# Transmitter Hunting:
# Tracking Down the Fun

## *Part 1*–Excitement, suspense and intrigue await you. Find out how easy it is to become a "T-hunter."

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Every weekend, in cities and towns all across the country, ham radio operators gather on hilltops for a very special kind of contest. In cars, trucks, and vans laden with radio gear and bristling with antennas, they anxiously await a faint signal with strange beeps and squawks. There's some twisting of antenna masts, followed by a few moments with a map board and protractor. And then...they're off!

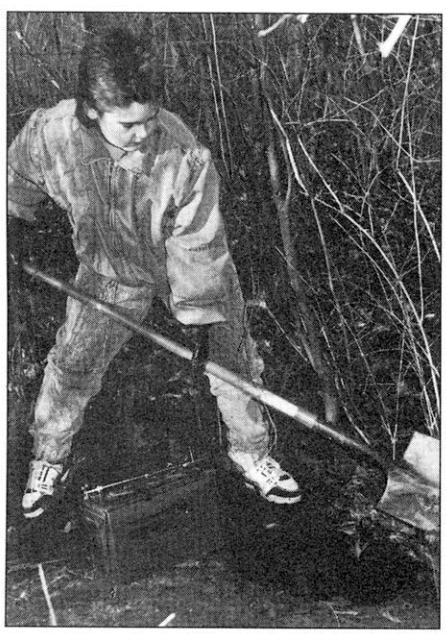
Perhaps you have seen these strange-looking vehicles in your town. If they're not cruising along right at the speed limit, they'll be at the side of the road, occupants huddled over their equipment with perplexed looks on their faces. Which way to go? Hence the historic name for this activity: radio direction finding (RDF).

Somewhere out there, one or more hams have put a transmitter on the air. When the contesters start out, they have no idea where they'll end up. Usually they don't even know what they are looking for. Will the signal source be a car by the road, or a hand-held in the bushes, or something even more unusual?

Hams have enjoyed the search for concealed transmitters since the infancy of our hobby. A "hidden transmitter hunt," as it was called then, was featured at the second National ARRL Convention in Chicago 66 years ago! Long-time hams in your club probably remember mobile hunts on 75 and 10 meters in the 1950s.

RDF contests have several different names. The sport is most commonly called "foxhunting," after the British hill-and-dale horseback events. You'll hear the term around the world, although you may encounter regional variants such as "fox-teering" or "fox-tailing." "Foxhunting" and "bunny hunting" are the usual names in eastern and central USA. In western states, it's almost always "T-hunting." The station you're looking for is the "hidden T."

In Europe and Asia, it's a foot race. Only young athletes stand a chance of capturing the prizes. Stateside, most hunts involve mobiles—cars, trucks, vans, even motorcycles. Your vehicle may take you all the way to the transmitter, or there may be a short hike at the end.



T-hunting is fun for all ages. Jason Pelaez, N8NDQ, is burying a 100-mW hidden transmitter for the Dayton Amateur Radio Association Winter Foxhunt. (*photo by David Pelaez, AH2AR*)

### Something For Everyone

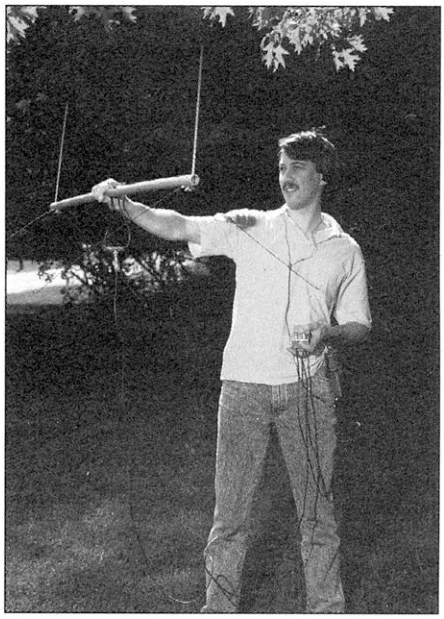
Hunting activities can be found all over the country. But as you'd suspect, most are in metropolitan areas with lots of roads and a variety of terrain, such as the suburbs of Los Angeles and Chicago.

Anyone can join in. This radio version of hide-and-seek is fun for the whole family, licensed or not. Some participants aren't yet old enough to drive, while others are in their seventies. Kids love to try sniffing[1] out the fox.

