

2018 ACCESSORIES & EQUIPMENT

Active Noise Cancellation - Equinox & Terrain

SPECIFICATIONS

FASTENER SPECIFICATIONS

Reusable Threaded Fastener Tightening Specifications

NOTE:

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

Application	Specification
	Metric (English)
Radio Speaker Amplifier Bolt	2.5 N.m (22 lb in)
Radio Speaker Amplifier Nut	6 N.m (53 lb in)

SCHEMATIC WIRING DIAGRAMS

ACTIVE NOISE CANCELLATION WIRING SCHEMATICS

Active Noise Cancellation Module Power, Ground and Serial Data (NKC with UZ6 without IOR)

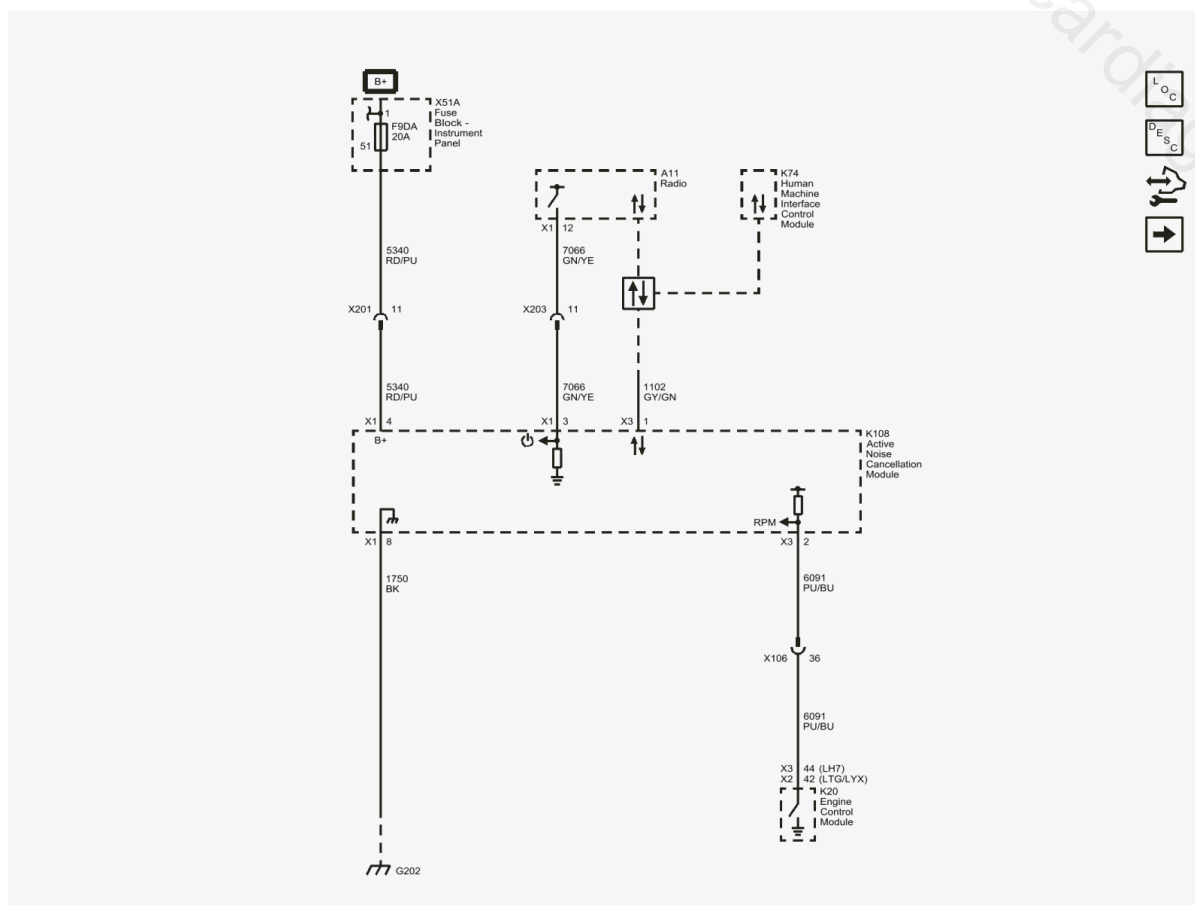


Fig. 1: Active Noise Cancellation Module Power, Ground and Serial Data (NKC with UZ6 without IOR).

