

A Guide to UHF Television Reception

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Introduction

The purpose of this Guide is to provide information for improving UHF television reception in the home. The Federal Communications Commission originally allocated twelve channels for television broadcasting. These channels, numbers 2 through 13, are in the "very high frequency" or VHF band. (Originally Channel 1 was also included, but was soon reassigned to other purposes.)

The tremendous growth in television broadcasting following World War II made it obvious that 12 channels were not enough. So in 1952, the FCC allocated 70 additional channels above the VHF television band and called them "ultra high frequency" or UHF band. The channels are 14 through 83. UHF signals, however, due to the physics of radio frequency transmission, are inherently less efficient in the conversion of radio waves to the electrical signals used by the television receiver, and are subject to more losses from some environmental conditions than VHF. Good UHF reception, therefore, requires more attention to antenna installation and set tuning than does VHF reception. On the other hand some VHF channels are subject to certain types of interference to which UHF channels are generally immune.

Simply stated, clear UHF reception requires more attention to antenna installation and set tuning than does VHF reception. While the broadcasting industry is working to improve the technical elements of UHF reception, there is much that can be done, at reasonable cost, with present available equipment—and that's what this publication wants to reveal.

Perfect reception for television signals can't be guaranteed simply because there are too many variables involved. However, by following the recommendations in this Guide, the chances for clear reception will be greatly improved.

Improving UHF reception can be a do-it-yourself job. Even if the work is given to a professional, the information in this guide will provide a better understanding of what is needed and what can be expected.

Poor Reception and Poor Antennas

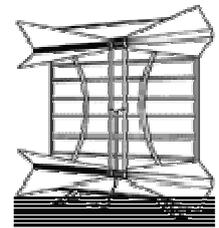
If UHF reception in general is bad, how it's bad can help determine the problem. "Snow" is visual noise caused by a weak signal. poor antenna system, the set itself, or a combination of these. "Ghosts" or multiple images are caused by a signal arriving from two or more directions simultaneously reflected off buildings, trees and mountains. A good antenna system often solves these reception problems. An outdoor antenna is better than an indoor antenna. An indoor antenna is better than no antenna at all. If an outdoor antenna is needed for VHF, you'll almost certainly need an outdoor antenna for UHF. But if good VHF reception can be obtained with an indoor antenna, a loop or other UHF antenna on the set may also work.

Indoor Antennas

All indoor antennas can be adversely affected by the walls of a house, inadequate height, and by movement of people in the room-as may be noticed with VHF "rabbit ears." Loop or single bow tie UHF antennas are usually not satisfactory. They are difficult to adjust for maximum signal pick up or for elimination of ghosts. Be sure their lugs are secure to the UHF antenna terminals on the back of the set. The indoor combination VHF/UHF antenna has a multi-position switch to get the best picture. As a rule, this type of antenna is not good for UHF. The rod antenna, or "monopole," is a VHF/UHF antenna found on some portable sets, Normally UHF reception is poor, but can be enhanced when the rod is telescoped to its smaller size.

The Best Indoor Antenna

If an indoor UHF antenna must be used, the two-bay bow tie with a reflector screen **(pictured at right)** is the best choice. But, keep in mind, outdoor antennas are always better than indoor antennas. Make sure the antenna wires are connected to the UHF terminals on the back of the TV set.

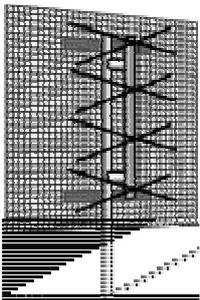


Outdoor Antennas

There are many different kinds of outdoor antennas available in a wide price range. The kind selected is determined primarily by the geographic location of the receiver.

Recommended UHF antennas

- Four-way bow tie **(pictured below)** for metropolitan areas with strong signal
- Eight-way bow tie for suburban areas with medium signal



Television signals are strongest when the station transmitting tower and the home receiving antenna are in line-of-sight. If the line-of-sight is blocked or weakened by mountains, buildings or trees, the signal, likewise will be weakened or lost. The signal will also grow weaker as it travels farther.

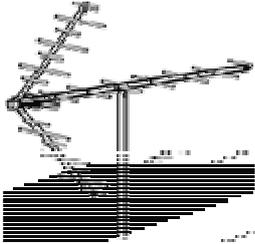
"Gain" is the measure of an antenna's sensitivity - and its ability to pick up signals. It is measured in decibels (dB). The farther away from the station tower, the more gain the antenna should have. Gain can also vary from channel to channel. For example, an antenna's advertised gain rating may be at Channel 20, but the gain may be much less at Channel 69. Make sure the dealer guarantees that the antenna purchased is for channels in your area.

Where buildings or other obstructions cause "ghosts," an antenna with good directivity is recommended.

Directivity is the ability to receive only those signals at which an antenna is pointed. Highly directive antennas

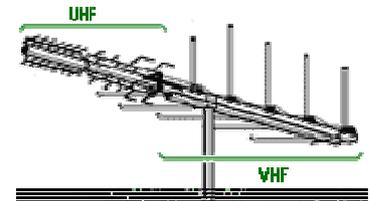
have narrow receiving angles (measured to degrees) and high "front to back ratios." To insure the best reception aim the antenna carefully.

If a good VHF antenna installation is already on hand, it will probably be less expensive to add a good quality UHF antenna on the same mounting mast. The separate UHF antenna also will permit pointing to VHF and UHF antennas independently.