In southern California, T-hunting is more popular than in any other part of the country. From San Diego to Santa Barbara, no month goes by without at least a dozen T-hunts, daytime and nighttime. The majority are on 2 meters, but you can find them on every ham band from 50 to 450 MHz. Typical boundaries range from 75 to 2500 square miles.

On the quarterly All-Day Hunt, the boundaries encompass the entire continental US! Hunters from all over southern California set out from the top of the Palos Verdes peninsula on Saturday morning. They have tracked their way to foxes on a mountaintop in Death Valley, a hilltop near Yuma, Arizona, and a mountain pass in southwest Nevada, all more than 200 miles from the start.

[1]Notes appear on page 51.



David Pingree, N1NAS, *QST*'s Senior Technical Illustrator, shows off a simple (but effective) T-hunting setup: A 2-meter hand-held, an attenuator box and a home-brew RDF antenna. (*photo by Kirk Kleinschmidt, NTØZ*)

It's not unusual for this mother-of-all-hunts to last an entire weekend. Every team works independently; no collaboration is allowed. Any form of clue is a big no-no. A simplex frequency (146.565 MHz) has been coordinated to accommodate these wide area hunts.

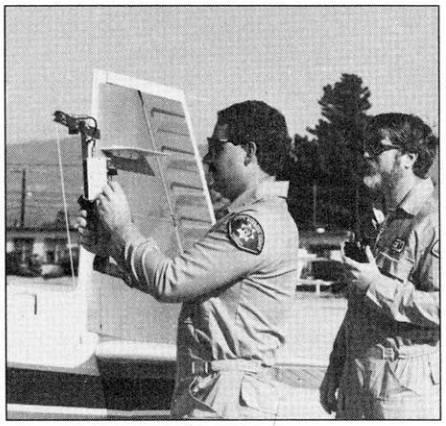
At the other end of the scale, there are events just for beginners. Boundaries are strictly limited. The hider makes short transmissions on a repeater input, taunting the hunters and urging them on. After a while, he or she gives some clues. Help from base stations with directional antennas may be allowed. The goal is to have all hunters arrive in plenty of time for a leisurely picnic or snacks at a nearby restaurant.

### Fun, But Beneficial

No matter why you got into ham radio, you'll find that T-hunting will multiply your enjoyment. "Techies" like the thrill of finding the hidden T with gear they made themselves. They relentlessly work to improve their RDF setups. Mystery buffs and dyed-in-the-wool contesters love the challenge, because every hunt is a fresh start to a new adventure. Your past performances are forgotten. It's just your team and your equipment against today's hider and the other hunters.

As a contest, a T-hunt is hard to beat. You get to meet and socialize with your competitors before and after. Usually, you'll find out your score and how well you placed before you go home. You may encounter your com-

At a T-hunt starting point, you'll see a lineup of vehicles with all manner of unusual antennas. This group is in Albuquerque, New Mexico. (*photo courtesy of the author*)



RDF knowledge can save lives. Some hams put their skills to work in local search and rescue groups. Steve Kirkman, KB6IMB (l), and Jim Frank, KB6ONC, of the Los Padres Search and Rescue Team, are tracking an Emergency Locator Transmitter at the airport in Santa Barbara, California. (*photo by Austin Rudnicki, K6IA*)

petitors along the way, with opportunities to try to "psych them out" or misdirect them. (Hence the southern California maxim: "Never trust anything said by a T-hunter or hider.")

You'll discover that your knowledge of RDF techniques is very practical. It simplifies such chores as finding a neighborhood source of power line interference or TV cable leakage. Some T-hunters put their talents to public benefit in the Civil Air Patrol or US Coast Guard Auxiliary, where they could help save the lives of pilots and boaters in distress.

### Getting Your Bearings, Simply

There's a strange signal on your favorite 2-meter frequency. Where is it coming from? How can you find it with just your hand-held or mobile rig?

You could start by driving around, watching the S meter. If the signal gets stronger, you're probably getting closer. (But maybe not. It could be that you gained altitude, or something had been blocking the path.) Some people call this the "hot/cold" method of T-hunting, because the only instrument is your meter. It says, "You're hot," or "You're cold," like the kids' game.

My name for it is the "needle in a haystack" method, and I'd only want to use it if the haystack (the hunt area) is very small. It's far better to have an indication of the direction to go. That's why it's called direction finding!

