



# **Radio Install Basics**

**(How Aftermarket Radios Integrate Into Electronics Of Vehicles)**

Document# 999003

For additional information on similar topics, please consult the following technical documents:

- 999004** Soldering vs. Crimping Your Connection (When And Why To Use Each Method)
- 999008** Why Use A Snap On Wire Harness Adapter
- 999009** Wiring Your New Radio Using A Snap On Wire Harness Adapter
- 999013** Testing And Verifying Power And Speaker Wires When Installing A New Radio

## A Radios Integration Into A Vehicle

When the auto makers original factory radio is removed, a dash wire harness will unplug from the rear of the radio. For most vehicles all necessary wires to complete the installation of a new replacement radio will be connected to this in dash wire harness.

**Getting Power:** Modern digital car stereos have come along way since the days of manual tuning analog radios. One such advancement is use of digital electronics which gives us clocks, digital displays, and stations presets that memorize our favorite stations. But to do this, unlike those old manual tuning radios, modern car stereos must have a constant voltage source which allows the modern digital radio to keep track of time and station presets while the car is off. Because of this, modern digital radios have one additional power wire compared to earlier manual tuning analog radios.

**(+) 12 Volt Constant Wire (also referred to as the “Battery” wire:** (typical replacement radio wire color: Yellow)

This wire allows the radio to have a constant power source for the radio to memorize the correct time and to memorize station presets. This wire is almost always attached to the in-dash wire harness that was originally plugged into the rear of the auto makers original factory radio. This wire will have (+) 12 Volts regardless if the vehicles key is turned on or turned off.

**(+) 12 Volt Ignition Wire (also referred to as the “switched” power wire:** (typical replacement radio wire color: Red)

This wire is the vehicles on/off switch. This wire will turn the radio on when the ignition is turn on, and turns the radio off when the ignition is turned off. As with the (+) 12 Volt Constant/Battery wire, the (+) 12 Volt Ignition wire is almost always attached to the in-dash wire harness that was originally plugged into the rear of the auto makers original factory radio.

**Ground Wire:** (typical replacement radio wire color: Black)

This wire completes the electric circuit that powers the radio and any other electric device. Many times plugging in the antenna into the radio will give a ground for the radio to operate. However, this is not the proper method to operate. Unlike the (+) 12 Volt Constant/Battery and (+) 12 Volt Ignition wire, many auto makers do NOT place a ground wire in the in-dash wire harness. Many auto makers factory radios use metal brackets to mount and secure the factory radio to a metal dash. For these radios, the ground is actually a ground path through metal instead of a ground wire. When installing radios where no ground wire exists in the in-dash wire harness, it is best to crimp on a ring terminal connector to the new replacement radios ground wire and screw the ring terminal and attached ground wire to the metal of the dash when mounting the new radio.

**Power Antenna Turn On Wire:** (typical replacement radio wire color: Blue)

This wire sends a small pulse of voltage that will activate a power antenna on a vehicle. More commonly in modern car stereo systems the power antenna wire is used to activate or turn on an amplifier. Amplifiers require a “remote turn on” to let the amplifier know the radio has been turned on. The power antenna wire is a perfect wire to do this.

**Note:** Some radio manufacturers design their power antenna turn on wires only to operate when the radio is turned on. With this type of design, whenever a CD, or cassette, or CD changer is turned on, the power antenna wire stops operating. This means that if the power antenna wire is used to trigger amplifiers or other external equipment, those devices will turn off when the CD, or cassette, or CD changer is activated. This is important to know when designing a system, selecting equipment, and installing the equipment.

For more information on power antennas, please refer to the following technical documents:

- 999311** Mazda Power Antennas Prior To 1992-Problems And Solutions When Adding A New Radio
- 999404** Relays, Applications For (One Of An Installers Most Powerful Installation Devices)

**Connecting To Speakers:** An important thing to remember about car stereo systems and mobile electronics as a whole is that every auto maker designs vehicles differently, including stereo systems. What appears to be a standard looking factory radio installed in the vehicle from the factory, may hide many secrets. More and more, auto makers factory radios are becoming more complex. And this poses problems when the vehicles owner wants to replace the auto makers factory radio with a new replacement radio.

