VOLVO
Volvo Trucks North America, Inc.
Greensboro, NC USA

Service Bulletin Trucks

This Service Bulletin replaces Service Manual 39, “Delco Audio System Troubleshooting, VN” (12.1998), publication number PV776–TSP109859.

Audio System Troubleshooting
Delco/Delphi
VN, VHD

Audio Problems

Delco/Delphi

This service information covers the Delco Delphi Audio System Troubleshooting. For further information refer to Group 3.

Contents:

Note: Information is subject to change without notice.
Illustrations are used for reference only and may differ slightly from the actual vehicle being serviced. However, key components addressed in this information are represented as accurately as possible.

Stereo Receiver

You must read and understand the precautions and guidelines in Service Information, group 30, "General Safety Practices", before performing Troubleshooting procedures.

Theftlock

If the radio is in the “Secure” mode and the battery power is lost, the radio will not operate. **LOCKED** will appear on the display when the radio PWR button is pushed or when the ignition is turned on.

To unlock a LOCKED radio:

Note: Pause no more than 15 seconds between the steps.

1 Press SEEK **(5)**. The display will show 0000.

2 Press SEEK **(5)** as many times as needed to make the last digits agree with the secret code.

3 Press TUNE **(6)** as many times as needed to make the first digits agree with the secret code.

4 Confirm that the code on the display matches the code you have chosen.

5 Press BAND **(1)**. The display will show **SECURE** indicating that the radio is operating and the THEFTLOCK is active.

Note: If the display shows **LOCKED**, the incorrect code was entered. Repeat steps 1–5.

If the wrong code is entered 8 times, **InoP** will appear on the display. You will have to wait an hour with the ignition ON before you can try again. When you try again, you will only have three more chances (8 tries per chance) to enter the correct code before **InoP** appears again.

To unlock a LOCKED radio when the code is not available:

To obtain an unlock code for a LOCKED radio when the entered code is not available contact the local Volvo Dealer or call technical support at 1–800–52–VOLVO.

Weather Band and High Performance Family

Harness Connectors

4 Speaker System

Cavity	Circuit	Function
1	499RF+	+ RHS Dash Speaker
2	499LF+	+ LHS Dash Speaker
3	490-A	12 V Supply (Accessory)
4	141R	Dimmer Control
5	497R+	+ RHS Door Speaker
6	497L+	+ LHS Door Speaker
7	497L-	- LHS Door Speaker
8	497R -	- RHS Door Speaker
9	0C - F	Ground
10	90A	Light Control
11	492	12 V Supply (Battery)
12	499LF-	- LHS Dash Speaker
13	499RF-	- RHS Dash Speaker

6 Speaker System

Cavity	Circuit	Function
1	499RF+	+ RHS Dash Speaker
2	499LF+	+ LHS Dash Speaker
3	490-A	12 V Supply (Accessory)
4	141R	Dimmer Control
5	498RR+	+ RHS Rear Speakers
6	498LR+	+ LHS Rear Speakers
7	498LR-	- LHS Rear Speakers
8	498RR-	- RHS Rear Speakers
9	0C - F	Ground
10	90A	Light Control
11	492	12 V Supply (Battery)
12	499LF-	- LHS Dash Speaker
13	499RF-	- RHS Dash Speaker

Note: The following checks are valid for both non-amplified and amplified sound systems. However, always check the amplifier system before replacing the stereo receiver. Refer to “Amplifier” page 28.

No Stereo Receiver Operation

- Confirm no operation of receiver or playback devices. If the receiver operates but the playback device does not, refer to “Cassette Tape Player” page 24 or “CD Player” page 26.
- Check for power supply. Ignition key must be in ON or ACC position. Back probe the wiring harness connector to the stereo receiver.

Measuring Points[1]	Expected Value
Pin 3 ⇔ Alternate ground	B+

If not correct, check for blown fuse or damage/incorrect truck wiring and take appropriate corrective action.

- Check for proper ground. Ignition must be in OFF position. Back probe the wiring harness connector to the stereo receiver.

Measuring Points[1]	Expected Value
Pin 9 ⇔ Alternate ground	less than 1 Ω

If not correct, check for damage/incorrect truck wiring and take appropriate corrective action.

- Check speaker outputs from the receiver. Ignition must be in ON or ACC position. Back probe the wiring harness connector to the stereo receiver.

Measuring Points[1]	Expected Value
Pin 1 ⇔ Pin 13	AC voltage changing proportionately with volume
Pin 2 ⇔ Pin 12	AC voltage changing proportionately with volume
Pin 8 ⇔ Pin 5	AC voltage changing proportionately with volume
Pin 6 ⇔ Pin 7	AC voltage changing proportionately with volume

If correct, check speakers or wiring harness.

After performing the above tests, if no faults were found, replace the stereo receiver. Test operation after replacement.

[1]See “Harness Connectors” page 4

The Receiver Will Not Maintain Pre-Sets

- The stereo receiver should maintain preset stations and the time even with the ignition key in the OFF position. If the preset stations are not maintained check the constant power source and ground. Ignition key must be in OFF position. Back probe the wiring harness connector to the stereo receiver.

Measuring Points[2]	Expected Value
Pin 11 ⇔ Alternate ground	B+
Pin 9 ⇔ Alternate ground	less than 1 Ω

If not correct, check for blown fuse or damage/incorrect truck wiring and take appropriate corrective action.

After performing the above test, if no faults were found, replace the stereo receiver. Test operation after replacement.

No Sound From Some Speakers

Note: If equipped with an amplifier, only the upper two rear bunk speakers will play in the sleep mode. Also if there is a failure in the power supply or the ground of the amplifier, only the upper two rear bunk speakers will play.

- Check for AC voltage at suspect speakers, see “Speakers” page 34.
- Check speaker outputs from the stereo receiver. Ignition key must be in ON or ACC position. Back probe the wiring harness connector to the stereo receiver.

Measuring Points[2]	Expected Value
Pin 1 ⇔ Pin 13	AC voltage changing proportionately with volume
Pin 2 ⇔ Pin 12	AC voltage changing proportionately with volume
Pin 8 ⇔ Pin 5	AC voltage changing proportionately with volume
Pin 6 ⇔ Pin 7	AC voltage changing proportionately with volume

If correct, check speakers or wiring harness.

After performing the above test, if no faults were found, replace the stereo receiver. Test operation after replacement.

[2]See “Harness Connectors” page 4

No Stereo Receiver Display Illumination

The stereo receiver display should illuminate when the ignition key is in the ON or ACC position. Additionally, the premium stereo receiver display should illuminate in the “sleep mode”.

- Check for power supply. Ignition key must be in ON or ACC position. Back probe the wiring harness connector to the stereo receiver.

Measuring Points[3]	Expected Value
Pin 3 ⇔ Alternate ground	B+

If not correct, check for blown fuse or damage/incorrect truck wiring and take appropriate corrective action.

- Check for proper ground. Ignition key must be in OFF position. Back probe the wiring harness connector to the stereo receiver.

Measuring Points[3]	Expected Value
Pin 9 ⇔ Alternate ground	less than 1 Ω

If not correct, check damage/incorrect truck wiring and take appropriate corrective action.

After performing the above test, if no faults were found, replace the stereo receiver. There are no field replaceable lamps in the stereo receiver assembly. Test operation after replacement.

