

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

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Audio System Design and Function Delco/Delphi VN, VHD

Audio System

Delco/Delphi

This service information covers the Delco/Delphi System Design and Function. For further information refer to Group 3.

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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.

Volvo VN Sound System

The audio receiver systems in the Volvo VN series trucks are selected and tuned for optimized performance. All VN models are available with a variety of Delco/Delphi Electronics components.

Three receiver families are available:

- The Weatherband family is available with or without a cassette player or early production VNs through approximately June 1999.
- The High Performance family is available with a cassette or CD player on early production VNs through approximately June 1999.
- The Extreme Audio family, known as XTA, is available on later production VNs beginning approximately June 1999. It is standard on the VHD vehicles. The XTA series is available in a "Basic" system with or without a cassette player, and an "Uplevel" system with a cassette or CD player.

All VN/VHD models are also available with either basic or premium speaker packages. The VN 770 premium speaker system includes an 8 channel amplifier and a subwoofer. The VN 660 and VN 770 models are available with remote CD changers.

Consult the "Owner's Manual" that is supplied with the vehicle for complete operation instructions.

Repair/Replacement

As an alternative to expensive replacement, Delco/Delphi Electronics Devices may be repaired at approved service centers. Call D&B Auto Radio at 1-800-323-4813 for repair information.

Unauthorized Repair

The warranty may not apply if the product is worked on by an unauthorized person.

Radio Signals

The radio signal is sent from a broadcast station and this signal is then received by an antenna. The strength of the signal depends on the following:

- The power output (wattage) of the broadcasting station.
- The location of the receiver relative to the broadcast tower.
- Obstacles between the tower and the receiver.
- Atmospheric conditions.
- What band (AM or FM) the station is broadcasting.
- Type of antenna and the grounding bases.

In North America, commercial radio signals are legislated into two bands:

- AM 530-1710 kHz (in 10 kHz steps)
- FM 87.9-107.9 MHz (in 200 kHz steps)

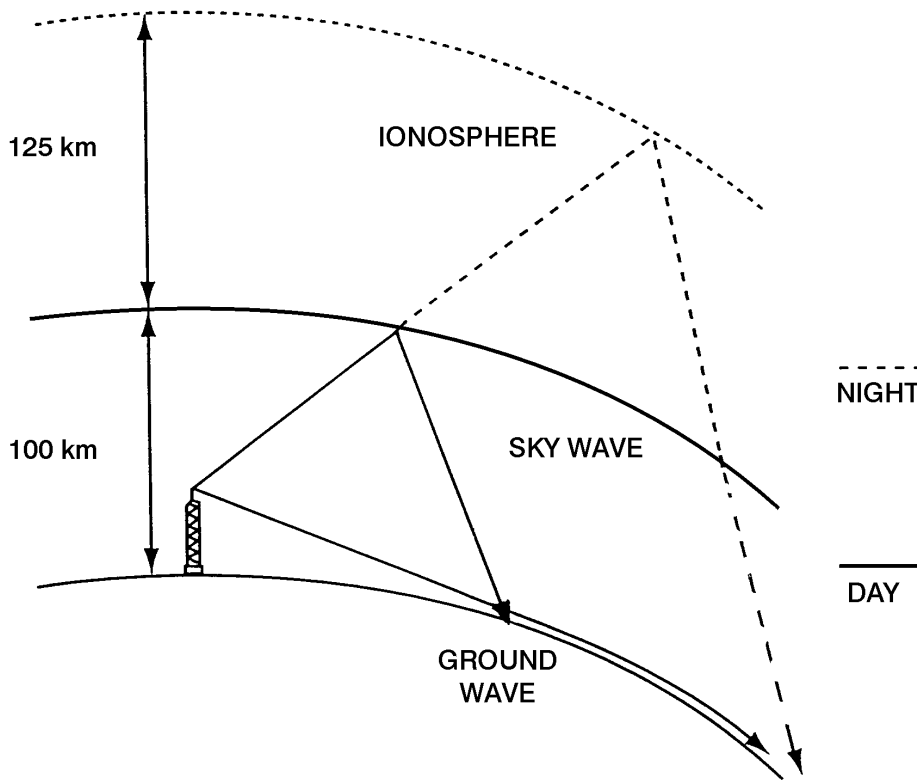
Each frequency range uses a different modulation method. Since a radio wave is really just electromagnetic energy, it must be controlled in a certain way to carry information. The process of adding the information to the radio signals is called modulation.

There are two modulation techniques used in radio broadcasts:

- AM = Amplitude Modulation
- FM = Frequency Modulation

The characteristics of the signal depend on both the frequency and the modulation. It is important to understand these characteristics to properly verify a complaint.

AM Band



AM radio signals. (100 km = 62 miles)

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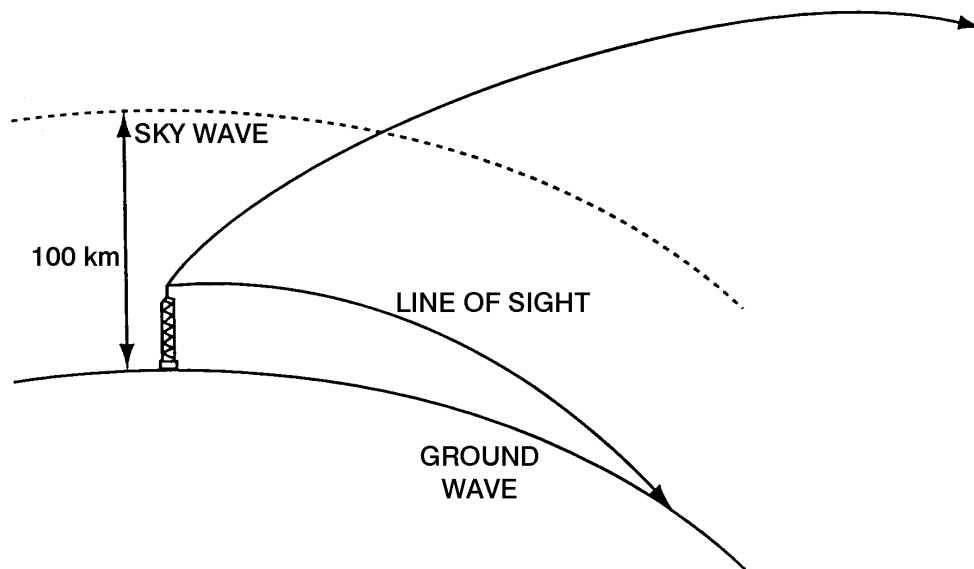
Radio signals in the AM band have lower frequency and longer wavelengths than the FM band. Some characteristics of the AM band include:

- The frequency used is relatively low; therefore, these waves can bend around obstacles and skip along the ground.
- The waves are reflected by the ionosphere layer in the atmosphere.
- Long range reception is sometimes available.
- AM is subject to electrical interferences.
- AM can be blocked by steel and/or concrete structures.

The AM frequencies have longer range due to the ground wave. The ground wave follows the curvature of the earth and is effected by its conductivity. The greater the conductivity, the less the signal loss; so transmission over water is better than over land. The ground wave in this frequency band has a range of 80–320 kilometers (50–200 miles).

The sky wave will pass through the atmosphere and reflect off of the ionosphere to the vehicle's antenna. At night, the ionosphere is actually higher than during the day, so it is possible for AM signals from great distances to be received during nighttime hours. As a result, many AM stations actually reduce transmitting power in the evening hours to maintain the same coverage as during the day.

FM Band



W3003002

FM band signal. (100 km = 62 miles)

Radio signals in the FM band have higher frequency and shorter wavelengths than the AM band. Some characteristics of the FM band include:

- FM is able to eliminate atmospheric noise mainly due to its method of propagation. Atmospheric noises are generally amplitude related and have little effect on FM signals.
- Reflect off of obstacles.
- Penetrate the ionosphere.

Radio frequencies over 30 MHz are effectively absorbed by the earth, eliminating the ground wave. Even when out of a direct line of sight, the signal may be reflected into areas that would be in a "shadow" otherwise.

FM signals and light rays respond to atmosphere in a similar manner. The atmosphere bends them both so they will follow the curvature of the earth to a certain extent. This is called refraction and it is similar to a lens which can bend light waves. A good example of this is when you see a sunset. The sunlight is visible with the sun well below the horizon. FM signals characteristically have a shorter range than AM signals.

Factors which affect the line of sight include:

- Height of the broadcast antenna.
- Height of the receiving antenna.
- Terrain and buildings in the broadcast path.

Weatherband

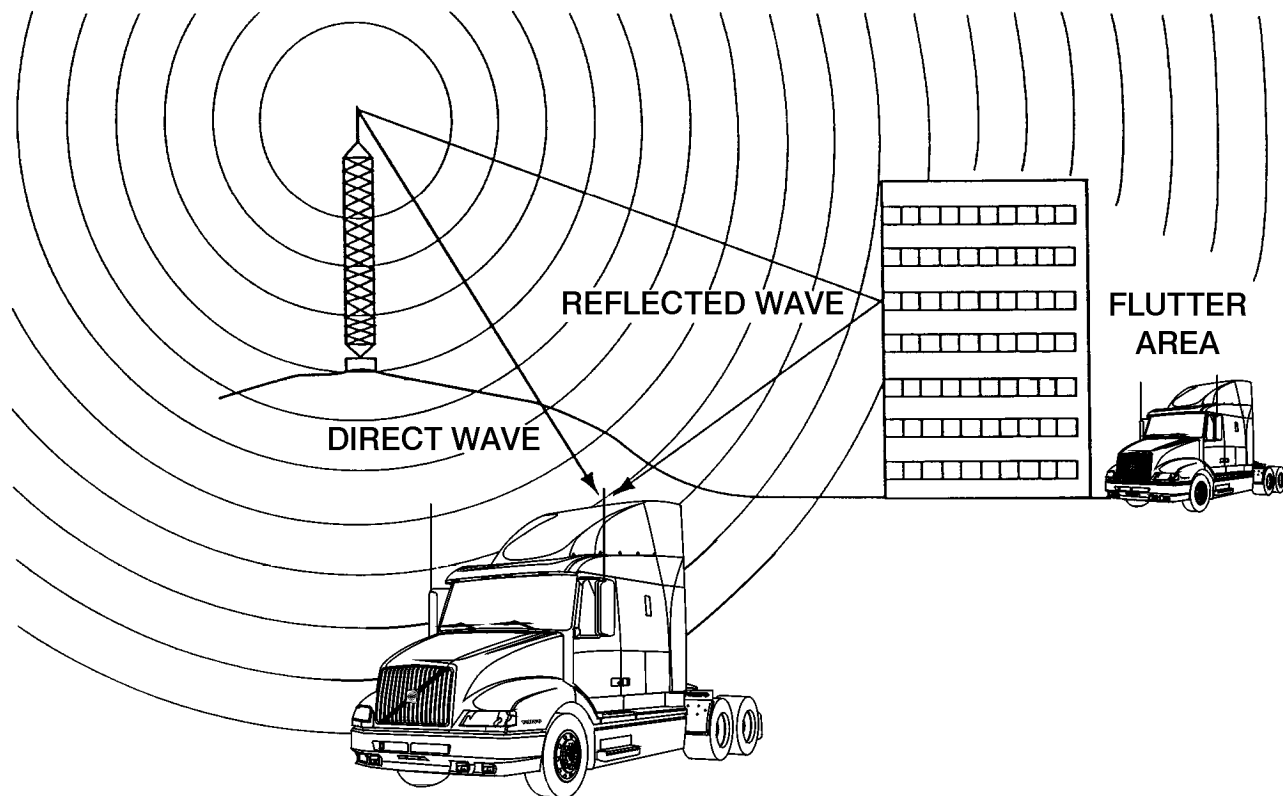
NOAA — (National Oceanic and Atmospheric Administration) is a service of the "Voice of the National Weather Service." It provides continuous broadcasts of the latest weather information directly from the National Weather Service offices. Taped weather messages are repeated every four to six minutes and are routinely revised ever one to three hours, or more frequently if needed. Most of the stations operate 24 hours a day.

The weather for your area can be found on one of seven stations. The frequency associated with each channel is as follows:

- 162.550 MHz
- 162.400 MHz
- 162.475 MHz
- 162.425 MHz
- 162.450 MHz
- 162.500 MHz
- 162.525 MHz

Approximately 90 percent of the nation's population is within listening range of a NOAA Weather Radio broadcast.

Signal Disruption



W3003001

Since the higher frequency signals behave more like light, the signal may be reflected or there may be areas of shadow. When a receiver has more than one signal due to reflection, we call it multipath distortion. When a receiver is located in a signal shadow, we call it flutter.

Multipath

This condition is caused by reflected signals. The reflected signal must travel further than the direct signal, so it takes longer to get to the antenna and it is weaker when it gets there. The receiver then has two signals which are slightly out-of-time with each other. The two signals tend to cancel each other out. This condition is most common in built-up areas which reflect the signals. A multipath area is often only a few inches wide. At home you can locate the antenna to avoid a multipath area, but in your vehicle you may drive in and out of multipath areas.

Flutter

Flutter occurs when the signal strength is too low to allow proper reception. Flutter can occur when in a fringe area of a transmitter. Flutter can occur much closer to the transmitter if the receiver is located in a signal shadow. In a strong signal area, reflection will generally fill in the reception shadows. When there is little to support reflection, an obstacle may cause a signal shadow. Operating in the shadow will cause flutter. This may also be called "picket fencing".

Electrical Interference

Electrical interference signal disruptions may come from electrical fields near high tension power lines, vehicle electrical devices or other high power radio signals. Strong FM band signals are usually not affected by electrical interference.

Atmospheric Interference

A loss of sensitivity (especially from stations more than 25 miles away) may be due to atmospheric conditions. An increase in sensitivity for a short period may be due to a complementing atmospheric alignment.

Electrical storms will cause atmospheric interference, especially in the AM band.

Noise

Noise is an undesirable interference in the audio system. Noise can enter the audio system one of two ways, conducted or radiated.

- Conducted noises will have a physical connection to the audio system through one of the audio system circuits.
- Radiated noises have no physical connection to the audio system, but the electrical or magnetic fields reaching the audio system or wiring induce an electrical effect causing noise.

