

160 metre Vertical Antenna

This antenna is built around a Haverford's 7 metre heavy duty squid pole and also uses their ground mounting stake (not essential but handy)

The antenna is top loaded, using a resonator coil and capacity hat. It is directly fed with 50 ohm coaxial cable via a small impedance matching network.

A ground radial system is required.

From the ground up!

Radials are 4 x 12.5 metre long made from light duty hook up wire. (13 x 0.12mm) Jaycar sells them on spools of 25 metres thus determining their length. The spools are used for storing the top hat assembly.

Radials are deployed along the ground at 90 degrees. I found no effect on the SWR if these were folded to half their length. The radials are red to make them more visible.

Feed Point. I used a bit of aluminium plate from a previous project. The plate is fitted with a crimp type panel mount BNC connector. 50 ohm coaxial cable connects to 2 x plastic banana binding posts. The short coaxial cable is cable tied to avoid damage from snagging and is heat shrunk insulated.

The aluminium plate is attached to a suitable section of 50mm electrical conduit.

This size fits over the bottom section of the squid pole. The plate is attached with counter sunk head 3/16 metal threads. Note that the left side edge is folded back at 90 degrees providing a greater contact area with the conduit.

Over the conduit is wound a 10 turn coil of about 1mm enamel wire. One end is connected to ground via one of the aluminium plate mounting screws, the other is connected to the binding post where the centre wire of the coaxial cable also connects. This coil is loosely spaced and around 22mm. Allow a bit of length for connections.



Resonator Wire. Also light duty hook up wire. 5420mm long and uses right angle banana plug connectors. Connects between the feed point and resonator.

Resonator. 310mm long bit of 40mm electrical conduit fitted with end caps. Length includes the end caps. Over this is a close wound 85 turn inductor. Each end is terminated into a banana chassis socket. Coil tension is achieved by taking the wire through small holes drilled through the conduit. To make connections easier, PVC wire was used to connect into the chassis sockets.

The coil uses the same 1mm enamel wire and is 205mm long (plus connection leads).

The resonator fits over the join of the top 2 sections of the squid pole. The bottom cap was drilled with a 16mm hole saw then reamed out with a sharp knife to provide a snug fit. The top cap was drilled with a 20mm hole saw and a 20mm plain to screwed conduit adapter coupling fitted. This is also a snug fit to the pole.



Top Hat. A 955mm long bit of 20mm conduit slides into the resonator conduit coupling. At the top, a conduit junction box lid is also fitted with a plain to screwed conduit adapter coupling and this slips on to the top of the 20mm conduit.

The conduit junction box lid has a ring of enamel wire fitted and connected to a 1020mm length of PVC wire. With the squid pole top rubber stop, when re-inserted, sits neatly inside the top conduit adapter and provides some extra support to the squid pole. From the enamel wire ring is connected 3 x 3130mm long PVC wires. Each end is soldered into a loop for connection of the guy ropes.

I used some heavier gauge wire on the top hat as it is also the top guy section.

The combination of the resonator and top hat assembly means the guy point load is extended over a larger section of the squid pole (compared to simply guying at the very top)

Guy Ropes. The three ropes use 15 metre long builder's line. Both the ropes and wires are kept intact and wound up on the light duty hook up wire spools. Colour is fluorescent pink to help with visibility.

Tune up

Nearly everything started off a bit longer than what is described here.

Feed point impedance was best matched with 10 turns.

The resonator was reduced to 85 turns on a separate experimental bobbin using longer top hat connection wire. 85 turns was selected when the lowest SWR and best impedance was around 1790 kHz

Then I reduced the resonator connection wire length to close to minimum. This had an effect of improving the input impedance and slightly raising the resonant frequency.

Next I trimmed the capacity hat connection wire to provide best match on 1825 kHz. This also involved shortening the top conduit to its present length and by chance, this made it convenient to fit the top squid pole rubber stop.

100mm snips of the Top Hat wire increased the resonant frequency by around 1.5 kHz. From a starting point at 1798 kHz, I trimmed some 925mm from what I started with. This originally longer wire was wide spread helically wound around the top conduit which was originally 275mm longer.

At 1825 kHz the 1.5 : 1 SWR band width is 1817 kHz to 1833 kHz

2.0 : 1 SWR band width is 1814 kHz to 1837 kHz.

The spread of the top hat is critical with centre of band performance.

With maximum spread (using full guy ropes) resonant frequency was 1809 kHz

8 metre radius spread; resonant frequency 1820 kHz

7 metre radius spread; resonant frequency 1825 kHz

6 metre radius spread; resonant frequency 1833 kHz

Therefore, adjusting the spread of the top hat allows for some frequency agility.

MFJ -259B antenna analyser used for tuning. Some wire lengths and other dimensions were determined by mechanical constraints, available materials and what looked about right.

Test in the back yard with Allen VK3ARH over 120 km produced the first contact with 559 received. Using the KX3 and 10 watts. My back yard is far from an optimum antenna site.

Plugs, particularly for the radials, are recommended due to the tripping hazard. Better to pull the plug out rather than break the wire or pull the antenna over. Be careful with the coaxial cable feeder though.

Construction method attempts the KISS method; essential in portable operation. Further edits may apply. This could include tapping or substituting the resonator for use on 80 metres or adapting for 40, 30 and 20 metres?

Setup procedure:

1. Select open area. Minimum 13 metre radius and overhead clearance.
2. Insert mounting stake or use suitable securing post.
3. Open squid pole and remove rubber stops.
4. Fit feeder connection, extend top squid pole sections and fit resonator.
5. Partially unwind top hat cables.
6. Fit top hat conduit and wire assembly to squid pole. Fit squid pole top rubber plug.
7. Fit squid pole to mounting stake & secure.
8. Fully unwind top hat wires and guy ropes at approximately 120 degrees.
9. Fit top hat and resonator feed wires to resonator.
10. Extend squid pole. Pull and twist sections. Tape joins.
11. Determine the wind direction. Mark out 7 metres from the squid pole.
12. Run out top hat guy ropes. Tie point 7 metre radius at ground level.
12. Loosely tie off each guy rope.
13. Adjust each guy rope for optimum tension and pole straightness.
14. Plug resonator wire into feeder connection.
15. Plug in radial and unwind. Deploy at 90 degrees. Radials are 12.5 metres.
16. Plug in coaxial feeder.
- 17 Unpack and set up radio equipment.

Pack up procedure:

1. Pack up radio equipment.
2. Wind up and stow radials.
3. Lower squid pole.
4. Wind up resonator wire & stow. Unplug top hat.
5. Wind up capacity hat guy ropes and wires.
6. Carefully remove resonator complete with capacity hat. Catch squid pole stop.
7. Separate capacity hat conduit from resonator & hat section.
8. Stow resonator and capacity hat.
9. Remove and stow feeder connection / impedance match network & stow.
10. Remove squid pole from mast. Fit rubber stops. Stow
11. Remove mounting stake & tie strap & stow.

References

[Minooka Special](#) I used this for the impedance matching. Deleted L2 and reduced L1 by using a capacitance hat.

[Shoddytenna 160m portable antenna](#) (select antenna projects) after seeing Peter's antenna at the MDRC SOTA conference.

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