Courtesy of GENERAL MOTORS COMPANY

Active Noise Cancellation Microphones (NKC with UZ6 without IOR)

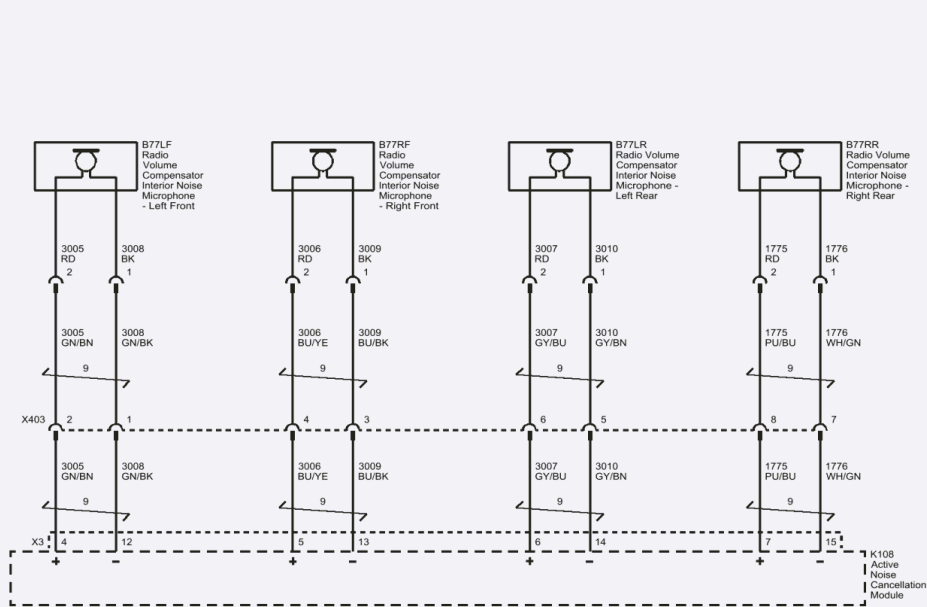


Fig. 2: Active Noise Cancellation Microphones (NKC with UZ6 without IOR).
Courtesy of GENERAL MOTORS COMPANY

Active Noise Cancellation Microphones (NKC and UQA with IO5/IO6/IOS/IOT/IOU)

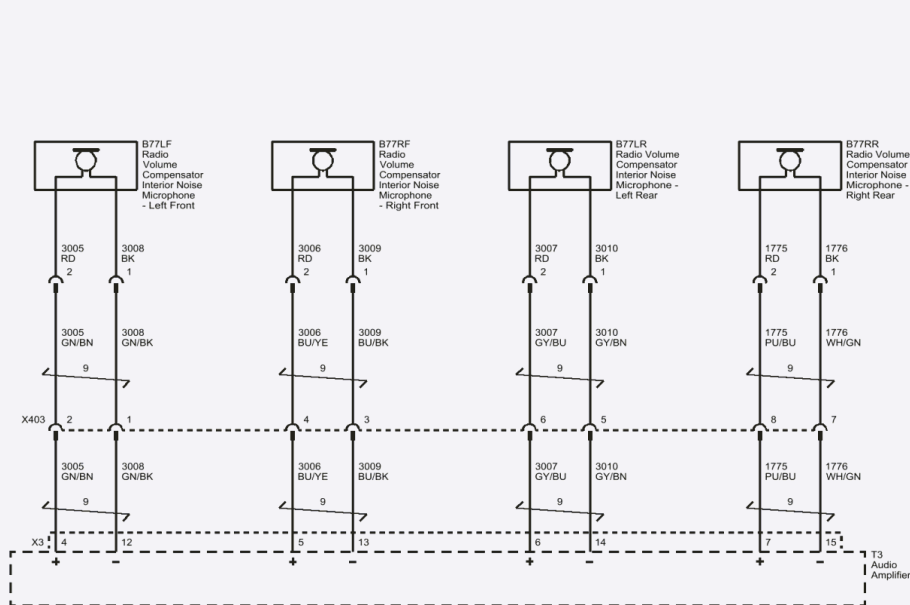


Fig. 3: Active Noise Cancellation Microphones (NKC and UQA with IO5/IO6/IOS/IOT/IOU).
Courtesy of GENERAL MOTORS COMPANY

Active Noise Cancellation Microphones (IOR)

