

What to do if you have an electronic interference problem

This is a self-help pamphlet for the consumer published by the American Radio Relay League (ARRL).

Introduction

As our lives become filled with more technology, the likelihood of unwanted electronic interference increases. Every lamp dimmer, hair dryer, garage-door opener, radio transmitter, microprocessor-controlled appliance or remote-controlled new technical "toy" contributes to the electrical noise around us. Many of these devices also "listen" to that growing noise and may react unpredictably to their electronic neighbors.

Interference: What Is It?

Complex electronic circuitry is found in many devices used in the home. This creates a vast interference potential that didn't exist in earlier, simpler decades. Your own consumer electronic equipment can be a source of interference, or can be susceptible to interference from a nearby noise source or radio transmitter.

The term "interference" should be defined without emotion. To some people, it implies action and intent. The statement, "You are interfering with my television" sounds like an outright accusation. It is better to define interference as any unwanted interaction between electronic systems — period! No fault. No blame. It's just a condition.

Personalities

You can't overestimate the importance of personal diplomacy when you're trying to solve a

problem that involves two or more people! The way you and your neighbor behave when you first discuss the problem can set the tone for everything that follows. Everyone who is involved in an interference problem should remember that the best solutions are built on cooperation and trust. This is a view shared by electronic-equipment manufacturers, the FCC and the ARRL.

Responsibilities

No amount of wishful thinking (or demands for the "other guy" to solve the problem) will result in a cure for interference. Each individual has a unique perspective on the situation — and a different degree of understanding of the technical and personal issues involved. On the other hand, each person may have certain responsibilities toward the other, and should be prepared to address those responsibilities fairly.

The radio operator is responsible for the proper operation of the radio station. The station should be properly designed and installed. It should have a good ground and use a low-pass filter, if needed. If consumer electronic equipment at the station is not suffering the effects of interference, you can be almost certain that the problem **does not** involve the radio station or its operation. However, if the interference is caused by a problem at the station, the operator will eliminate the problem there.

Manufacturers of consumer electronics equipment are competing in a difficult marketplace. To stay competitive, most of them place a high priority on service and customer satisfaction. For example, many manufacturers have service information that can be sent to a qualified repair dealer. Most manufacturers are willing to resolve any interference problems that involve their products. Over recent years, manufacturers have built up a good track record designing equipment that functions well in most electrically noisy environments.

The FCC will do what it can to help consumers and radio operators resolve their interference problems. They expect everyone involved to cooperate fully. Experience has taught them that

solutions imposed from the outside are not usually the best solutions to local problems. Instead, they provide regulatory supervision of radio operators and manufacturers. The FCC also publishes a booklet on interference, the **Interference to Home Electronic Entertainment Equipment Handbook**. It is available for \$2.50 postpaid from the U.S. Government Printing Office. It explains the several laws and FCC policies that relate to interference problems.

Finally, the consumer has responsibilities, too. You must cooperate with the manufacturer, the radio operator, and, if necessary, the FCC as they try to determine the cause of the problem. They need your help to find a solution.

What Causes Interference?

Interference occurs when radio signals or electromagnetic "noise" sources are picked up by consumer electronic products — most often telephones, audio equipment, VCRs or TVs. It usually results in noise, unwanted voices or distorted TV pictures. In most cases, the source is nearby.

There are three common types of interference:

1) **Noise:** Interference can be caused by an electromagnetic noise source. Defective neon signs, bug zappers, thermostats, electrical appliances, switches or computer systems are just a few of the possible sources of this type of interference. Both you and your neighbors may be suffering from its effects. In some cases, the noise may be the result of a dangerous arc in electrical wiring or equipment and may provide warning of an unsafe condition that should be immediately located and corrected.

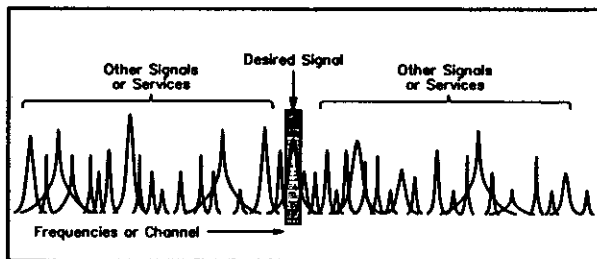


Figure 1—Every electronic appliance must select only the desired signal while rejecting all others.

2) Overload: Even if a nearby radio signal is being transmitted on its assigned frequency, if it is strong your equipment may be unable to reject it. Your telephone, radio, stereo or TV should be able to separate the desired signal or sound from a large number of radio signals and electrical noises. This is shown in Figure 1.

Consumer-equipment manufacturers have worked in cooperation with government regulators to set and meet voluntary standards of interference immunity. Modern equipment usually includes enough filtering and shielding to ensure proper performance under average conditions. Older equipment may not meet these standards, however, and even modern equipment can be affected if the interfering signal is particularly strong. In these cases, your equipment is working as designed, but it may need some additional filtering or shielding to function properly.

3) Spurious emissions: A nearby radio transmitter could be inadvertently transmitting weak signals on a frequency not assigned to that transmitter. These signals are called spurious emissions. FCC regulations concerning spurious emissions are very clear. If interference is caused by spurious emissions, the operator of the transmitter must take whatever steps are necessary to reduce the interference. Fortunately, modern transmitting equipment is manufactured to meet stringent regulations, and many radio operators are examined and licensed by the government. These federally licensed operators often have the technical skill to resolve interference problems that originate from their radio stations.

