

Intro to Foxhunting

Waterville Area Wireless Association

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Object: To find a hidden transmitter (the fox or bunny) either with the quickest time or the lowest mileage. Foxhunts can be on foot, such as in a park, or from a motor vehicle. Each type would use different hunting equipment. Our club has only done vehicle hunts so far. Foxes are supposed to stay out of crowded areas such as shopping mall parking lots, etc., to avoid “hunting” accidents. It is strongly suggested to vehicle hunt in pairs, with one person driving and the other doing the navigating.

Location: Hunts usually start in Winslow at the former paper company parking lot, near the Winslow fire department. This is a fairly high location so you can get your first bearing on the fox quite easily. The hunts start about 9:30 AM, so you should be there about 9:00 or so to get set up & check in. The fox usually goes to hide about 9:00 AM and is hidden somewhere in the Waterville - Winslow area. The hunters have about 2 hours to find it. The fox person will sometimes give clues on the 146.760 repeater, so hunters should monitor that frequency to keep informed.

Equipment: To locate a hidden transmitter will require creative thinking, even to the point of being coy, sly, & cunning. The signal you’re trying to find could be very weak or very strong, hidden among other commercial transmitters, or bounced & reflected off of metal objects in the area. It’s all a part of the game. For vehicle hunts you should have a directional antenna such as a 3-element beam or a 2-element quad. Take a bearing on the fox from your location, check the map for a likely hiding spot, and you’re off. Some people just drive around heading in that first general direction, while others will drive off to the side to get another bearing. They will then plot the two bearings on a map, and drive to the intersection of them. They will not be at the foxes hiding place, but should be close. Keep taking beam headings and narrow your search. When you get close to the fox, your directional antenna will not do you any good, as the signal will be too strong, and it will pin the S-meter at any heading. It’s now time to attenuate the receive signal somehow.

Foxes & Frequencies: Foxhunts are usually done on the 2M or 80M bands. We use the 2M band for our hunts. The national foxhunt frequency is 146.565 Mhz, but per a request we use 146.560 at the present time. The fox belongs to KA1C, and is an Icom HT packed into a weather case with a home brew controller and a large gel-cell battery. A ¼ wave collapsible whip antenna attaches to one end, and the unit radiates about ¼ watt. It transmits “KA1C Foxhunt” and then dead carrier for 20 seconds. The message repeats at a set interval. It has an identification label on both sides of the case so as not to alarm anyone finding it, and to identify it to the hunters. Another “Fox” is being built and it will be very small compared to this one and much harder to find. It is hoped to be hidden somewhere near the location of the first fox and be hunted on foot. The second fox’s frequency will be given out when hunters arrive at fox #1.

Foxhunting methods: As mentioned earlier, foxhunting does require some special equipment. You can buy it, or build it if you are capable and enjoy that part. I find the building to be as much fun as the hunt itself, and most of it is not that expensive to build. A 3-element tape measure beam and an HT is a good place to begin. A tape measure beam is usually made from PVC pipe and sections of an old 1” wide tape measure. It is very flexible for use around people, trees, and getting in & out of vehicles. Tape the ends to protect the eyes! You can get directional bearings on your HT’s S-meter for beginning readings. It just won’t work that well when you get in close because you will get readings even without “any” antenna. The signal will go right through the radio’s case and pin the needle/bar graph. Some method of attenuating the fox’s signal is needed when hunting in close. You can use some of the ideas on the next page to get started.

Body fade: This is a very simple technique that requires no extra equipment. Simply remove the radio's antenna & turn up the volume. Hold the radio against your body in the chest area and turn your body around in a circle while standing in place. When you hear squelch noise instead of the fox's carrier, your body is blocking the fox's signal from getting into the radio. Turning your body from side to side to find the greatest noise should place the fox directly behind you, unless there is a reflection from nearby metal objects!!

Radio in can or tube: Place your HT in a deep metal can or a mailing tube covered with tin foil. The only way a signal can enter your radio now is from the open end of the tube or can. Simply rotate the unit until a signal is heard. Aiming for the best (quietest) signal should point in the direction of the fox. The deeper the radio is shielded down in a tube, etc., the sharper your detection should be. Removing the antenna from the radio will decrease its sensitivity even more.

Listen on 440Mc: The third harmonic of 146.560Mc is 439.680Mc, and easily received on a dual band radio. Your directional antenna should still work. Would there be a difference between an antenna for 440 and 2M?? Probably, but I haven't tried it. At one foxhunt, Dennis, WX1V devised a quick & dirty 440 antenna for his HT by taking a paper clip he happened to have handy, and bending it into a U-loop. He pushed one end into the radio's BNC center connector and taped the other to the outside of the BNC jack. Very clever guy!! This is what ham radio is about.