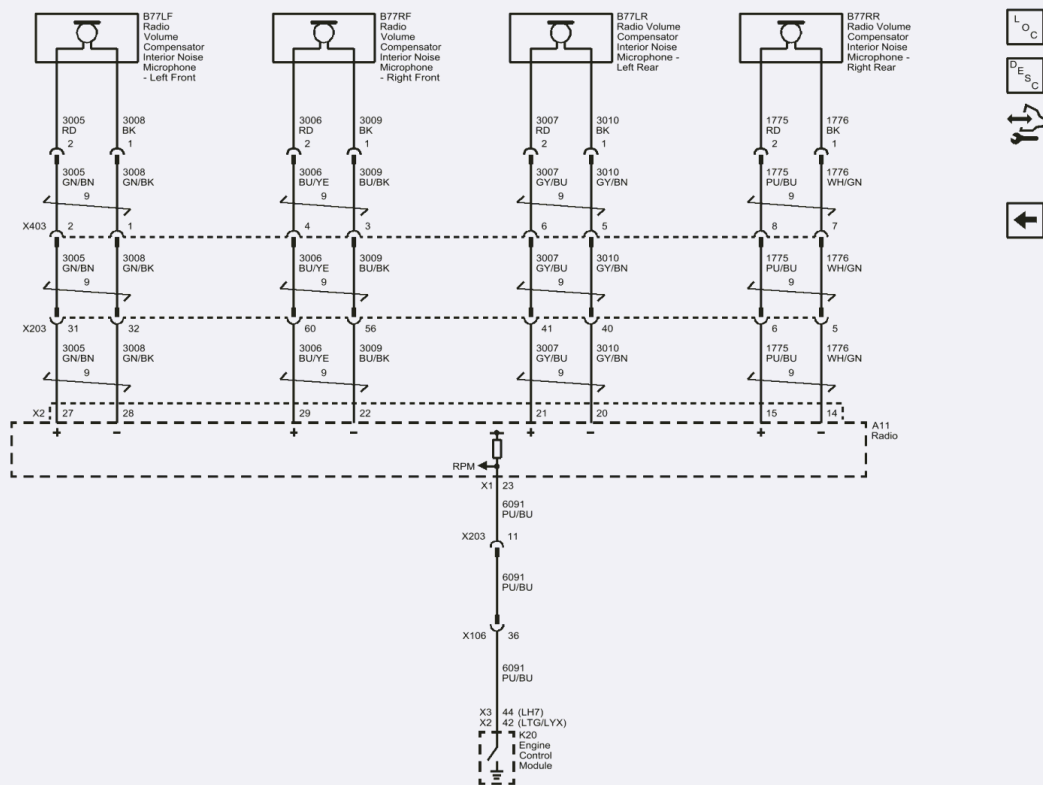


Fig. 4: Active Noise Cancellation Microphones (IOR).

Courtesy of GENERAL MOTORS COMPANY

DIAGNOSTIC INFORMATION AND PROCEDURES

DTC B0560: ENGINE RPM INPUT CIRCUIT SIGNAL INVALID

Diagnostic Instructions

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

DTC Descriptor

DTC B0560 08

Engine RPM Input Circuit Signal Invalid

Circuit/System Description

The Audio Amplifier receives a discrete pulse-width modulated engine speed signal from the Engine Control Module. The Audio Amplifier uses the engine RPM signal for operating active noise cancellation.

Conditions for Running the DTC

- Engine running, Radio ON
- Battery voltage between 9 - 16 volts.

Conditions for Setting the DTC

- The Audio Amplifier receives a serial data message that the engine is running.
- The discrete engine speed signal to the Audio Amplifier indicates the engine speed is less than 300 RPM or greater than 9000 RPM.

Action Taken When the DTC Sets

The active noise cancellation system is disabled.

Conditions for Clearing the DTC

- A current DTC clears when a valid engine speed signal between 300 - 9000 RPM is received.
- A history DTC clears when the ignition cycle counter reaches the reset threshold without a repeat of the malfunction.

Reference Information

Schematic Reference

Active Noise Cancellation Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Active Noise Cancellation 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

NOTE: Diagnose any Engine Control Module DTCs before performing this diagnostic.

1. Ignition OFF, disconnect the X3 harness connector at the T3 Audio Amplifier.
2. Engine running at 600 RPM,
3. Test for 575-800 Hz AC between the signal circuit terminal 2 and ground.
 - **If not between 575-800 Hz AC**
 1. Ignition OFF, disconnect the harness connector at the K20 Engine Control Module. 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
 3. Ignition OFF.
 4. 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
 5. 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 K20 Engine Control Module.
 - **Go to next step: If between 575-800 Hz AC**
4. Test or replace the T3 Audio Amplifier.