In diagnosing noise complaints, technicians may need to identify noise sources that are physically connected (back-way noise) or sources affected only by radiation. The vehicle contains many “noisy” components which radiate an electromagnetic signal. As the distance from the radio transmitter station increases, on-board components may begin to compete with desired radio signals. The following pages will help isolate the cause of radio noise and suggest a fix.

EMI / RFI

EMI (Electromagnetic Interference) is the undesirable interference of an electrical system via radiated emissions from another electrical system.

The term “EMI” includes all disturbances in the electromagnetic spectrum. Within the EMI category is a smaller group known as RFI (Radio Frequency Interference). This is the frequency group of EMI that is the radio frequency band.

RFI characteristics:

- RF (Radio Frequency) waves are radiated when a high-frequency current and proper geometry exist in a circuit.
- Waves travel in all directions and pass easily through non-conductive materials.
- Waves are reflected by conductive materials unless the geometry is correct for absorption. If so, then the wave is converted into electrical potential.

The energy radiated relates to the amount of energy in the circuit and the geometry.

If conditions are correct, the RF wave is absorbed into the system and will induce stray currents internally within the system. RFI has the capability to cause disturbances over longer distance because of the probability of susceptible devices being highly sensitive. Therefore, RFI can be very difficult to combat in some cases so good diagnostic practices are absolutely required.

Some possible vehicle sources of interference:

- Charging system
- Solenoids
- Motors
- Engine electronics
- 2-way radios
- Citizen band (CB) radios
- Cellular phones
- Satellite Communication systems
- After-market electrical devices

Troubleshooting Consideration

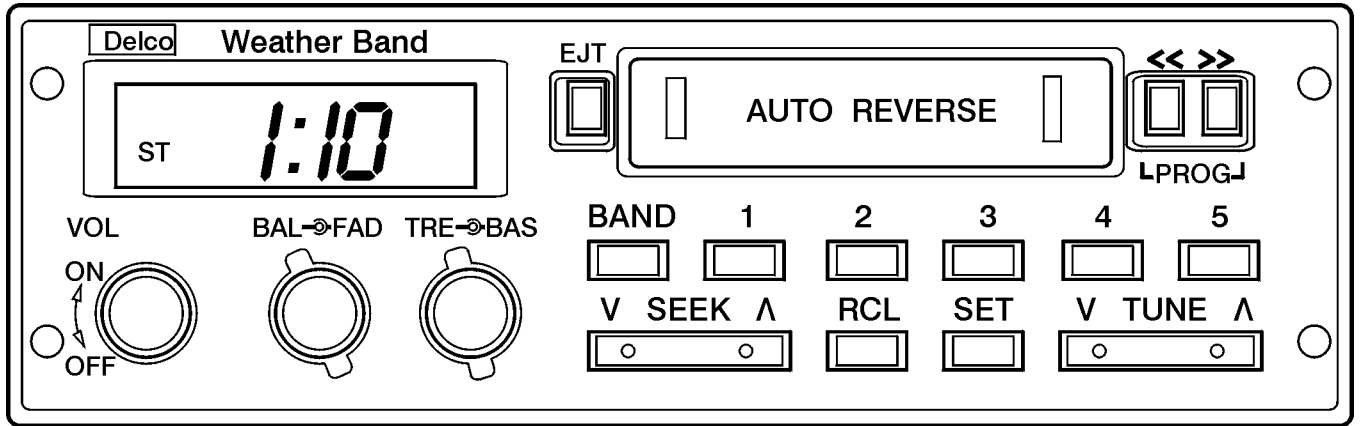
When troubleshooting radio reception problems consider problems associated with radio signals. Do not attempt to troubleshoot radio problems:

- inside buildings (steel and concrete structures are worst).
- in an area with reflected signals (see "Multipath" page 7).
- close to areas with known electrical interference such as near high tension power lines.
- with electrical storms in the area.

To minimize flutter, tune to radio stations with a strong signal while troubleshooting.

Stereo Receiver

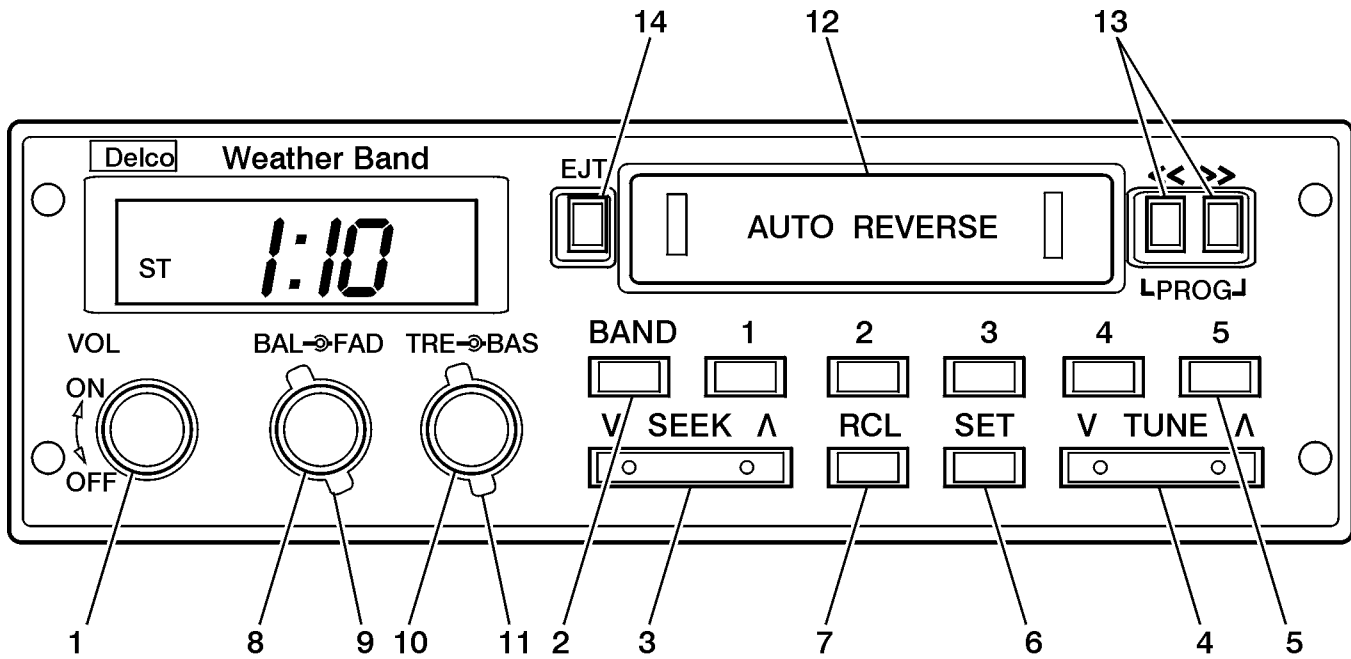
Weatherband Family



W3003393

This features a Delco/Delphi Heavy Duty stereo receiver with weather-band. The basic stereo receiver is also available with a cassette tape player. The stereo receiver is installed in the dash and receives constant battery power for its clock and memory functions. The basic stereo receiver does not have ability to detect and display error messages.

Operating instructions



W3003394

- 1 Radio Power** – Rotate the ON/OFF (1) control clockwise to turn the radio on; rotate CCW to turn radio off.
Volume – Rotate VOL (1) control clockwise to increase volume.
- 2 AM/FM or WX** – Press BAND (2) switch to select desired band. (AM/FM or WX will be displayed on band choice.)
Note: The last station heard on each band will be stored in memory. When switching back to that band, it will automatically return.
- 3 SEEK** – Press SEEK ∇ / Δ (3) to automatically search for the next higher or lower listenable station and stay there. It will find another station and stay there. It will find another station each time that you press the button.
- 4 Manual Tuning** – Press and hold TUNE Δ (4) button to increase frequency. Release as desired frequency is approached. Press TUNE ∇ (4) to decrease frequency.

5 **Push-buttons** – Press one of the five push-buttons (5) to recall a preset station. (Use the following procedure to setup push-buttons.)

- Locate a favorite station by using SEEK ∇ / Δ (3) or the TUNE ∇ / Δ (4) buttons.
- Press SET (6) push-button. The station frequency will flash 5 seconds or until set.
- Press the push-button that you want to establish for that station.
- The radio will now return to that frequency each time that button is pressed.

Note: A total of fifteen stations can be preset – 5 AM, 5 FM and 5 WX.

6 **SET** – Press the SET (6) button to set a stations frequency.

7 **Clock** – If time-of-day is not on the display, press RCL (7).

- Press and hold SET (6) button and at the same time press and hold TUNE Δ (4) until correct *minute* appears. (Seconds will set to 00 when adjusting minutes.)

Frequency – If radio is turned on and time is being displayed, press RCL (7) to display frequency.

Stereo – The radio will automatically switch to stereo when tuned to an FM station broadcasting stereo, and the stereo indicator light **ST** will be displayed.

Note: **FADe** and **BALance** controls have a detent position at the center for a balance of front to rear and left to right.

8 **Balance** – The left-right stereo balance is adjusted by rotating the BAL (8) control in the corresponding direction from the detent position.

9 **FADE** – Using the tab behind the BAL control, adjust the FAD (9) control to the right to fade toward the rear speakers. Adjust it to the left to fade toward the front speakers.

10 **Treble** – Rotate TRE (10) control to the left to decrease treble; rotate TRE control to the right to increase treble.

11 **Bass** – Rotate BAS (11) control to the left to decrease bass; rotate BAS control to the right to increase bass.

Note: Both controls, for bass and treble, have a detent position at the center for a balance of treble and bass.

12 **Tape Player** – Insert a tape into the door marked **AUTO REVERSE (12)**. Insert the tape with the raised side to the right.

Note: The arrow, in the display window, points in the of tape play.

13 **Fast Forward** – To activate fast forward press the right hand arrow (>>) button (13). Press the left hand arrow (<<) button lightly to cancel fast forward and return to play mode.

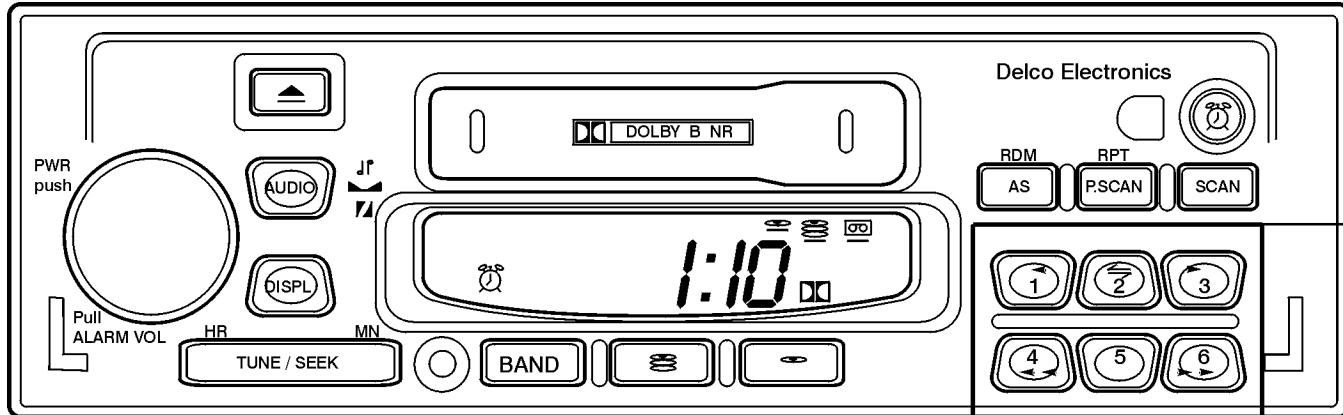
Fast Reverse – To activate fast reverse press the right hand arrow (<<) button (13). Press the right hand arrow (>>) button lightly to cancel fast reverse and return to play mode.

Program – Press both direction buttons (13) (<< and >>) simultaneously. The direction arrow will change in the display window and the player will play the other side of the tape.

14 **Eject** – Press EJT (14) button firmly to eject a tape.

Note: When a tape is ejected, the radio becomes operative. It is not necessary to eject a tape when leaving the vehicle; a solenoid removes internal pressure automatically.

High Performance Family



The premium sound system features a Delco/Delphi Heavy Duty High Performance stereo receiver available with either a cassette or a CD player. The stereo receiver is installed in the dash and receives constant battery power for the clock and the memory functions. The premium stereo has the ability to detect and display some error codes from the cassette or CD player, and from the CD changer (if equipped). Some of the standard features of the premium sound system include:

- THEFTLOCK® theft deterrent feature.
- Sleep Feature.
- Infrared remote control.
- Cassette Tape or CD Player.

The VN 770 and VN 660 are also available with optional:

- Six disc CD Changer.
- Premium speaker system including a 8 channel amplifier and a subwoofer.

Theft Deterrent Feature

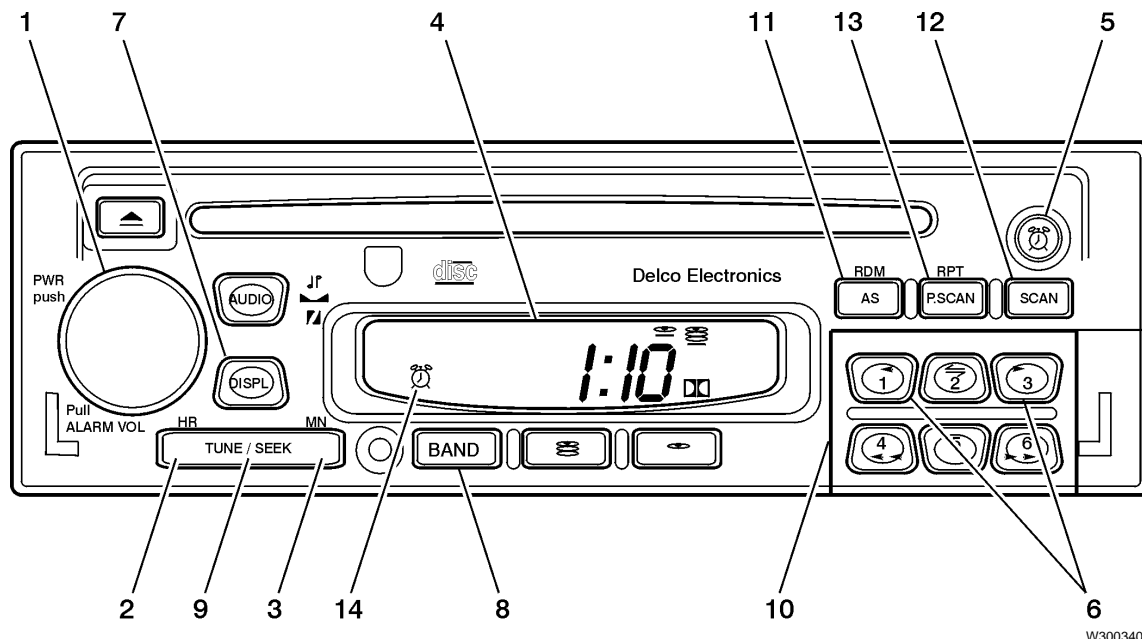
THEFTLOCK® is designed to discourage theft of your radio. It works by using a secret code that you select to disable all radio functions whenever the radio is disconnected from the vehicle or battery power is removed.