A crude way to find the direction of a signal is the "body fade" technique, so named because the blockage of your body causes the signal in your hand-held to fade. Hold your HT close to your chest and turn all the way around slowly. Listen for the null (weakest signal). This indicates the source is behind you. If the signal is so strong that you can't find the null, try tuning 5 kHz off frequency. If your hand-held is a dual-bander (144/440 MHz), try tuning to the third harmonic of the signal in the 70-cm band.

### Don't Mortgage the Rig

Just as you aren't likely to win the ARRL DX contest with 10 watts and a dipole, you won't become a T-hunting champion without acquiring some "serious" RDF gear. Military and government agencies (including the FCC) have complex and expensive

### Quotable Quotes

To give you an idea of how much fun hidden transmitter hunting can be, I asked a few of my T-hunting colleagues to share some of their thoughts and stories. As you'll soon see, almost anything can, and does, happen when you're foxhunting:

❑ *John Moore, NJ7E:* My most memorable hunt was the time my teammate got a gun stuck in his belly. The transmitter was hidden in a city park, in a green plastic trash bag under a bush. For some reason, there was a bunch of plain-clothes narcotics cops lurking around the park when we came charging in to look for the transmitter. We jumped out of the truck and went running into the bushes, which was suspicious, I guess.

My partner DFed the transmitter, and just as he got close, this cop, thinking he's found the stash of drugs, pulls a gun on him. My friend says, "I gotta get to the transmitter," and the cop's saying, "Don't touch that thing!" It was funny, because once they realized what was going on, they gave some sort of hand signal and three or four people who had been lounging around the park suddenly got up and left.

❑ *J. Scott Bovitz, N6MI:* Transmitter hunting is the only Amateur Radio competition where the "big guns" and the "little pistols" mix it up each time, and the "little pistol" is just as likely to come out on top.

❑ *Steve Heinemann, N6XFC, hunter for 3 years:* I like T-hunting because you go to places that you would not normally get to visit. I can enjoy the countryside that most people never see. My favorite time was the hunt a few of us put on at Cone Peak, at 9000 feet, in Monterey County. We had a TV up there, of course, and it was a comfortable place to be for four days. The first hunter didn't show up for a day and a half.

❑ *Clark Harris, WB6ADC, age 74, hunter for 19 years:* I've been on hundreds of hunts. I like the ingenuity of hiders when they do things like hide underground, or run the antenna up a dried weed, or on a ferris wheel, or in a phony fire plug. On one hunt, the hider loaded up a sprinkler in somebody's front yard. You had to get wet to find the antenna!

❑ *Ken Mirabella, KM6YH, hunter for 5 months:* I do it so my son (KD6AAN) and I can do something together. It's a good weekend activity for us; we can spend time together and develop our knowledge. It's a mental challenge, I think. You have to put all your skills together—it's not just talking on the radio. This involves manual dexterity in building the equipment, knowledge of plotting and orienteering. It's a fun sport. My son is the driving force. If there's a T-hunt and we don't go out, I hear about it!

❑ *Marty Mitchell, N6ZAV, ham for 30 months, hunter for 9 months:* First, there's no better way to understand 2-meter propagation than by being a T-hunter. You really learn it well. Second, I enjoy building all the projects that go along with T-hunting. I've built a Doppler and several other projects, and it's been a blast. And finally, the camaraderie of T-hunters is better than any other group I've been with. It's taken up all my free time.

If you haven't tried transmitter hunting, there's no time like the present. At least you now know what you've been missing!—*KØOV*

## The Family Car Becomes a Huntmobile

The best mount for a mobile beam allows both driver and right-front passenger to turn the mast. It includes some sort of thrust bearing at mast bottom for easy turning at highway speeds, plus an indicator for accurate bearing readout. It protects the beam-turner's hand from bad weather. Last but not least, it allows relatively large antennas to be used without violating overhang limits.†

The only mounts that meet all these requirements are hole-through-the-roof mounts and weatherproofed sun roof mounts. Few hunters start out with such creature comforts, but most eventually put their fears of lower resale value aside and get out the hole saw. Meanwhile, you'll see them hunting with simpler setups.