The majority of vehicles still use standard designs for their factory radios, but many upgrade vehicles now have premium upgraded radios as well. Some of these systems are: Bose, JBL, Infinity, Mach, Active, and others. These upgrade or premium sound systems pose problems for modern installers. Getting the speakers to work in these systems is a challenge.

But for this document, we will focus on the basics of standard factory radios. As stated above, every auto maker designs their radio systems differently. We will look at 2 types of wiring configurations seen in standard factory radio systems.

**Floating Ground Wiring:** this speaker wiring configuration is the most common in modern vehicles. Floating ground means that each speaker has an independent (+) positive and independent (-) negative connection directly to the amplifier. In other words, the front left speaker in a vehicle will have a dedicated (+) positive wire at the amplifier running directly to the (+) positive terminal of the speaker, and the same for the negative wire of that speaker. Thus, this single speaker has two wires that connect to the amplifier. So for 4 speakers in a vehicle, there will be 8 wires running to the amplifier. This is important to understand. This means that there are 4 independent ground wires for the 4 speakers. In floating ground systems, these 4 speaker ground wires remain independent until they enter into the amplifier. Once inside the amplifier, the ground wires may remain independent (meaning there are 4 separate amplifiers inside the case of the amplifier) or the two left and two right speakers might be combined (meaning there are 2 separate amplifiers inside the case of the amplifier). To make sense of this, as power output of the amp increases, it is important for the amp to begin to isolate each speaker. Isolating each speaker by separating each amplifier inside the main amplifier case allows the amplifier as a whole to operate more efficiently and generate higher power. Combining speakers inside the amplifier can cause problems such as excess heat generated by the amp, audio signal distortions, increased current loads on the amp, and others. Floating the grounds, or separating the independent speaker grounds makes an amplifier operate more efficiently.

**Note:** Most modern replacement radios are designed with floating ground amplifiers inside. Installing these radios into vehicles which use 2 speaker wires to power the speaker is preferred. Connecting radios with floating ground amplifiers to a common ground wired vehicle may damage the amplifier in the radio.

**Common Ground Wiring:** this speaker wiring configuration is not common in modern vehicles. However, certain auto makers still use common ground wiring for some of their vehicles (who knows why). Common ground wiring configurations use individual (+) positive speaker wires to connect to each speaker but they use the SAME (-) negative wire to connect all speakers (many older cars actually connect the (-) negative terminal of the speaker to the metal of the car. This was acceptable for when car stereos were low powered, but as car stereos increased in power, the need for floating ground amplifiers increased. Owners of vehicles with common ground wiring have only 2 choices when replacing the auto makers factory radio with a new replacement radio.

**Option 1:** rewire every speaker so that each speaker has its own (+) positive and (-) negative speaker wire running to the radio or external amplifier.

**Option 2:** many entry level replacement radios still use a common ground wiring inside the amplifier. Purchasing this type of radio will allow the owner to replace the auto makers factory radio without rewiring every speaker in the vehicle.

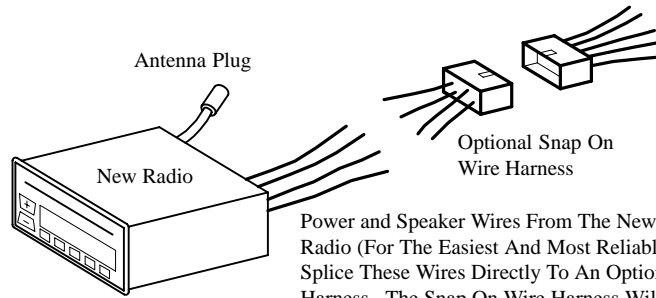
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If you own a vehicle that might have a premium sound system such as Bose, JBL, Infinity, Mach, Active, or others, The Install Doctor has placed information specifically regarding these systems in additional documents. For information on these premium sound systems, please refer to the following technical documents:

**999701** Replacing A Premium Radio System From The Factory - Bose, Mach, JBL, Active, Others

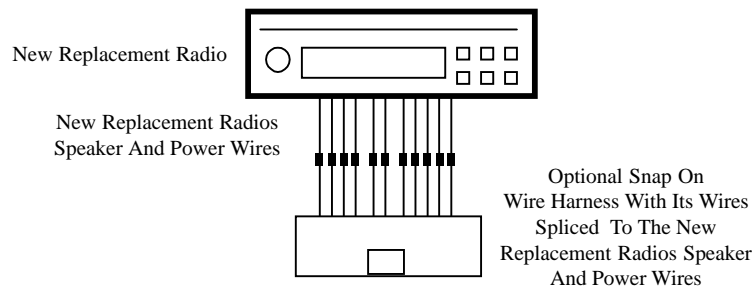
**999702** Replacing A Dodge/Chrysler/Plymouth Infinity Sound System Radio

## A Visual Of Radio Wiring

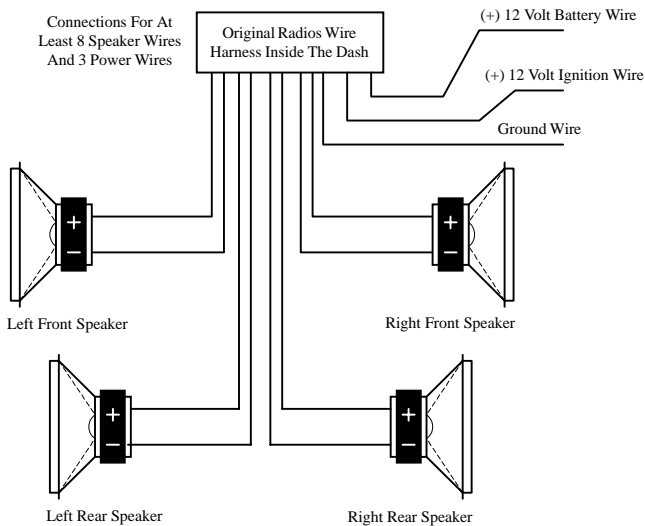


Vehicles Dash Wire Harness That Was Plugged Into Rear Of Auto Makers Factory Radio Which Contains The Necessary Wires To Install A New Replacement Radio

Power and Speaker Wires From The New Replacement Radio (For The Easiest And Most Reliable Installation, Splice These Wires Directly To An Optional Snap On Wire Harness. The Snap On Wire Harness Will Plug Into The Vehicles Dash Wire Harness Preventing The Need To Cut The Vehicles Wires And Make Installation Quicker As Well As Saving Any Warranty The Vehicle May Have.)

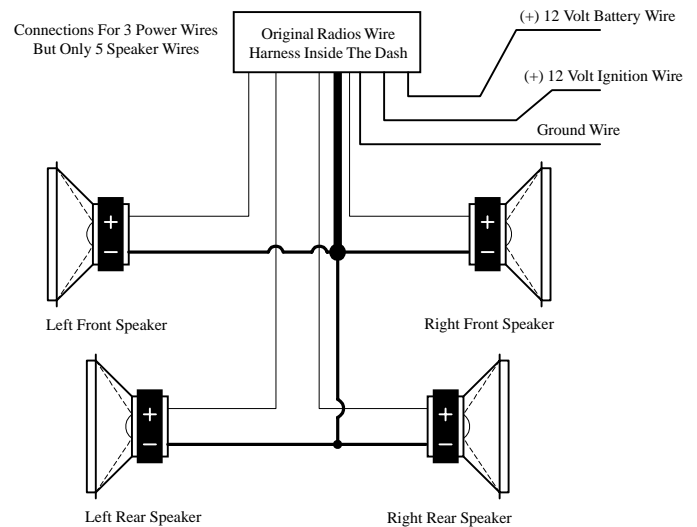


## Floating Ground Speaker Wiring



**Speaker Wire Note:** each speaker has its own (+) positive and (-) negative speaker wire for a total of 8 speaker wires.

## Common Ground Speaker Wiring



**Speaker Wire Note:** each speaker has its own (+) positive speaker wire but ALL 4 speakers share the same (-) negative ground wire (or the same "common" wire)