With all of these possibilities, it is difficult to guess which type of problem is causing your interference. Usually, only a technical investigation can pinpoint the cause and suggest a solution. This is where a spirit of cooperation and trust will pay off! If you believe your equipment is picking up signals from a nearby radio transmitter, the operator may be able to help you both find a solution to a mutual problem.

How to Find Help

Most consumers do not have the technical knowledge to resolve an interference problem. Even so, it's a comfort to know that help is available.

Gather information about interference. The FCC and ARRL have self-help information packages or books.

If the problem involves an electrical-power, telephone or cable-television system, contact the appropriate utility company. They usually have trained personnel who can help you and your neighbor pinpoint the cause of the problem.

Consumer equipment manufacturers will also be able to help you. Your owner's manual, or a label on your equipment, may give you information about interference immunity or tell you who to call about interference problems. If not, the EIA will be able to give you the address of your equipment manufacturer's interference-resolution personnel. The manufacturers know their equipment better than anyone else and will usually be able to help you.

Operators of licensed amateur or commercial transmitters usually have some technical ability. These operators are the nearest source of help. Remember, the station operator may also be a neighbor! Use a polite approach to ensure that the relationship stays "neighborly." Licensed Amateur Radio operators have access to volunteers (Technical Coordinators and local interference committees) who are skilled at finding solutions for most interference problems.

Testing one, two, three . . .

If you think a neighbor's radio transmitter might be involved, you and your neighbor should arrange a test. It's important to determine whether the interference is (or is not) present when the radio station is "on the air." Your neighbor may want to ask another operator friend to participate in the test at your home. By the same token, you may want to invite a friend to attend the test at the radio operator's station. Having impartial witnesses will make you and

your neighbor more comfortable with the outcome — whatever it may be. Be sure to choose your witness carefully. Select someone who is diplomatic and tactful.

The tests must be thorough. The transmitter operator must try all normally used frequencies, antenna directions and power levels. All results must be carefully written down. More than one set of tests may be needed. Once you and your neighbor have determined which frequencies and power levels cause the problem, you'll be one step closer to finding a solution.

Self-help Cures

In some cases, when all else fails, you may need to resolve the problem yourself, or with the help of your electronic service person. It's impossible to use the remaining space to outline all of the possible cures for interference problems (the subject is quite complex.) However, a few simple cures using commonly available parts can eliminate most problems. The self-help packages supplied by the ARRL and the FCC explain these cures in more detail.

Try the Easy Things First

Sometimes, the easiest solutions are the best. Many cases of interference can be resolved without the need for technical investigations or knowledge.

If you suspect that the problem is caused by electrical noise, check for overloaded circuits, frayed wires, loose sockets, etc. These types of problems should be fixed no matter what! Have your electrician shut off one breaker at a time, noting if this has any effect on the interference. If so, determine which devices are connected to that particular line, then remove the suspect devices one at a time. When the interference goes away, you've found the "culprit." Your electric utility company service department will offer assistance if the interference is coming from defective equipment on the power lines or distribution equipment.

Interference filters for your consumer equipment can be purchased locally or by mail order. These filters usually eliminate unwanted interference if they are used properly on the equipment that is in need of additional filtering.

According to the FCC *Interference Handbook*, telephones and other audio devices that pick up radio signals are improperly acting as radio receivers. The interference can usually be cured, but the necessary filtering must be applied to the affected device.

Several companies sell modular telephone interference filters that are very effective. Your telephone company service department may be able to help.

A high-pass filter may reduce interference to an antenna-connected television receiver or VCR. A common-mode filter should be tried first on TVs or VCRs connected to a cable system. An ac-line interference filter may help with electrical or radio interference. These items can be purchased locally or by mail order.

Some interference cures must be applied to the internal circuitry of the affected equipment. This should always be done by authorized service personnel.

The ARRL has a free information package called *RFI Tips*. They also sell a book, *Radio Frequency Interference - How to Find It and Fix It*, that provides additional guidance and technical information. Although it was written for amateur radio operators, the book may be helpful to you, too. Contact ARRL for information about their products and membership services.

Interference Can Be Cured!

Remember, most cases of interference can be cured! It takes cooperation between the consumer, the manufacturer and the radio operator. With a little bit of work you and your neighbor can both enjoy your favorite activities in peace.

For More Information...

The ARRL and the FCC have self-help packages available to help you resolve interference problems.

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RFI Desk • 225 Main St.
Newington, CT 06111 tel (860) 594-0214

Electronic Industries Association
Consumer Electronics Group
2500 Wilson Boulevard
Arlington, VA 22205
tel (703) 907-7626

Federal Communications Commission
Washington, DC 20554

U.S. Government Printing Office
Superintendent of Documents
POB 371954
Pittsburg, PA 15250 • (202) 512-1800

Sources of Products:

High-pass filters: Industrial Communication Engineers
Radio Shack catalog #15-579, 15-582
TCE Labs

Common-mode filters: Industrial Communication Engineers
TCE Labs

Telephone-interference filters: AT&T model #Z100B1 SKU #09205
Industrial Communication Engineers
K-Com
TCE Labs

AT&T—call (800) 222-3111 for the location of the nearest AT&T Phone Center

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