



## Fractal Magic DIY HDTV Antenna

by [tigers58](#) on January 2, 2013

### Table of Contents

Fractal Magic DIY HDTV Antenna .....	1
Intro: Fractal Magic DIY HDTV Antenna .....	2
Step 1: Gather The Needed Materials .....	2
Step 2: Download and Print Antenna Template .....	3
File Downloads .....	4
Step 3: Punch Holes & Cut Slots In Poster Board .....	4
Step 4: "Lace" The Wire Onto The Poster Board .....	4
Step 5: Connect Lead-in Wire or Coax To Antenna .....	5
Step 6: Lash Lead-in To Poster Board .....	5
Step 7: Insert Tabs A & B Into Slots A & B .....	5
Step 8: Attach Matching Transformer To Lead-in .....	6
Step 9: Personalize Your Antenna .....	6
Related Instructables .....	7
Advertisements .....	8
Comments .....	8

## Intro: Fractal Magic DIY HDTV Antenna

After reading an article about the use of fractal mathematics in the design of cell phone antennas that have incredible bandwidth in spite of their extremely small size, I began to experiment with using a very simple fractal pattern, the Koch Snowflake, as the basis for an easy to build indoor HDTV antenna. The result of that experimentation is presented here as what I believe to be not only the best DIY HDTV antenna, but the also the simplest to build, not only in terms of the materials needed, but also in the labor required. So, with that in mind, let's get started.



### Step 1: Gather The Needed Materials

Things you will need:

1 - A piece of poster board that measures 15-3/4" x 6" (400mm x 150mm). A 24" x 28" sheet of poster board, enough to make six of these antennas, can be purchased for about a dollar in stores selling arts and crafts supplies. This is the same material used to make cake boxes and the gift boxes used for shirts and blouses.

2 - A pattern for making the antenna (download the pdf file).

3 - Some Scotch Tape.

4 - Scissors

5 - A map pin or other sharp pointy tool for punching holes in the poster board.

6 - 3.2 meters (10-1/2 feet) of small diameter (22 or 24 AWG) copper or aluminum wire. A 100-foot roll of 22 or 24 AWG uninsulated copper wire can be purchased at almost any hardware store for less than \$5.00; however, there are many other sources for copper wire, e.g. the field windings of burnt out or discarded electric motors. At the time of this writing a package containing 30-feet of suitable aluminum wire can be purchased at Hobby Lobby for \$1.99.

7 - A pair of small crimp connectors and pliers or other tool for crimping the connectors.

8 - A length of 300 Ohm Twin Lead antenna wire and a matching transformer with screw terminals\*, or...

9 - An in-line 300 Ohm to 75 Ohm matching transformer\* and a length of 75 Ohm coax cable.

Misc. - A screw driver for attaching 300 Ohm lead-in wire to the matching transformer and a craft knife, or other knife with small sharp blade, for cutting slots A & B into the poster board. .

