The following article was written over 30 years ago and may have been superseded by more recent techniques.
Most of my equipment was donated to the QCARC so I am no longer in Bunny Hunting mode!
Good luck.
Ian,
VE6OB
January 6, 2021

Bunny-Hunting on 2 Meters - Ian Burn, VE6OB (Written in 1990 +/-)

A few years back there was an avid group of amateurs in the Edmonton area taking part in weekly 2-Meter hidden transmitter hunts (Bunny Hunts). The activity has decreased except in the cases of tracking down errant signals that interfere with local repeaters. This article provides the information on how to construct the necessary direction finding equipment.

The equipment that became fairly standard consisted of a four element quad, an attenuator, a field strength meter ("sniffer") and a 2-Meter rig with an S-Meter. A remote dash-mounted S-Meter, was also used by most participants.

Our hidden transmitter usually consisted of a 10 watt unit with a timer that allowed one minute of transmit time followed by three minutes of quiet. There was no audio on the signal other than periodic CW identifier. A radio controlled remote start/stop capability was also included. This package was built by and still belongs to Peter Morrison, VE6PM.

All hunters would meet at a pre-determined location and wait for the start signal from the Bunny. A 1 1/2 hour time limit was imposed along with the unwritten rule that the Bunny could not hidden in areas of dense traffic (for obvious safety reasons).
Many amusing tales can be told of the previously mentioned transmitter or modified "handhelds" being hidden near the top of lamp standards, buried in ravines or even located in a parked taxi using the taxi's existing antenna. The sight of six to ten cars, all with miniature rotating clothes lines, caused many a bewildered head to turn!

In terms of equipment, we used the following as the initially with each individual adding his/her secret embellishments.

Four Element Quad

Our concept for this antenna came from WA6TEX. It is designed for good directional characteristics rather than maximum gain / best match. However, I use one as my base station 2-Meter antenna with good results. Over 20 bunny-hunting quads were built at a workshop at my QTH in 1982. This approach allowed us to order the components in bulk. Bruce Smith, VE6BS, and I also built a series of jigs to assist in the construction.

Ideally the spreaders should be made of quarter inch fiberglass rod or something of similar strength. This becomes self evident as one crashes through dense bush in the final attack on the prey. If quarter inch dowel spreaders and a broomstick boom are used, greater care will be necessary.

The boom is 28 inches long and made of one inch plastic pipe or wooden dowel. The hole spacing is as shown in Figure 1.

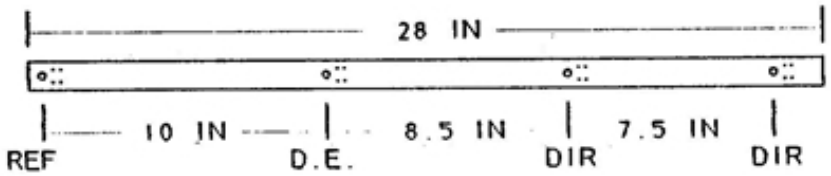

Figure 1

The spreader lengths are as follows:

Reflector (2 req'd) - 30 inches with 1/16 inch diameter holes located 1/4 inch from each end.

Driven element (2 req'd) - 29.5 inches with 1/16 inch diameter holes 1/4 inch from each end. For one spreader only, place a second 1/16 inch hole at 1/2 inch from one end. This will become the feed point.

Directors (4 req'd) - 28 inches long again with 1/16 inch holes 1/4 inch from the ends.

Fasten the spreaders to the boom using whatever method you find handy. We used rubber bands made by cutting 1/4 inch slices of bicycle inner tube. These have held up for seven years! One rubber band is necessary for each spreader if you choose this method (Figure 2). The driven element spreader with the two holes in the end should be in the horizontal position.

Wire size for the four loops is not critical however be sure to remove any insulation at the point where each loop (other than the driven element) connects to itself. Solder these connections. The driven element is strung as an open loop starting the wire at the 1/16 inch hole located 1/2 inch from the end of the driven element spreader that has the extra hole. The loop will end at the same spreader but in the hole closer to the end (Figure 3). Be sure that they do not short out.

