1	1	-
Mute Signal	B3622 39, B3622 59	1	1	-
Serial Data	1	U1510 00, 1	1	-
Low Reference	-	U1510 00, 1	-	-
1. Steering Wheel Controls Inoperative				

Circuit/System Description

The steering wheel controls switch - right upper is connected to the instrument cluster serial data and provides input from the steering wheel controls switch - right lower switch and steering wheel controls switch - left upper. The instrument cluster identifies the switch selection and activates the feature.

Conditions for Running the DTC

Ignition ON/Vehicle in Service Mode.

Conditions for Setting the DTC

B3622 39

An internal electrical malfunction has been detected in the steering wheel controls switch.

B3622 59

A stuck switch has been detected in the steering wheel controls switch.

Action Taken When the DTC Sets

No action is taken.

Conditions for Clearing the DTC

The DTC will clear when the conditions for setting the DTC are no longer present.

Diagnostic Aids

If DTC B3622 is set and no symptoms are present no repairs should be made.

Reference Information

Schematic Reference

Steering Wheel Secondary/Configurable Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Steering Wheel Controls Description and Operation

- [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. Verify the driver information center (DIC) illuminates.
 - **If the DIC does not illuminate**
Test or replace the instrument cluster.
 - **If the DIC illuminates**
2. Verify all the associated primary controls on the radio (Volume, Mute, Seek, etc.) operate properly.
 - **If any of the primary controls do not function properly**
Refer to [Symptoms - Entertainment](#)
 - **If all of the primary controls function properly**
3. Verify all functions on the S70D Steering Wheel Controls Switch-Right Upper operate properly.
 - **If some, but not all, functions on the S70D Steering Wheel Controls Switch-Right Upper do not operate**
Test or replace the S70D Steering Wheel Controls Switch-Right Upper
 - **If all functions on the S70D Steering Wheel Controls Switch-Right Upper do not operate**
Refer to S70D Steering Wheel Controls Switch-Right Upper Malfunction in Circuit/System Testing with UV6 or without UV6.
 - **If all functions on the S70D Steering Wheel Controls Switch-Right Upper operate properly**
4. Verify the favorite functions of the S70B Steering Wheel Controls Switch - Left Lower operate properly.
 - **If the favorite function does not operate from the S70B Steering Wheel Controls Switch - Left Lower**
Refer to S70B Steering Wheel Controls Switch - Left Lower Malfunction in Circuit/System Testing.
 - **If the favorite functions of the S70B Steering Wheel Controls Switch - Left Lower operate properly**
5. Verify the talk and mute functions of the S70C Steering Wheel Controls Switch - Left Upper operate properly.
 - **If the talk and mute function does not operate from the S70C Steering Wheel Controls Switch - Left Upper**
Refer to S70C Steering Wheel Controls Switch - Left Upper Malfunction in Circuit/System Testing.
 - **If the volume functions of the talk and mute functions of the S70C Steering Wheel Controls Switch - Left Upper operate properly**
6. All OK.

S70D Steering Wheel Controls Switch - Right Upper Malfunction without UV6

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S70D Steering Wheel Controls Switch - Right Upper. 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 5 and ground.
 - **If greater than 10 Ω**
 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 that a test lamp illuminates between the B+ circuit terminal 9 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the control circuit end to end.
 - If greater than 2 Ω , 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.
 2. Test for infinite resistance between the B+ circuit terminal 9 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the S70D Steering Wheel Controls Switch - Right Upper.
 - **If the test lamp illuminates**
5. Test for 2-10 V between the serial data circuit terminal 8 and ground.
 - **If less than 2 V**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the P16 Instrument Cluster.
 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 P16 Instrument Cluster.
 - **If greater than 10 V**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the P16 Instrument Cluster, ignition ON.
 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 P16 Instrument Cluster.
 - **If between 2-10 V**
6. Test or replace S70D Steering Wheel Controls Switch - Right Upper