Repair Instructions

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

Refer to [Control Module References](#) for Audio Amplifier or Engine Control Module replacement, programming, and setup.

DTC B126E, B126F, B127C, OR B127D: MICROPHONE (2-5) INPUT SIGNAL CIRCUIT (IOR)

Diagnostic Instructions

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

DTC Descriptors

DTC B127C

Microphone 2 Input Signal Circuit

DTC B127D

Microphone 3 Input Signal Circuit

DTC B126F

Microphone 4 Input Signal Circuit

DTC B126E

Microphone 5 Input Signal 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
Microphone High Signal Circuit (LF)	B127C 02	B127C 04	B127C 01	B127C 1A
Microphone Low Signal Circuit (LF)	B127C 02	B127C 04	B127C 01	B127C 1A
Microphone High Signal Circuit (RF)	B127D 02	B127D 04	B127D 01	B127D 1A
Microphone Low Signal Circuit (RF)	B127D 02	B127D 04	B127D 01	B127D 1A
Microphone High Signal Circuit (LR)	B126F 02	B126F 04	B126F 01	B126F 1A
Microphone High Signal Circuit (LR)	B126F 02	B126F 04	B126F 01	B126F 1A
Microphone Low Signal Circuit (RR)	B126E 02	B126E 04	B126E 01	B126E 1A
Microphone Low Signal Circuit (RR)	B126E 02	B126E 04	B126E 01	B126E 1A

Circuit/System Description

The active noise cancellation system uses four microphones in the vehicle headliner: one above each front seating position, and two above the rear seats. The Radio provides a bias voltage to each microphone (+) and (-) signal circuits for operation of the microphone. The microphones monitor the vehicle cabin for undesirable engine sounds. The Audio Amplifier uses the microphone inputs and an engine RPM signal to determine the frequency of the undesirable sound.

Conditions for Running the DTC

The Radio performs a self diagnostic of the microphone circuits 16 seconds after initial power up, then periodically every 400 milliseconds thereafter.

Conditions for Setting the DTC

DTC B127C 01, B127D 01, B126F 01, B126E 01

- DTC B1325 is not current
- A short to voltage is detected on the specified (+) or (-) signal circuit for more than 1.5 seconds

DTC B127C 02, B127D 02, B126F 02, B126E 02

- DTC B1325 is not current
- A short to ground is detected on the specified (+) or (-) signal circuit for more than 1.5 seconds

DTC B127C 04, B127D 04, B126F 04, B126E 04

- DTC B1325 is not current
- An open is detected on the specified (+) or (-) signal circuit for more than 1.5 seconds

DTC B127C 1A, B127D 1A, B126F 1A, B126E 1A

- DTC B1325 is not current
- An out of range voltage is detected on the specified (+) or (-) signal circuit for more than 1.5 seconds

Action Taken When the DTC Sets

The active noise cancellation system is disabled.

Conditions for Clearing the DTC

- A current DTC clears when the self diagnostic passes on the next ignition cycle.
- A history DTC clears when the ignition cycle counter reaches the reset threshold without a repeat of the malfunction.

Diagnostic Aids

- Installation of aftermarket replacement speakers, additional speakers/subwoofers, or aftermarket exhaust systems can cause undesirable behavior of the active noise cancellation system.
- The noise reduction microphones have foam blocks above them to seal the microphones and aid in the reduction of headliner vibration. Missing or out of place foam blocks can impact system performance.