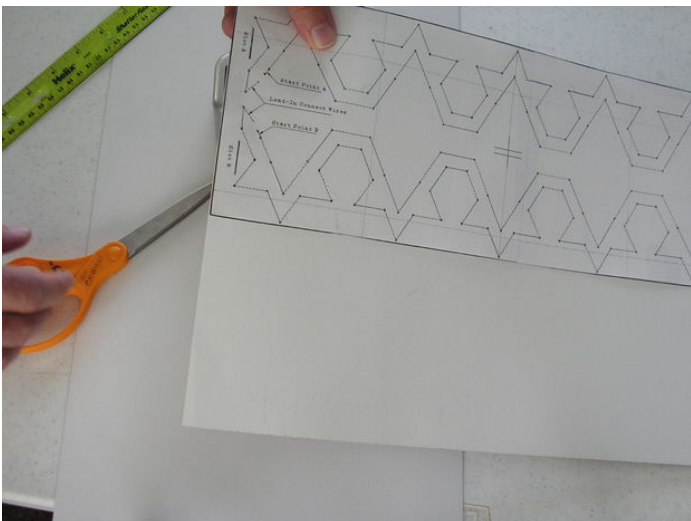
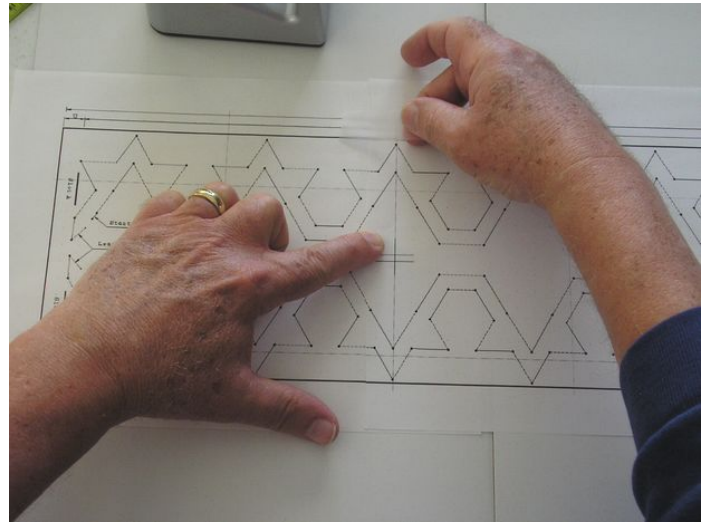
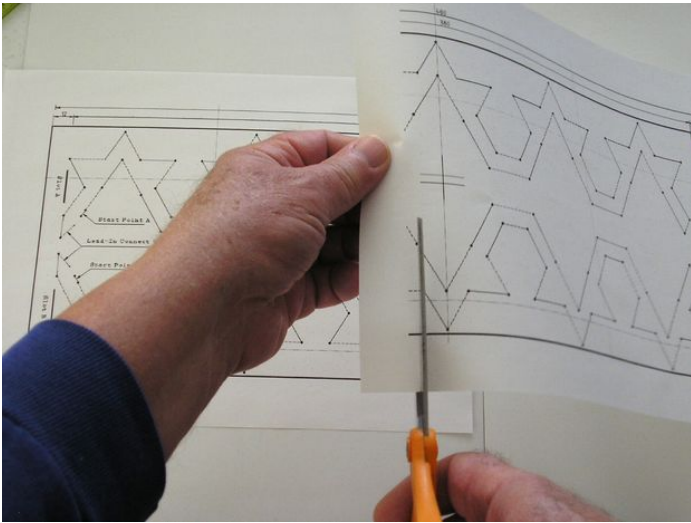
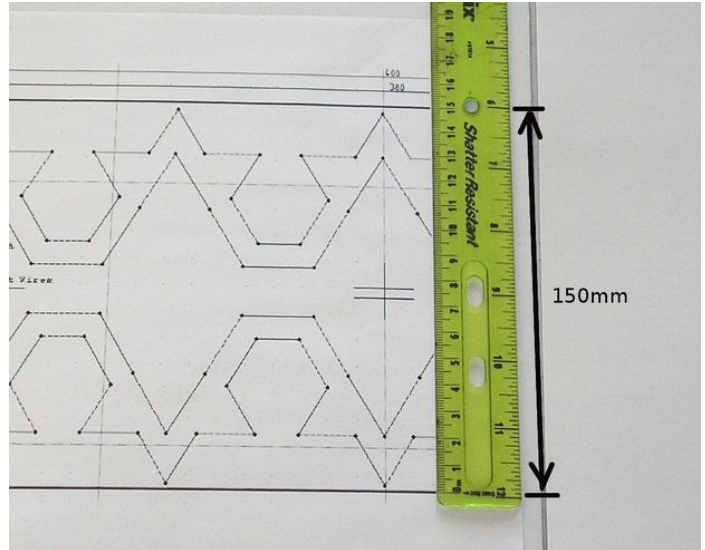
\*Note: I'd had excellent results with eliminating the 300 Ohm Twin Lead antenna wire and the matching transformer and attaching the center conductor and shielding of RG-6 coax directly to the separate sides of the antenna. The use of the 300 Ohm lead-in wire and matching transformer make connecting the antenna wires to the coax cable an easier task, but they do not seem to be required to match the impedance of the antenna to that of the 75 Ohm transmission line.



## Step 2: Download and Print Antenna Template

Print out one copy each of Part 1 and Part 2 of the antenna template. Make sure your printer properties are set to print the images at 100% rather than "Fit To Page" or at some reduced size. If you are not sure of your printer settings, print only Part 1 of the template and check the side-to-side and top-to-bottom distances on the printed sheet with a ruler before printing Part 2. Note that the measurements on the antenna template are in millimeters, not inches. Trim the left hand edge of Part 2, lay it on top of Part 1 being careful to align the pattern on both parts, and tape the pages together to form the complete template.