Sleep Feature

The premium AM/FM radio receives a battery feed and can be turned on when the ignition is OFF by pushing in the POWER knob. With the ignition OFF, the radio will play for one hour and automatically turn off.

Note: On amplified systems, when the sleep feature is in use, only the two upper bunk speakers can be heard. In order to play the stereo through all speakers, the ignition switch must be turned on. (Applies only the VN 770's premium speaker package.)

Operating Instructions



Clock

12 or 24 Hour Mode:

- 1 Turn the ignition ON and the radio off.
- 2 Press both the HR (2) and MN (3) buttons at the same time. Hold them for 2 seconds.
- 3 Press both buttons again and hold to switch modes.

The current mode will appear on the display (4).

To Set the Clock:

- 1 Turn the ignition ON and the radio off.
- 2 Press and hold HR (2) until the correct hour appears on the display.
- 3 Press and hold MN (3) until the correct minute appears on the display.

The clock is now set.

Alarm

To Set the Alarm:

- 1 Press the alarm button (5) and hold until an alarm icon (14) and the time at which the alarm is currently set appear on the display.
- 2 Press the HR button (2) until the desired hour appears on the display.
- 3 Press MN button (3) until the desired minute appears on the display.

When the alarm icon and the time appears on the display, the alarm has been set. If the radio is on the alarm sounds. To turn off the alarm sound activate snooze or turn off the alarm by pressing the alarm button (5).

To check the time for which the alarm is set, momentarily press the alarm button.

To Turn Off the Alarm:

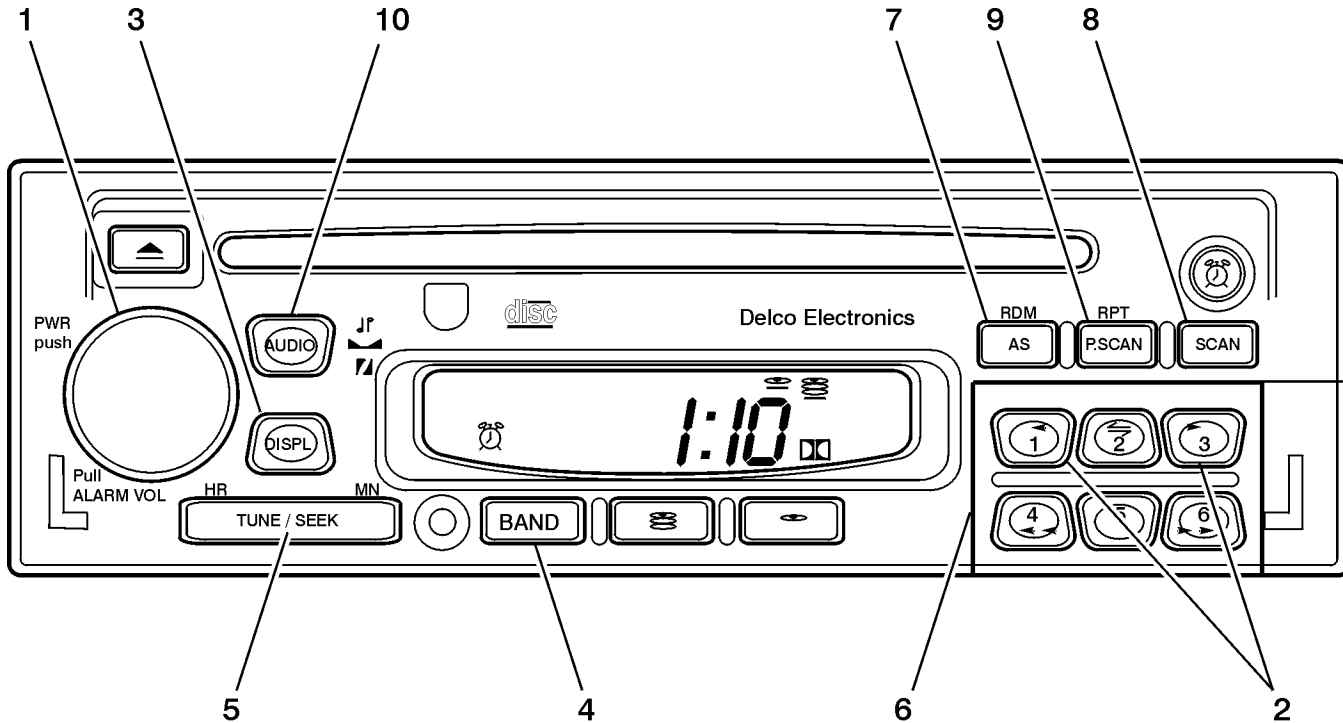
- 1 Press and hold the alarm button (5) until the alarm clock icon on the display disappears.

To Set the Alarm Volume:

- 1 Turn the radio on.
- 2 Pull out the volume knob (1) gently, and rotate to set the alarm volume.
- 3 Push the knob in to set the alarm volume.

The radio will return to the volume level at which the radio was previously playing.

- Press any button or the volume knob when the alarm is sounding. The display will show **SNOOZE** momentarily. The alarm will sound again every 9 minutes until it is turned off.



Radio

Power: The radio can be turned on when the ignition is ON or OFF by pushing the PWR knob (1). If the ignition is OFF the radio will play for one hour and automatically turn off (sleep feature).

IGN OFF – Radio ON/OFF: The radio can be programmed to switch on and off independent of the ignition.

- 1 Turn the ignition ON and the radio off.
- 2 Press and hold push-buttons 1 and 3 (2) at the same time until it beeps. The radio display will show **IGN OFF=RADIO OFF** or **IGN OFF=RADIO ON**.
- 3 Repeat this procedure to implement the opposite condition.

If the display reads **IGN OFF=RADIO OFF**, the radio will turn off when the ignition turns OFF. If the display reads **IGN OFF=RADIO ON**, the radio will play, when the ignition is turned OFF, until the radio is turned off or the battery runs down.

Note: The automatic turn off after 1 hour is only valid when the radio is turned on while the ignition is OFF.

Default Display:

- 1 Press DISPL (3) to view either radio frequency or the time. Pressing DISPL more than one time allows to toggle between the two displays.
- 2 Press DISPL again, hold it until it beeps, to set the display.

To Find a Station:

Band: Press the BAND (4) button to switch between AM, FM1 and FM2. The radio display shows the selection.

TUNE: Press the TUNE/SEEK button (5) once to tune to the next higher or lower station one frequency at a time. Press and hold TUNE/SEEK until it beep to seek the next station. When a station with a strong enough signal is found, the seek function will stop and the station will play. Press TUNE/SEEK to stop seeking.

Presetting Stations: 6 stations per band can be preset.

- 1 Turn the radio on.
- 2 Select the band.
- 3 Tune in the desired station.
- 4 Press and hold one of the 6 push-buttons (6) until it beeps. Whenever the button is pressed now, the station set will be played.
- 5 Repeat steps 1 – 4 for each push-button.

AS: Press AS (7) (Auto Store) to automatically store the 6 strongest stations onto the preset push-buttons. AS only presets the default band.

SCAN: Press SCAN (8) to scan all station on the default band. When a frequency of sufficient strength is found, the radio will play for 5 seconds and then continue scanning for next station. To stop the scanning press SCAN again.

P.SCAN: Press P.SCAN (9) to scan the presets on the default band. To stop the scanning press P.SCAN again.

Adjusting the Radio:

AUDIO: To adjust Balance, Fade, Bass, Treble, DIM and SEEK Sensitivity, press the AUDIO button **(10)** until the feature appears on the display.

Balance: Rotate the VOL knob **(1)** to move the sound to the left or right speakers.

Fade: Rotate the VOL knob to move the sound to the front or rear speakers.

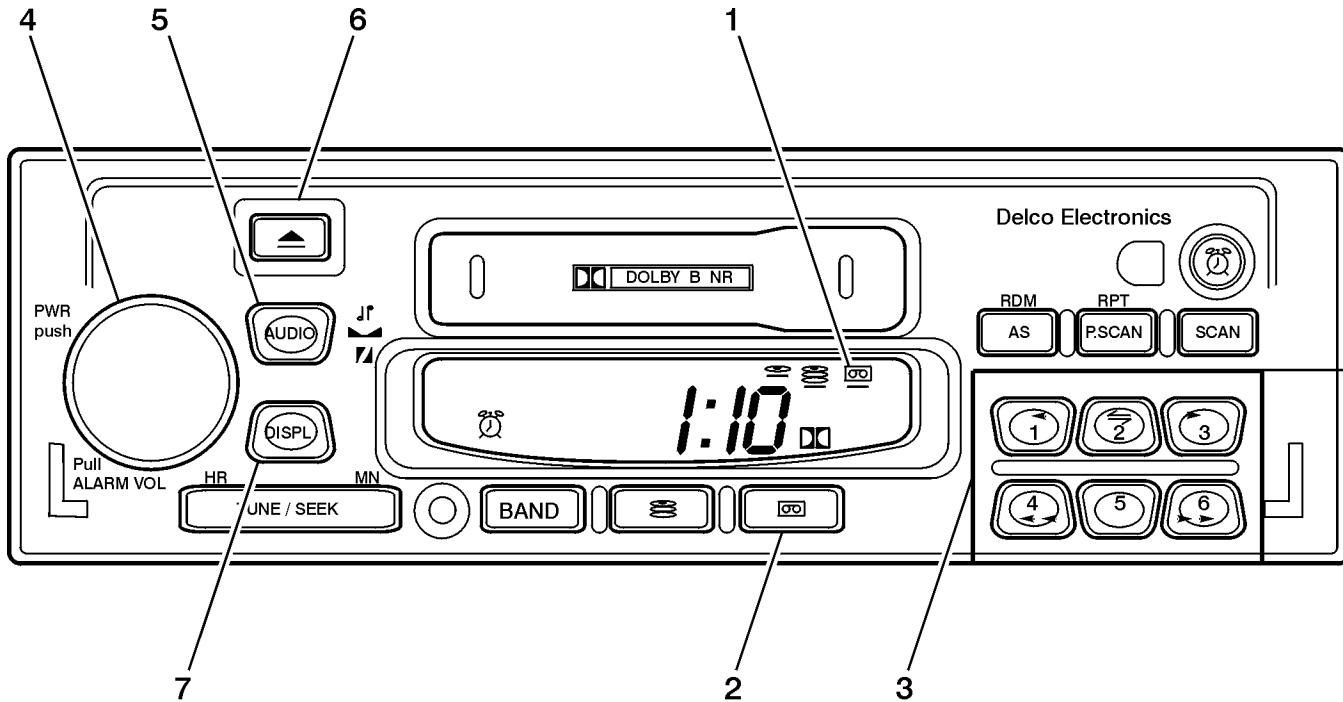
TREBLE: Rotate the VOL knob to adjust treble sound.

BASS: Rotate the VOL knob to adjust the bass sound.

DIM: Rotate the VOL knob to adjust the brightness of the radio display. The brightness can be only be adjusted when the vehicle lights are on.

SEEK: To set the radio to seek and find station with a weak signal, press the AUDIO button until **SEEK+2** appears. To set the radio to seek only strong signals, press the AUDIO button until **SEEK-2** appears.

Press the AUDIO button one more time to set all adjustments and return to the default display.



W3003404

Cassette Tape Player

To Play a Cassette Tape:

- 1 Turn the radio on.
- 2 Insert a cassette into the cassette slot. The cassette icon (1) will appear on the display and the tape will begin to play.
- 3 If the radio or a CD is playing, press the tape button (2) to play the cassette. If no tape is loaded into the player, the display will show **NO TAPE**. If a tape is in the player, **SIDE 1** or **SIDE 2** will be displayed.
- 4 The six numbered push-buttons (3) helps to operate the tape player conveniently.
 - Press 1 to go to the beginning of the selection being played. If this button is pressed during the first 8 seconds of the selection, the previous selection will be played.
 - Press 2 to reverse the direction of the tape and play the existing track in that position.
 - Press 3 to go to the next selection.
 - Press 4 to rewind.
 - Press 5 to turn the Dolby background noise reduction on or off.
 - Press 6 to fast forward.
- 5 Use the VOL knob (4) and AUDIO button (5) to adjust the sound.

EJECT: Press the eject button (6) to eject a tape from the tape player.

DISPL: Press the DISPL button (7) to view the time, SIDE 1 or SIDE 2. Pressing DISPL more than one time allows to toggle between the displays. Press DISPL and hold it until it beeps, to set the default display.

TAPE: Press the tape button (2) and hold for 2 seconds any time the radio is on, to enable or disable "Radio Monitor". This feature allows you listen to the radio while a tape is rewinding or fast forwarding. The display will read **RADIO ON** or **RADIO OFF**.

If the radio detects a bad cassette, **BAD TAPE** will appear on the display, and the tape will be ejected. The tape may be damaged or too tight. If it is damaged, try a new tape.

If the tape is too tight, the player can not turn the tape hubs. Remove the tape and hold it with the open end down. Try to turn the right hub counterclockwise with a pencil. Turn the tape over and repeat. If the hubs do not turn easily, the tape may be damaged and should not be used in the player.