Reference Information

Schematic Reference

Active Noise Cancellation Wiring Schematics

Connector End View Reference

COMPONENT CONNECTOR END VIEWS - INDEX

Description and Operation

Active Noise Cancellation 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

1. Ignition OFF, disconnect the harness connector at the appropriate B77 Radio Volume Compensator Interior Noise Microphone. Ignition ON.
2. Test for 8.5 - 9.5 V between the signal circuit terminal 2 and ground.
 - **If less than 8.5 V**
 1. Ignition OFF, disconnect the X2 harness connector at the A11 Radio.
 2. Test for infinite resistance between the signal circuit and ground.
 - If less than infinite resistance, repair the short to ground in 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 A11 Radio.
 - **If greater than 9.5 V**
 1. Ignition OFF, disconnect the X2 harness connector at the A11 Radio. 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 A11 Radio.
 - **Go to next step: If between 8.5 - 9.5 V**
3. Test for less than 1 V between the signal circuit terminal 1 and ground.
 - **If greater than 1 V**
 1. Ignition OFF, disconnect the X2 harness connector at the A11 Radio. 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 in the circuit.
 - If less than 1 V, replace the A11 Radio.
 - **Go to next step: If less than 1 V**
4. Ignition OFF, disconnect the X2 harness connector at the A11 Radio.
5. Test for infinite resistance between the appropriate B77 Radio Volume Compensator Interior Noise Microphone signal circuit terminal 1 and ground.
 - **If less than infinite resistance**
Repair the short to ground in the circuit
 - **Go to next step: If infinite resistance**
6. 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
 - **Go to next step: If less than 2 Ω**
7. Replace the appropriate B77 Radio Volume Compensator Interior Noise Microphone.
8. Ignition ON
9. Verify the DTC does NOT set.
 - **If the DTC sets**
Replace the A11 Radio.

- Go to next step: If the DTC does not set

10. All OK.

Repair Instructions

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

- Refer to [Active Noise Cancellation Microphone Replacement](#)
- Refer to [Control Module References](#) for Audio Amplifier replacement, programming, and setup.

DTC B1277, B127C, B127D, OR B126F: MICROPHONE (1-4) INPUT SIGNAL CIRCUIT (WITHOUT IOR)

Diagnostic Instructions

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

DTC Descriptors

DTC B1277

Microphone 1 Input Signal Circuit

DTC B127C

Microphone 2 Input Signal Circuit

DTC B127D

Microphone 3 Input Signal Circuit

DTC B126F

Microphone 4 Input Signal 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
Microphone High Signal Circuit (LF)	B1277 02	B1277 04	B1277 01	B1277 1A
Microphone Low Signal Circuit (LF)	B1277 02	B1277 04	B1277 01	B1277 1A
Microphone High Signal Circuit (RF)	B127C 02	B127C 04	B127C 01	B127C 1A
Microphone Low Signal Circuit (RF)	B127C 02	B127C 04	B127C 01	B127C 1A
Microphone High Signal Circuit (LR)	B127D 02	B127D 04	B127D 01	B127D 1A
Microphone High Signal Circuit (LR)	B127D 02	B127D 04	B127D 01	B127D 1A
Microphone Low Signal Circuit (RR)	B126F 02	B126F 04	B126F 01	B126F 1A
Microphone Low Signal Circuit (RR)	B126F 02	B126F 04	B126F 01	B126F 1A

Circuit/System Description

The active noise cancellation system uses four microphones in the vehicle headliner: one above each front seating position, and two above the rear seats. The Audio Amplifier/Active Noise Cancellation Module provides a bias voltage to each microphone (+) and (-) signal circuits for operation of the microphone. The microphones monitor the vehicle cabin for undesirable engine sounds. The Audio Amplifier uses the microphone inputs and an engine RPM signal to determine the frequency of the undesirable sound.

Conditions for Running the DTC

The Audio Amplifier/Active Noise Cancellation Module performs a self diagnostic of the microphone circuits 16 seconds after initial power up, then periodically every 400 milliseconds thereafter.

Conditions for Setting the DTC

DTC B1277 01, B127C 01, B127D 01, B126F 01

- DTC B1325 is not current
- A short to voltage is detected on the specified (+) or (-) signal circuit for more than 1.5 seconds

DTC B1277 02, B127C 02, B127D 02, B126F 02

- DTC B1325 is not current
- A short to ground is detected on the specified (+) or (-) signal circuit for more than 1.5 seconds

DTC B1277 04, B127C 04, B127D 04, B126F 04

- DTC B1325 is not current
- An open is detected on the specified (+) or (-) signal circuit for more than 1.5 seconds

DTC B1277 1A, B127C 1A, B127D 1A, B126F 1A

- DTC B1325 is not current
- An out of range voltage is detected on the specified (+) or (-) signal circuit for more than 1.5 seconds

Action Taken When the DTC Sets

The active noise cancellation system is disabled.

Conditions for Clearing the DTC

- A current DTC clears when the self diagnostic passes on the next ignition cycle.
- A history DTC clears when the ignition cycle counter reaches the reset threshold without a repeat of the malfunction.