No Stereo Receiver Face Illumination

The stereo receiver face should illuminate when the headlight switch is on and also the display background light should automatically dim to reduce glare. The dimmer switch should raise and lower the brightness of the face illumination and the display background light.

- Check for power supply. Headlight switch must be on. Back probe the wiring harness connector to the stereo receiver.

Measuring Points[3]	Expected Value
Pin 4 ⇔ Alternate ground	B+ to 0 volts, variable with dimmer control.

If not correct, check for blown fuse or damage/incorrect truck wiring and take appropriate corrective action.

[3]See “Harness Connectors” page 4

- Check for proper ground. Ignition key must be in OFF position. Back probe the wiring harness connector to the stereo receiver.

Measuring Points[4]	Expected Value
Pin 9 ⇔ Alternate ground	less than 1 Ω

If not correct, check damage/incorrect truck wiring and take appropriate corrective action.

After performing the above test, if no faults were found, replace the stereo receiver. There are no field replaceable lamps in the stereo receiver assembly. Test operation after replacement.

[4]See “Harness Connectors” page 4

Receiver Diagnostics

Basic Sound System

Cavity	Pin #	Function	I/O
A1	1	N/C	
A2	2	N/C	
A3	3	Park Lights	**I**
A4	4	Ignition	**I**
A5	5	Power Antenna	**O**
A6	6	Dim	**I**
A7	7	Battery	**I**
A8	8	Power Ground	**I**
B1	9	RR+ (Speaker)	**O**
B2	10	RR- (Speaker)	**O**
B3	11	RF+ (Speaker)	**O**
B4	12	RF- (Speaker)	**O**
B5	13	LF+ (Speaker)	**O**
B6	14	LF- (Speaker)	**O**
B7	15	LR+ (Speaker)	**O**
B8	16	LR- (Speaker)	**O**
C1	17	N/C	
C2	18	N/C	
C3	19	RSA_Enable	**O**
C4	20	N/C	
C5	21	N/C	
C6	22	RSA_Control (Rear Seat Audio)	**I**
C7	23	N/C	
C8	24	N/C	
C9	25	N/C	
C10	26	N/C	
C11	27	N/C	
C12	28	Test Pin (for manufacturing use only)	**I**
C13	29	N/C	
C14	30	N/C	
C15	31	N/C	
C16	32	N/C	
C17	33	N/C	
C18	34	N/C	

Cavity	Pin #	Function	I/O
C19	35	N/C	
C20	36	N/C	

W3006208

Rear of Radio 20 Pin Terminal Layout

W3006209

Rear of Radio 36 Pin Terminal Layout

Uplevel Sound System

Uplevel Cassette and CD Pin Connections

Cavity	Pin #	Function	I/O
A1	1	N/C	
A2	2	N/C	
A3	3	Park Lights	**I**
A4	4	Ignition	**I**
A5	5	Power Antenna	**O**
A6	6	Dim	**I**
A7	7	Battery	**I**
A8	8	Power Ground	**I**
B1	9	RR+ (Speaker)	**O**
B2	10	RR- (Speaker)	**O**
B3	11	RF+ (Speaker)	**O**
B4	12	RF- (Speaker)	**O**
B5	13	LF+ (Speaker)	**O**
B6	14	LF- (Speaker)	**O**
B7	15	LR+ (Speaker)	**O**
B8	16	LR- (Speaker)	**O**
C1	17	N/C	
C2	18	Amp Sense	**I**
C3	19	RSA_Enable	**O**
C4	20	Cel_Tel_Mute	**I**
C5	21	ASWC (Analog Steering Wheel Control)	**I**
C6	22	RSA_Control (Rear Seat Audio)	**I**
C7	23	L_AUX_IN	**I**
C8	24	AUX_SHIELD_GND	**I**
C9	25	AUX_COM	**I**
C10	26	R_AUX_IN	**I**
C11	27	AUX_ON_OFF	**I**
C12	28	Test Pin (for manufacturing use only)	**I**
C13	29	CDX_L_IN	**I**
C14	30	E&C	**I/O**
C15	31	CDX_BATT	**O**
C16	32	CDX_R_IN	**I**
C17	33	CDX_SHIELD_GND	**I**

Cavity	Pin #	Function	I/O
C18	34	CDX_GND	**I**
C19	35	CDX_COM	**I**
C20	36	N/C	

XTA Family Radio Display Codes

Radio Errors

Radio receiver error codes when problems are detected relating to the Radio operation:

FAULT: Radio mutes the outputs anytime the radio is “ON”, until either the amplifier PIN #18 (Cavity C2) senses either 5 Volts DC or an “Open” fault is displayed:

1 If the AMPSENSE line is shorted to ground either at the Radio or Amplifier.

2 If the Amplifier Battery Power is removed [Blown Amplifier Fuse] or shorted to the ground.

3 If the XTA Radio left front speaker outputs [both + and –] to the Amplifier left front speaker inputs are open, the Amplifier will not detect the XTA Radio and therefore causing the display fault to occur.

LOCKED: Unlock the radio using either the customer stored code or secret unlock code.

Note: If presets were stored using the Auto Store (AS) when battery is removed the customer stored presets are returned to each preset button. If you want them stored find the strongest stations using the Auto Store function. Then press and hold the Auto Store button for two seconds. Individually press and hold each preset to store them as Customer Stored Presets.

Tape Player Errors

The radio receiver displays error codes when problems are detected relating to the Tape Player operation:

BAD TAPE: Bad tape conditions are detected:

1 Cut tape

2 Tape wound too tight

3 Pinched tape roller

NO TAPE: No cassette tape inserted or Eject Audio Mute selected

TP CLEANER: Tape Clean Indicator (Clean the tape player and then press and hold the EJECT until CLN RST appears and then disappears.

CD Player Errors

Radio receiver displays error codes when problems are detected relating to the CD Player operation:

FOCUS: Optics focus error or disc is upside down in CD Player

LOAD: Load/unload motor problem

NO CD: No CD inserted or communication problem

TRACKING: Optics loss of tracking control or disc is upside down in CD Player

CD Changer Errors

Radio receiver displays error codes when problems are detected relating to the CD Changer operation:

COMM ERR: Communication Error (device pressed is not responding or cable not plugged in properly

FOCUS: Optics focus error or disc is upside down in magazine

MOTOR ER: Load/unload motor problem

NO CDX: Empty magazine or communication problem (check CDX harness)

NO DISC: Time out displayed when CD Magazine cartridge is empty

TRACKING: Optics loss of tracking control

Note: Neither the Base Stereo or Base Cassette will work with an Amplifier or CD Changer. An Uplevel Cassette or CD is required to utilize these types of systems.

Uplevel Plays for One hour and quits with Ignition ON

These diagnostics are valid for the receiver on the Uplevel Sound System. Uplevel supports a one hour play mode with the ignition off.

Check for Battery (B+) on Ignition line. Ignition key must be in the ON or ACC (Accessory) position.

Back probe the radio wiring harness connector with the Volt Ohm Meter (VOM) set to Volts DC.

Measure between pin # A4 (Ignition) and A8 (Ground); B+ (10.5 to 16 VDC)

If not correct, check for blown fuse or damaged/incorrect wiring and take the appropriate corrective action.

No Radio Receiver Operation

These diagnostics are valid for the receiver in both the Basic Sound System and the Uplevel Sound System.

Verify that the complaint is accurate.