Note: When using a CD adapter or a cleaning cassette, the bad tape detector must be turned off.

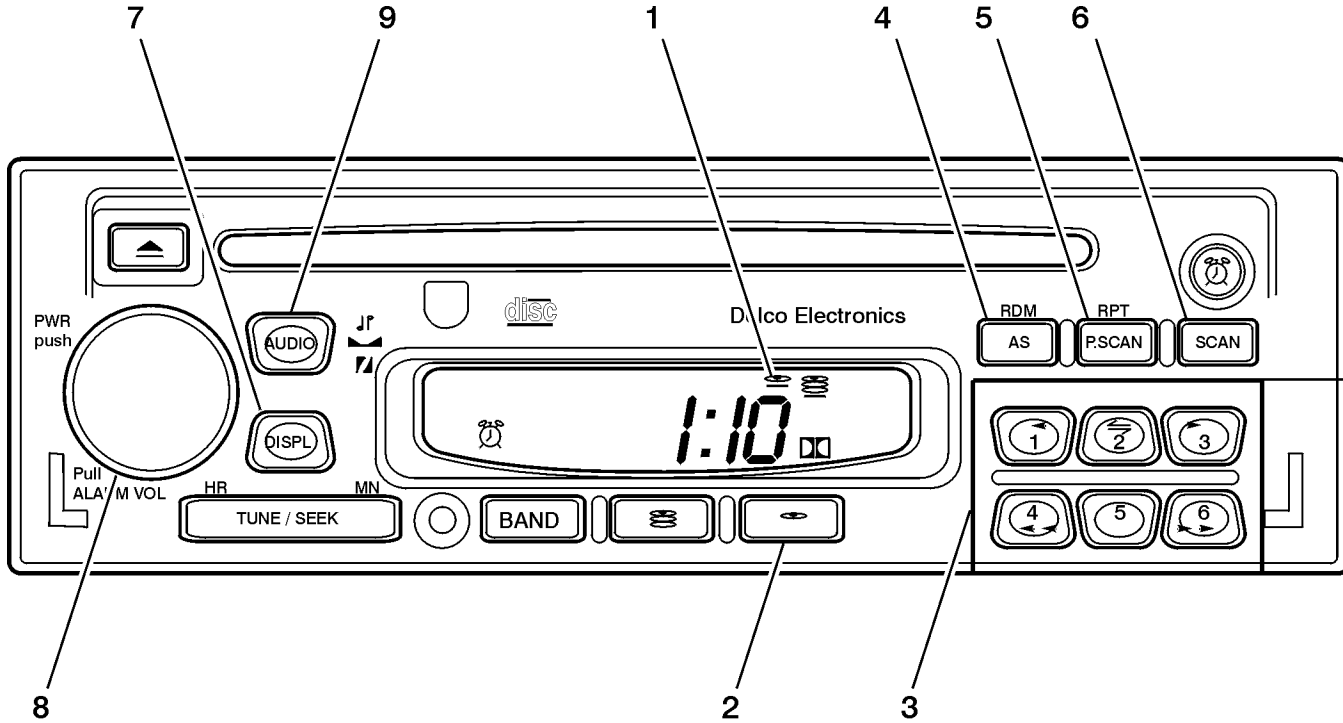
Bad Tape Detector, ON/OFF:

- 1 Turn the ignition ON and the radio off.
- 2 Press and hold the tape button (2) for 5 seconds. The display will read **BAD TAPE DETECT OFF**; a beep confirms that the bad tape detector is off until the next ignition cycle.

Cleaning the Tape Player: After 24 hours of cassette play, the display will read **TIME TO...** If then pressing the DISPL button **(7)**, **CLEAN TAPE PLAYER** will appear.

Note: Avoid touching the cassette head with magnetic or hard objects or/and lubricating the player mechanism.

- 1 Turn off the "Bad Tape Detect".
- 2 Insert a wet-type, nonabrasive, scrubbing cassette cleaner.
- 3 Follow the cleaning instructions provided with the cassette cleaner.
- 4 Press the AUDIO button until the display reads **CLEAN** ◊.
- 5 Rotate the VOL knob until **YES** appears.
- 6 Approximately 5 seconds after YES appears, the cleaning reminder will disappear, and the display will return to the previously set display.



Compact Disc Player

To Play a CD:

- 1 Turn the radio on.
- 2 Insert a CD part way into the slot, with the label side up. The CD icon (1) will appear on the display and the disc will begin to play if the radio is in the CD mode.

Note: The player will automatically pull the disc in once it has been partially inserted.

- 3 If the radio or a cassette is played, press the CD button (2) to play the CD. If no CD has been loaded into the player, the display will show **NO CD**. If a CD is loaded, the display will show the track number followed by the elapsed time on the track.
- 4 The numbered push-buttons (3) helps to operate the CD player conveniently.
 - Press 1 to go to the beginning of the track being played. If this button is pressed during the first 8 seconds of the track, the previous track will be played.
 - Press 3 to go to the next track.
 - Press 4 to fast reverse.
 - Press 6 to fast forward.
- 5 Use the VOL knob (8) and AUDIO button (9) to adjust the sound.

Note: When driving on a very rough road or if it is very hot, the disc may not play and **ERROR** and a number may appear, for 5 seconds, on the display. Error may also appear if a disc is dirty, wet or the air is very humid.

Note: If a CD is inserted upside down, **FOCUS** will appear on the display. Remove the CD and insert it with the label up.

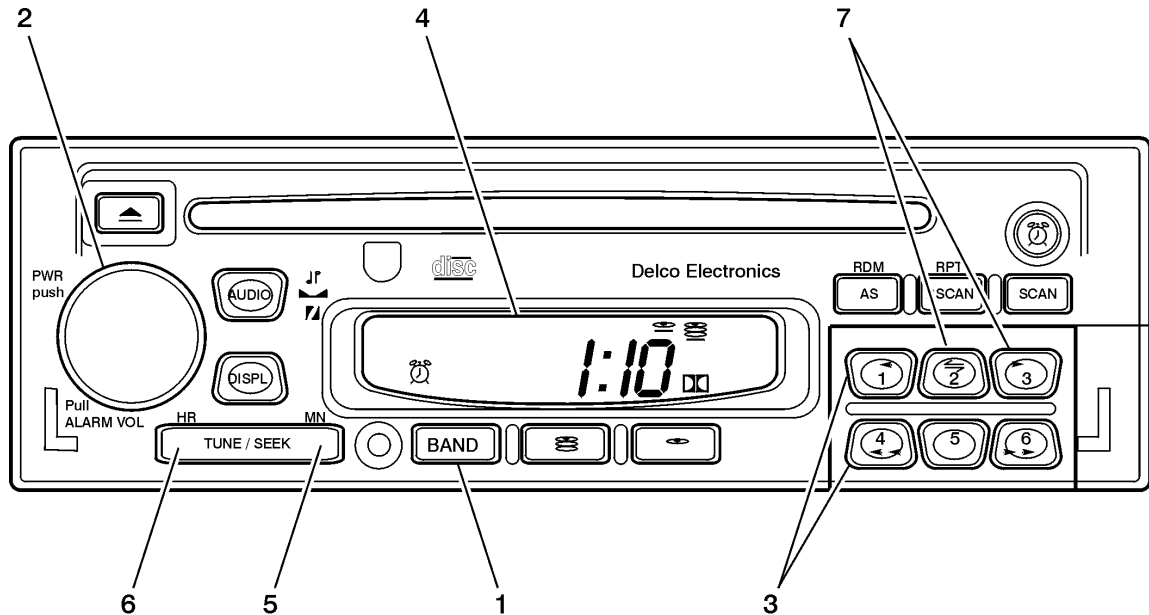
RDM: Press the RDM button (4) to activate random track selection. RDM will illuminate. All tracks on the CD will be played in random order. RDM on the display indicates "random play" on. Press this button again to turn off the "random play" beginning with the next track played.

RPT: Press the RPT button (5) to repeat the same track again. RPT on the display indicates that this feature is on and the track will be repeated until the RPT button is pressed again. The disc number and track number will also show on the display.

SCAN: Press the SCAN button (6) to immediately advance to the next track. SCAN will appear on the display and 10 seconds of the track will be played, the CD will advance to the next track, play 10 seconds and continue. To deactivate SCAN, press the SCAN button again.

DISPL: Press the DISPL button (7) to view the disc number, elapsed time, track number or the time. Pressing the DISPL button more than one time allows to toggle between the displays. Press the DISPL button and hold it until it beeps to set the default display.

W3003401



Theftlock

When THEFTLOCK is activated, the radio will display **LOCKED** to indicate a locked condition anytime battery power is removed. If your battery loses power for any reason, you must unlock the radio with the secret code before it will operate.

The instructions that follow explain how to enter your secret code to activate the THEFTLOCK system. It is recommended that you read through all 11 steps before starting the procedure.

Note: If you allow more than 15 seconds to elapse between any of the steps, the radio will automatically revert to time and you must start the procedure over at step 4.

To activate THEFTLOCK:

- 1 Choose a 4-digit code between 0000 and 9999.

Note: Keep the code in a secure place.

- 2 Turn the ignition ON.
- 3 Turn the radio off (2).
- 4 Press push-buttons 1 and 4 (3) at the same time. Hold them until ---- shows on the display (4).
- 5 Press MN (5), 0000 will appear on the display.
- 6 Press MN (5) as many times as needed to make the last two digits agree with the secret code you have chosen.
- 7 Press HR (6) as many times as needed to make the first two digits agree with the secret code you have chosen.

- 8 Confirm that the code on the display matches your secret code.
- 9 Press BAND (1). The display will show **REPEAT** to let you know that you need to confirm your code.
- 10 Repeat step 5–8 to confirm your code.
- 11 Press BAND (1). The display will show **SECURE** to let you know that your radio is secure. If THEFTLOCK has not been activated, ---- will show on the display. To activate, repeat steps 4–11.

To disable the THEFTLOCK:

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

- 1 Turn the ignition ON.
- 2 Turn the radio off.
- 3 Press the push-buttons 1 and 4 (3) together until **SECURE** shows up on the display.
- 4 Press MN (5). The display will show 0000.
- 5 Press MN (5) as many times as needed to make the last digits agree with the secret code.
- 6 Press HR (6) as many times as needed to make the first digits agree with the secret code.
- 7 Confirm that the code on the display matches the code you have chosen.
- 8 Press BAND. The display will show ---- indicating that the radio is no longer secure.

Note: If the display shows **SECURE**, the incorrect code was entered. Repeat steps 1–8.

Infrared Remote Control

High Performance and XTA Uplevel receivers are compatible with an optional hand-held remote control. The remote control will:

- Turn the receiver on and off
- Select a band
- Adjust the volume
- Select a preset station
- Seek up and down
- Play a tape/CD
- Select the next or previous cassette/CD track
- Select the next CD

Button Functions:

- **PWR**: Press to turn the receiver on/off
- **VOL**: Press to adjust the volume

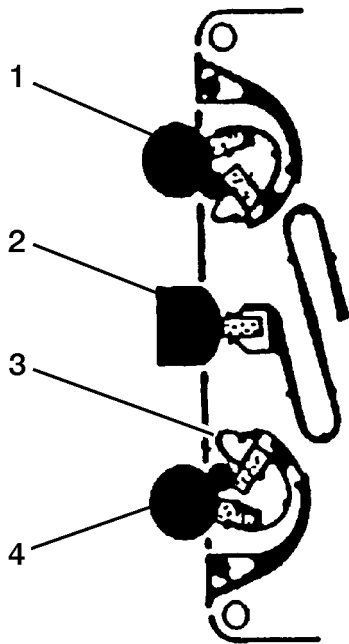
- **BAND**: Press to select AM, FM1, FM2, FM3, or WX
- **SEEK**: Press this button to move to the next strongest radio station or to go to the next track of your cassette or CD.
- **1 – 6**: Press this button to advance through the presets in the current band.
- **//**: Press this button to reduce volume to a minimum. The display will read "MUTE." To deactivate mute press this button again. The music will continue to play while the volume is at a minimum.
- **CASS/CD**: Press this button to turn on the cassette or integral CD player. Press this button again to change tape sides or advance to the next CD track.
- **AUX**: Press and hold this button to play a CD loaded in the CD changer. Press this button again to select the next loaded CD if in the changer mode.

Cassette Tape

Cassette tapes operate on the basis of magnetics. When an unrecorded tape passes through the record head, the oxide particles are magnetized such that the pattern represents electronically the sound information that one wishes to record. Once the information has been recorded, it is played back by the tape passing over the playback head. The magnetically stored information is decoded as electrical voltages. These differences in voltages are amplified through several stages until an audio signal is obtained.

Cassette Tape Player

Those parts most important in the playback of a cassette are; the supply reel, take-up reel, capstan, pinch rollers and the tape head. When the cassette is properly loaded, the motor starts. The motor will then rotate the capstan. (The capstan is a rod which comes up, rotates and allows the tape to feed over the head.) One of the pinch rollers comes forward and "squeezes" the tape between it and the capstan. Simultaneously, the head pulls into place. For the cassette to play, the head can be no more than 0.7–0.8 micros away from the tape head. (A human hair is typically 60–100 micros thick.) The tape then passes over the playback head. The magnetic information stored on the tape is read by the playback head and then converted into an electrical signal. This signal, on the order of 90 mV (millivolts), is sent to a pre-amplifier in the cassette player. The pre-amplifier creates a signal of about 0.58 V. This signal is sent to the receiver where it is amplified and played at the specified level.



W3003392

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

Bad Tape Detect

If the receiver detects a bad cassette, "BAD TAPE" will appear on the display, and the tape will be ejected. The tape may be damaged or too tight. If it is damaged, try a new tape. If the tape is too tight, the player cannot turn the tape hubs. Remove the tape and hold it with the open end down. Turn the right hub counterclockwise with a pencil. Turn the tape over and repeat. If the hubs do not turn easily, your tape may be damaged and should not be used in the player.

In order to use a CD adapter or a cleaning cassette, the bad tape detector must be turned off.

