

# Radio Direction Finding Antenna for VHF

by **FN64** on July 31, 2007

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## Intro: Radio Direction Finding Antenna for VHF

I needed an antenna to chase down a noise source.. After much ado I settled on some plans I found on the web, added my own modifications & took some photos along the way. It has a cardioid pattern with a deep null on the rear. I made a few minor changes to the original design but these were mostly for structural integrity, looks & ease of assembly.

This antenna will DF noise or signals in the area of the 2 meter amateur radio band..(144 - 148 MHz). I have tried it as high as 155MHz with good results. It is flexible so it won't break or bend as will most commercial directional antennas. It also tunes well on the 2 meter band.

You will need the following:

- # A tape measure with a 1 inch wide steel tape. (Or a replacement tape)
- # 3 PVC crosses for 1/2 inch pipe.
- # ~3 ft section of 1/2 inch PVC pipe.
- # 2 stainless hose clamps for 1 1/4 dia hose.
- # Electrical tape.
- # Soldering iron & associated tools.
- # 6 feet or more of 50 Ohm coax & connector (BNC, PL-259, SMA...)
- # Scissors or small shears to cut steel tape.
- # Hack saw or tubing cutter to cut pipe.
- # A Dremel tool is handy but sandpaper will do.
- # You will need a receiver that has an "S-meter" to locate the direction of the signal.

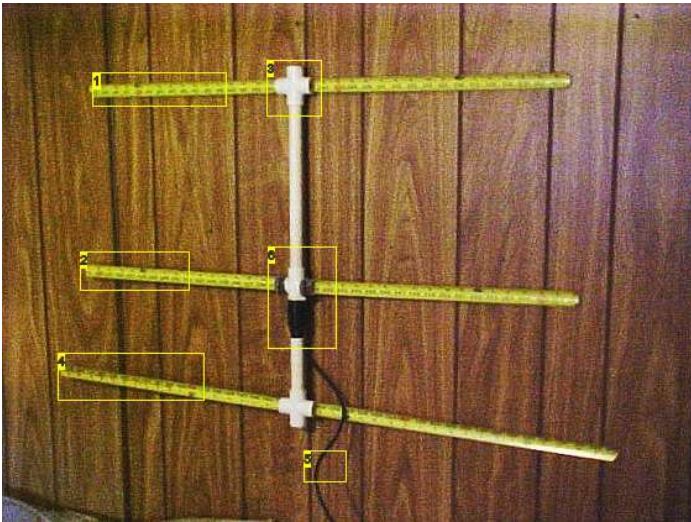


### step 1: Cutting the tape measure

Remove the tape from the tape measure and use the tail end for your elements.. This part sees much less wear & tear than the first 10 ft or so. Measure your elements to the following dimensions.

- # Reflector: 41 3/8 inches
- # Driven element: 35 1/2 total.. cut in half for 2 @ 17 3/4 inches
- # Director: 35 1/8 inches

These can be cut with regular scissors.. BE CAREFUL.. The ends will be quite sharp. I cut all ends with 45 degree angles. Some folks have taped or dipped the ends in Plasti-Dip but I just sanded mine a bit to take the sharp corners off.



**Image Notes**

1. Director 41 3/8 inches
2. Driven Element. Two pieces 17 3/4 inches.
3. 1/2 inch PVC cross.
4. Reflector: 35 1/8 inches.
5. 50 Ohm coax feedline.
6. This "cluster" will be explained in detail as we go along!!



**Image Notes**

1. Sand these corners

**step 2: Assembling the Reflector & Director..**

Mark the center of these elements with a sharpie & slide them through a cross till they're centered. You might need to sand the "stop lip" inside the cross a bit to make this easier.

Cut 4 pieces of PVC pipe about a half inch long. These "keepers" will hold the tape centered in the reflector & director crosses. Sand off any burrs.