If the stereo functions but the playback device does not function, refer to the Cassette Diagnostics or CD Diagnostics.

Check for Power Supply or Battery (B+)

Measure between pin # A7 (Battery) and A8 (Ground); B+ (10.5 to 16 VDC).

If not correct, check for a blown fuse or damaged/incorrect wiring and take appropriate corrective action.

Check for Battery (B+) on Ignition line. Ignition key must be in the ON or ACC (Accessory) position.

Measure between pin # 4 (Ignition) and A8 (Ground); B+ (10.5 to 16 VDC).

If not correct, check for blown fuse or damaged/incorrect wiring and take the appropriate corrective action.

Check for proper ground. Ignition key must be in the OFF position. Back probe the radio wiring harness connector with VOM set to Ohms.

Measure between pin # A8 (Ground) and vehicle ground (Battery –), less than 1 Ohm.

Measure between pin # A8 (Ground) and Vehicle Chassis Ground, less than 1 Ohm.

If not correct, check for damaged/incorrect wiring and take the appropriate corrective action.

Check the speaker outputs from the radio receiver. Ignition key must be in the ON or ACC (Accessory) position. Back probe the radio wiring harness connector with VOM set to Volts AC.

Measure between pin # B1 (RR Speaker +) and B2 (RR Speaker –)	AC Voltage changing proportionally with Volume and Music
Measure between pin # B1 (RR Speaker +) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)
Measure between pin # B2 (RR Speaker –) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)
Measure between pin # B3 (RF Speaker +) and B4 (RF Speaker –)	AC Voltage changing proportionally with Volume and Music
Measure between pin # B3 (RR Speaker +) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)
Measure between pin # B4 (RR Speaker –) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)
Measure between pin # B5 (LF Speaker +) and B6 (LF Speaker –)	AC Voltage changing proportionally with Volume and Music
Measure between pin # B5 (RR Speaker +) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)
Measure between pin # B6 (RR Speaker +) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)
Measure between pin # B7 (LR Speaker +) and B8 (LR Speaker –)	AC Voltage changing proportionally with Volume and Music
Measure between pin # B7 (RR Speaker +) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)
Measure between pin # B8 (RR Speaker +) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)

Note: If the outputs are not correct, check for speakers and the wiring harness that is shorted to the ground or battery.

Note: If the outputs are correct, replace the radio receiver. Test the radio receiver operation after replacement.

Radio Receiver Will Not Retain Presets

The radio receiver should remember Preset radio stations that have been programmed in by the owner. The Preset radio stations are stored internally and should be recalled even if the Power Source or Battery (B+) and the ground are removed. The only exception to this rule is the Presets that are stored using the Auto Store (Auto) button. The Auto Store (Auto) button automatically stores the six strongest stations on Push buttons one through six (1–6). These are temporary Presets unless the user presses the Auto Store (Auto) button again for two seconds, then the original presets will be stored. Individually select each radio station found by pressing the Auto Store (Auto) and press each Preset button until a beep is heard.

Note: If no faults were found, replace the radio receiver. Test the radio receiver operation after replacement.

No Sound From Some Speakers

If equipped with an Uplevel Cassette or Uplevel CD there may also be an amplifier. If the amplifier is hooked up and the ignition is OFF, with the radio receiver ON, only the speakers that are not hooked to the output of the amplifier will play. The two upper rear speakers operate independently of the amplifier. If the upper, rear speakers do not operate, check the radio receiver, harness or speakers.

Measure between pin # B1 (RR Speaker +) and B2 (RR Speaker –)	AC Voltage changing proportionally with Volume and Music
Measure between pin # B1 (RR Speaker +) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)
Measure between pin # B2 (RR Speaker –) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)
Measure between pin # B3 (RF Speaker +) and B4 (RF Speaker –)	AC Voltage changing proportionally with Volume and Music
Measure between pin # B3 (RR Speaker +) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)
Measure between pin # B4 (RR Speaker –) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)
Measure between pin # B5 (LF Speaker +) and B6 (LF Speaker –)	AC Voltage changing proportionally with Volume and Music
Measure between pin # B5 (RR Speaker +) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)
Measure between pin # B6 (RR Speaker –) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)
Measure between pin # B7 (LR Speaker +) and B8 (LR Speaker –)	AC Voltage changing proportionally with Volume and Music
Measure between pin # B7 (RR Speaker +) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)
Measure between pin # B8 (RR Speaker +) and A8 (Ground)	1/2 B+ (5.25 to 8 VDC)

Note: If the outputs are not correct, check for speakers and the wiring harness that is shorted to the ground or battery.

Note: If the outputs are correct, replace the radio receiver. Test the radio receiver operation after replacement.

No Radio Receiver Display Illumination

The radio receiver displays the Time of Day when the receiver is OFF. The radio receiver display should illuminate when the Ignition key is in the ON or Accessory (ACC) position. With the ignition off, the receiver can be turned on by pressing the Power (PWR) button or the ON/AUDIO knob. This activates the one hour timer of the receiver. The receiver turns off after one hour. The timer can be reactivated by pressing the Power (PWR) button or the ON/AUDIO knob again.

Check for Power Supply or Battery (B+)

Measure between pin # A7 (Battery) and A8 (Ground)	B+ (10.5 to 16 VDC)

Note: If not correct, check for blown fuse or damaged/incorrect wiring and take the appropriate corrective action.

Check for Battery (B+) on Ignition line. Ignition key must be in the ON or Accessory (ACC) position. Back probe the radio wiring harness connector with the Volt Ohm Meter (VOM) set to Volts DC.

Measure between pin # A4 (Ignition) and A8 (Ground)	B+ (10.5 to 16 VDC)

Note: If not correct, check for blown fuse or damaged/incorrect wiring and take the appropriate corrective action.

Check for proper ground. Ignition key must be in the OFF position. Back probe the radio wiring harness connector with VOM set Ohms.

Measure between pin # A8 (Ground) and vehicle ground (Battery –)	Less than 1 Ohm
Measure between pin # A8 (Ground) and vehicle chassis (Ground)	Less than 1 Ohm

Note: If not correct, check for blown fuse or damaged/incorrect wiring and take the appropriate corrective action.

Note: If no faults are found, replace the radio receiver. There are no field replaceable lamps in the radio receiver assembly. Test the radio receiver operation after replacement.

No Radio Receiver Face Illumination (Backlighting)

Depending on how the vehicle is wired, the brightness of the display can be adjusted by pressing and holding the SCAN/DIM button until “DIM” and the brightness level appear on the display. Rotate the AUDIO knob clockwise to increase the brightness fo the receiver display and counter-clockwise to decrease it. Otherwise, the radio receiver should illuminate when the headlight switch is on, and the display background light should automatically dim to reduce glare. The dimmer switch should raise and lower the brightness of the face illumination and the display background light.

Check for Power Supply or Battery (B+). Headlight switch must be ON. Back probe the radio wiring harness connector with Volt Ohm Meter (VOM) set to Volts DC.

Measure between pin # A7 (Battery) and A8 (Ground)	B+ (10.5 to 16 VDC)

Note: If not correct, check for blown fuse or damaged/incorrect wiring and take the appropriate corrective action.

Check Battery (B+) on Ignition line. Ignition key must be in the ON or Accessory (ACC) position. Back probe the radio wiring harness connector with Volt Ohm Meter (VOM) set to Volts DC.