Diagnostic Aids

- Installation of aftermarket replacement speakers, additional speakers/subwoofers, or aftermarket exhaust systems can cause undesirable behavior of the active noise cancellation system.
- The noise reduction microphones have foam blocks above them to seal the microphones and aid in the reduction of headliner vibration. Missing or out of place foam blocks can impact system performance.

Reference Information

Schematic Reference

Active Noise Cancellation Wiring Schematics

Connector End View Reference

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

Scan Tool Reference

Control Module References for scan tool information

Circuit/System Testing

1. Ignition OFF, disconnect the harness connector at the appropriate B77 Radio Volume Compensator Interior Noise Microphone. Ignition ON.
2. Test for 7.8 - 8.8 V between the signal circuit terminal 2 and ground.
 - **If less than 7.8 V**
 1. Ignition OFF, disconnect the X3 harness connector at the T3 Audio Amplifier/K108 Active Noise Cancellation Module.
 2. Test for infinite resistance between the signal circuit and ground.
 - If less than infinite resistance, repair the short to ground in 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 T3 Audio Amplifier/K108 Active Noise Cancellation Module.
 - **If greater than 8.8 V**
 1. Ignition OFF, disconnect the X3 harness connector at the T3 Audio Amplifier/K108 Active Noise Cancellation Module. 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 T3 Audio Amplifier/K108 Active Noise Cancellation Module.
 - **Go to next step: If between 7.8 - 8.8 V**
3. Test for less than 1 V between the signal circuit terminal 1 and ground.
 - **If greater than 1 V**
 1. Ignition OFF, X3 harness connector at the T3 Audio Amplifier/K108 Active Noise Cancellation Module. 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 in the circuit.
 - If less than 1 V, replace the T3 Audio Amplifier/K108 Active Noise Cancellation Module.
 - **Go to next step: If less than 1 V**
4. Ignition OFF, disconnect the X3 harness connector at the T3 Audio Amplifier/K108 Active Noise Cancellation Module.
5. Test for infinite resistance between the B77 Radio Volume Compensator Interior Noise Microphone signal circuit terminal 1 and ground.
 - **If less than infinite resistance**

Repair the short to ground in the circuit

- **Go to next step: If infinite resistance**

6. 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

- **Go to next step: If less than 2 Ω**

7. Replace the B77 Radio Volume Compensator Interior Noise Microphone.

8. Ignition ON

9. Verify the DTC does NOT set.

- **If the DTC sets**

Replace the T3 Audio Amplifier/K108 Active Noise Cancellation Module.

- **Go to next step: If the DTC does not set**

10. All OK.

Repair Instructions

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

- Refer to [Active Noise Cancellation Microphone Replacement](#)
- Refer to [Control Module References](#) for Audio Amplifier replacement, programming, and setup.

REPAIR INSTRUCTIONS

ACTIVE NOISE CANCELLATION MODULE REPLACEMENT (EQUINOX)

