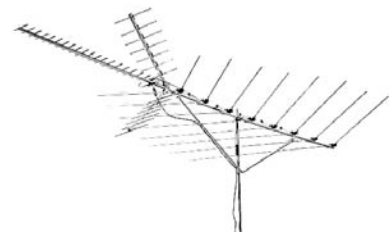


Choosing & Installing an Antenna for Digital TV or HDTV

by Steve Kindig, Senior Home A/V Editor at Crutchfield



There is no one magic antenna or antenna type that will deliver excellent TV reception in every location. The main factors determining reception are the distance and direction from the TV station transmitters to your home. Other factors include the transmitter's power and the height of its tower, the terrain between the tower and your antenna, and the size and location of any large buildings in the path of the transmission.

If you live within a few miles of the transmitter, and the signal path is relatively unobstructed, you may be able to get adequate reception using a small set-top indoor antenna. But as you move farther away, getting usable signal strength becomes trickier. This is where careful antenna selection and installation become essential.

The information below will help you zero in on the type(s) of antenna that should work best for you. Keep in mind that even in the same neighborhood reception conditions often vary from house to house. For that reason, it's best to purchase your antenna from a dealer who offers no-hassle returns with a money-back guarantee.

VHF and UHF

Like analog signals, digital TV signals can be broadcast over two different frequency ranges: VHF (Very High Frequency) and UHF (Ultra High Frequency). The VHF channel range is 2-13, while the UHF range is 14-83. Over 90% of digital stations currently broadcasting are in the UHF frequency band, meaning you can receive them with a UHF antenna. If some of the local stations you want to receive are below channel 14, especially in the channel 2-6 range, you may need a VHF/UHF antenna.

This can be trickier than it sounds because the FCC requires digital stations to embed a "reference" to their analog channel so viewers won't have to memorize a whole new set of channel numbers. So, your TV might identify a digital station as being in the VHF range when it's actually in the UHF range. For example, Richmond's CBS station is known as "Channel 6," but its true digital channel is 25.

What is the difference between UHF and VHF antennas? Mainly size. Antenna elements are based on the size of the waves they're designed to receive, and VHF frequencies are lower so the waves are longer, requiring a larger antenna surface to receive them. It's possible to build a much more elaborate UHF antenna with more elements for stronger reception while keeping the antenna size physically manageable.

Uni-directional vs. multi-directional TV antennas

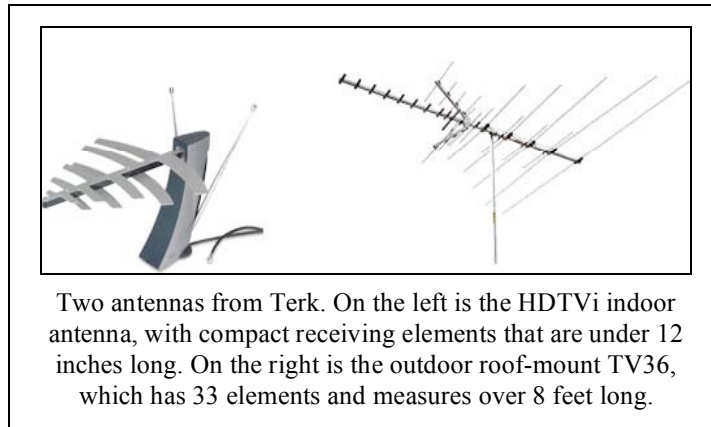
Antennas described as "uni-directional" or sometimes just "directional" are designed to receive signals from one direction. "Multi-directional" or "omni-directional" antennas are able to receive signals from all directions.

Directional antennas are able to pull in signals from greater distances, and because they "see" in only one direction they are resistant to noise and "multipath distortion" (a problem created when an antenna receives reflections of the desired signal). Because multi-directional antennas "see" in many directions they are more likely to pick up noise, interference, and multipath distortion.

It's important to determine the direction (or directions) you'll want to point your antenna to get the best signal. There are resources on the Internet that can help <http://www.tvfool.com/> to locate your desired stations, giving you an accurate picture of their direction in relation to your home. If all of those stations are transmitting from an area covering a range of 20° or less, you can probably receive them using a uni-directional antenna.

If the transmitters are positioned more than 20° apart, try a multi-directional antenna. As an alternative to a multi-directional antenna, you might consider combining a uni-directional antenna with a "rotor," which lets you remotely rotate the antenna to pick up stations in multiple directions.

Indoor vs. outdoor antennas



Indoor antennas are generally small, designed to be placed on or near your TV. Outdoor antennas tend to be significantly larger and are intended for roof- or attic-mounting. In general, the larger an antenna's surface area is, the stronger the signal it will provide. The relative strength of the signal an antenna can deliver to a tuner is referred to as "gain" and is measured in decibels (dB). The higher the dB rating, the greater the gain.

Nearly all outdoor antennas perform better than even the best indoor antennas. Along with their size disadvantage, indoor antennas have a height disadvantage, and are adversely affected by the

walls of a house and even by movement of people in the room. Other sources of household interference include fluorescent lights, computers and cordless phones.

Amplified vs. non-amplified antennas

One way to help antennas overcome size or height disadvantages, or otherwise enhance signal gain, is through the use of electronic amplification. The amplifier can be built in as it is in many indoor antennas, or it can be a separate device that installs in-line between the antenna and TV. An amplifier that installs on an outdoor antenna or mast is often called a preamplifier or "preamp." Most experts recommend only using an amplifier if you need to. The potential drawbacks of amplifiers are that they amplify noise along with the signal, and they can be overdriven by strong signals, which can make reception worse.