Measure between pin # A4 (Ignition) and A8 (Ground)	B+ (10.5 to 16 VDC)

Note: If not correct, check for blown fuse or damaged/incorrect wiring and take the appropriate corrective action.

Check for proper ground. Ignition key must be in the OFF position. Back probe the radio wiring harness connector with VOM set Ohms.

Measure between pin # A8 (Ground) and vehicle ground (Battery –)	Less than 1 Ohm
Measure between pin # A8 (Ground) and vehicle chassis ground	Less than 1 Ohm

Note: If not correct, check for blown fuse or damaged/incorrect wiring and take the appropriate corrective action.

Check for the Power Supply or Battery (B+) on Park Lights. Headlight switch must be ON. Back probe the radio wiring harness connector with Volt Ohm Meter (VOM) set to Volts DC.

Measure between pin # A3 (Park Lights) and A8 (Ground)	B+ (10.5 to 16 VDC)

Note: If not correct, check for blown fuse or damaged/incorrect wiring and take the appropriate corrective action.

Note: If no faults are found, replace the radio receiver. There are no field replaceable lamps in the radio receiver assembly. Test the radio receiver operation after replacement.

Check for the Power Supply or Battery (B+) on DIM. Headlight switch must be ON. Back probe the radio wiring harness connector with VOM set Ohms.

Measure between pin # A6 (DIM) and A8 (Ground)	B+ (0 VDC, variable with Dimmer control)

Note: If not correct, check for blown fuse or damaged/incorrect wiring and take the appropriate corrective action.

Steps to Verify USA Frequency

1

Turn vehicle ignition "ON" and radio "OFF" (Radio displays current time).

2 Press and hold DSPL/TM SET button on radio, until the hour digit on the time display begins flashing.

3 Immediately press BAND button once. If the radio displays USA. **DO NOT PRESS ANY BUTTONS UNTIL RADIO DISPLAY RETURNS TO CURRENT TIME.**

Steps to Change Radio to USA Frequency

1 Turn vehicle ignition "ON" and Radio "OFF" (Radio displays current time).

2 Press and hold DSPL/TM SET button on radio, until the hour digit on the time display begins flashing.

3 Press BAND button several times until the radio displays USA. **DO NOT PRESS ANY BUTTONS UNTIL RADIO DISPLAY RETURNS TO CURRENT TIME.**

Cassette Tape Player

Error Messages — High Performance Family

Note: The premium stereo receiver equipped with a cassette player can identify and display the following error codes. The basic stereo receiver does not have the ability to display error codes.

Error Message		Cause	
Display Message	***Code No.***	***Type***	***Description***
BAD TAPE	10	Tight Tape	The player is unable to turn tape spindles and the tape is ejected.
BAD TAPE	11	Broken Tape	The spindles of the tape are not turning proportionally and the tape is ejected.
ERROR 13	13	Communication	There is a communication problem with the tape player.

The radio receiver displays error codes when problems are detected relating to the Tape Player operation:

BAD TAPE BAD TAPE conditions that are detected:

1 Cut tape

2 Tape wound too tight

3 Pinched tape roller

NO TAPE No cassette tape inserted or Eject Audio Mute selected.

TP CLEAN Tape Cleaner Indicator (Clean the tape player and then press and hold EJECT button until CLN RST appears and then disappears.

Dirty Head

For optimal audio performance, the tape heads should be cleaned after every 15 hours of playback. The cleaning should take place every 50 hours to prevent damage to the playback unit. Symptoms of a dirty tape path include:

- Incorrect tape speed.
- Tape won’t eject.
- Tape won’t play in one direction.
- Muffled sound - no high frequency response.
- Left or right channel dead or plays at a lower volume.
- Tape deck “eats” tape.

Use a cleaning kit to clean the tape head. The Diagnostic Test Kit (Kent More J39916-A) contains a tape head cleaning kit, see “Diagnostic Test Kit — Cassette Head Cleaning” page 25.
A cleaning kit will generally contain:

- Tape head cleaner.
- Cleaning solvent.
- Extra cleaning pads.

Internal Faults

If the radio on the stereo receiver works properly but the cassette tape player does not, there is likely an internal fault in the cassette tape player. There are no field repairs available for the cassette tape player. Replace if necessary.

Diagnostic Test Kit

The Delco Audio System Diagnostic Kit (Kent Moore - J39916A) can be used to diagnose cassette player complaints. See “Diagnostic Test Kit” page 48.

Diagnostic Test Kit — Cassette Head Cleaning

Note: The audio system’s equipped with a “Bad Tape” detector which must be turned off when cleaning the cassette player.
Inspection of the player must take place before using the cleaning and diagnostic cassette. Using a light source, carry out a visual check through the cassette entry flap and ensure that there is no debris inside the player and that the tape is not wrapped around the capstan.

Before proceeding with the diagnostic cassette, the tone head, pinch wheel(s) and capstan(s) must be cleaned. To do this, use the head cleaning cassette as follows:

1 Auto reverse tape drive
2 Tape head
3 Capstan
4 Pinch roller

W3003505

1 Put two drops of the cleaning solution on each felt pad.
2 Insert the cleaning cassette into the tape player and play for 20 seconds, engage the “auto reverse” feature and clean for another 20 seconds.
3 Remove the cleaning cassette. Now allow 2 - 3 minutes of drying time before proceeding.

Note: It is recommended that the cleaning cassette is used every 15 hours of play time. **Replace cleaning cartridges when the felt pads look dirty.**

CD Player

Error Messages — HP Family

Note: The premium stereo receiver equipped with a CD player can identify and display the following error codes.

Error Message		Cause	
Display Message	***Code No.***	***Type***	***Description***
FOCUS	20	CD Focus	Optic focus error - upside down CD, moisture, etc.
ERROR 21	21	CD Tracking	Loss of optic tracking control.
ERROR 22	22	CD Load/Eject	Mechanism unable to complete load/unload within specified time frame.
ERROR 23	23	CD Communication	There is a communication problem with the CD mechanism.

Error Messages — XTA Family

Display Message	***Description***
FOCUS	Optics focus error or Disc is upside down in CD player
LOAD	Load/Unload motor problem
NO CD	No CD inserted or Communication Problem
TRACKING	Optics loss of tracking control or Disc is upside down in CD Player

CD Skips or Mutes

- CD Changer Mounts:
  Check for loose Stereo Receiver mounts. Secure as necessary.
- Vibration Skip:
  The CD player has been designed with a shock absorbing suspension, much like that of a car. Only under extreme operating temperatures and severe shock or vibration should the music be temporarily muted. The temporary muting is considered normal and should not cause damage to the player or compact disc. The player will resume normal playing when the vibration or shock subsides.
- Dew Point Operation:
  Under certain cold temperature and humidity conditions, moisture in the air will condense on the surrounding surfaces. This most commonly occurs in the spring and fall when moisture accumulates on the windshield and body of the vehicle if it is left out at night. The heart of the CD player is a laser/lens assembly reading a shiny digital encoded disc. If this lens or disc becomes fogged up with moisture, the mechanism will have difficulty reading the disc and reproducing the music. When this condition exist, the player may intermittently mute.
  This type of reaction is considered normal and will clear as soon as the CD or the player has warmed up enough to evaporate the moisture.
- Hot Operation:
  Additional heat generated from the heater ducts during humid conditions, when combined with that generated from the integral compact disc player, can create temperatures in excess of normal operating conditions.
  If the CD player encounters theses conditions, it may produce distorted audio and temporarily mute. These reactions are normal and if these conditions occur, remove the CD until the operating temperature has returned to normal.