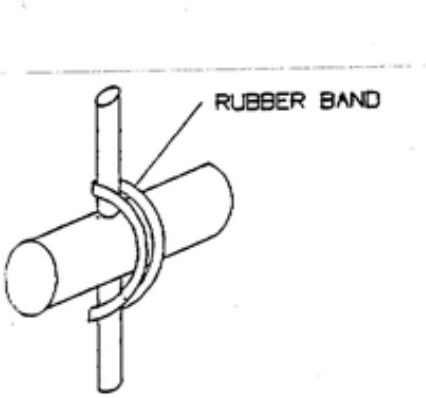

Figure 2

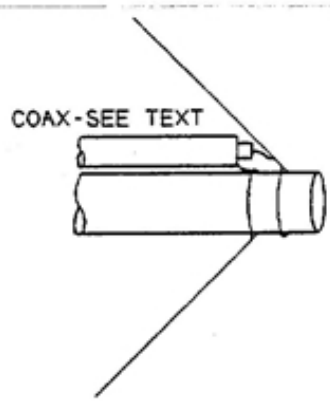

Figure 3

The feed method is a little different and requires some care. Start by selecting a suitable length of RG 58 coax, probably ten feet or so. At one end attach the type of connector that you will use with your equipment. BNC connectors are recommended since equipment will be interchanged frequently during a hunt. At the other end prepare one inch of free centre conductor and, one inch of braid for connecting to the driven element loop BUT don't connect it yet! The matching method used consists of placing a balun stub at the end of the coax next to the quad feedpoint. This consists of a 13 1/4 inch length of shield from a piece of RG 8 coax slipped over the outer insulation of the R 58 and carefully connecting it to the RG 58's shield at a point 13 1/2 inches back from the feed point (Figure 4). This "extra shield is NOT connected at the feed point end. Once in place, the shield is firmly taped with electrical tape to prevent a shorting out at the feed point end.

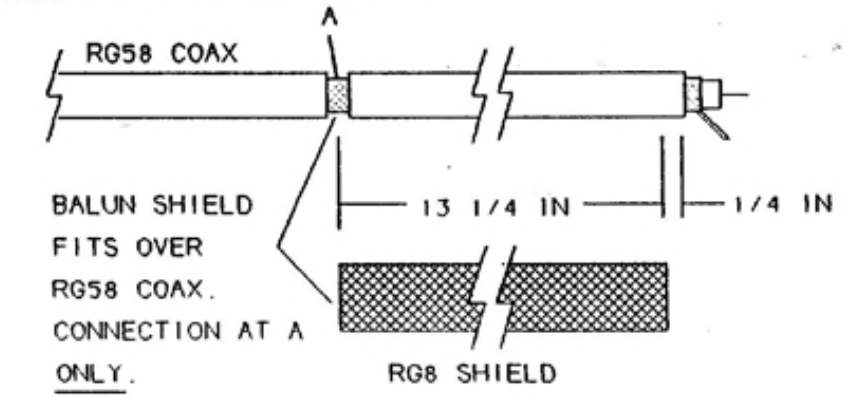

Figure 4

The feedline is now connected to the driven element, ensuring that the ends do not touch. If everything is connected properly, an SWR of less than 2:1 should be possible on transmit at 146.5 MHz. When used on receive with a weak signal the directional characteristics become apparent. There will be sharp nulls on either side of the quad and a good front to back ratio. Many a hunter has forgotten to check the front to back ratio and headed in the opposite direction!

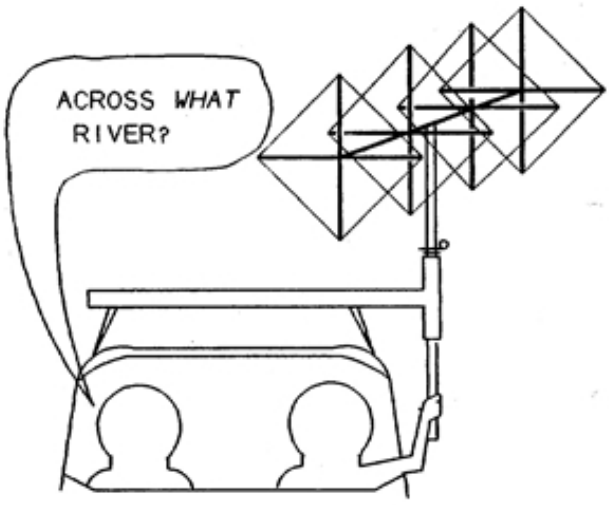

Figure 5

The antenna can be mounted on a short mast and this in turn can be fastened to a car roof rack so that the PASSENGER can rotate the antenna, watch the S-Meter and adjust the attenuator as driver CONCENTRATES ON DRIVING (Figure 5). The antennas built at our workshop used 1 inch PVC pipe for the boom and the mast with a tee connector at the centre of the boom.