If all television signals are coming from the same direction, both VHF and UHF reception can be improved. Choose an antenna according to the distance to the most distant UHF station for which reception is desired by installing an all-channel combination antenna. Combining both antennas in a single mechanical structure imposes design problems which make the selection of a well-engineered antenna very important.

There are several good combination VHF/UHF antennas available. One of the best types combine a "log periodic" VHF antenna with a "yagi" (**pictured at right**) UHF antenna on a single horizontal boom. If the UHF stations to be received are located in different directions from the house (more than 30 degrees apart):



- Either use separate antennas with a mixer or a switch (get professional help for this kind of installation.)
- Or use an antenna rotator with remote control. The rotator is ideal when signals come from many directions.

Lead-in Lines

A good lead-in line installation delivers the signal from antenna to set with relatively little loss of strength. Choose a quality grade of either one. Flat ribbon twin lead, shielded twin lead and solid core coaxial cable don't work well for UHF. Lead-in lines deteriorate over time. Lead-in lines over five years old (or less depending on environmental conditions) should be replaced with new cables.

Twin Lead

- is initially less expensive.
- has moderate to poor life; signal loss increases as it weathers and ages.
- foam filled type works best.

Coaxial Cable (75 ohm line)

- costs more initially, but less frequent replacement makes it less costly in time.
- occasionally needs matching transformers at antenna and set, and uses
- special connectors.
- lasts much longer, Has slightly more signal loss than new twin lead, but
- loss doesn't increase with age.
- foam core works best.
- is better at screening local interference.
- looks better.

A good installation can be made using either type of line. Get professional help if you have special problems like local interference or very weak signals. Few sets still have 300 ohm antenna connectors, a matching transformer to connect coaxial cable to the set will be needed.

With separate VHF and UHF antennas, separate lead-in lines are used to connect them to their respective terminals on the television set. Most combination VHF/UHF antennas have a connection for a single lead-in line, and in most locations a single high quality lead-in line will deliver good VHF and UHF signals. However, a single line cannot be connected to both the VHF and UHF 300 ohm terminals. Instead, a good VHF/UHF "splitter"-rated 300 ohms for twin lead or 75 ohms for coaxial is required. Connect the lead-in line to one end, and the two pairs of wires at the other end to the appropriate set terminals.

Splitters (also called "mixers") can also reduce signal strength. So in a weak signal area, use separate lead-ins or add a booster amplifier to the antenna. If a booster amplifier is added, it should be in the line before any splitters, and as close to the antenna as practical.

Installation

The Best Antenna Location

- Higher is usually better. Six to eight feet above the roof should be adequate.
- Buildings or other obstructions shouldn't block the line-of-sight to the TV tower.
- The shorter the lead-in line, the less signal is lost.
- Avoid attaching the antenna to a working chimney.
- Fumes are harmful to the aluminum antenna parts.
- Heed local ordinance.

Tips on Installation

- The dealer can advise what hardware to use to mount the antenna.
- Be sure the antenna is assembled correctly. Read the instruction sheet carefully.
- Check the area to be sure there are no power lines nearby that could touch the antenna, lead-in lines, or metal extension ladder.
- Ground the antenna mast electrically, using No. 6 or larger wire and standard ground rod to help protect the antenna and TV set from lightning.
- Masts taller than 10 feet need guy wires.
- If a separate UHF antenna is used, mount it 4 or 5 feet above the VHF antenna.
- Aim the antenna at the TV station tower. Where this is not feasible, a signal reflected from a large building or other obstruction may work.
- Experiment with antenna height and aiming, because a few inches can make a big difference. Have someone watch the set and report of reception quality as the antenna position is changed.
- Keep lead-in line free of splices and sharp bends.
- Keep twin lead at least three inches from metal gutters and pipes by using "stand-off" devices every three feet.
- Don't run twin lead and rotator wires through the same stand-offs.
- If a rotator is used, leave enough slack in the lead-in line for rotating the antenna.
- Secure twin lead to stand-offs or tape coaxial cable to the mast to avoid strain on antenna connections.
- Twist twin lead 1/2 turn per foot to prevent wind whipping and to reduce FM or other interference.
- Form the lead-in line into a half loop where it enters the house, so rain water will drip off. Seal the entry with a waterproof material.
- Excess line coiled in the wall or behind the set can cause signal loss and interference.

Multiple Sets

More than one television set (or FM radio) may be connected to one antenna by using a multiple set "coupler." Most couplers weaken signals. If signals are weak a coupler and an amplifier may be needed, which substantially increased the cost. It may be cheaper to erect a second antenna.

Booster Amplifiers

All television sets, particularly older ones, add some noise or "snow" to weak UHF signals. A booster (or preamplifier) may reduce the snow, but first be sure a good antenna installation is in place. Keep in mind, outdoor booster antenna are more efficient than indoor models mounted at the set.

Maintenance

Regardless of initial quality, antennas and lead-in lines gradually deteriorate with age. Pollutants and salt ocean air are particularly destructive. Check the complete installation and hose the antenna with water yearly.

Cable TV Systems

Cable systems rarely carry a UHF station on its own UHF channel. UHF stations are usually transmitted either on an unused VHF channel or on one of the special cable channels available through a set-top converter furnished to the subscriber. The cable company will provide a listing of channels to which the UHF channels have been converted.

Take care to fine tune the channel on which the UHF station is supposed to appear, or some of the service paid for will be missed.

Occasionally a converted UHF signal will show interference from a strong adjacent channel. If a neighbor of yours has the same problem with his television set, ask the cable company to correct the problem.