Internal Faults

If the radio on the stereo receiver works properly but the CD player does not, there is likely an internal fault in the CD player. There are no field repairs available for the CD player. Replace if necessary.

Diagnostic Kit test

The Delco Audio System Kit (Kent Moore - J39916A) can be used to diagnose CD player complaints. See “Diagnostic Test Kit” page 48.

Amplifier

Harness Connectors

Amplifier Harness To Amplifier

Cavity	*Circuit*	*Function*
E1	499RA	+ RHS Front Input
E2	499LA	+ LHS Front Input
E3	499LB	- LHS Front Input
E4	498RB	- RHS Rear Input
E5	498RA	+ RHS Rear Input
E6	498LA	+ LHS Rear Input
E7	498LB	– LHS Rear Input
E8	0C	Ground
E9	0C	Ground
E11	490	12 V Supply
E12	490	12 V Supply
E13	L4 +	+ LHS Dash Speaker
E14	L4 -	- LHS Dash Speaker
E15	L6 +	+ LHS Door Speaker
E16	L6 -	- LHS Door Speaker
F1	499RB	- RHS Front Input
F2	R4 +	+ RHS Dash Speaker
F3	R4 -	- RHS Dash Speaker
F4	S2 -	- Subwoofer (Coil 2)
F5	S2 +	+ Subwoofer (Coil 2)
F6	R6 -	- RHS Door Speaker
F7	R6 +	+ RHS Door Speaker
F10	S1 -	- Subwoofer (Coil 1)
F11	S2 +	+ Subwoofer (Coil 1)
F13	R -	- RHS Rear Wall Speaker
F14	R +	+ RHS Rear Wall Speaker
F15	L +	+ LHS Rear Wall Speaker
F16	L -	- LHS Rear Wall Speaker

Amplifier Harness To Stereo Receiver

Cavity	*Circuit*	*Function*
1	499RA	+ RHS Dash Speaker
2	499LA	+ LHS Dash Speaker
3	490	12 V Supply
4	141	Dimmer Control
5	498RA	+ RHS Door Speaker
6	498LA	+ LHS Door Speaker
7	498LB	- LHS Door Speaker
8	498RB	- RHS Door Speaker
9	0C	Ground
10	90A	Light Control
11	492	12 V Supply
12	499LB	- LHS Dash Speaker
13	499RB	- RHS Dash Speaker

Wiring Harness

W3003443

1 Amplifier
2 Connectors
3 Upper harness
4 Connectors
5 Lower harness
6 Connectors

The amplifier harness is a two piece harness. The harness runs from 2 connectors at the stereo receiver to 2 connectors behind the left kick panel. The upper harness runs from the 2 connectors behind the left kick panel, up the left A-pillar, across the cab under the lower headliner to the amplifier and a connector for the rear speakers.

No Amplifier Operation

- Confirm operation of stereo receiver. The two upper rear speakers operate independently of the amplifier. If the upper rear speaker do not operate, check stereo receiver, harness or speakers. Remember, the amplifier will only work with High Performance Family receivers or XTA Uplevel Family receivers. Verify that the correct receiver is used.
- Ignition key must be in ON or ACC position. Back probe the amplifier connector with a multimeter (Kent Moore J39200) at the following measuring points.

Measuring Points[5]	**Expected Value**
Pin E11 ⇔ Alternate ground	B+
Pin E12 ⇔ Alternate ground	B+

If not correct, check for blown fuse or damage/incorrect truck wiring and take appropriate corrective action.

- Check for proper ground. Ignition key must be in OFF position. Back probe the amplifier connector with a multimeter (Kent Moore J39200) at the following measuring points.

Measuring Points[5]	**Expected Value**
Pin E8 ⇔ Alternate ground	less than 1 Ω
Pin E9 ⇔ Alternate ground	less than 1 Ω

If not correct, check damage/incorrect truck wiring and take appropriate corrective action.

- Check speaker inputs from the stereo receiver. Ignition key must be in ON or ACC position. Back probe the amplifier connector with a multimeter (Kent Moore J39200) at the following measuring points.

Measuring Points[5]	**Expected Value**
Pin E2 ⇔ Pin E3	AC voltage changing proportionately with volume
Pin E1 ⇔ Pin F1	AC voltage changing proportionately with volume
Pin E4 ⇔ Pin E5	AC voltage changing proportionately with volume
Pin E6 ⇔ Pin E7	AC voltage changing proportionately with volume

If not correct, check the stereo receiver outputs or wiring harness.
If correct, check speakers and wiring harness.
If all are correct, replace the amplifier.

[5]See “Harness Connectors” page 28.

- Check speaker outputs from the amplifier. Ignition key must be in ON or ACC position. Back probe the amplifier connector with a multimeter (Kent Moore J39200) at the following measuring points.

Measuring Points[6]	**Expected Value**
Pin E13 ⇔ Pin E14	AC voltage changing proportionately with volume
Pin E15 ⇔ Pin E16	AC voltage changing proportionately with volume
Pin F2 ⇔ Pin F3	AC voltage changing proportionately with volume
Pin F4 ⇔ Pin F5	AC voltage changing proportionately with volume
Pin F6 ⇔ Pin F7	AC voltage changing proportionately with volume
Pin F10 ⇔ Pin F11	AC voltage changing proportionately with volume
Pin F13 ⇔ Pin F14	AC voltage changing proportionately with volume
Pin F15 ⇔ Pin F16	AC voltage changing proportionately with volume

If not correct, replace the amplifier.

If correct, check the wiring to speakers and check the speakers.

[6]See “Harness Connectors” page 28.

Amplifier Does Not Operate On All Channels

- Check speaker inputs from the stereo receiver. Ignition key must be in ON or ACC position. Back probe the amplifier connector with a multimeter (Kent Moore J39200) at the following measuring points.

Measuring Points[7]	Expected Value
Pin E2 ⇔ Pin E3	AC voltage changing proportionately with volume
Pin E1 ⇔ Pin F1	AC voltage changing proportionately with volume
Pin E4 ⇔ Pin E5	AC voltage changing proportionately with volume
Pin E6 ⇔ Pin E7	AC voltage changing proportionately with volume

If not correct, check the radio receiver outputs and wiring harness.

If correct, check speakers and wiring harness. If all are correct replace the amplifier.

[7]See “Harness Connectors” page 28.

- Check speaker outputs from the amplifier. Ignition key must be in ON or ACC position. Back probe the amplifier connector with a multimeter (Kent Moore J39200) at the following measuring points.

Measuring Points[8]	**Expected Value**
Pin E13 ⇔ E14	AC voltage changing proportionately with volume
Pin E15 ⇔ E16	AC voltage changing proportionately with volume
Pin F2 ⇔ F3	AC voltage changing proportionately with volume
Pin F4 ⇔ F5	AC voltage changing proportionately with volume
Pin F6 ⇔ F7	AC voltage changing proportionately with volume
Pin F10 ⇔ F11	AC voltage changing proportionately with volume
Pin F13 ⇔ F14	AC voltage changing proportionately with volume
Pin F15 ⇔ F16	AC voltage changing proportionately with volume

If not correct, check the radio receiver outputs and wiring harness.

If correct, check speakers and wiring harness. If all are correct replace the amplifier.