Trim the excess paper from the edges of the template. At one corner of the poster board, align two of the template edges with two edges of the poster board and tape the template to the poster board. Cut the poster board along the edges of the template and re-tape the template to the poster board along the edges where the tape was cut.



## File Downloads



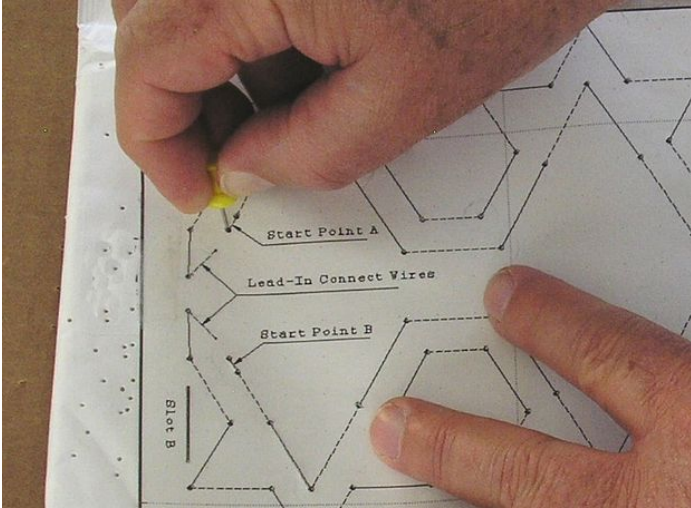
The Pattern.pdf (89 KB)

[NOTE: When saving, if you see .tmp as the file ext, rename it to 'The Pattern.pdf']

### Step 3: Punch Holes & Cut Slots In Poster Board

Using a couple of layers of shipping carton cardboard as padding, use the map pin or other sharp pointy object to punch a hole through the poster board at each of the locations marked on the template with a dot at the points of the wire pattern. Using an X-Acto knife or other small sharp blade, cut through the template and poster board to form slots A & B.

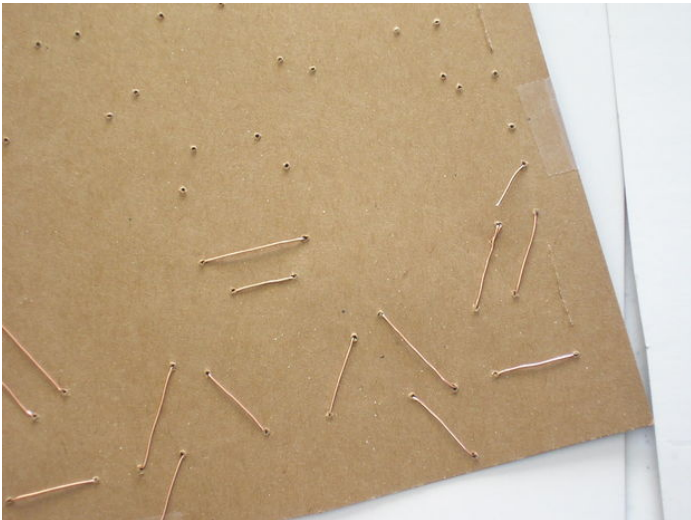
After punching all of the holes and cutting the slots, remove the pattern from the poster board.



### Step 4: "Lace" The Wire Onto The Poster Board

Measure and cut a piece of wire that is 1.6 meters (5' 4") in length, and starting at the hole marked "Start Here" on either side of the template, insert about ¼ inch of wire into the hole and fold it sharply so that it stays on the back side of the form. Then following the pattern on the template, alternating between front (solid lines on template) and back (dashed lines on the template) sides of the poster board, "lace" the wire around the wire pattern. Take your time doing this, being careful to not let the wire kink as you pull it through the holes. Keep the wire as tight and straight as possible between the holes. Lacing the wire from one hole through the next takes less and less time and gets easier as the amount of unlaced wire decreases. When the wire has been passed through the last hole in pattern, trim the end of it so as to leave about ½ inch sticking out the back of the poster board – one side of the lead-in wire will be connected to this end-wire. Repeat this step on the other side of the poster board.

Tip: Tape down the end-wire of the first half of the antenna to the back of the poster board so that you don't stick yourself with it while wiring the second half of the antenna.



