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Feeding Your Receiver a Line

For the radio monitoring enthusiast, the antenna is an interface with the world. To maximize the fun which comes to us through that interface, we usually try to get the best antenna we feel the situation and our pocketbooks warrant. Getting a good antenna and putting it into the air is one thing: getting the signal from that antenna on down to the receiver is another. This month we'll discuss how to get that signal where you want it without losing any more of the signal than is necessary and without adding any unnecessary noise.

As you will see, the basic concepts involved are few and relatively simple, but if we ignore them we may find that a good antenna performs poorly due to excess signal loss and/or unnecessary noise interference in some situations.

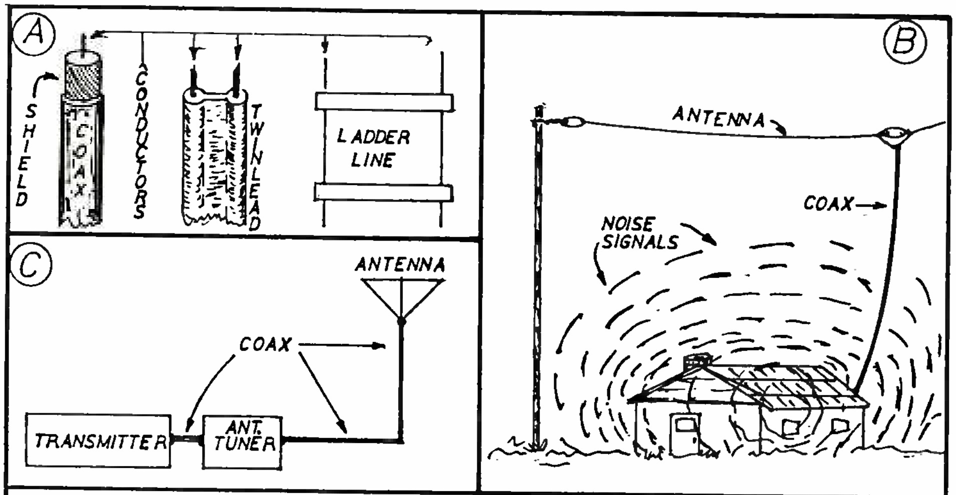

FIG.1. COMMON FEEDLINE TYPES (A), GETTING THE ANTENNA OUT OF THE NOISE (B), TUNER HOOK-UP (C).

Born to Lose?

A major factor in feedline performance is the degree of loss which a signal will undergo in traversing the line. If you must run your feeder for a long run between antenna and receiver, then you will have more feedline loss: a very short run of feedline will have relatively low loss. But what constitutes a long or short run is subjective. Sixty to 100 feet or more might be considered a long run on the HF bands (3-30 MHz). For the VHF or UHF bands a run of 20 to 40 feet can be considered long, especially at UHF.

If you are concerned about feedline loss, as you might be in monitoring very weak signals, the lowest-loss choice is generally a decent grade of twinlead (Figure 1). Or, better yet, its big brother, ladder-line, an open-wire two-conductor feeder. But even though it may be the lowest loss line available to you, twinlead may still not be your best choice due to other factors. For instance, twinlead may not work at all well if it must be run through a metal duct, underground, or too close to a metal building or roof.

Coaxial cable (Figure 1A) is not affected by such environmental factors as nearby metal objects or being run through a metal duct. It can even be run underground or under water and still function perfectly if its outer waterproof jacket is intact. So for many long lines you may want to use a very good grade of foam coax to reduce the amount of signal loss.

What Noise Annoys a Monitor?

Have you ever been monitoring some interesting DX station and noticed a loud burst of interference which seemed to happen just when an automobile or truck would drive by? Such interference is caused by sparks in the ignition system of the auto or truck. This kind of electrical noise is just one example of the sort of electrical noise that can interfere with our monitoring pleasure and success.

Unfortunately electrical noise abounds in many homes or monitoring locations due to sparking from the operation of electrical motors, appliances with relays, various kinds of lighting, certain kinds of solid-state circuitry, and other electrical devices. In other words, we live immersed in a veritable cloud of waves which can cause electrical radio interference. And, more to the point, our radio receivers live in this cloud also (see Figure 1B).