[8]See “Harness Connectors” page 28.

Speakers

No Sound From Speaker

With the speaker removed from its mounting location and wiring harness disconnected the following checks can be performed:

- Visually inspect for obvious damage such as a torn cone or wiring from the connector to the voice coil broken.
- With a multimeter (Kent More J39200) check the resistance value of the speaker. The specified resistance value should be printed on the speaker (generally 2, 4, 6, 8 or 10 Ω (ohms)).
-

  The speaker may be tested with a 1.5 volt “flashlight” battery by connecting one speaker terminal to the battery negative post and momentarily touching the other speaker terminal to the positive post. The speaker should produce a “pop” when connected. If the speaker contains a capacitor, it will only “pop” once. Do not leave the battery connected.

With the speaker removed from its mounting location and wiring harness connected the following checks can be performed:

- With a multimeter (Kent Moore J39200) check the AC voltage at the A and B speaker terminals. A small AC voltage should be present with the stereo receiver volume low and increase proportionately with volume increase. If AC voltage is correct, replace the speaker. If no AC voltage is present, check the wiring and the stereo receiver outputs.

Speakers Rattle

- Isolate the problem speaker. Inspect for loose or damaged speaker or grill.
- The Delco Audio System Diagnostic Kit (Kent Moore - J39916-A) can be used to diagnose speaker buzz or rattle. A test CD and cassette tape will provide the technician with test tones for speaker testing. The stereo receiver must be equipped with a CD player or cassette tape player to use this test kit. See “Diagnostic Test Kit” page 48.

Noise

RFI Questionnaire

To begin diagnosing RFI conditions, it is important to understand the nature of the condition and the elements that may be involved. The following questionnaire will help determine vital pieces of information for the diagnostic process.

Question	Yes	No
Is the vehicle equipped with any non-factory installed electronics? (This includes radar detectors, scanners and hand-held communications devices.)		
If the condition occurs with a non-factory installed radio, have the radio installation guidelines been followed?		
If the concern is with the entertainment radio, is the tape or CD affected?		
Identify when the condition occurs:		
• Ignition key in OFF position?		
• Ignition key in ACC position?		
• Ignition key in ON position, engine running?		
• Engine running?		
• AM or FM band?		
• What frequencies are affected?		
• Is the condition on station or between stations?		
• Does condition occur with volume turned down?		
• Does condition vary with volume?		
• Is condition RPM related?		
• Does condition occur when switching an accessory on or off?		
• Check antenna and lead-in cable. Does condition persist?		
• Further test for condition at low volume with antenna disconnected. Does condition persist?		
If the condition is related to a fleet vehicle, answer the following:		
• Who installed the radio(s)?		
• Were the installation guidelines followed?		
• Is this the only vehicle which demonstrates this condition?		
• Do similar vehicles have different antennas?		
• Are the antennas mounted in the same location?		

Front-Way Noise

Front-way noise is any noise that enters the audio system through the antenna system. Some electrical noise is always present in the signals reaching the antenna, but the antenna system cannot be filtered or suppressed. To diagnose front-way noise, test if the antenna system meets specifications or if there is an electrical noise emitter present in the vehicle.

Possible Causes:

- Poor grounding of the following:
  - Antenna
  - Receiver
  - Some electrical components
  - Body panels
- Defective or marginal components (relays, switches, solenoids, motors etc.).
- Antenna lead-in too close to electrical or electronic components.
- Opens, shorts or electrical leaks in the ignition system.

Troubleshooting Hints:

- If noise is present with the radio on but goes away when the CD or cassette tape player is on, it is likely that front-way noise is the problem.
- Confirm that the antenna system is the source of noise with the test antenna. See “Test Antenna” page 46.
- Always verify grounding first. If more than one component interferes, poor grounding probably exists.

1 Check the antenna system:
   - Antenna lead-in cable must have low resistance.
   - All antenna cable connectors must be in good condition and tight.
   - Antenna base must be well grounded.
   - Lead-in to radio connection must be tight and low resistance.

2 Check for excess noise reaching the antenna system:
   - Pinpoint the noise source. See “Noise Sniffer” page 40.
   - Route the antenna cable away from electrical/electronic noise circuits.
   - Check for malfunctioning electrical/electronic components on the vehicle.
   - Electrically noisy devices can sometimes be filtered or suppressed.
   - Check for poor grounds or other poor connections in noisy circuits.

Side-Way Noise

W3003059

1 Radio receiver
2 Speaker

Side-way noise is any noise that enters stereo receiver by a radiated field through the stereo receiver case.

Possible Cause:

- Auxiliary electrical components (monitors, cell phones, notebook computers, etc.).
- Noisy wiring or harness too close to the stereo receiver.
- Strong magnetic fields reaching the cassette tape player pickup head.
- High current wiring too close to the stereo receiver.

Troubleshooting Hints:

- If noise is present with the stereo receiver on, but goes away when the receiver is moved out of its mounting location, it is likely that sideway noise is the problem.
- Disconnect any auxiliary electrical components. If noise goes away change the mounting location of the auxiliary electrical components and/or of their wiring harness routing.
- Suppress or shield the noisy harness or wire, or reroute it.

Back-Way Noise

Back-way noise is noise that enters the audio system through its wiring harness.
Back-way noise is most commonly conducted through the power or ground circuits. Some interference or noise is always present in the power and ground circuits.
When the unwanted signals overcome the ability of the audio system to suppress them, they become interference.
These noises are often heard when a particular accessory or system is operated.
Diagnose back-way noise after eliminating front-way or side-way noise.

Possible Causes:

- Poor grounding of the receiver (measure with the antenna lead-in disconnected).
- Non-suppressed electrical components.
- Poorly routed wires.
- Defective electrical components or defective suppression components.

Troubleshooting Hints:

- Determine if noise is present only if the engine is running or when certain electrical components are operating. Removing fuses one at a time can help isolate the noise source.
- Grounds shared between electrically noisy components and audio components can be noise sources. Establish new grounds if necessary.
- Switch pops are suppressed using capacitors. See “Switch Pop Suppression” page 45.
- Capacitors or filter packages are most effective when installed at the noise source.
  Whines, squeals or buzzes are best suppressed using filter packages. See “Capacitors” page 43 and “Filters” page 44.

Harness Noise

W3003060

Speaker harness noise entry.

1 Radio receiver
2 Speaker

Harness noise is any noise induced into speaker wires or any low level audio signal wire used to connect audio components.

Possible Causes:

- Magnetic or electronic fields reaching the low level audio lines.
- Noisy wiring or components too close to the speaker or audio wires.
- Broken, shorted or intermittent audio signal or speaker wires.
- Faulty shield wires.

Troubleshooting Hints:

- Noise induced into individual speakers is likely harness noise. However, if the noise is induced into harnesses between audio system components (stereo receiver to amplifier, etc.) all speakers may be affected.
- Temporary speaker wires may be connected between the stereo receiver and noisy speaker to confirm harness noise entry.
- Check for improper component mounting or wire routing.
- Make sure all shield wiring is properly connected in mating connectors.

Noise Sniffer

Sniffer Construction

The noise sniffer can be used along with the vehicle's radio to locate "hot spots" which are generating radio noise interference. These "hot spots" will be found in the harnesses.

The sniffer can be made from an old piece of antenna lead-in from a mast or power antenna. The longer lead-in the better, since it will make the sniffer more flexible as a diagnostic tool.