### Step 5: Connect Lead-in Wire or Coax To Antenna

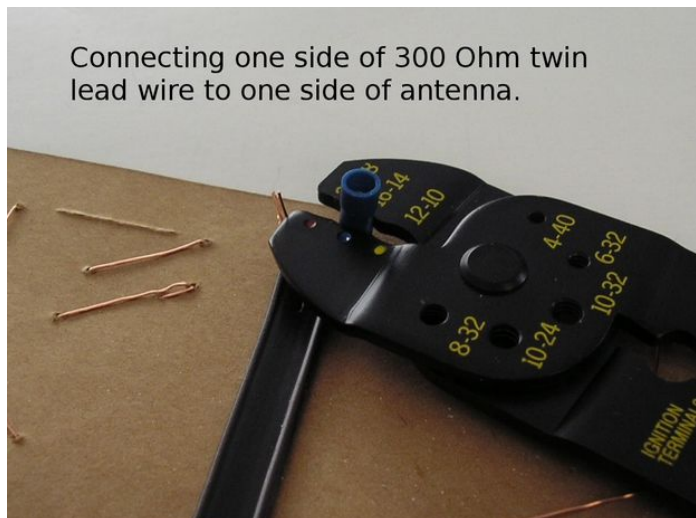
There are a number of ways in which the lead-in wire, coax cable or in-line matching transformer can be attached to the antenna. The methods I have used are listed here, and as far as I can tell judging by the performance of the antenna, all of these work equally well. So, just choose the method that best matches the tools and materials you have at hand. First strip about ¼ to ½ inch (6 to 12 mm) of insulation from both wires of the 300Ω twin lead, from the braided shielding and center conductor of the coax, or from both leads of an in-line matching transformer. Then use one of the following methods to connect each side of the lead-in to the antenna.

**Crimp Connectors:** Insert one side of the lead-in and one of the antenna end-wires into one crimp connector and crimp with a pair of pliers or crimping tool. Then repeat this procedure to connect together the other side of the lead-in and the other antenna end-wire.

**Soldering Iron:** Twist together one side of the lead-in and one of the antenna end-wires and solder them together. Then repeat this procedure to connect together the other side of the lead-in and the other antenna end-wire.

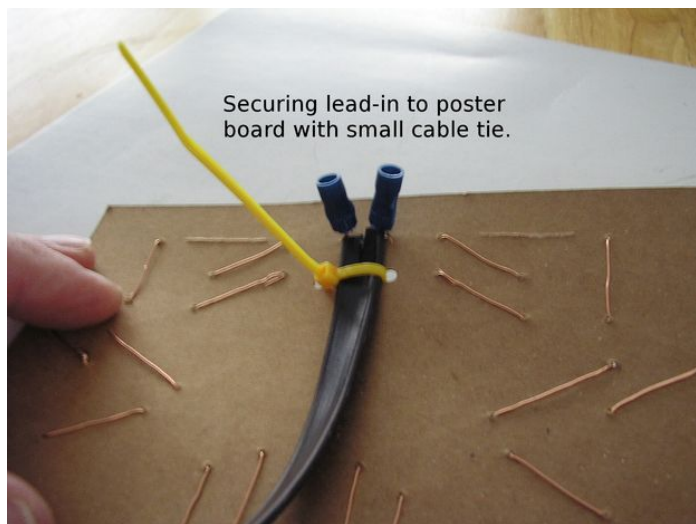
#### A Pressure Connection Using Small Screws, Washers and Nuts

Punch two holes near the ends of the antenna wire and insert a ¼ " #4-32 screw with two flat washers into each of these holes and put a nut onto each screw. Insert one side of the lead-in and one of the antenna end-wires between the flat washers on one screw and tighten the screw using a small screw driver. Then repeat this procedure to connect together the other side of the lead-in and the other antenna end-wire.



### Step 6: Lash Lead-in To Poster Board

Lay the lead-in flat on the poster board, and near the place where the lead-in is connected to the antenna end-wires, punch a hole large enough for a cable tie or twist tie to pass through on both sides of the lead-in. Then secure the lead-in firmly to the poster board with a small cable tie or twist tie.



