

## Learning Unit 4

### Direction Finding

#### *Objective:*

To understand the basics of transmitter hunting, a popular VHF activity.

#### *Student Preparation Required:*

A hand-held VHF transceiver or receiver.

*Our thanks to Joe Moell, K0OV. His excellent [Homing In](#) Web site was a key source for much of the information used to create this lesson.*

#### *Information:*

This Amateur Radio activity goes by different names. Some call it direction finding, transmitter hunting or fox hunting. Still others refer to it as RDF (radio direction finding) or DFing. No matter what you choose to call it, the goal is always the same: find the hidden transmitter. This can be an activity that you do by yourself (using your skills to track down an interfering signal, for instance), but direction finding is most enjoyable when it is done in the social setting, such as with a club or with a group of friends.



Like any other facet of Amateur Radio, you can buy some pretty sophisticated equipment for direction finding and spend a great deal of money doing it. But for everyday foxhunting, this is unnecessary. You can thoroughly enjoy this facet of our hobby with simple, affordable gear. In many instances, a hand-held transceiver and a basic beam antenna are all you need.

In some parts of the world, direction finding is a highly competitive endeavor. These [Amateur Radio Direction Finding \(ARDF\) Championships](#) are genuine radio *sports*! Not only do you have to be proficient in the use of your equipment, you have to be in good physical shape. The goal is not just to find a transmitter, but to find it quickly over a long,

difficult course--and on foot. For those of us less athletically inclined, the good news is that domestic transmitter hunting is a lot less strenuous!



**Figure 4.2 - Medal winners of the 2001 ARDF Championships.**

Transmitter hunting is fun no matter how you do it, but it also has a serious side. In wilderness areas, transmitter hunting is essential to finding downed aircraft, or lost hikers. Scientists have recruited Amateur Radio operators to do transmitter hunting for special applications. For example, wildlife researchers have placed transmitter tags on saw-whet and [burrowing owls](#) and have asked amateurs to report any signals they receive.



**Figure 4.3 - Burrowing owl with transmitter tag.**

### **What Equipment Do You Need?**

Perhaps the most essential piece of equipment is the most obvious: an FM hand-held transceiver, preferably a 2-meter model because most fox hunting takes place on the 2-meter band (often at 146.565 MHz). Almost any hand-held transceiver will do, *but it*

*must have a signal strength meter.* You can't accurately determine the strength of an FM signal by listening to it. You need to have a visual indication of how strong the signal actually is as you move your antenna. Many hand-held transceivers sold today offer signal-strength metering of some sort, often as a bargraph in an LCD display.

And what about antennas? Many transmitter-hunting enthusiasts use small hand-held 2-meter Yagi antennas. Others use different types of antennas such as quads. In either case, the idea is to use a highly directional antenna. You want to be able to move the antenna and quickly focus on where the signal appears to be.