Compact Disc

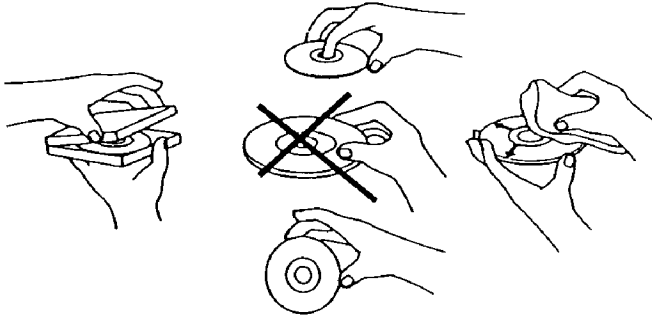
A compact disc contains digitally encoded music which is read by a laser beam. The data is read as a change in laser light intensity. Since no stylus ever touches the disc surface, there is no disc wear from playing. Thus, digital storage, error protection and disc longevity create a high fidelity audio medium.

Compact Disc Player

CD (Compact Disc) players are somewhat similar to conventional record players. The disc is rotated by a motor, just like record is. However, the CD plays inside to outside unlike the record player which plays outside to inside. The speed of a record player does not change, but the rotation speed of a disc does change to maintain the same velocity as the spiral diameter changes. The speed slows down as the laser moves from the inside to the outside of the disc.

A CD player reads the information as digital electronic signals, whereas a phonograph reads the information as mechanical signals. An optical pickup (laser beam) performs the same function as that of the record player's mechanical stylus. Nothing mechanical ever touches the disc. The light beam emitted from the pickup carries the data. This signal is converted into an analog signal which is filtered to achieve the final audio signal which can be processed by a home stereo or a vehicle system.

Compact Disc Care



W3002998

Particular care and handling should be taken to preserve compact discs.

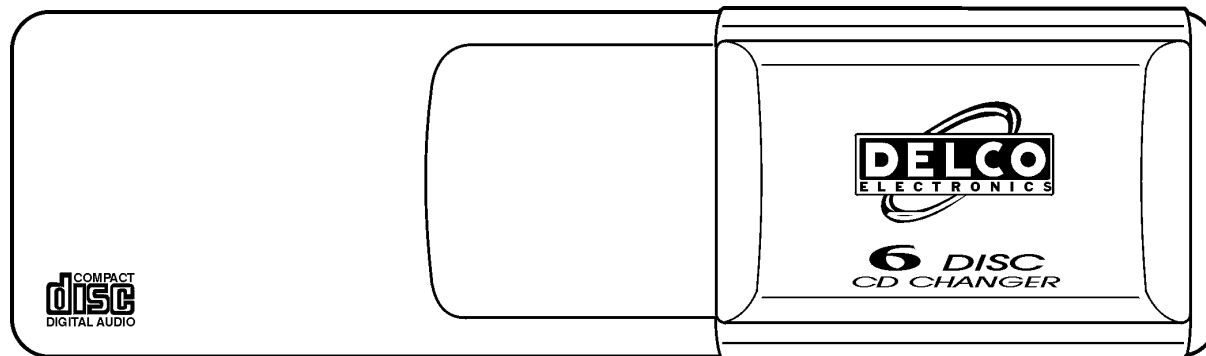
- Mini CDs called “singles” (about 0.1 m (4 in.) in diameter), in most cases, will not eject and should not be used.
- The ability of the compact disc to play is adversely affected by fingerprints, dirt, scratches and sometimes data defects caused during manufacturing of the disc. These can decrease the amount of light reflected from the recorded surface, thus affecting sound quality. If the disc becomes soiled, gently wipe any soil from the center of disc to the outer edge.

Note: Do not use volatile chemicals such as benzene, thinner, record sprays or antistatic agents, which can damage the disc.

If a cleaner is needed, use a solution of mild neutral detergent.

- Do not attempt to play cracked or warped discs. Should a player exhibit playability problems, substitute another clean/new disc to verify whether the problem is in the disc or the player. The disc revolves at a high speed within the player so a defective disc should not be used.
- Be sure never to touch the signal surface when handling discs. Pick up discs by grasping the outer edge.
- Do not affix paper or tape to the disc and avoid scratching the disc.
- As with traditional audio records, compact discs are made of plastic. To avoid warping, keep the discs in their cases, and do not store them in direct sunlight.

CD Changer — High Performance Family



W3002991

The VN 770 and the VN 660 equipped with a High Performance Family System may be equipped with a six disc CD changer, capable of storing and playing up to 6 full size CD's.

The changer can be distinguished from the later versions by the loading door, which is on the right side.



CAUTION

The CD Changer should be loaded only when the vehicle is stationary. Do not attempt to load the changer while driving. Loading CDs while driving can create a safety hazard.

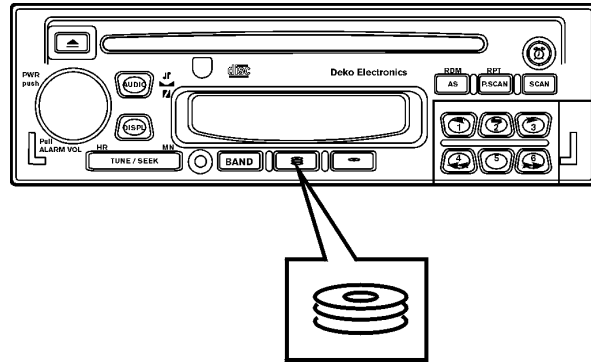
XTA Uplevel Family

VN 770 and 660 vehicles equipped with the XTA Uplevel family receivers are equipped with a newer generation of six-disc changers. The newer generation changers can be distinguished from the earlier versions by the loading door, which is on the left side.

Once the discs have been loaded in the magazine, slide the door of the CD Changer open completely (You should hear a 'click'). Push the magazine into the changer in the direction of the arrow marked on the magazine until the magazine clicks in place. Close the door of the changer completely. The system will begin checking for discs.

While the system is loading CDs, the CD changer icon on the receiver display will blink. This may take up to one and half minutes. When the icon stops blinking, the changer is ready to be used. Whenever a CD magazine with discs is loaded in the changer the CD Changer icon will appear on the receiver display.

All CD functions, except ejecting of the magazine, are controlled by stereo buttons. While the CD changer is loading CDs, the CD changer icon in the radio display will blink. This process takes approximately one minute.



W3003006

CD Changer Magazine

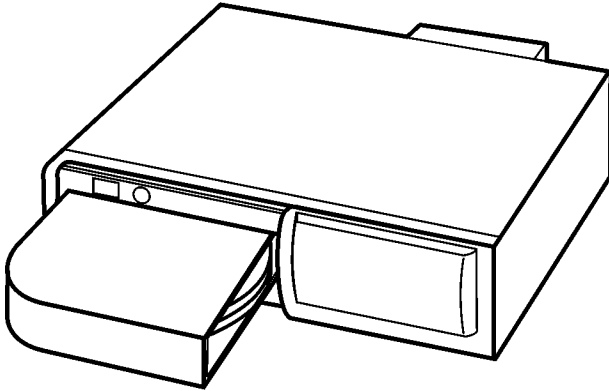
Handling the CD Magazines

Precautions for handling magazines:

- Do not put the magazine in a place where it will be exposed to high temperatures or direct sunlight.
- Do not disassemble the magazine or knock it against anything.
- Never insert anything other than compact discs.
- Do not attach a label or tape to a disc.
- The use of benzine, thinner, insecticide or other volatile chemicals may damage the magazine surface. Clean with a soft, dry cloth.

Inserting Discs

- Load the CDs from the bottom of the CD Magazine to the top. The disc numbers are listed on the front of the magazine, with "1" on the bottom and "6" on the top.
- Be sure to place the discs in the magazine straight and label side up. If you load a disc label side down, the disc will not play and "FOCUS" will appear on the display.
- Repeat this procedure for up to six discs in the magazine

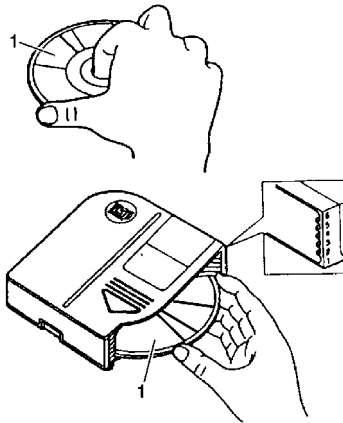


W3006166

Loading and Unloading the CD Magazine — High Performance Family

To Insert a Disc

- 1 Be sure to hold a disc with the label (the side where titles are printed) up as shown.
- 2 With the disc mark on the magazine up, insert disc, one at a time, straight into slots of the magazine until it is locked with a click.



W3003004

1 Label side

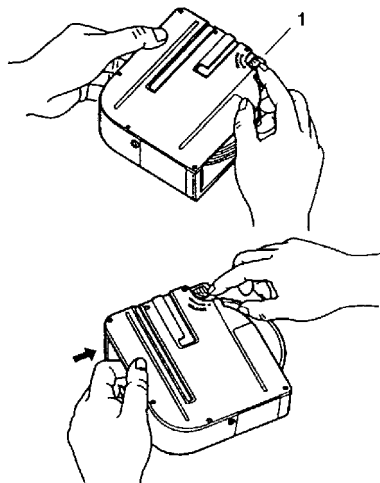


CAUTION

Insert each disc straight and level, not tilted, into a slot to avoid trouble.

To Remove a Disc

- 1 Turn the magazine upside down, hold it level and turn the disc release lever in the direction of release to unlock.
- 2 The disc can now be removed from the magazine by lightly pushing them through the opening. Be careful not to drop the disc.



1 Disc release lever

W3002997



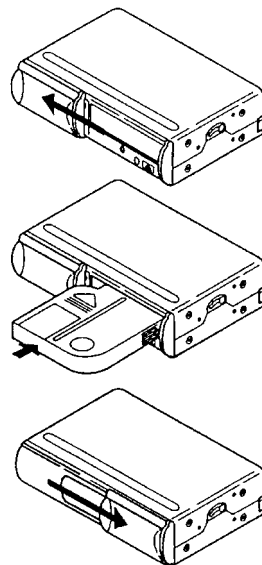
CAUTION

Be sure to use the magazine supplied with the unit as an accessory, any other magazine can not be used. Never use protected film or stabilizer, commercially available as a CD accessory, for the unit because it may cause malfunction.

Inserting and Removing the CD Magazine — High Performance Family

To Load a CD Magazine

- 1 Slide the door to the left until it is fully open with a click.
- 2 Check the unit for its top and magazine inserting direction and carefully push the magazine into it until you hear a click.
- 3 Close the slid door fully until you hear a click.



W3002995

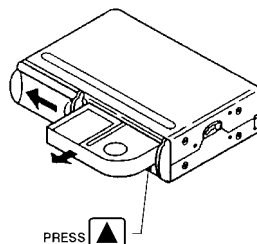


CAUTION

Be sure to keep the CD door closed to prevent dirt and dust from getting into the unit and causing possible malfunctions.

To Remove a CD Magazine

- 1 Open the slide door.
- 2 Press the eject button. The magazine will eject automatically.
- 3 Pull the magazine straight in the arrow direction until it comes off the unit.



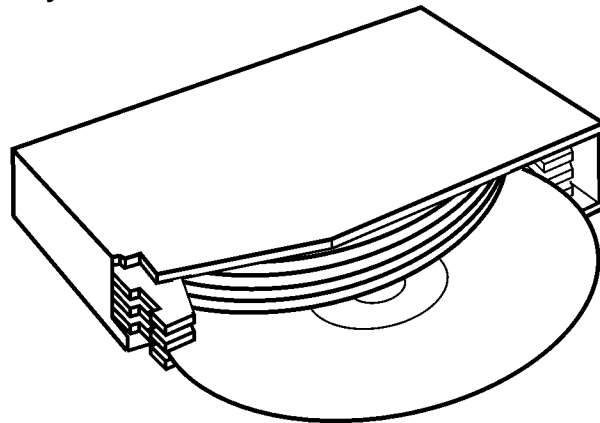
W3002996

Loading and Unloading the CD Magazine — XTA Family

The CD Changer Magazine can hold up to six discs. To load the magazine, use on the following methods:

Method 1:

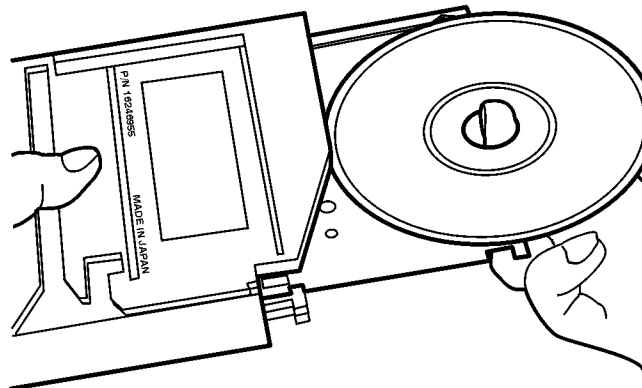
- 1 Select up to six discs to load into the magazine.
- 2 Hold one CD with the label side up (the title side), touching only the center hole and the outside edge of the disc.
- 3 Turn the magazine, so that the arrow side is on tip and the opening is facing upward at a straight angle.
- 4 One at a time, slowly insert the discs into the magazine slots, making sure the label side of the disc faces the arrow side of the magazine. It is important that both sides of the discs are in the same tray.
- 5 Push each disc in slowly until it is completely in a tray and each tray is in the magazine as far as it will go.



W3006165

Method 2:

- 1 Select up to six discs to load into the magazine.
- 2 With one hand, hold the magazine, so that the grooved side faces up and the arrow side faces down.
- 3 With the thumb or finger of your other hand, pull the handle of the disc tray you want to unload outward until it stops.
- 4 Using the same hand, grab the center hole and an outer edge of a disc. Place the disc on the tray.
- 5 Slowly push the disc into the magazine until both the disc and the tray are in the magazine as far as they will go.



W3006161

Note: Inserting a disc that is not level or is tilted in the magazine tray, can cause the changer to malfunction.