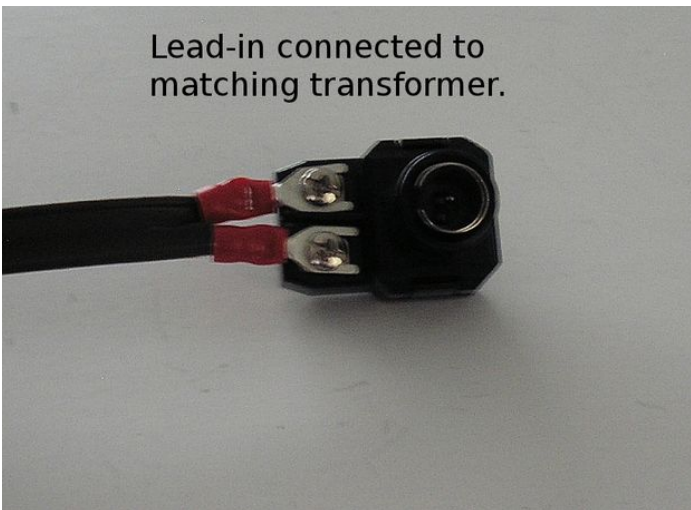
### Step 7: Insert Tabs A & B Into Slots A & B

Roll the poster board into a cylinder, insert Tabs A & B into Slots A & B, and fold the tabs back on the inside of the cylinder. A little Scotch brand tape on the seams works wonders in maintaining the cylindrical shape of the antenna.



### Step 8: Attach Matching Transformer To Lead-in

Attach the matching transformer to the free end of the lead-in wire.



### Step 9: Personalize Your Antenna

The completed antenna fits comfortably into an empty 100-count CD/DVD storage box, and this in turn can be used to display family photos, beautiful scenery cut from last year's calendar, or to display your favorite sports picture.

Enjoy!



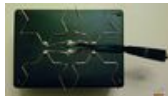
**Related Instructables**



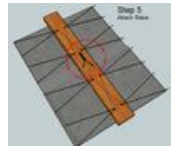
**Foil based fractal antenna.**  
by Computothought



**Dtv Antennas I have tried or will try. (Photos)**  
by Computothought



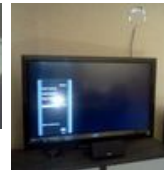
**How to make a fractal antenna for HDTV / DTV plus more on the cheap**  
by williamruckman



**HDTV Antenna constructed of baling wire and duct tape - CHEAP**  
by weblar



**Yagi foil HDTV antenna.**  
by Computothought



**Pie-tenna, The simplest HDTV antenna possible, possibly. (video)**  
by Tool Using Animal

## Comments

4 comments [Add Comment](#)

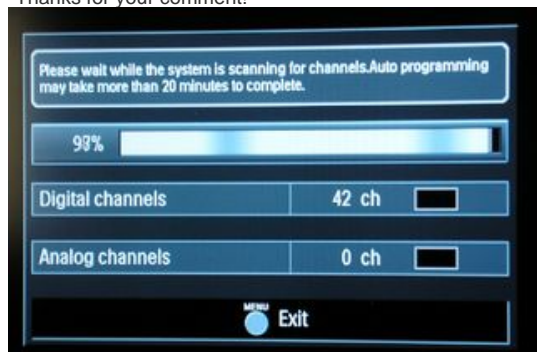


**tigers58** says:

Feb 12, 2013. 9:48 AM [REPLY](#)

I designed it to be omnidirectional, hence the cylindrical shape, but I've noticed that it is not completely omnidirectional - turning it will improve the reception of some more distant stations. Turning it on its side makes it much more directional than placing it in an upright position. The website Antenna Web (<http://www.antennaweb.org/Stations>) shows that I should be able to receive up to 42 channels from 25 over-the-air stations at my location, and with this antenna I'm receiving 42 over-the-air stations.

Thanks for your comment!



**rimar2000** says:

Feb 12, 2013. 9:50 AM [REPLY](#)

Very interesting. Have you noticed a real improvement with respect other designs?



**tigers58** says:

Feb 12, 2013. 9:59 AM [REPLY](#)

Yes! I had previously purchased a commercially available indoor HDTV antenna that cost a little over \$40.00 (with tax), and placed in the same location at my antenna, it received only 9 over-the-air channels. I don't know if I can get in trouble giving the name of the company marketing the other antenna I purchased, but it is an American company with Radio in it's name that is chiefly known by its initials. :-)



**caitlinsdad** says:

Feb 12, 2013. 8:59 AM [REPLY](#)

Nice. Is this an omnidirectional antenna or do you have to turn it or lay it down to get better reception on some signals?