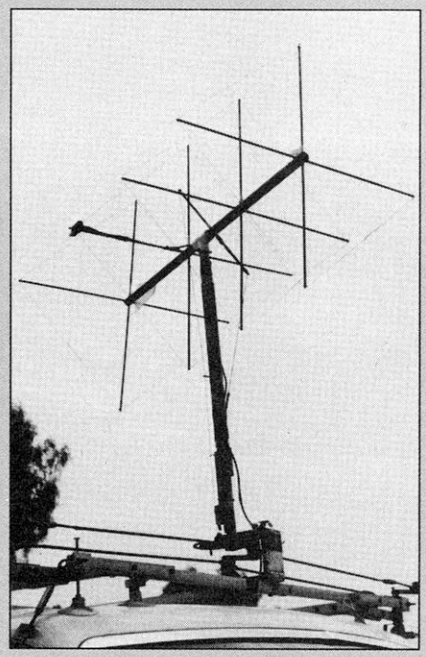
Beginners usually extend the mast through a window. Installation on each car model is different, but usually it can be supported with some sort of cup in the arm rest and with a plastic tie at the top of the window. This technique works best on cars with frames around the windows, allowing the door to be opened with the antenna still in place.

A window box is a big improvement. It provides a solid, easy-turning mount for the mast. The Plexiglas cover keeps out bad weather. A custom design must be done for each model of vehicle. Overhang statutes may limit the use of a window box to the passenger side of the vehicle.

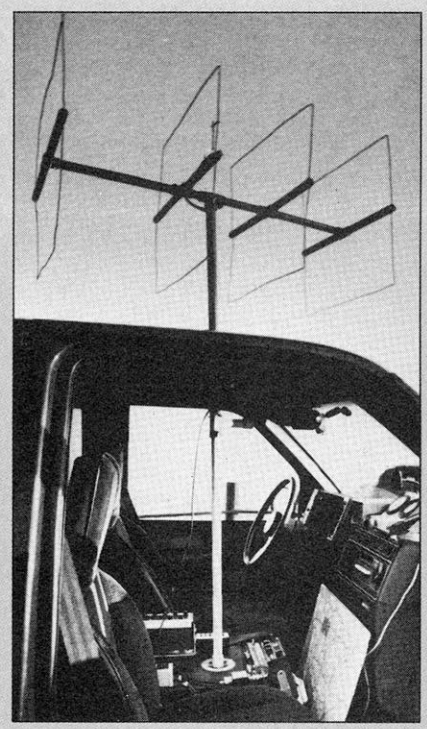
For the ultimate in convenience and versatility, cast your fears aside, drill a hole in the center of the roof, and install a waterproof bushing. Then the driver, front passenger, and even a rear passenger can turn the mast when required. I use a roof-hole bushing made from mating threaded PVC pipe adapters and reducers. When the antenna is removed, a PVC pipe cap is a watertight cover.

It is important to allow for quickly changing antenna polarization. Hiders can use any polarization on most hunts, so hunters must attempt to determine the correct polarization at the start. Hunting a horizontal signal with a vertically polarized beam, for example, causes the T's direct signal to be attenuated. In addition, reflections and scattered signals from buildings and terrain features are enhanced relative to the direct signal.

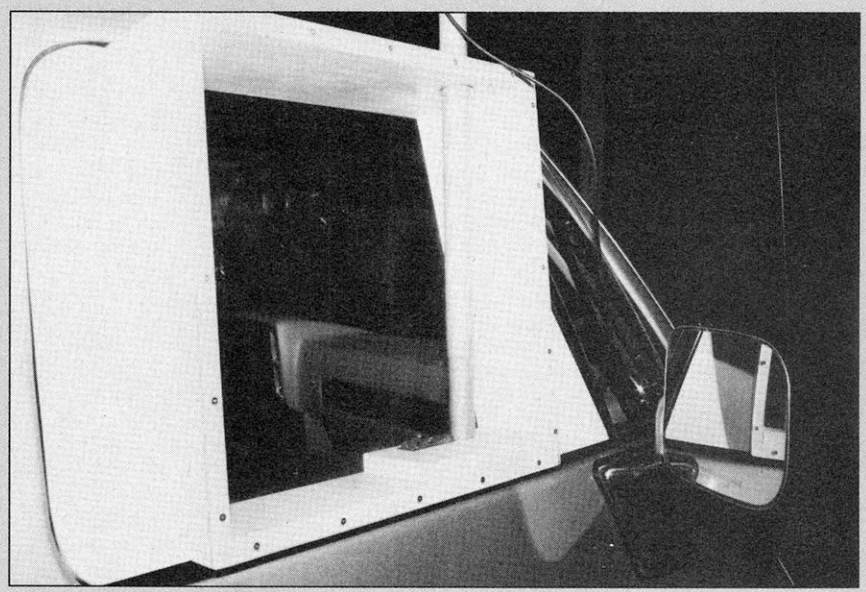
Most RDFers use some sort of slip joint at the boom-to-mast junction for rapid polarization selection. Some add strings and pulleys so they can change polarization from inside the car or by reaching out. A few use two orthogonally polarized Yagis, with separate feed lines and a switching arrangement that selects several linear (and perhaps circular) polarization modes.—*KØOV*