I used a "C-clamp" to squeeze the little "keepers" into the crosses but a vice would probably work as well or better.. They can also be tapped in with a hammer if you're careful & use a block of wood or dowel as a driving pin. *Make sure your tape stays centered.*

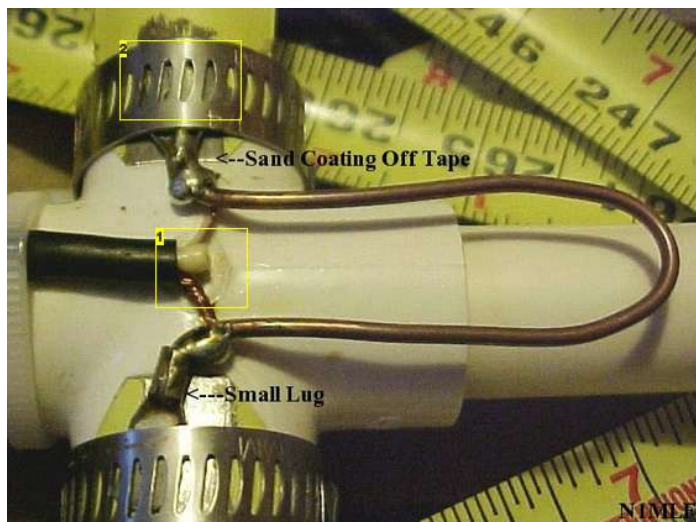


**Image Notes**

1. A little "crinkling" can be expected. This will be a real snug fit so keep an eye on the center mark on your element so it stays in the center of the cross.

### step 3: The Driven Element

The feedline is connected to the driven elements directly through a "hairpin match" This was the original concept and it works well so I followed suit. Cut a piece of solid wire (14 gauge or smaller) 5 inches long. Form this into a shape resembling a tall "ohms symbol". Strip 1 1/2 inches of cover off the coax & separate the core. Solder the coax to the hairpin as shown in picture.. Trim the excess coax wire close to the solder. The ends of the hairpin need contact with the elements but soldering is extremely difficult on the steel tape. I crimped & soldered some small connector lugs to the ends of the hairpin and these are contacting the steel under the hose clamps. The tape measure sections need to be sanded to remove any coating at the contact area.



#### Image Notes

1. A dollop of silicone sealant would be nice here to keep moisture out of the coax. I'll fix that tomorrow ;-)
2. Everything here is held tightly together by the hose clamps.

### step 4: Setting the Element Spacing

Cut a piece of pipe 11 inches and another at 7 inches. Sand any burrs from the ends. These will set the spacing nicely.. I didn't "glue" anything.. they're held together by a tight fit.

The 7 inch section goes between the reflector and driven elements.

The 11 inch section goes between the driven elements and the director.



#### Image Notes

1. Reflector and Cross
2. 7 inch pipe section
3. 11 inch pipe section.
4. Director and cross
5. Feedline.

## step 5: Tweaking, Tuning & Using

Not only will this antenna function well as an RDF unit, it will also tune well for transmit on 2 meters.

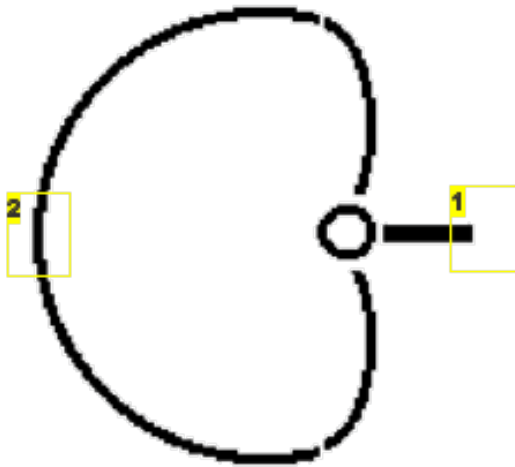
The SWR is adjusted by tweaking the distance between the driven elements. Mine is set at 1 inch for a 1.3:1 match.