S70D Steering Wheel Controls Switch-Right Upper Malfunction with UV6

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S70D Steering Wheel Controls Switch - Right Upper. 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 5 and ground.
 - **If greater than 10 Ω**
 1. Ignition OFF/Vehicle OFF, 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 that a test lamp illuminates between the B+ circuit terminal 9 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the control circuit end to end.
 - If greater than 2 Ω , 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.
 2. Test for infinite resistance between the B+ circuit terminal 9 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the S70D Steering Wheel Controls Switch - Right Upper.
 - **If the test lamp illuminates**
 5. Ignition OFF/Vehicle OFF, disconnect the harness connector at the P29 Head-Up Display, ignition ON.
 6. Test for 2-10 V between the S70D Steering Wheel Controls Switch - Right Upper serial data circuit terminal 8 and ground.
 - **If less than 2 V**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the P16 Instrument Cluster.
 2. Test for infinite resistance between the S70D Steering Wheel Controls Switch - Right Upper serial data circuit terminal 8 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for infinite resistance between the P29 Head-Up Display serial data circuit terminal 1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 4. Test for less than 2 Ω in the S70D Steering Wheel Controls Switch - Right Upper 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 P16 Instrument Cluster.
 - **If greater than 10 V**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the P16 Instrument Cluster, ignition ON.
 2. Test for less than 1 V between the S70D Steering Wheel Controls Switch - Right Upper serial data circuit terminal 8 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 1 V between the P29 Head-Up Display serial data circuit terminal 1 serial data 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 P16 Instrument Cluster.
 - **If between 2-10 V**
 7. Connect the harness connector at the S70D Steering Wheel Controls Switch - Right Upper. Ignition ON/Vehicle in Service Mode.
 8. Verify steering wheel controls function properly.
 - **If steering wheel controls function properly**

Replace P29 Head-Up Display.

- **If steering wheel controls do not function properly**

9. Ignition OFF/Vehicle OFF. Disconnect harness connector at the S70D Steering Wheel Controls Switch - Right Upper. Connect the harness connector at the and P29 Head-Up Display. Ignition ON/Vehicle in Service Mode.

10. Verify head-up display functions properly.

- **If head-up display functions properly**

Replace S70D Steering Wheel Controls Switch - Right Upper.

- **If head-up display does not function properly**

11. Replace P16 Instrument Cluster.

S70B Steering Wheel Controls Switch - Right Front Lower Malfunction

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S70B Steering Wheel Controls Switch - Right Front Lower.

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

- **If greater than 10 Ω**

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. Test for 4.8-5.2 V between the between the following signal circuits and ground

- Favorite Up - Terminal 3
- Favorite Down - Terminal 4

- **If less than 4.8 V**

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S70D Steering Wheel Controls Switch-Right Upper.

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 S70D Steering Wheel Controls Switch-Right Upper.

- **If more than 5.2 V**

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S70D Steering Wheel Controls Switch-Right Upper, ignition ON.

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

- If 1 V or greater, repair the short to voltage on the circuit.
- If less than 1 V, replace the S70D Steering Wheel Controls Switch-Right Upper.

- **If between 4.8-5.2 V**

4. Replace the S70B Steering Wheel Controls Switch - Right Front Lower.

S70C Steering Wheel Controls Switch - Left Front Upper Controls Malfunction

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S70C Steering Wheel Controls Switch - Left Front Upper.

2. Test for less than 10 Ω between the ground circuit terminal 7 and ground.

- **If greater than 10 Ω**

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. Test for 4.8-5.2 V between the between the following signal circuits and ground
- Favorite Up - Terminal 1
 - Favorite Down - Terminal 2
 - **If less than 4.8 V**
1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S70D Steering Wheel Controls Switch-Right Upper.
 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 S70D Steering Wheel Controls Switch-Right Upper.
 - **If more than 5.2 V**
1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S70D Steering Wheel Controls Switch-Right Upper, ignition ON.
 2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the S70D Steering Wheel Controls Switch-Right Upper.
 - **If between 4.8-5.2 V**
4. Replace the S70C Steering Wheel Controls Switch - Left Front Upper.

Repair Instructions

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

[Control Module References](#) for instrument cluster replacement, programming and setup.

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.

DTC Descriptors

DTC B3622

Steering Wheel Controls

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+	U1510 00, 1	U1510 00, 1	-	-
Favorite Up Signal	B3622 39, B3622 59	1	1	-
Favorite Down Signal	B3622 39, B3622 59	1	1	-
Talk Signal	B3622 39, B3622 59	1	1	-
Mute Signal	B3622 39, B3622 59	1	1	-
Serial Data	1	U1510 00, 1	1	-
Low Reference	-	U1510 00, 1	-	-
1. Steering Wheel Controls Inoperative				

Circuit/System Description

The steering wheel controls switch - right upper is connected to the instrument cluster serial data and provides input from the steering wheel controls switch - right lower switch and steering wheel controls switch - left upper. The instrument cluster identifies the switch selection and activates the feature.