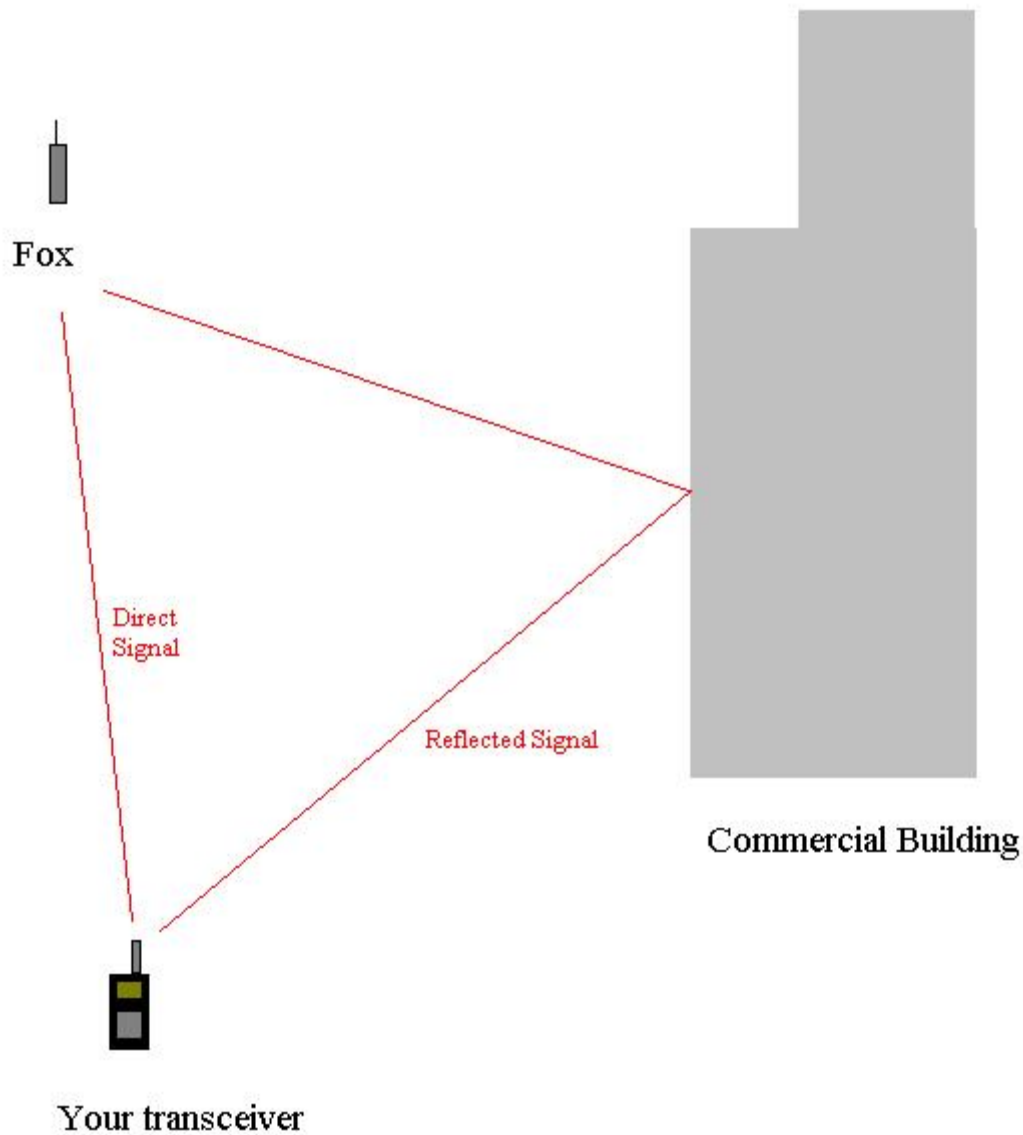
Another type of RDF instrument, called the homing or dual-antenna RDF, has its place in the arsenal of the well-equipped hunter. These units have a pair of vertical antennas, a switching circuit, and a direction sensor with some sort of left-right indicator, such as a meter or a pair of LEDs. They are easy to use: When the indicator says LEFT, turn the unit left; when it indicates RIGHT, turn right. There is a sharply defined crossover at which the unit points toward the signal source direction.



**Figure 4.4 - A typical dual-antenna RDF in use.**

### **Tracking the Signal**

Pinpointing the fox transmitter isn't always as straightforward as it sounds. If you're searching for a transmitter in a valley, the signal from the transmitter is likely to reflect off the edges of the valley and give you false readings. The same thing happens when you are transmitter hunting in an urban area with lots of buildings. It's a phenomenon known as *multipath propagation*.



**Figure 4.5 - In this example, you are receiving two signals: one directly from the fox transmitter and another reflected off a nearby commercial building.**

How do you know the difference between a signal that is coming directly from the transmitter and one that is simply reflected from another object? This is where the art and, frankly, the *experience* of transmitter hunting comes into play. You might turn your antenna in various directions, watching your meter carefully and looking at the signals to

see which appears to be stronger. It may take several readings in several locations before you can pinpoint which is the direct signal and which is the reflection.

### **The Attenuator**

Another tool that is essential to the transmitter hunter is an *attenuator*.



**Figure 4.6 - A typical attenuator**

As you get closer to the transmitter, you will find that the signal becomes so strong that you can no longer see a directional indication on the meter. By placing an attenuator in the line between the antenna and the hand-held, you can significantly reduce the receive signal to the point where it is possible to see a difference in strength as you rotate your antenna. An attenuator is really just a box with resistors and switches. As you toggle the various switches, the resistors are selected to reduce the strength of the incoming signal.

When you are *really* close to the transmitter--right on top of it--even a weak signal may be overwhelming. Some hunters disconnect their antennas entirely at this point!