The mobile RDF installation of Clarke Harris, WB6ADC, features a strung-wire quad for 2 meters and a mechanical linkage that permits the driver or front passenger to rotate the mast by hand. (*photo courtesy of the author*)



The author uses this mobile setup for RDF on several bands, with separate antennas for each band that mate with a common lower mast section, pointer, and 360° indicator. Antenna shown is a stiff-wire quad for 2 meters. (*photo courtesy of the author*)



A window box allows the navigator to turn a mast-mounted antenna with ease while remaining dry and warm. No holes in the vehicle are needed with a properly designed window box. (*photo courtesy of the author*)

†California's Vehicle Code prohibits anything from protruding beyond the line of the fenders on the driver's side, but permits six inches of overhang on the right. Check the law in your state.

RDF instruments available to them. Commercial direction-finding equipment is available to hams, too, but most hunt enthusiasts I know built everything except the receiver, and they didn't have to break into the piggy bank.

Simple directional antennas work fine for foxhunting on the popular VHF bands. If you have a lightweight beam and your receiver has an easy-to-read S meter, you're halfway there. All you need is an attenuator[2] and some way to mount the setup in your vehicle. With a little bit of effort, you could be ready to go this weekend.

Cubical quads (with 3-5 elements) are the most popular mobile RDF antennas for 2 meters. In an afternoon, you can make a diamond-shaped quad with PVC pipe or a wood boom and elements made of thin wire strung on fiberglass spreaders.

Thin wire can break, so many hunters prefer the stiff-wire version of the quad.[3] Elements are #10 or #12 solid wire on a rigid PVC pipe frame. A stiff wire quad is much more tree-resistant. It can get mashed going under a willow, but it is easily re-shaped and returned to service.

Imaginative hunters have also built triangular (delta) quads (affectionately known as "turkey racks") and quads with circular elements. Occasionally you will see some other kind of home-brew gain antenna, such as a "ZL special."

Yagis are a close second to quads in popularity among T-hunters. Commercial Yagis work fine, provided that the mast is attached at a good balance point. Try to find a lightweight model, for ease of turning at high speeds.

## Next Month

Next month, in "Tracking Down the Fun—*Part 2*," we'll continue our introduction to T-hunting and explore some more advanced topics—especially RDF antennas and detection systems you can use to find even the most elusive foxes.

**Notes:**

[1]"Sniffing" is a term for close-in on-foot foxhunting. Many mobile hunts have a "sniff" at the end.

[2]An RF step attenuator between the beam and transceiver decreases the signal level to keep your S meter in usable range while closing in. See B. Shriner and P. Pagel, "A Step Attenuator You Can Build," *QST*, Sep 1982, pp 11-13. Also, plans for two attenuator styles are in *Transmitter Hunting—Radio Direction Finding Simplified*, by J. Moell and T. Curlee, TAB Books, Blue Ridge Summit, PA, pp 55-62. This book is available from your local dealer or from ARRL HQ (see the ARRL Publications Catalog elsewhere in this issue).

The attenuator kit described in the 1982 article (and recent editions of *The ARRL Handbook*) is no longer available. However, FAR Circuits is producing the eight-section attenuator *enclosure* that accepts standard size slide switches. Price: $8, plus $1.50 shipping. A three-section enclosure suitable for constructing an attenuator similar to that described by Bill Leavitt, W3AZ, in "A Line Noise 'Sniffer' That *Works*," *QST*, Sep 1992, pp 52-55 is also available for $4.50 plus $1.50 shipping. Contact FAR Circuits at 18N640 Field Ct, Dundee, IL 60118-9269.

[3]Plans for both strung-wire and stiff-wire quads are in *Transmitter Hunting—Radio Direction Finding Simplified*, pp 32-36 QST