Other good antenna info resources

If you know of any neighbors who are using an antenna, find out what type/model it is and how well it performs. You could also try calling local TV stations with your antenna questions. It's definitely in their interest to help their viewers improve reception.

Another excellent source for info on digital TV reception is the AVS Forum's local HDTV message boards, which are loaded with great suggestions and solutions to particular reception problems in locations ranging from big cities to small towns and rural communities.

Finally, the Antennaweb <<http://www.antennaweb.org>> site has wealth of general antenna info in its antenna FAQ, and can also help you find over-the-air broadcasts in your area.

Next, we'll look at what's involved in antenna installation. Whether you're considering installing an antenna yourself or having one professionally installed, it's good to know the basic steps involved.

Antenna cabling: always use 75-ohm coax cable

Whether you want to install an antenna on your roof, on a pole, or in your attic, using the right kind of cable is crucial. The two types of wire commonly used to connect an antenna to a TV are 300-ohm twin-lead and 75-ohm coax. Twin-lead is a flat wire, while coax cable looks like the round cable installed in homes for cable TV service. In recent years, virtually all TVs have gone to the coax-style connection.

Coax cable is superior to twin-lead in every way and should be used if possible. Even if your home has an existing run of twin-lead cable, consider replacing it with coax. Twin-lead is not shielded and the entire length of wire can act like an antenna, which may cause reception problems. Coax cable is shielded, which prevents signals from leaking into or out of your system. Coax cable is also unaffected by your home's electrical wiring or by contact with metal objects. And coax has a much longer lifespan than twin-lead.

Antenna cabling tips:

- For the best performance and reliability, use high-quality UL-rated dual- or quad-shield RG-6 cable
- Cable should run as directly as possible from the antenna to the tuner; try to minimize the number of splices
- Avoid sharp bends in the cable as they can impair performance
- If the antenna is installed outdoors (including on the roof) run the cable into the house through an attic or basement if possible; never run the cable through a window or door
- Outdoor antennas should be grounded for lightning protection. Place a grounding block where the antenna cable enters the house and run a wire from the grounding block to your home's ground rod. This is not only an important safety consideration but also a potential code requirement
- Outdoor connections should be protected from exposure to the elements by applying silicone grease to the connection and covering it with a weather boot

Tips on installing an outdoor antenna

Large outdoor antennas can be installed on a roof or a free-standing pole, and many can be installed in an attic. For the best results, your antenna should have the clearest possible "view" of the transmitter tower. That is achieved with a roof- or pole-mount installation (attic-mount installation is covered below).

People living in neighborhoods with homeowners' associations may wonder if association covenants can restrict antenna use. The Telecommunications Act of 1996 prohibits restrictions that impair the installation or use of antennas to receive video programming. It covers digital satellite dishes, TV antennas, and wireless cable antennas.

Most TV antennas designed for roof- and/or attic-mounting do not include a mounting mast. Here are some general tips for roof-mount antenna applications:

- Locate and avoid power lines and other wires in the work area
- Do not climb on a wet or icy roof
- Do not attempt high installations on windy days
- Do not climb onto a roof when there is no one else around
- Do not install an antenna under large, overhanging tree branches if it can be avoided
- If possible, avoid chimney-mounting an antenna as smoke and gases from the chimney can impair the antenna's performance and shorten its life

When you're aiming the antenna, use a compass to ensure your antenna is accurately and precisely oriented toward the signal source. At this stage, it's best to have a helper who can check picture quality and relay the information to you. (Most, but not all HDTVs and HDTV tuners include an onscreen signal strength meter.) Be sure to check the picture on all channels you want to receive before securing the antenna in place.

If you plan to use an antenna in addition to a digital satellite TV system, you have a couple of options. One fairly easy solution is to attach a "clip-on" antenna like Terk's TV44 to your satellite dish. This amplified VHF/UHF antenna has built-in "diplexers" that combine the

satellite and antenna signals onto a single cable, which can eliminate the need to run new cable. You'll need to install a diplexer at each satellite receiver to provide separate connections to the "Satellite In" and "Antenna In" jacks. A clip-on antenna usually performs better than an indoor antenna, but not as good as a larger outdoor antenna.

Attic installation

Compared to roof-mounting, installing an antenna in your home's attic has several appealing advantages: installation is much easier, the antenna is hidden from view, and the antenna and connections are not directly exposed to harsh weather.



Channel Master CM4228 antenna mounted in an attic. The antenna is about 40" square. The small box sprouting cables near the bottom of the mast is part of the Channel Master 7777 preamplifier.

The main disadvantage of attic-mounting is poorer reception. As an example, a single layer of asphalt shingles over a standard plywood roof creates a 30%-50% reduction in signal strength. Attic-mounting can be an effective option in areas where strong signals are present. To maintain adequate signal strength, an amplifier or preamp is often used.

Other potential obstacles to attic-mounting include a metal roof, aluminum siding, metal gutters, or foil-backed insulation in your walls or under the roof. Any of these conditions can result in signal interference or blockage. If that happens, try installing the antenna in a different location. For the best reliability and performance, mount the antenna to a mast and don't let the antenna touch the attic floor.

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