The radio I use is an old Realistic HTX-202.. I was getting some RF on the feedline causing the rig show an error message. I wound 7 turns of the coax around the pipe that connects to the reflector & secured it with wire ties and electrical tape.. That cleared the problem.. Depending on your use, you may or may not need this step.

Using the antenna for RDF is easy.. USE the BACKSIDE to find the NULL. (second photo). The front lobe has quite a wide beam width but the null on the cardioid pattern tells you much better especially when you get closer to the source. Watch your S-Meter as you swing the beam from side to side. The weakest signal strength indicates the direction.

If you bought a 10 foot section of pipe, the remainder can be used as a mast of sorts. Just insert the end of it into the cross that holds the driven elements. With 6-8 feet of coax this allows plenty to reach the rig.

This antenna folds up nicely to fit behind a car seat or for storage.. (third photo)

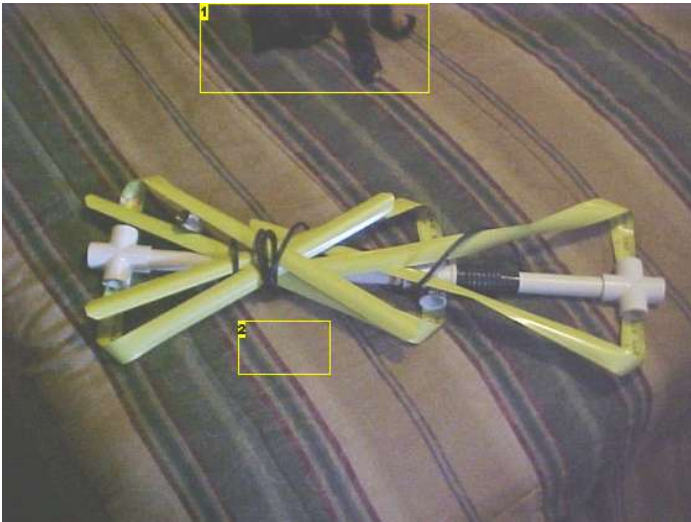


### Image Notes

1. For transmit use.. adjust the distance between the inner ends of the driven element. Mine was best at one inch..yours may differ a little.

### Image Notes

1. This is the Reflector end with the deep "null". This end will indicate the direction towards the signal. Look for the "lowest" signal strength.
2. This would be the pattern on the Director end of the antenna. This being the stronger side is used for 2 way communications.



#### Image Notes

1. Worthless Cat.. Not necessary in building the antenna but great to torment :-)
2. Folds rather nicely for storage.

#### step 6: Final Thoughts.

This wouldn't be complete without credit where it's due.

Joe Leggio - WB2HOL started this whole concept and I encourage you to check out his methods and explanations as well as his other RDF projects.

Joe's Design

So there you have it. I don't have a cost rundown but 10 bux is a reasonable guess.. Some of the parts were junkbox items. Hope you enjoyed my first go at Instructables 73..FN



## Related Instructables



Increase and extend the range of a USB Bluetooth dongle! by Nottslad89



Create your own radio broadcast from an Itrip by Inmate1440



Medium Wave AM broadcast band resonant loop antenna. by manuka



Icom Handheld Dual-Band Radio Mod by Blastwavelabs



Make a simple AM transmitter by bmlbytes



Mod a Ricochet radio modem to take an external antenna by Myself



Upgrading a car radio (for a Toyota Corolla) by abizar



Listen to Shortwave Broadcasts on an AM Radio by Phil B

## Comments

15 comments

[Add Comment](#)



**welder guy** says:

this will work for a 2meter 2watt ht right? cool idea and i think i'll build it. 73's, KC2VDM

Oct 30, 2009. 10:55 AM [REPLY](#)



**FN64** says:

It will work fine for tx as well as rx. I wouldn't recommend anything over 10 watts unless you get enough feed line to be away from the near field rf. I don't know how much power it will handle before a meltdown so you're on your own on that one.