Conditions for Running the DTC

Ignition ON/Vehicle in Service Mode.

Conditions for Setting the DTC

B3622 39

An internal electrical malfunction has been detected in the steering wheel controls switch.

B3622 59

A stuck switch has been detected in the steering wheel controls switch.

Action Taken When the DTC Sets

No action is taken.

Conditions for Clearing the DTC

The DTC will clear when the conditions for setting the DTC are no longer present.

Diagnostic Aids

If DTC B3622 is set and no symptoms are present no repairs should be made.

Reference Information

Schematic Reference

Steering Wheel Secondary/Configurable Control Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

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

1. Ignition ON/Vehicle in Service Mode. Verify the driver information center (DIC) illuminates.
 - **If the DIC does not illuminate**
Test or replace the instrument cluster.
 - **If the DIC illuminates**
2. Verify all the associated primary controls on the radio (Volume, Mute, Seek, etc.) operate properly.
 - **If any of the primary controls do not function properly**
Refer to **Symptoms - Entertainment**
 - **If all of the primary controls function properly**
3. Verify all functions on the S70D Steering Wheel Controls Switch-Right Upper operate properly.
 - **If some, but not all, functions on the S70D Steering Wheel Controls Switch - Right Upper do not operate**
Test or replace the S70D Steering Wheel Controls Switch - Right Upper
 - **If all functions on the S70D Steering Wheel Controls Switch - Right Upper do not operate**
Refer to S70D Steering Wheel Controls Switch-Right Upper Malfunction in Circuit/System Testing with UV6 or without UV6.
 - **If all functions on the S70D Steering Wheel Controls Switch - Right Upper operate properly**
4. Verify the favorite functions of the S70B Steering Wheel Controls Switch - Left Lower operate properly.

- **If the favorite function does not operate from the S70B Steering Wheel Controls Switch - Left Lower**

Refer to S70B Steering Wheel Controls Switch - Left Lower Malfunction in Circuit/System Testing.

- **If the favorite functions of the S70B Steering Wheel Controls Switch - Left Lower operate properly**

5. Verify the talk and mute functions of the S70C Steering Wheel Controls Switch - Left Upper operate properly.

- **If the talk and mute function does not operate from the S70C Steering Wheel Controls Switch - Left Upper**

Refer to S70C Steering Wheel Controls Switch - Left Upper Malfunction in Circuit/System Testing.

- **If the volume functions of the talk and mute functions of the S70C Steering Wheel Controls Switch - Left Upper operate properly**

6. All OK.

Circuit/System Testing

S70D Steering Wheel Controls Switch - Right Upper Malfunction without UV6

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S70D Steering Wheel Controls Switch - Right Upper. 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 5 and ground.

- **If greater than 10 Ω**

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 that a test lamp illuminates between the B+ circuit terminal 9 and ground.

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

1. Ignition OFF/Vehicle OFF.

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

- If greater than 2 Ω , 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.

2. Test for infinite resistance between the B+ circuit terminal 9 and ground.

- If less than infinite resistance, repair the short to ground on the circuit.
- If infinite resistance, replace the S70D Steering Wheel Controls Switch - Right Upper.

- **If the test lamp illuminates**

5. Test for 2-10 V between the serial data circuit terminal 8 and ground.

- **If less than 2 V**

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the P16 Instrument Cluster.

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 P16 Instrument Cluster.
- **If greater than 10 V**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the P16 Instrument Cluster, ignition ON.
 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 P16 Instrument Cluster.
- **If between 2-10 V**
- 6. Test or replace S70D Steering Wheel Controls Switch - Right Upper