To Unload the Magazine

- 1 With one hand, hold the magazine, so that the grooved side faces up and the arrow side faces down.
- 2 With the thumb or finger of your other hand, pull the handle of the disc tray you want to unload outward until it stops.
- 3 Using the same hand, grab the center hole and an outer edge of a disc. Remove the disc from the tray.
- 4 Slowly push the empty tray back into the magazine until it stops.

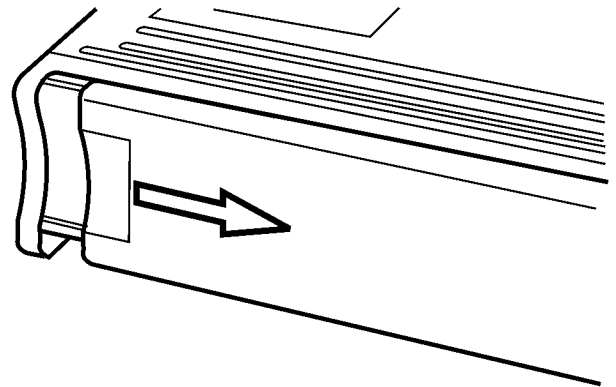
Note: Additional magazines can be purchased for the changer. See your dealer for details.

Note: Be sure to use the magazine supplied with the changer or optional accessory magazine (Part no. 16246955). No other magazine type can be used in the changer.

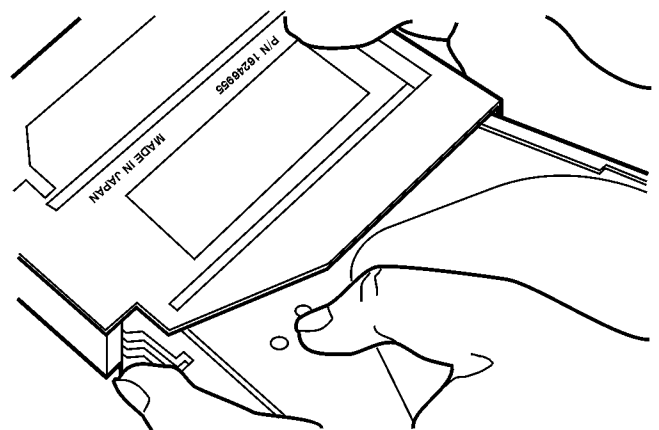
Note: Never use commercially available protective film or stabilizer as a CD accessory. Using either can damage the magazine and/or changer.

Reloading a Disc Tray

Disc trays may come out of the magazine if they are pulled out too far or too hard. To put a disc tray back in a magazine, press the disc tray lever, while carefully pushing the tray into the magazine slot.



W3006168

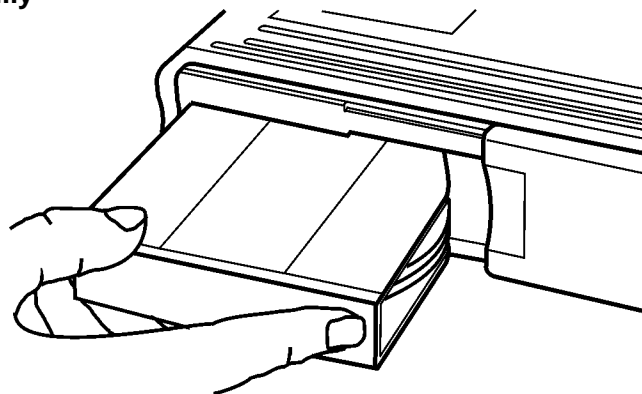


W3006162

Inserting and Removing CD Magazines — XTA Family

Note: The CD Changer Magazine can be loaded into the changer with the vehicle's ignition on or off.

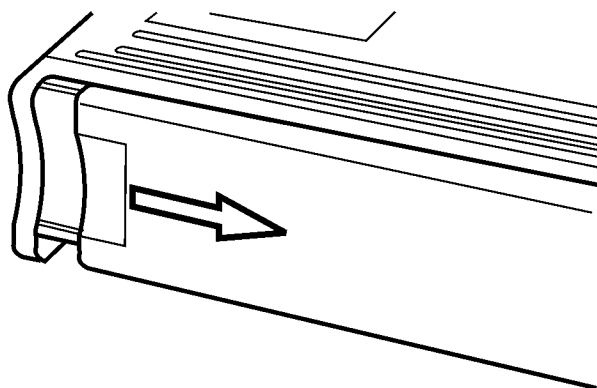
After the magazine is loaded, it initializes and checks to see which magazine trays have been loaded. Depending on the number of discs in the magazine, initialization can last a little over a minute. After the changer completes initialization, the disc in the lowest numbered tray is loaded, and the changer is ready to play.



W3006163

To Insert the CD Magazine into the Changer:

- 1 Carefully load the magazine according to the "Loading and Unloading the CD Magazine" section of this manual. Ensure that all your CDs are loaded with the label facing the arrow side of the magazine and that they are completely in the disc tray.
- 2 Using the CD Changer door handle, slide the changer's door all the way to the right. There should be an audible 'click' when the door is completely open.
- 3 With the arrow side of the magazine facing up, gently push the magazine into the changer in the direction of the arrow until it stops.
- 4 Close the CD Changer door. There should be an audible 'snap' when the door is completely closed.



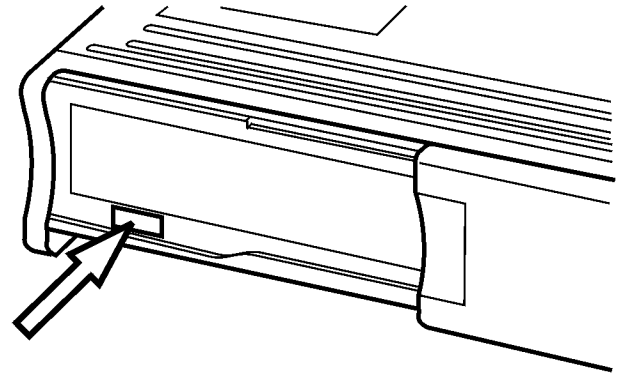
W3006168

To remove the CD Magazine from the Changer

- 1 Open the changer's door.
- 2 Push the eject button (EJECT). The magazine ejects automatically.
- 3 Slowly pull the magazine straight out of the changer.

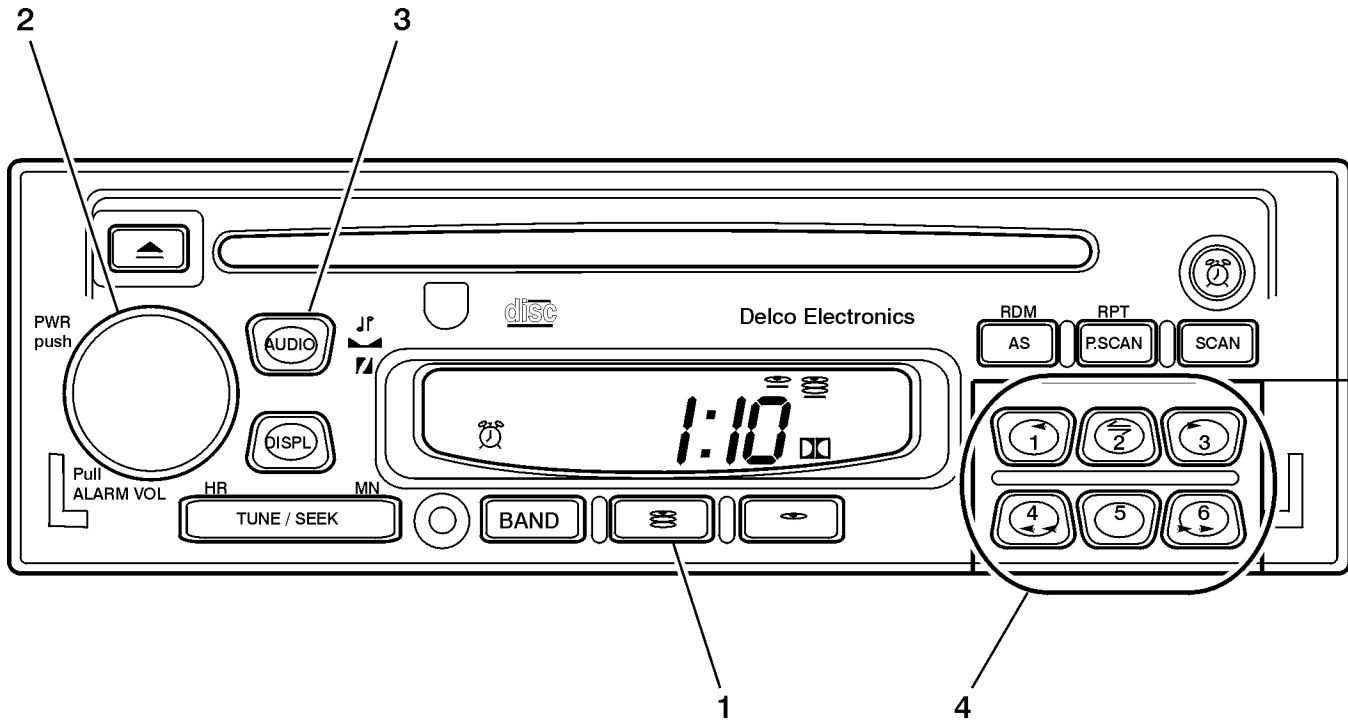
Note: If you press the eject button and the magazine does not eject, do not pry the magazine out of the changer. Trying to remove the magazine forcefully, may damage the CD Changer and magazine. If the magazine will not eject, send the changer and the magazine to an authorized repair center. Damage to the CD Changer and magazine, caused by prying, is not covered by warranty.

Note: Unless you are loading or unloading a magazine, be sure to keep the changer door closed to prevent dirt, dust or foreign objects from getting into the changer. These items can damage your CD Changer or cause it to malfunction.



W3006164

Playing CDs Loaded in the CD Changer



High Performance Family

- 1 Make sure the CD changer is loaded.
- 2 Turn on the radio.
- 3 Press the CD changer button **(1)** on the radio. When a CD begins to play, the display will show the disc and track number followed by the elapsed time on the track and then return to the default display you have chosen.
- 4 While the CD is playing, use the VOL knob **(2)**, AUDIO button **(3)** and the push-button **(4)** just as when playing a CD player (see "Compact Disc Player" page 20).

XTA Family

- 1 Make sure the CD Changer is loaded.
- 2 Turn on the receiver.
- 3 Press the **CD Changer** button **(1)** on the receiver. When a CD begins to play, the display will show the disc number, track number and the elapsed time on the track. Then the display returns to the default display you have chosen. If there is not a CD loaded in the changer and you press the changer button, the display will read "NO DISC" for 5 seconds.
- 4 The receiver push buttons operate the same in the CD Changer mode as in the CD mode. The CD Changer also includes the following functions:

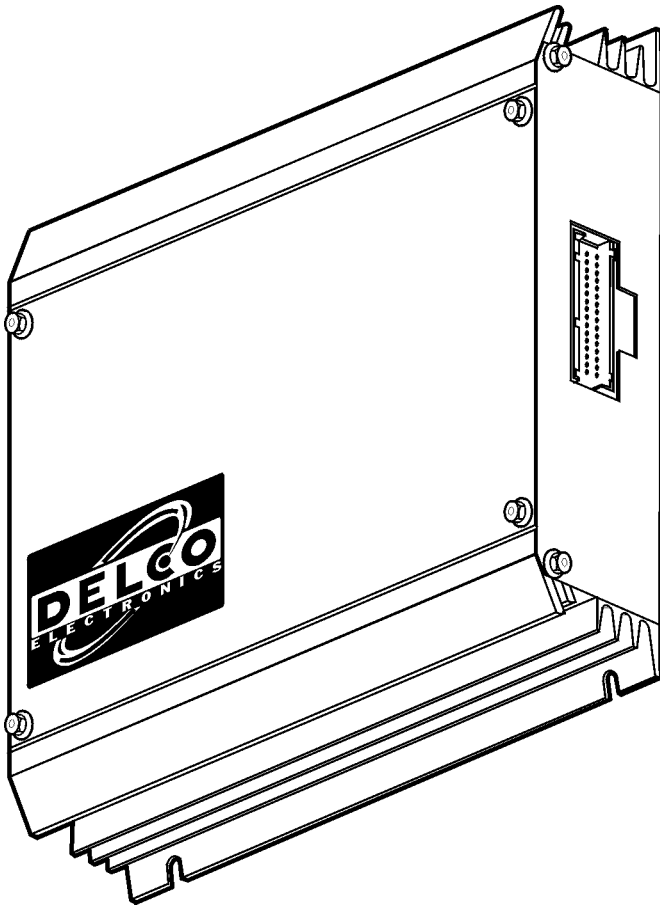
CD Changer: Press the CD Changer button to play the CDs that have been loaded into the changer. Once in the CD Changer mode, press this button to increment the disc.

Random Play: Random Play allows all tracks on all discs in the changer to be played in random order. It operates the same as in the CD mode with the 3/RDM button.

Repeat: The repeat function may repeat the current selection or repeat the entire disc. Pressing the 2/RPT button once repeats the current track and the display shows the "RPT" and CD Changer icons. Pressing the RPT button a second time will repeat the current disc. In this case the "RPT" icon will illuminate and the CD Changer icon will flash. A third press of the RPT button disables the Repeat function.

DSCN (Disc Scan):1/DSCN enabled while in the CD Changer mode will cause the changer to play the first 10 seconds of the first track of each disc in the CD Changer in consecutive order starting from the current disc. The display will show the "DISCSCAN" and this disc number.

Amplifier



W3003014

The purpose of an amplifier is to increase the power of a voltage or current signal. The output signal of an amplifier may consist of the same frequencies as the input signal or it may consist of only a portion of the frequencies of the input signal, as in the case of a subwoofer or a mid-range amplifier.

The amplifier provides better sound performance in general and can be played at higher volume levels without noticeable distortion. The Delco/Delphi Electronics amplifier in the VN 770's High Performance, Premium speaker package has been tuned with special volume levels and filters at specific frequencies on all eight channels to optimize the system components for the vehicle's unique acoustics.

Speakers

All speakers operate on the same basic principle. A basic speaker consists of a cone, voice coil, magnet, magnetic core and two wires which connect the speaker to the receiver.