Use a radio with a built in attenuator: Some mobile radios may have a built in attenuator. Simply turn down the signal strength as you get close to the fox. A directional antenna would be helpful.

Offset attenuator: Because a mobile radio or HT can receive a fox's signal right through the case when you get close enough to it, any directional antenna will be useless. The radio is listening on the fox's frequency of 146.560. When you get close to the fox, the signal will be strong enough to go right through the radio case with no antenna needed! Here is where an offset attenuator is helpful! This is a device that has a 1Mc crystal oscillator connected to a diode mixer. Received fox signals from your directional antenna are mixed in the diode with the signal from the 1Mc crystal. This creates sum and difference signals at +/-1Mc. The new fox signals will be at 147.560 and 145.560Mc. Simply tune your radio to one of the "offset" frequencies. When you get close to the fox that is operating on 146.560Mc, and you are listening 1Mc above or below that, the fox's signal cannot get through because your radio is not tuned to the fox's real frequency. A simple control to vary the power of the 1Mc crystal will increase or decrease the signal strength to your radio at +/- 1Mc. This is your signal attenuation control. Now connect your directional antenna to the offset attenuator, connect the attenuator to your radio, and go get 'um! Start with minimum attenuation. As you get closer to the fox, the S-meter or bar graph will stay pinned. Simply reduce the signal with the attenuator control to keep the received signal within the limits of your detector (S-meter).

WARNING!! Do not transmit through ANY receive adapter connected to your radio. It is suggested you lock out PTT on any radio with a receive adapter. Accidents can happen!!

Use a sniffer: For on-foot foxhunts, an RF sniffer would probably be necessary. This is a device much like a field strength meter except it turns a detected RF signal into an audio signal. The closer you are to the fox, the more RF signal there is to get detected, and the higher the audio frequency you are listening to in your headphones. A built in attenuator can reduce the signal from your directional antenna, usually a 2-element tape measure beam. Simply start with minimum attenuation, aim your antenna for the highest audio frequency, and walk (run) in that direction. When the signal stays at a high frequency all the time, add in more attenuation. This device is neat because you don't even have to look at the radio, just where you're walking!!

Specialized equipment: There are many special types of radio direction finding (RDF) equipment. One such device is called a doppler. A hand-held doppler uses two 1/4wave antennas placed about 19" apart on a thin board or other non-conducting material. A control box and handle are placed in the middle between the antennas. Each antenna is connected to the control box with exactly the same length mini coax. A special control circuit electrically swaps antennas at about 500 hertz. When both antennas are exactly the same distance from the fox, the audio tone, known as the doppler effect, will be cancelled. Rotate the two antennas on the handle until the audio tone nulls or quiets. At this point, both antennas are exactly the same distance from the fox, and you are pointed either directly towards the fox, or directly away from it. If there are signal reflections from metal objects, you could be both or neither! A mobile version of the doppler is also sometimes used. This unit will have four, 1/4wave antennas mounted on a vehicle. Another control box will electrically rotate (select in sequential order) the 4 antennas. Another audio tone is generated from this rotating effect, and is fed into a decoder to determine the direction the signal is coming from. This will light up an LED display with from 4 to 16 lights of a compass rose, giving you the signal direction, not counting multi-path and reflections. Dopplers only work reliably on vertically polarized signals so a doppler hunt for horizontal or 45-degree polarization doesn't work!

Where to find info: Do a web search on RDF, direction finding, fox or bunny hunting to locate technical details. A search for the tape measure beam, doppler equipment, a fox hunt sniffer, etc. will turn up more sites with info than you can imagine. There are also books available on this subject. Look up WB2HOL, K0OV, and WB6UZZ.

tape measure beam

http://home.att.net/~jleggio/projects/rdf/tape_bm.htm

fox hunting equipment

<http://home.att.net/~jleggio/projects/rdf/rdf.htm>

offset attenuator

<http://www.homingin.com/joek0ov/offatten.html>

Thoughts on foxhunting: The purpose of fox hunting is to be able to locate a signal source. It may be a weak one or several hundred watts strong. Its location could be all by itself, or it could be physically camped in between other high power signals, making RDF very difficult. If we are tracking a bootlegger, jammer, or other spurious signal, we won't have the benefit of knowing it is in a specific area, how much power it is radiating, if the signal is vertical or some other angle, etc. We will have to devise ways of finding these sly, cunning foxes with the tools we have as they hide amongst us.

Ham radio is all about fun, and fox hunting is just another way to have fun.