S70D Steering Wheel Controls Switch-Right Upper Malfunction with UV6

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S70D Steering Wheel Controls Switch - Right Upper. 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 5 and ground.
 - **If greater than 10 Ω**
 1. Ignition OFF/Vehicle OFF, 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 that a test lamp illuminates between the B+ circuit terminal 9 and ground.
 - **If the test lamp does not illuminate and the circuit fuse is good**
 1. Ignition OFF/Vehicle OFF.
 2. Test for less than 2 Ω in the control circuit end to end.
 - If greater than 2 Ω , 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.
 2. Test for infinite resistance between the B+ circuit terminal 9 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance, replace the S70D Steering Wheel Controls Switch - Right Upper.
 - **If the test lamp illuminates**
5. Ignition OFF/Vehicle OFF, disconnect the harness connector at the P29 Head-Up Display, ignition ON.
6. Test for 2-10 V between the S70D Steering Wheel Controls Switch - Right Upper serial data circuit terminal 8 and ground.
 - **If less than 2 V**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the P16 Instrument Cluster.
 2. Test for infinite resistance between the S70D Steering Wheel Controls Switch - Right Upper serial data circuit terminal 8 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 3. Test for infinite resistance between the P29 Head-Up Display serial data circuit terminal 1 and ground.
 - If less than infinite resistance, repair the short to ground on the circuit.
 - If infinite resistance
 4. Test for less than 2 Ω in the S70D Steering Wheel Controls Switch - Right Upper 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 P16 Instrument Cluster.
- **If greater than 10 V**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the P16 Instrument Cluster, ignition ON.
 2. Test for less than 1 V between the S70D Steering Wheel Controls Switch - Right Upper serial data circuit terminal 8 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 1 V between the P29 Head-Up Display serial data circuit terminal 1 serial data 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 P16 Instrument Cluster.
 - **If between 2-10 V**
- 7. Connect the harness connector at the S70D Steering Wheel Controls Switch - Right Upper. Ignition ON/Vehicle in Service Mode.
- 8. Verify steering wheel controls function properly.
 - **If steering wheel controls function properly**
Replace P29 Head-Up Display.
 - **If steering wheel controls do not function properly**
- 9. Ignition OFF/Vehicle OFF. Disconnect harness connector at the S70D Steering Wheel Controls Switch - Right Upper. Connect the harness connector at the and P29 Head-Up Display. Ignition ON/Vehicle in Service Mode.
- 10. Verify head-up display functions properly.
 - **If head-up display functions properly**
Replace S70D Steering Wheel Controls Switch - Right Upper.
 - **If head-up display does not function properly**
- 11. Replace P16 Instrument Cluster.

S70B Steering Wheel Controls Switch - Right Front Lower Malfunction

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S70B Steering Wheel Controls Switch - Right Front Lower.
2. Test for less than 10 Ω between the ground circuit terminal 2 and ground.
 - **If greater than 10 Ω**
 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. Test for 4.8-5.2 V between the between the following signal circuits and ground
 - Favorite Up - Terminal 3
 - Favorite Down - Terminal 4
 - **If less than 4.8 V**
 1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S70D Steering Wheel Controls Switch-Right Upper.
 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 S70D Steering Wheel Controls Switch-Right Upper.

• **If more than 5.2 V**

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S70D Steering Wheel Controls Switch-Right Upper, ignition ON.
2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the S70D Steering Wheel Controls Switch-Right Upper.

• **If between 4.8-5.2 V**

4. Replace the S70B Steering Wheel Controls Switch - Right Front Lower.

S70C Steering Wheel Controls Switch - Left Front Upper Controls Malfunction

1. Ignition OFF/Vehicle OFF and all vehicle systems OFF, disconnect the harness connector at the S70C Steering Wheel Controls Switch - Left Front Upper.

2. Test for less than 10 Ω between the ground circuit terminal 7 and ground.

• **If greater than 10 Ω**

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. Test for 4.8-5.2 V between the between the following signal circuits and ground

- Favorite Up - Terminal 1
- Favorite Down - Terminal 2

• **If less than 4.8 V**

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S70D Steering Wheel Controls Switch-Right Upper.
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 S70D Steering Wheel Controls Switch-Right Upper.

• **If more than 5.2 V**

1. Ignition OFF/Vehicle OFF, disconnect the harness connector at the S70D Steering Wheel Controls Switch-Right Upper, ignition ON.
2. Test for less than 1 V between the signal circuit and ground.
 - If 1 V or greater, repair the short to voltage on the circuit.
 - If less than 1 V, replace the S70D Steering Wheel Controls Switch-Right Upper.

• **If between 4.8-5.2 V**

4. Replace the S70C Steering Wheel Controls Switch - Left Front Upper.

Repair Instructions

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

[Control Module References](#) for instrument cluster 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.

The Steering Wheel Controls are divided into a right upper switch, right lower switch and left lower switch. The right upper switch is connected to the IPC LIN serial data and provides input from the right lower switch and left lower switch.

The right upper switch controller consists of UP/DOWN/LEFT/RIGHT directional, center "select", Push-to-Talk and Mute buttons. The LEFT/RIGHT buttons navigate the display regions of the cluster. The UP/DOWN buttons navigate the menus. The right lower switch consists of volume up and volume down buttons. The left lower switch consists of favorite up and favorite down buttons.

cardiagn.com