The speaker's permanent magnet creates a magnetic field that is radiated outward and through the voice coil that is attached to the cone. As the audio signal (alternating current) passes through the voice coil, it creates a varying magnetic field that interacts with the magnetic field from the permanent magnet. This interaction of magnetic fields forces the cone to move back and forth, thus creating sound waves.

The speaker plus (+) and minus (-) (or A and B) signs only define a direction of motion during the conversion from electrical to mechanical energy.

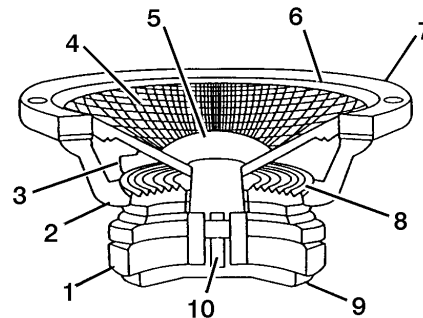
The plus and minus do not directly relate to a voltage level. By convention, if a battery's positive terminal is connected to speaker terminal (+) and battery negative is connected to speaker terminal (-) then the speaker cone will move outward. Speakers should be connected with the correct polarity to the receiver, otherwise the two different speaker cones can be moving in opposite directions during the same input. This will lead to less effective sound reproduction because the speakers are out of phase with each other.

When the speaker is at rest, such as during minimum volume, the voltage applied to each side of the speaker is 1/2 ignition system voltage. This way, the speaker cone can easily be driven in either direction (in or out). To do this, the amplifier will raise the voltage on one side of the speaker and will lower it on the other side; then quickly reverse this polarity to get the speaker cone moving in the opposite direction.

The sound produced by speakers may be different due to speaker construction, mounting location and vehicle acoustics.

It is not practical for one speaker to reproduce the entire musical frequency range well. The range may run from 30 Hz to over 16,000 Hz in just one musical program. Therefore, the frequency extremes are left to their own special speaker types. Large speakers called woofers produce the low frequencies the best, while smaller speakers called tweeters produce the high frequencies best.

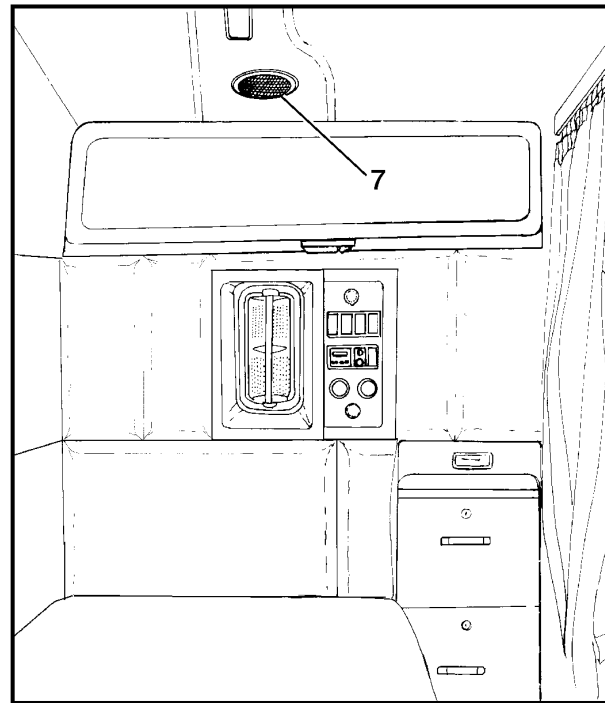
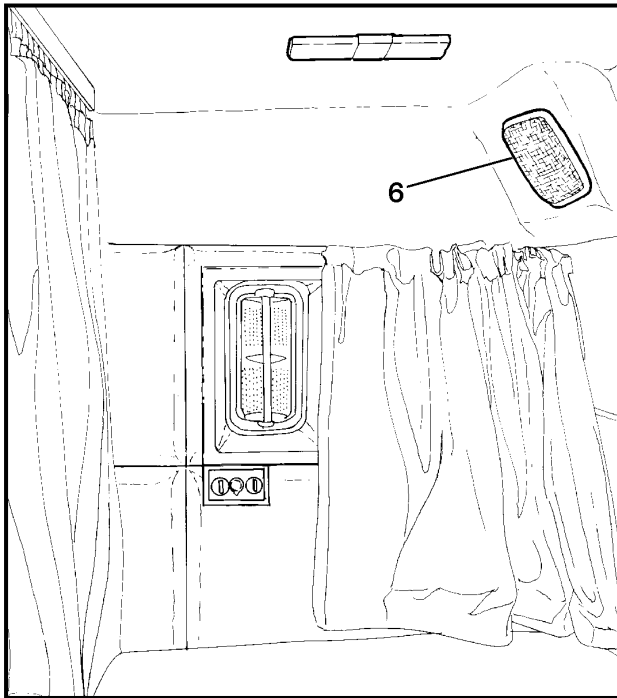
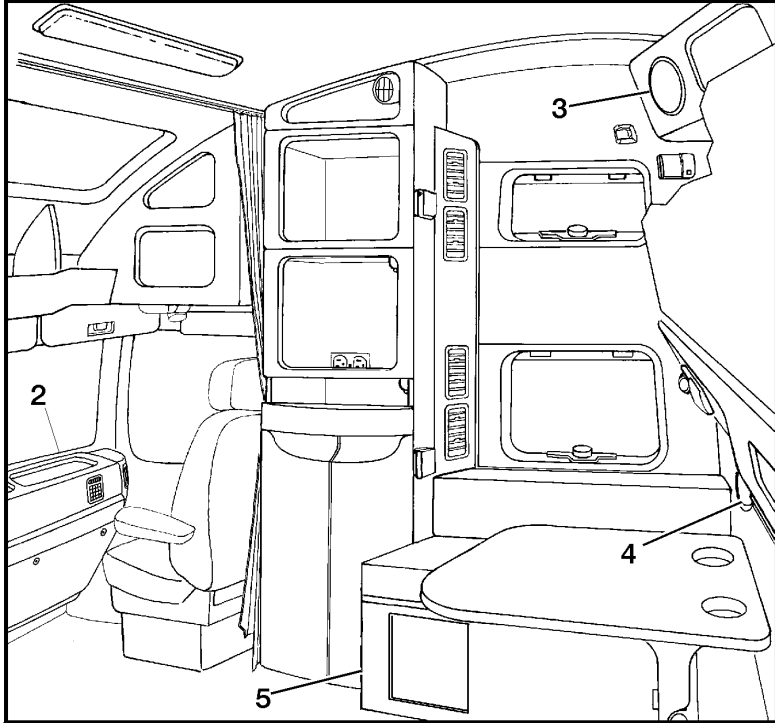
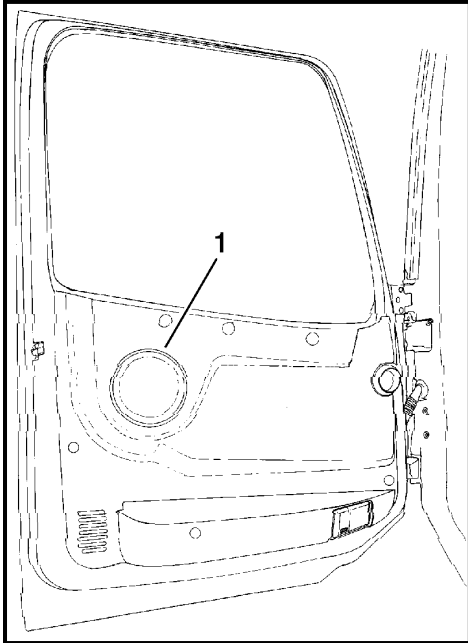
Volvo utilizes several types of speakers, all designed differently, in their vehicle sound systems. If speakers are replaced, always use OEM replacement parts to maintain sound balance and quality.



W3002993

- 1 Magnet
- 2 Frame/basket
- 3 Basket mounted connector
- 4 Cone
- 5 Dome
- 6 Surround
- 7 Gasket
- 8 Spider
- 9 Pole piece
- 10 Voice coil

Speaker Location



- 1 Door speaker (all models, both sides)
- 2 Dash speaker (all models, both sides)
- 3 Rear speaker (VN 660 / 770, both sides)
- 4 Rear speaker (VN 770, both sides)

- 5 Subwoofer (VN 770)
- 6 Rear speaker (VNL 420, both sides)
- 7 Rear speaker (VNL 610, both sides)

W3003016

Note: Rear speakers in the day cab vehicles have the same location as in the VNL 420 (7).

Antenna

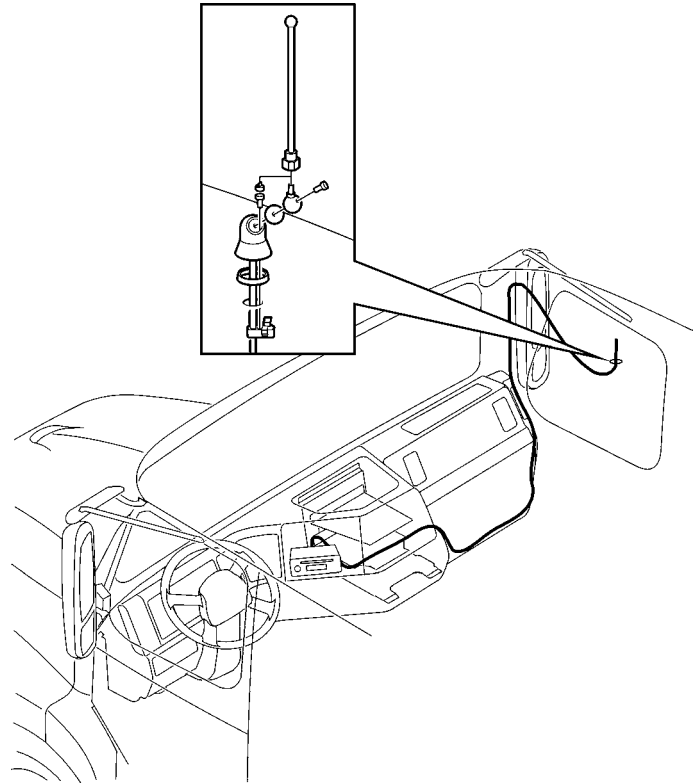
The antenna collects radio frequency signals. Electromagnetic energy (radio waves) from a broadcast antenna induces a very small AC voltage in the receiving antenna. The small AC voltage is then brought to the radio receiver for processing and conversion to acoustical energy. For best performance, the receiving antenna would be sized to receive the wavelength being broadcast. This is impractical as vehicle radio systems tune in a wide range of frequencies with wavelengths between roughly 3 meters (FM) and 566 meters (AM) (10 ft. and 1856 ft.). A vehicle antenna is a compromise of utility over performance with the receiver carrying the additional burden.

The vehicle antenna system consists of not only the mast but also the ground plane. The ground plane is more important than the antennae itself. However, a ground plane cannot exist without an antenna. The ground plane is a maintained area of "0 Voltage" potential across the entire vehicle chassis, with all points electrically tied together at the negative side of the battery. The antenna cable shield must be properly grounded at the antenna base. Without proper grounding the signal can be weak or even eliminated. Improper grounding can also make the antenna susceptible to noise.

Antenna Types

Three types of antennas are currently used on the Volvo VN/VHD series truck.

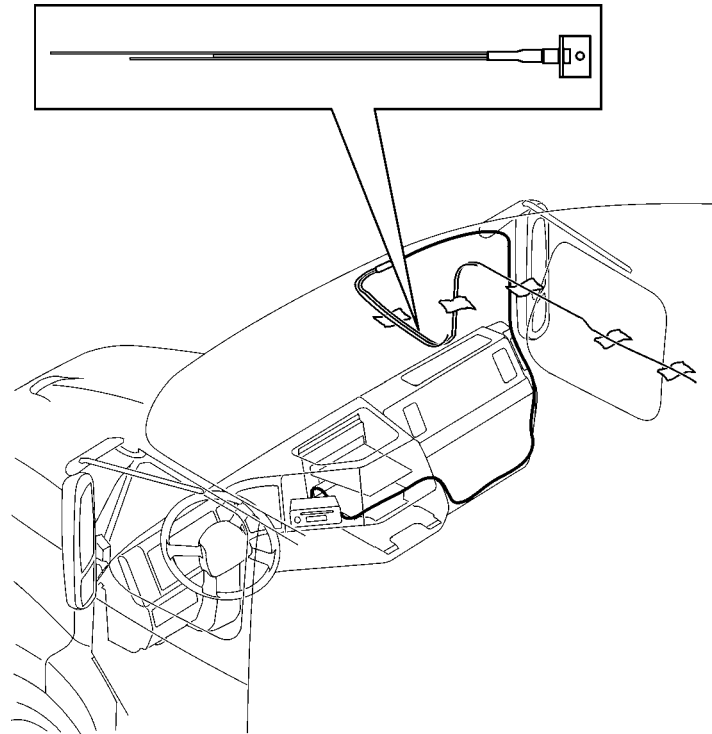
- **Fixed Mast** – Offer, excellent overall performance currently available. The antenna is grounded at the base to the metal roof of the cab by the mounting bracket.



The fixed mast antenna is standard on the VNM, VNL and VNL 420. These vehicles can also be equipped with the multiplexer antenna system as an option.

W3003140

- **Ribbon** – The ribbon antenna is made from a 3 conductor insulated wire with each conductor being precisely tuned to a desired frequency. The shortest conductor is tuned to the Weather-band, the middle length conductor is tuned to the FM band and the longest conductor is tuned to the AM band. The ribbon antenna is located between the headliner and the SMC roof panel in the area immediately above the windshield. The metal antenna base is grounded to the cab with a steel rivet (or screw). The ribbon antenna should be secured with vinyl tape to the SMC roof at least 0.1 m (4 in.) away from any metal objects that may tend to de-tune the antenna.