W3003061

1 Center conductor wire
2 50 mm (2 in.) of coax shield cut away
3 Antenna lead-in with antenna base connector removed

Construct sniffer per above graphic. The 50 mm (2 in.) section with the outer coating and braided shield stripped back becomes the antenna when the sniffer is plugged into the radio's antenna socket. It can then be used to probe and search out "hot spots".

Procedure

1 While listening to the complaint noise, disconnect the antenna and plug the sniffer into the antenna socket.

2 Turn the radio volume up.

3 When searching for the noise source, keep fingers off of the probe, otherwise erroneous results will be received.

W3003062

1 Noise
2 Wire from harness
3 Sniffer

When checking for noise on a wire, the best results will be achieved when the sniffer is placed parallel to the wire. The sniffer can also be used to determine from what area of the dash the noise is being generated onto the antenna. It must be noted that the sniffer will also locate "normal" hot spots. However, a technician who becomes familiar with the sniffer's capability will find it the most useful diagnostic tool in noise suppression work.

Noise Suppression

The correct application of noise suppression and devices is very important. Connecting a noise suppression device in the wrong place or incorrectly can cause a condition to worsen, circuits to become inoperative or incorrect operation.

Good Grounds

While a good DC ground is often called for, it is most important to realize just what makes a good ground in an audio system. Diagnostic procedures will often call for testing for a “good ground”. A good ground in the audio system is one with the following qualities:

- As short as possible.
- Total resistance of 0.2 ohms or less.
- Large surface area.
- Isolated from electrically noisy devices.

One diagnostic procedure calls for installing a braided ground strap from the chassis of the radio to a good grounding point. As important as it is to install the good ground, it is equally important to delete the previous ground at the radio. If two grounds were allowed to remain, it is possible to set up what is called a “ground loop”. This occurs when there are two paths for ground return but they are not at equal potentials. When this happens, one actually carries a current to the radio chassis and adds it to the normal radio current.

Braided Grounds

W3003063

Braided ground strap.

- Braid 10.5 in. — Volvo P/N 176001
- Braid 19 in. — Volvo P/N 176002
- Braid 21 in. — Volvo P/N 176003
- Braid 8.5 in. — Volvo P/N 176004

The audio system has small AC currents flowing in such places as the antenna system. In a high frequency AC circuit, the current migrates closer to and travels most efficiently near the outside surface of the conductor. This is called the “skin effect”. Because of the skin effect, the better ground in the audio system is one with a larger conductive surface area. This is why a braided ground strap is used where grounds do not resolve the condition, such as at the base of a power antenna mast. If installing a braided ground does not resolve the condition, reconnect the original ground.

Conductive Shielding Tape

Aluminum Tape (P/N 176005)

This tape is used in the audio system to create a shield around a wiring harness in the vehicle or a component in the vehicle. This tape will only suppress RFI conditions. The tape must also be grounded using a braided ground strap to obtain optimum results, see “Braided Grounds” page 41.

Nickel Tape (P/N 176006)

The purpose of this tape is to shield or suppress wiring harnesses and components from EMI/RFI disturbances that affect the electrical functions in the vehicle. The nickel tape is better able to shield magnetic interferences than aluminum tape. However, the nickel tape is very expensive compared to the aluminum tape.

1 Conductive shielding tape
2 Antenna coaxial lead
3 In-line connector
4 Connect ground strap to a good chassis ground

1 Conductive shielding tape
2 Connect braided ground strap to a good chassis ground

Capacitors

Capacitors are used to shunt AC noise to ground or to slow changes in voltage on a circuit.
Any capacitor that will be installed must be rated for 50 V operating voltage minimum. The capacitor (C) should be placed as close to the noise as possible in order to be most effective.

W3003068

Capacitors are connected in parallel to a DC circuit because the capacitor will act like an open circuit to a DC circuit. Capacitors will act like a resistance to an AC circuit and, therefore, short undesirable alternating currents to ground.

Capacitors may be packaged in several ways. Electrolytic capacitors by themselves will be marked with positive and negative leads and must be installed with the correct polarity.

W3003066

1 220 µF 50 V capacitor, P/N 176007
2 Fuse block capacitor, P/N 176008
3 Feed through capacitor, P/N 176009
4 0.47 µF capacitor, P/N 176010

Feed-through type capacitors have already taken care of connecting the capacitor in parallel with the correct polarity. To install the feed through capacitor, open the DC circuit then install the device in series. The feed-through capacitor body must be connected to a good ground for the capacitor to be effective.

Inductors

W3003070

L = Inductor

Inductors, sometimes called a “choke”, are windings of wire. To a DC circuit, this looks like a short; but to an AC circuit, this looks like a high resistance. Thus, AC is effectively blocked while DC passes normally.

Filters

W3003069

Inductors are often used with a capacitor to form a filter. Each end of the inductor (L) is connected in series to the DC circuit and the remaining end of the capacitor (C) to ground.

This forms a double tap for AC that may be traveling the DC circuit. The capacitor will short some AC to ground while the inductor will block any remaining AC.

Filter packages can be especially useful in suppressing noise caused by a constant AC interference. Such interference can be caused by an electric motor.

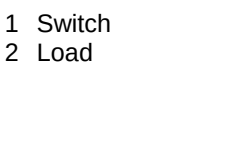
W3003067

1 Component battery or ignition feed
2 Capacitor ground lead (Try grounded and ungrounded)
3 Filter, P/N 176011
4 Splices
5 “Noisy” electrical component

Filter performance is polarity sensitive. Therefore, the effectiveness of the filter is dependent on whether the AC reaches the inductor or the capacitor first. The filter (2) is designed to be most effective when the end with the capacitor ground is connected toward the source of electrical noise. Install the filter in this polarity first. If the noise level is still not satisfactory, try disconnecting the capacitor ground. In some cases, if the first two connections do not eliminate the noise, try reversing the filter polarity and grounding the capacitor lead.

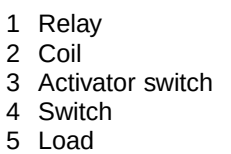
Switch Pop Suppression

Direct switch activated device



1 Switch
2 Load

Relay activated device



1 Relay
2 Coil
3 Activator switch
4 Switch
5 Load

C1, C2 and C3 = 0.47 µF capacitor (P/N 176007)

1 Determine which switch is causing a “pop” when activated.
2 Determine if the component being activated is direct switch activated or relay activated.
3 Install a 0.47 µF capacitor (C1) as shown above.
4 Check for switch pop. If pop is still present install a second capacitor (C2) as shown above.
5 Check for switch pop. If pop still present install a third capacitor (C3) as shown above.
6 Check for switch pop. If pop still present install a feed through capacitor (P/N 176009) between the switch and the component.

Diagnostic Test Kit

The Delco Audio System Diagnostic Kit (Kent Moore - J39916A) can be used to diagnose noise complaints. See “Diagnostic Test Kit” page 48.

Antenna

No AM Signal / Weak FM Signal

Usually symptoms of a broken center conductor of a lead-in cable will result in no AM signal and weak FM signal. Depending on the type antenna system used, the lead in cable may be tested with an ohmmeter. The multiplex antenna system, with its electronic circuitry and no removable connection at the electronic module, cannot be effectively tested. Also, due to the inaccessibility of the antenna end connection, it may not be practical to test the lead in cables on ribbon and mast type systems.