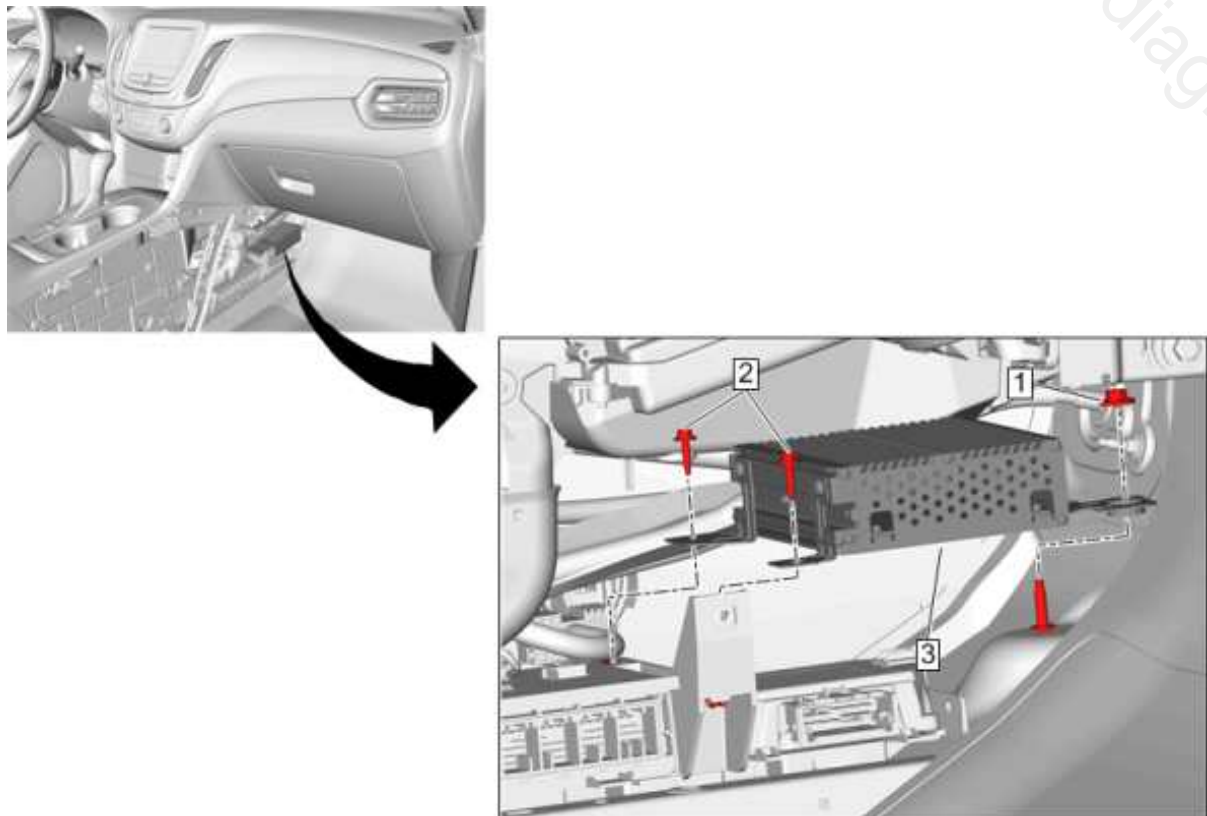


Fig. 5: Active Noise Cancellation Module (Equinox)

Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name

Callout	Component Name
Preliminary Procedures 1. Remove Front Floor Console Extension Panel - Left Side. Refer to Front Floor Console Extension Panel Replacement - Left Side (Equinox). 2. Remove Front Floor Console Extension Panel - Right Side. Refer to Front Floor Console Extension Panel Replacement - Right Side (Equinox).	
1	Radio Speaker Amplifier Nut CAUTION: Refer to Fastener Caution Tighten 6 N.m (53 lb in)
2	Radio Speaker Amplifier Bolt (Qty: 2) Tighten 2.5 N.m (22 lb in)
3	Active Noise Cancellation Module Procedure Disconnect the electrical connectors.

ACTIVE NOISE CANCELLATION MODULE REPLACEMENT (TERRAIN)