Luckily both of the commonly used antenna feedlines are resistant to some degree to this interference: coaxial cable being a great deal more resistant to it than twinlead. Thus, if we put our antenna away from the noise sources, somewhere outside the house, like on the roof, it will often pick up less noise than if it were in the house. And if we then feed the signals from the antenna to the receiver through coaxial cable, the coaxial feedline will pick up very little of the electrical noise which is generated in your house, even though the feedline passes through the area of strong noise in the house.

In this way we can often reduce noise levels at the receiver, as compared to just running a long wire — which essentially acts as an extension of the antenna — from the antenna, through the house and its noise field to the receiver.

The Perfect Match

If you are interested only in radio reception, not in transmitting, you can ignore this "perfect match" section. But if, in addition to your monitoring interests, you are a ham or a CB operator, you will be concerned with the amount of signal which traverses the feedline from your transmitter to the antenna.

When your transmitter produces a signal, this signal must get from the transmitter onto the feedline, and then after traversing the feedline it must get off the feedline and onto your antenna. In this case, you will want to make sure that your feedline "matches" both your transmitter and your antenna. Luckily we can do this fairly easily by getting a feedline with the same impedance as our antenna. For example, a halfwave dipole is 75 ohms impedance which matches 75 ohm coaxial cable or 75 ohm twinlead. Then, a so-called "antenna tuner" between the transmitter and the feedline (Figure 1C), actually "matches" the whole antenna system, i.e. antenna-plus-feedline to your transmitter's output.

But, if you are interested only in monitoring, you can usually forget the matching problem because reception limits are generally determined by how high the signal is above the noise that accompanies that signal, not on how well the antenna system is matched. Most often the quality of the coax is more important than the impedance, and 50, 75, or 92 ohm coax all often work essentially the same with an antenna in a receiving situation.

In a receive-only situation, an antenna tuner may seem to help, because you can tune it and hear the signals peak. However, without the tuner in the feedline, it is likely that the signals would be just as readable across the band with no peaking needed. In low-noise situations, an antenna tuner may occasionally help on very weak signals.

And So

So the things the monitoring enthusiast should especially remember about feedlines are:

1. If you are working very weak signals or using long runs of feedline, use a low-loss feedline such as twinlead or low-loss foam coaxial cable.

2. If you are bothered by locally generated noise, you may be able to get far enough away from it by moving your antenna farther away or higher and then using a coaxial cable to get the signal safely through the cloud of noise waves around your monitoring post.

3. If your feedline must run through regions likely to degrade a radio signal through a metal conduit, very close to a metal wall, through a damp environment, or underground, then coax is your best choice.

4. If you are concerned with transmitting from your antenna, then become familiar with the basics of matching antennas and feedlines, and of matching your transmitter to your antenna system.

RADIO RIDDLES

Last Month's:

Last month I asked: "What led Hertz to look for radio waves and thus develop the world's first transmitter, receiver and antenna?"

Well, the waves which Hertz found had been predicted through a mathematical treatment of known physical data on electrical and magnetic phenomena. Using this theoretical base, Hertz produced electromagnetic waves with a spark-coil and spark-gap. The rods which held the spark gap actually acted as antennas. He used other similar rods as a receiving antenna, and a minute sparkgap as a receiver (detector).

This work by Maxwell and Hertz laid the foundations for wireless and radio theory and is still vitally important today to physicists and engineers concerned with electromagnetic waves.

This Month's:

Can you tell me just what is "short" about a shortwave or "long" about a longwave?

Well, that's it for now. Get the answer to this month's radio riddle and much more in the next issue of Monitoring Times. Till then, Peace, DX, and 73.

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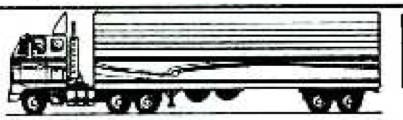
MOVING?



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