Good Luck & 73  
N1MLF ..fn64.. Jon

Nov 2, 2009. 11:13 AM [REPLY](#)



**KI6WTX** says:

can it be used as a transmitter and well, for 5 watts (what my hand held can put out) it sure would be useful when im just out side of a repeater....

Jun 4, 2009. 6:15 PM [REPLY](#)



**FN64** says:

Sorry for the late reply OM.. been out of the country..

YES.. it works well. thats the reason for the hairpin match and the choke coil to keep rf off the braid.. I've run 25 watts without problems but when I tried 50 it caused errors in the rig due to near field RF. Should be a great boost for a 5 watt HT..

Thanks for the comment  
N1MLF...Jon

Jul 5, 2009. 5:11 PM [REPLY](#)



**KI6WTX** says:

ok, do you think that it would work on 50watts?

Jul 6, 2009. 12:25 PM [REPLY](#)



**Misterfixit** says:

KI4PSR, Dave, with the Williamson County ARES group made up a pile of these kits and we assembled and used them for our EmComm Fox Hunts. They work great as a transmitting antenna. I am preparing to build one as a test bench to see just how many watts it will dissipate before melting down. All Hail KI4PSR!

73's Dave N4CVX

Jun 11, 2009. 5:03 AM [REPLY](#)



**ravingking2008** says:

ha i used a tape measure to make a di-pole bac in the pirate radio days. cracking idea

Jan 13, 2009. 7:53 PM [REPLY](#)



**ignition** says:

great instructable, stumbled across it before i was a ham, and was recently looking for a collapsible Yagi, remembered this, and i'll be building myself, and probably another buddy one for emcomm purposes.

73 from  
KC9OCD

Oct 22, 2008. 8:26 PM [REPLY](#)



**winston\_smith** says:

In the Image for step 1, shouldn't the reflector be the long element and the director the short one? I believe you have the tag's reversed..

Nov 8, 2007. 11:59 AM [REPLY](#)



**n0ukf** says:  
Looks like he must have fixed those tags by now.

Mar 7, 2008. 3:49 PM [REPLY](#)



**hailster** says:  
I made one of these about a year and a half ago. They do work pretty well for camping or any other temporary set-up.

Sep 4, 2007. 12:33 PM [REPLY](#)

At the end of the boom (reflector side) I added about a 6 inch piece of PVC that then joins into a 90 degree bend. I then added a 1 foot piece of PVC that connects into the 90 degree bend on one side and is not connected to anything on the other. This makes a great handle for the antenna and works very well for securing the coax for storage.

Also when using it for RDF keep in mind that cross-polarization drops the signal about 15-20 db. USE THIS TO YOUR ADVANTAGE.

KC9FSH



**ve2vfd** says:  
I made one of those 10 years ago and still use it to this day!

Jul 31, 2007. 9:30 PM [REPLY](#)

I made it as a backpacking directionnal antenna and between that and my roll-up j-pole I had all I needed for my 2m portable.



**rocketbat** says:  
oh wow! just what ive wanted to make for a while now!  
thankyou for posting!  
a "+" and faved!

Jul 31, 2007. 8:01 PM [REPLY](#)



**HamO** says:  
Excellent instructable, well done pix. Thanks for putting it on this site.

Jul 31, 2007. 6:39 PM [REPLY](#)

BTW I need FN64 on 2 and 6 meters.

I'm in EM20



**FN64** says:  
Hey HamO..  
Tnx for good rating. I've been lurking here for awhile & figured it was time I gave it a try.

Jul 31, 2007. 6:56 PM [REPLY](#)

We might get a lift on 6 sometime but a peek at the map sez 2 would require the birds. No AZ/EL right now.. that's another project ..but have 3 ele on 6 up @ 30-35.