If both ends of the lead-in cable can be accessed, the chart below can be used as a guide to determine if the lead-in cable is OK. When checking resistance, cautiously wiggle the lead-in tip and cable and watch for intermittent readings.

Note: “Zero” the meter to avoid a false reading.

W3003473

A Tip for radio
B Tip for antenna
C Metal case
D Metal case
E Negative battery cable

Measuring Points	Expected Value
A ⇔ B	less than 3.5 Ω
C ⇔ D	less than 1.0 Ω
A ⇔ D	infinite
C ⇔ B	infinite
A ⇔ C	infinite
B ⇔ D	infinite
C ⇔ E	less than 1.0 Ω

WARNING

When removing battery ground cable, disconnect other ground cables connected to the battery first (such as engine ECU, satellite system, etc.), then remove the battery ground cable. Electronic modules may be damaged when additional grounds are connected/disconnected without the main battery ground connected. Always disconnect the main battery ground **last**.

The antenna and the lead-in must be properly grounded for proper reception. The antenna gets its ground at the mounting bracket. Poor mounting of the antenna can cause poor reception and/or interference. To check the antenna and the lead-in grounding, disconnect the battery negative connector and check from the negative battery cable connector (E) to the lead-in cable shield (C) at the radio.

Test Antenna

Generally antenna systems will have very little resistance from the antenna mast to the center conductor tip where it plugs into the radio and very little resistance from the antenna base to ground. However in practice, it is difficult to test antennas in the VN series vehicle due to mounting locations or multiplex antenna circuitry. As an alternative to complex antenna testing, a simple test antenna/lead-in cable can be constructed to help isolate reception or noise problems. To use, the technician must gain access to the antenna input connection at the radio, disconnect the vehicle antenna and connect the test antenna. Connect the test antenna ground wire to a good vehicle ground.
If radio reception improves, it is likely that the antenna mast or lead-in is at fault, see “No AM Signal / Weak FM Signal” page 46. If radio noise improves, the vehicle lead-in cable may need to be moved away from electrically noisy devices, see “Noise Sniffer” page 40.

Note: Do not hold the antenna mast by hand. This will decrease the capability of the antenna to receive a station.

Test Antenna Construction

A test antenna can be constructed from any old antenna/lead-in assembly. Volvo antenna P/N 1586621 and lead-in base assembly P/N 1082185 make an excellent test antenna due to convenient size of the antenna and a long lead-in cable.

W3003386

Fabricate a sheet metal plate per the drawing above. Mount the plate on a 150 x 100 x 50 mm (6 x 4 x 2 in.) piece of wood. Install the ground wire, attach an alligator clip in the other end of the ground wire. Install the antenna assembly.

1 75 mm (3 in.)
2 100 mm (4 in.)
3 Mounting holes: 6.25 mm (1/4 in.)
4 Ground wire hole: 6.25 mm (1/4 in.)
5 Antenna hole: 18.75 mm (3/4 in.)

W3003385

Diagnostic Test Kit

Test CD/Cassette Tape

The Delco Audio Diagnostic Kit (Kent Moore – J39916–A) can be used to diagnose several audio complaints. The test CD/cassette tape will provide the technician with test tones for the following test.

Note: An instruction booklet is included with the kit.

Function

- Bass/subwoofer test
- Mid range speaker tests
- Door tweeter test
- All speaker test
- Speaker buzz and rattle test
- Noise diagnosis
- Coaxial speaker diagnosis
- Motor speed test

CAUTION

Improper use of this diagnostic CD/cassette tape can result in speaker or amplifier damage. Always begin testing procedures at minimum volume, working up to an appropriate level.

Each signal will be played for five minutes, starting with the low frequency tone. Use the fade and balance controls to evaluate the speakers. For example, when the test signal begins, fade full front and check the speaker response of the right and left speakers with the balance control. Then, fade full rear and check the rear speakers in the same manner. There should be enough time to check all speakers with each signal. If the signal ends, and the test is not completed, simply replay the necessary signal.

Note: Always compare the front speakers to front and rear speakers to rear. Don't compare the front speaker to rear speaker because they could be different speakers or their mounting environment could cause them to sound different.

The three basic tones used to test and evaluate base level speakers, or other complex speaker systems, are a bass (50 Hz sine) tone, a mid (500 Hz warble) tone and a tweeter (9 000 Hz spectral) tone. The combination tone is a blend of the above three tones.

Bass Speaker Test

The 50 Hz tone is used to evaluate the bass response of an audio system. This tone is also helpful in evaluating audio systems witch have separate subwoofer amplifiers and speakers.

Mid-Range Speaker Test

The 500 Hz warble tone is used for the evaluation of range speaker response. This tone is qualified as a warble tone because it has different audio characteristics than a sine tone. This tone produces a warble sound. At these mid-range frequencies, it is better to use a warble tone than a sine wave because the location of warble tone source, such as a speaker, is easier to identify. A normal sine tone can set up a standing wave within a vehicle which can make it difficult to determine its source location.

Tweeter Test

The 9 000 Hz spectral tone is used for tweeter or high frequency evaluation. This tone sounds like a group of crickets chirping. This type of tone is used for two reasons: one, much like the warble tone to locate its source, and two, this type of tone is easier to identify for those people with high-end hearing loss problems.

All Speaker Test

With the combination tone, you will be able to quickly diagnose overall audio performance in a vehicle. This tone can be used for numerous audio problems, such as distorted or no sound from speaker(s). Listening to the combination tone, you should be able to hear three distinct sounds. A low pitch steady tone of 50 Hz, a medium frequency warbling tone of 500 Hz and a high frequency hiss or cricket type of sound about 9 000 Hz. Concentrate on the appropriate element of the test signal; low, medium or high as you listen to the different speaker locations by means of the fade and balance control. **This tone can be an excellent signal to use in the diagnosis of coaxial speakers.** For example, if a coaxial speaker is not functioning properly, a direct comparison of the right to left speaker, or vice versa, can determine if the tweeter or woofer in the speaker assembly is inoperative.

Also, when using the combination tone, comparative AC voltage measurements can be made on the speaker terminals, provided the fade and balance controls are in the detent position. With these voltage measurements, a determination can be made in the diagnosis of speaker or amplifier. If the amplifier system of the vehicle is operating normally, the AC voltages should be very close or the same in value.

Speaker/Grill Rattle Test

This portion of the CD can be used to diagnose speaker and grill rattles. The first test is two variable frequency tones played back to back which can help you find or verify a speaker rattle or buzz. Tone two is also a sweep, but frequency change is at much slower rate. This can be used in the repair of a speaker rattle or buzz. If the problem has already been isolated, the fade and balance controls can be set to the proper location and the test tones can be played in the specific problem area.

Noise Diagnostic

This portion can be used for noise diagnostics such as alternator whine, switch pops etc. This portion of the diagnostic CD/cassette tape may be used in conjunction with the audio diagnostic section in the service manual, provided with the test kit.

Motor Speed

There is a 2 minute time period marked in a section of the diagnostic tape, for the purpose of checking the cassette tape motor speed. This portion of the diagnostic tape can be used to verify or resolve problems when a customer complains that the audio from the cassette tape sounds abnormal. In some cases, improper tape motor speed can cause abnormalities. If the time taken for this test is between 1 minute and 56 seconds to 2 minutes and 1 second, the tape motor speed is within tolerance.