Below is information provided by Martin BergerVE6ARA at the NARC Hamfest in 1995 on how to optimize the spacing for gain rather than directional properties.(Not part of original VE6OB article)

Element lengths
Reflector length 85.5 inches
Driven element length 81.0 inches
Director 1 77.0 inches
Director 2 77.0 inches

Spacing
Reflector to Driven element 16.0 inches
Driven element to 1st Director 13.0 inches
1st director to 2nd director 13.0 inches

Wire 14 or 16 ga.
Direct RG58 coax feed.
Measured front to back ratio is 16 db

Attenuators

The directional antenna and an S-Meter are rarely of much value by themselves in tracking down a signal. Once the input signal is strong enough to saturate the S-Meter, the directional properties of the antenna are lost. For this reason it is necessary to reduce the input signal to the rig using a simple attenuator. The unit on page 25-43 of the 1985 ARRL Handbook is ideal. Since you will not (until you forget) be transmitting through the attenuator, it is not necessary to match impedances and a simple 5K potentiometer in a well shielded box will also work.

As you get closer to the signal source, additional attenuation is switched in so that the S-Meter always stays below full scale. When you reach the point that even with maximum attenuation you have a saturated S-Meter, you are getting close. At this point you are probably ready to start on foot using your "sniffer". There will also likely be a river beside you and the antenna is pointing to the other side!

"Sniffers"

This is the area of black magic and great secrecy. A sniffer a simple field strength meter that, in our case, is tuned to 2-Meters. It must be sensitive to a fairly weak signal, yet usable with a very strong signal.

The following sniffer circuit (Figure 6) was developed in 1982 Gerhard Oberforcher VE6AQO with minor modifications by Les Abbott VE6OG and myself. A workshop was held and 12 were made and tested on a Saturday.

The key item is a Hamtronics 2 Meter pre-amp (Model P30k-144) which was ordered in kit form from the U.S. The rest of the circuit consists of front end attenuation, rectification and a meter amplifier.

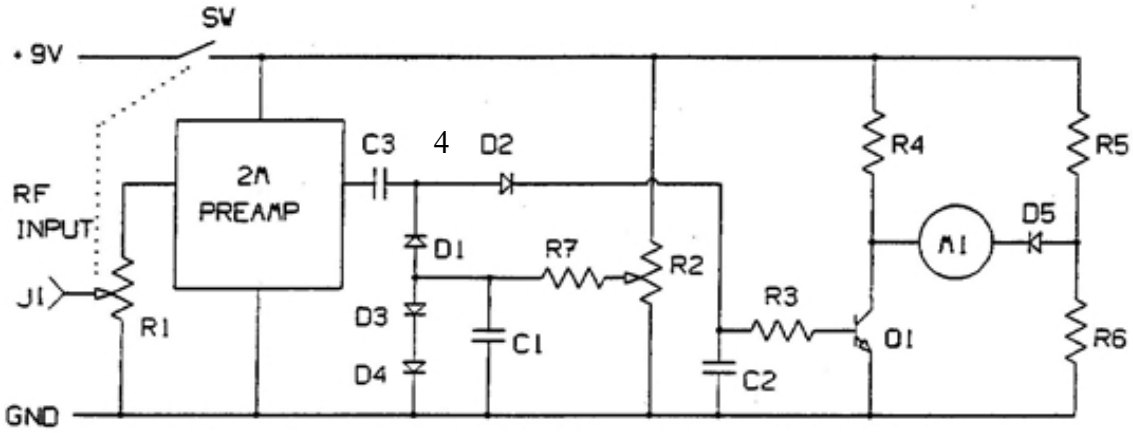

Figure 6

Sniffer Parts List

R1	1K linear pot c/w switch
R2	l00K linear trim pot
R3	10K 1/4 watt
R4-R7	4.7K 1/4 watt
Cl, C2	0.1 mfd
Dl, D2	Schottky Barrier Diodes (RS 276-1124)
D3-D5	Miniature silicon switching diodes
Q1	2N3904
Ml	0 - 50 microamp meter (RS 270-1751)
C3	3.3 pf
Box	Hammond 1411N case
Battery	9v Alkaline
J1	BNC Connector
Pre-Amp	Hamtronics Model P30K-144

Adjust R2 for a zero meter reading with no input signal. Diode D5 can be omitted for greater sensitivity but meter adjustment becomes more critical and thermal drift more apparent. Considerable time has passed since the above parts were obtained and the availability or parts numbers may have changed. The basic concept, however, has not.

~~Conclusion~~

Using the above equipment we have had a lot of fun over the years. We have also located a number of amateur transmitters that been left on transmit continuously, usually because of carelessness or component failure. We have also located a number of commercial installations that have been inadvertently been transmitting on 2-Meters, usually due to equipment failure. One such case was a scanning telemetry unit that put out a two second signal burst every few minutes. I regret that I have not been active in this area lately but my equipment is still read: to go at a moment's notice. Good hunting!