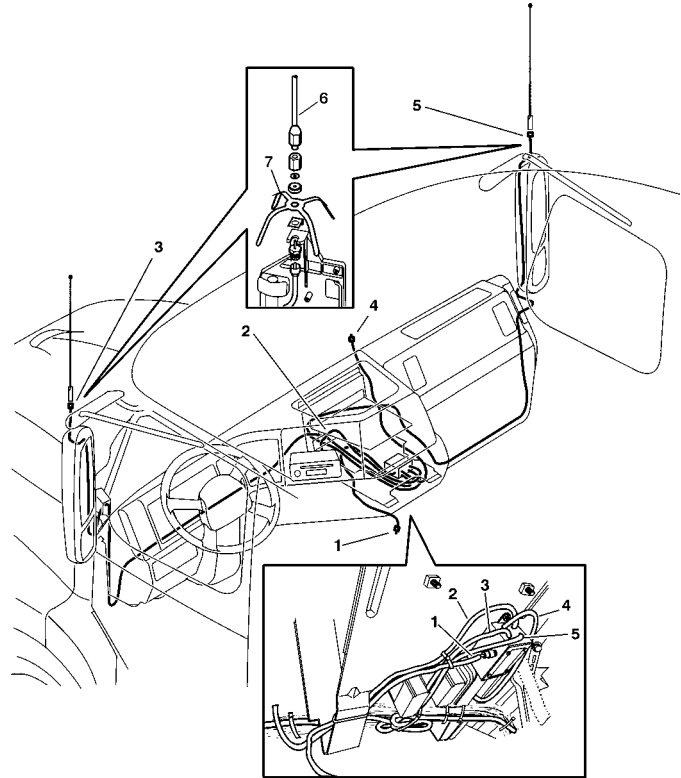


W3003272

The ribbon antenna is standard on the VNL 610. The VNL 610 can also be equipped with the multiplexed antenna system as an option.

- **Multiplexer** – A modification of the fixed mast design for operation of CB radio, cellular phone and stereo receiver. The multiplexer antenna system used in the Volvo VN/VHD series vehicle uses a combination AM/FM and CB radio antenna mast. The windings in the antenna are specific to this system and require no tuning. Always replace the antenna mast with OEM replacement parts. The use of a standard CB antenna mast will give unsatisfactory performance for CB reception and very poor or no reception on AM, FM and cellular phone frequencies. The multiplexer antenna mast used in the VN/VHD series can be identified by the clear plastic covering exposing the antenna windings and a top cap with the RAMI® logo.

Note: Multiplex antennas are available with single (drivers side only) or dual antennas.



W3003138

The multiplexer antenna system is standard on the Volvo VN 660, VN 770 and optional on other VN/VHD model vehicles.

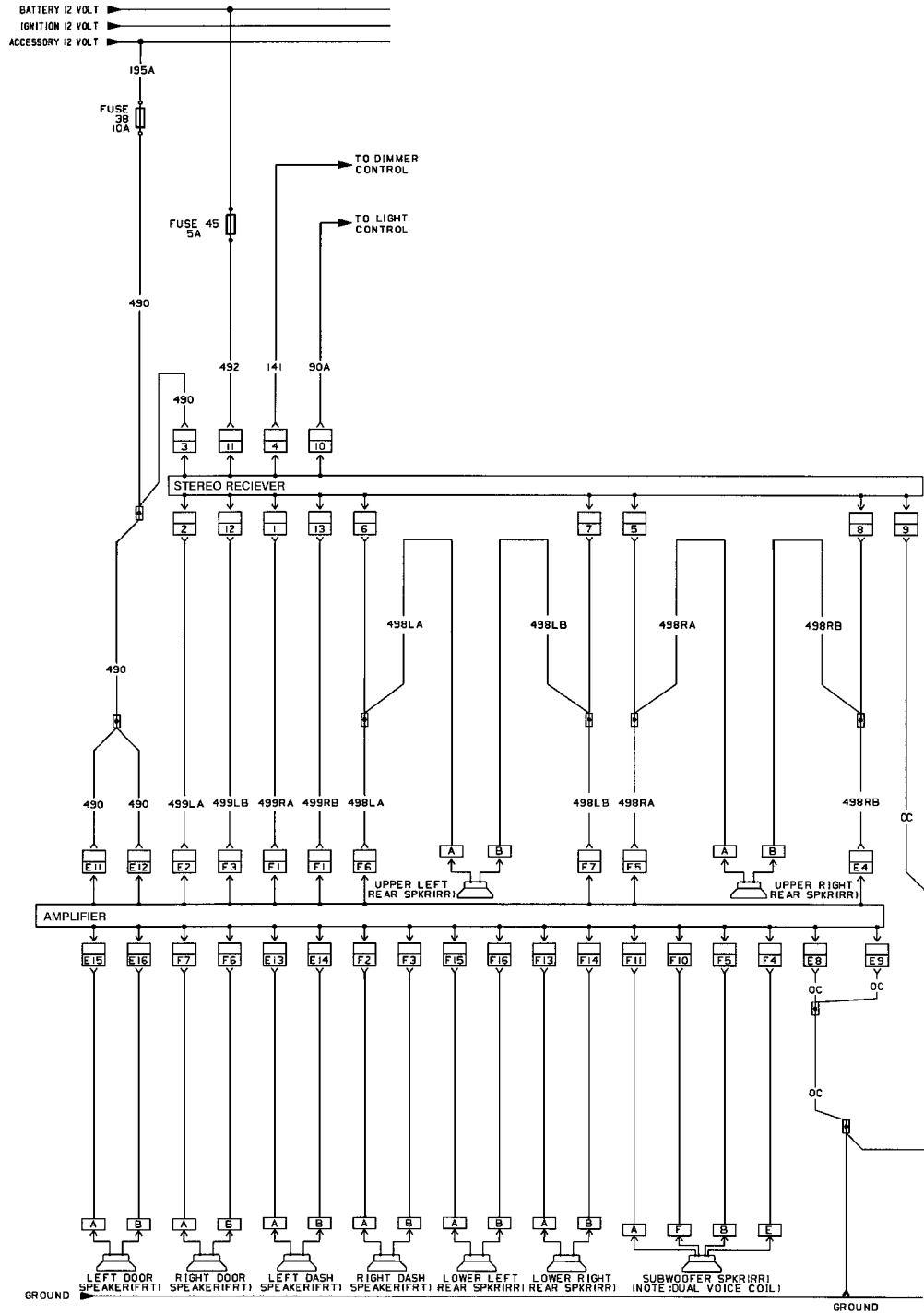
- 1 Cellular phone antenna cable (option).
- 2 Radio antenna cable.
- 3 Left side antenna mount.
- 4 CB radio antenna connection.
- 5 Right side antenna.
- 6 Multiband antenna mast.
- 7 Cellular phone antenna ground plane.

Antenna Lead-In Cable

The antenna lead-in cable carries the RF signal from the antenna to the AM/FM receiver. The lead-in cable consists of a center conductor, insulating material and an outer grounding shield. Some cables have a greater distance between the center conductor and outer shield so the cable acts less like a capacitor and less signal is lost on the lead-in. Receivers are matched or tuned to a specific lead-in type and cable length. Always use OEM replacement cables.

Schematics

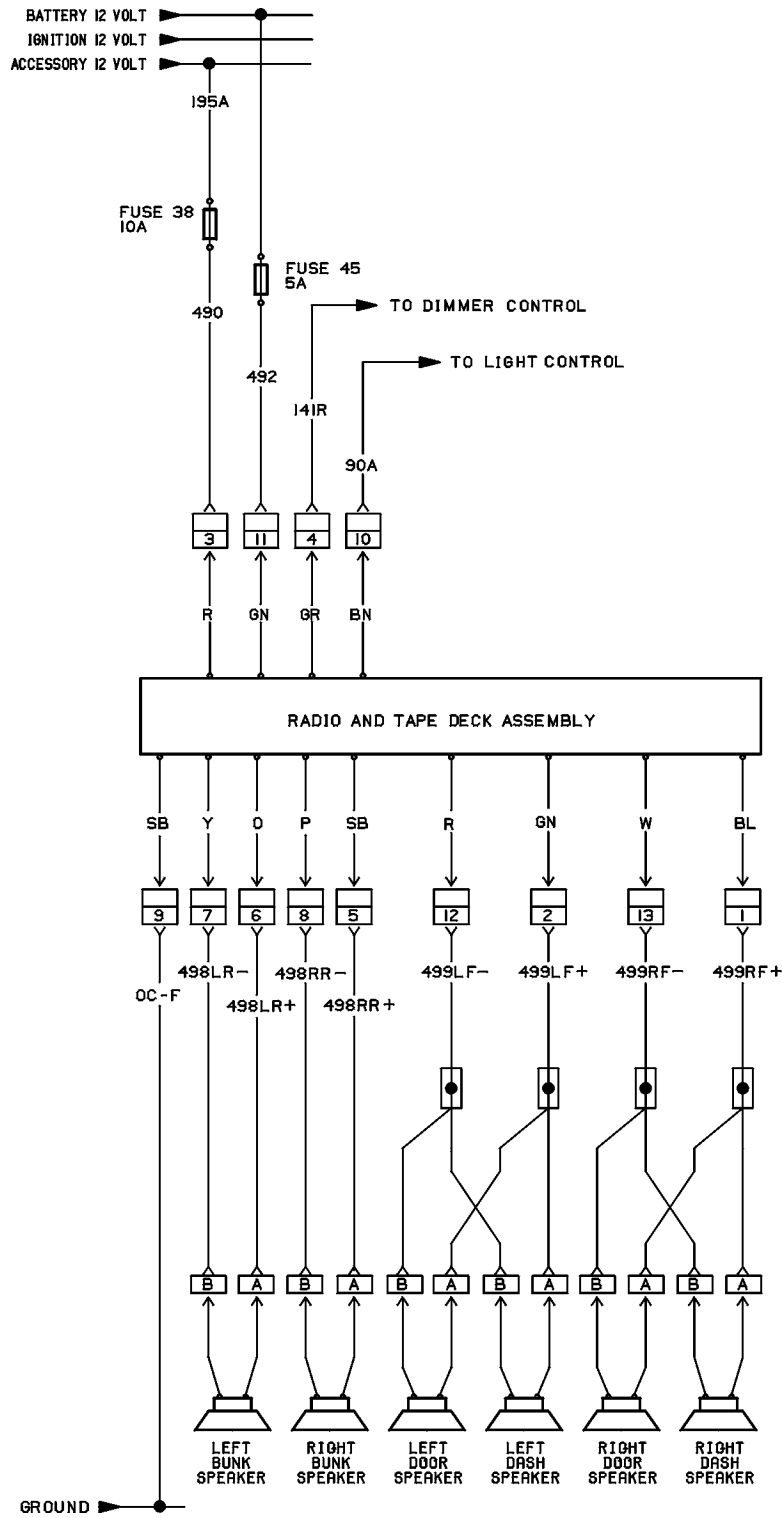
Amplified 8 Speaker (+ Subwoofer) System Schematic



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Note: For detailed, vehicle specific, electrical schematics see: VN/VHD Series Electrical Schematics – Group 37.

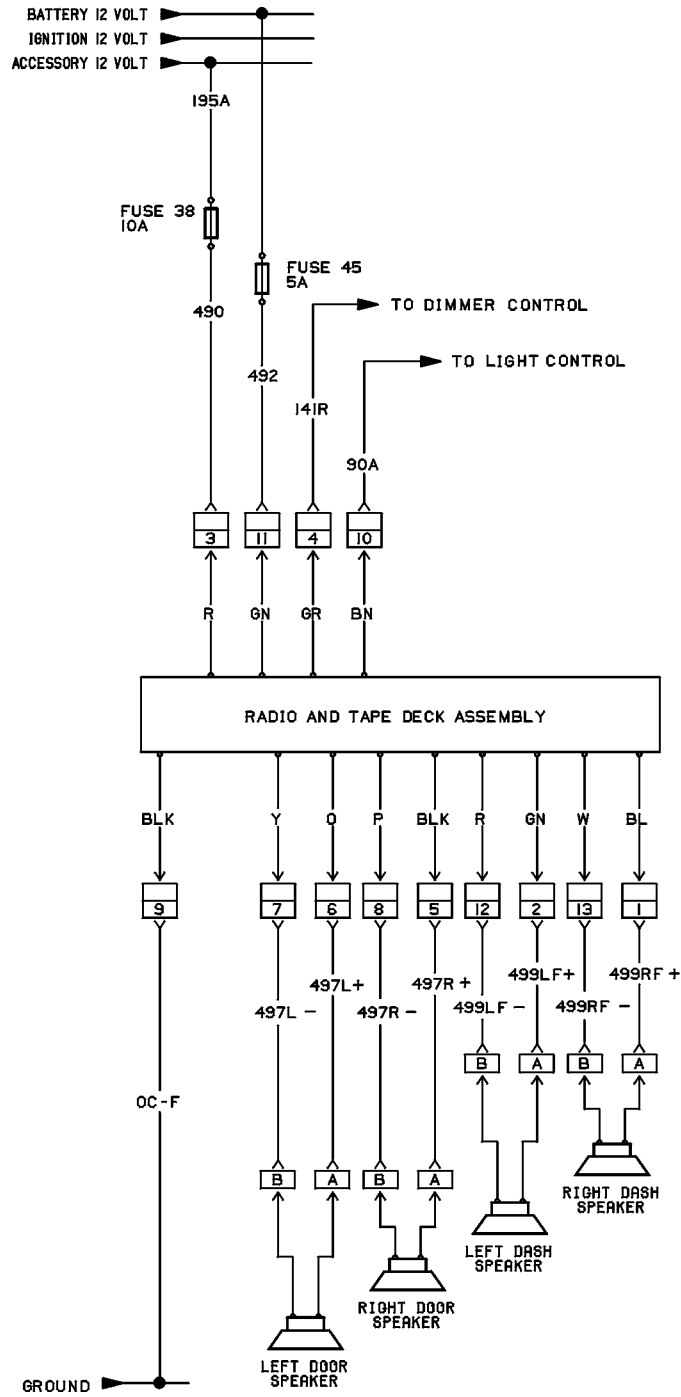
6 Speaker System Schematic



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Note: For detailed, vehicle specific, electrical schematics see: VN/VHD Series Electrical Schematics – Group 37.

4 Speaker System Schematic



W3003396

Note: For detailed, vehicle specific, electrical schematics see: VN/VHD Series Electrical Schematics – Group 37.