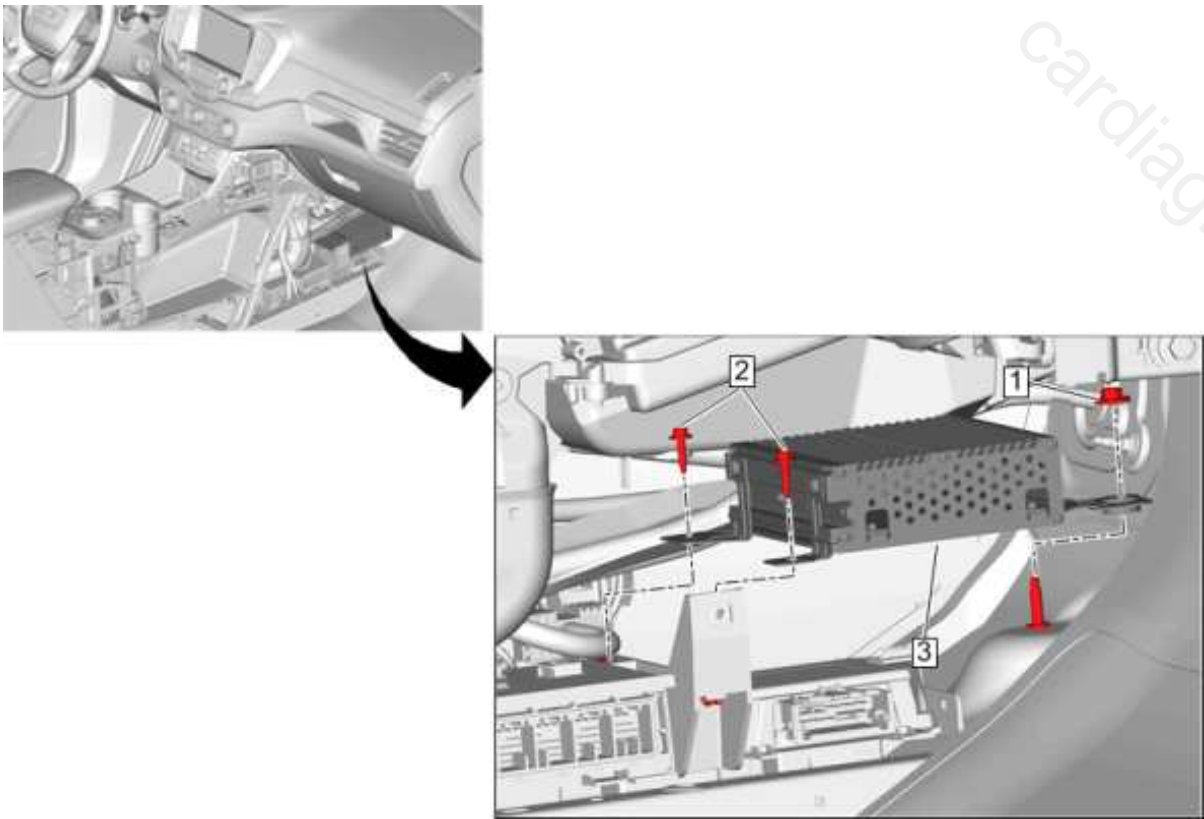


Fig. 6: Active Noise Cancellation Module (Terrain)
 Courtesy of GENERAL MOTORS COMPANY

Callout	Component Name
Preliminary Procedures 1. Remove Front Floor Console Extension Panel - Left Side. Refer to Front Floor Console Extension Panel Replacement - Left Side (Terrain). 2. Remove Front Floor Console Extension Panel - Right Side. Refer to Front Floor Console Extension Panel Replacement - Right Side (Terrain).	

Callout	Component Name
1	Radio Speaker Amplifier Nut CAUTION: Refer to Fastener Caution Tighten 6 N.m (53 lb in)
2	Radio Speaker Amplifier Bolt (Qty: 2) Tighten 2.5 N.m (22 lb in)
3	Active Noise Cancellation Module Procedure Disconnect the electrical connectors.

DESCRIPTION AND OPERATION

ACTIVE NOISE CANCELLATION DESCRIPTION AND OPERATION

The entertainment system on this vehicle may have several different configurations. To determine the specific configuration of the vehicle, please see the Service Parts ID Label, and refer to [RPO Code List](#).

The main components of the Active Noise Cancellation system are:

- 4 microphones in the vehicle headliner.
- A discrete engine speed (RPM) signal from the engine control module to the amplifier/active noise cancellation module.
- Active Noise Cancellation electronics and software integrated into the audio amplifier/active noise cancellation module.
- The vehicle speaker system, connected to the amplifier/active noise cancellation module, to output the desired cancellation frequencies.

The Active Noise Cancellation system is operational under the following conditions:

- The amplifier/active noise cancellation module has passed all self diagnostic checks
- All doors are closed
- Battery voltage is between 9.5 V and 16 V
- The vehicle cabin temperature is less than 140°F (60°C)
- Engine speed is between 550 and 3000 RPM

The Active Noise Cancellation system is a method used to reduce the perception of certain undesirable sounds generated by the engine into the vehicle cabin. The system uses microphone and engine speed signals, software integrated into the amplifier/active noise cancellation module, and the vehicle speakers to determine and generate the correct frequencies needed to achieve the desired reduction.

Four microphones are located in the headliner to monitor noise/sounds in the vehicle cabin, and are directly connected to the amplifier/active noise cancellation module. The amplifier/active noise cancellation module also receives a discrete engine speed (RPM) signal from the engine control module. The amplifier/active noise cancellation module processes these inputs to determine the frequency of the undesirable sound. The amplifier/active noise cancellation module then calculates the appropriate cancellation frequency and outputs a cancellation signal (audio tone) to the vehicle speakers to reduce the perception of undesirable sounds by the vehicle occupants so the vehicle cabin appears quieter and without vibration.

ESE Engine Sound Enhancement (if equipped with NKD)

The ESE feature improves the natural sounds of powertrain and exhaust systems. It uses the microphones and tachometer inputs (under heavy acceleration conditions) to modify the sound and play

it back through the speakers. This feature is always enabled and there are no controls to enable or disable the system.

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