Jerrold Swank W8HXR
657 Willabar Drive
Washington OH 43160

40m DX Antennas - The Easy Way

The trouble with 40 meter antennas is that they are usually longer than city lots, unless they are verticals. Then they are dependent on hard to dig radials. That is my problem. But what if antennas were half as long, and didn't need radials?

I have a 74 ft. wide lot, and was using 40 meter phased verticals to handle phone patches for the Antarctic stations during their winter, when no mail goes in or out. My yard is full of trees, most of which are as high as the verticals, and they are in leaf during this period, when it is summer here.

After several seasons, during which I handled a lot of traffic, I decided I needed to get a better signal from down there, and as well, put in a better signal to them.

I read an article on folded half wave radiators (by William Orr, *Ham Radio*, March, 1970) and tried one out. However, a horizontal antenna must be nearly a half wave above ground, or its DX properties are no better than my verticals with no radials. Then it dawned on me that vertical dipoles need no radials, and sloping dipoles have gain off the front of the slope.

My towers are only 48 ft. apart – not a half wave, but I decided to try. I sloped one dipole from the top of my 35 ft. TV tower to the southwest corner fence post at the back of my yard, and the other from 35 ft. up on the 47 ft. ham tower to the southeast corner of the yard. The antennas were pulled up by pulleys, making them easy to adjust and tune. On the southeast antenna I was 10 dB stronger in Miami (167°) than in New Orleans (211°), and vice versa when I used the southwest antenna. When I used both of them I was better in both directions than with either one alone.

When I started to handle traffic to the Antarctic I was amazed. I pinned the meter on several occasions at South Pole Station, and was 10 over 9 at McMurdo Sound. That season I ran more patches during June, July, August and September than any other station and was told by McMurdo that I ran more than one fourth of all patches in spite of the fact that I used only 40 meters and they used both 40 and 20 and 20 meter MARS. Many nights I was running phone patches when the other two "regulars" were unable to even copy the Ice stations. Fig. 1 shows the layout of the antennas. It is

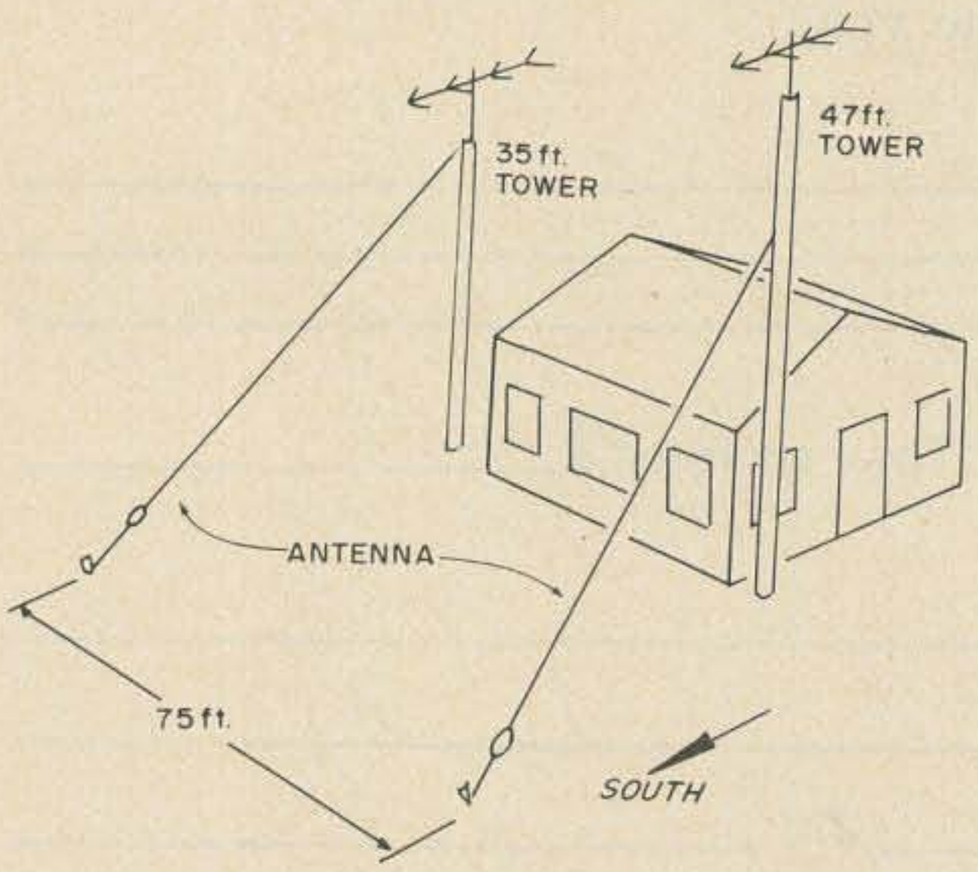


Fig. 1. Antenna layout.

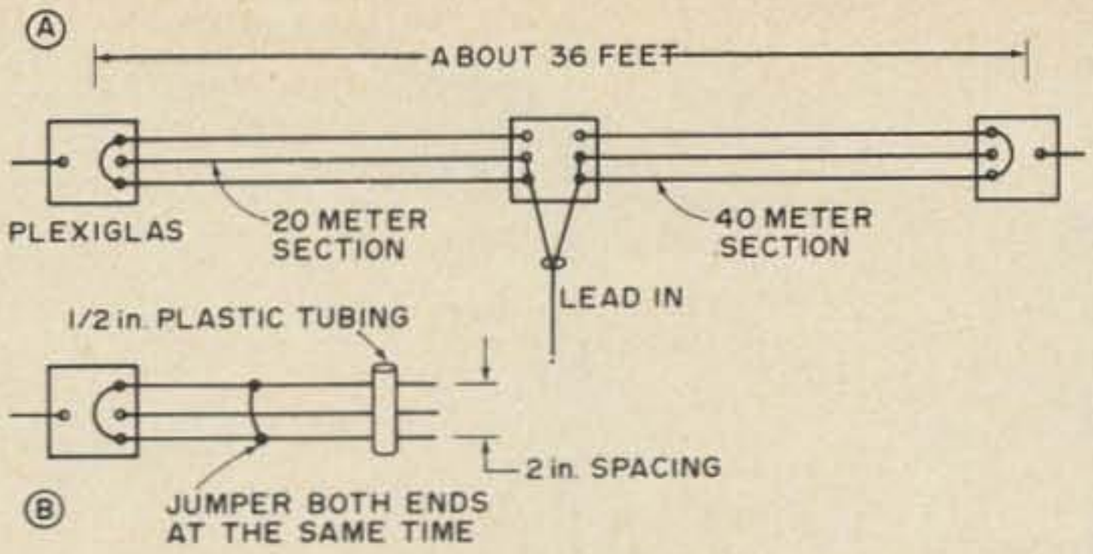


Fig. 2. (a) The design of the antenna. Cut the antennas for the low frequency of the band, and then, if necessary, tune by adding the jumper as shown. Then tune the higher frequency antenna by trimming at the ends. The antennas will cover quite a good band with low swr. (b) The 40m section can be tuned by moving the jumper.

important that both antennas be tuned to the same frequency for accurate phasing. By inserting a half wave of coax in one leg I can end fire into California and the East Coast, although the gain from the slope will be missing in these directions.

Fig. 2 shows the design of the antenna. The length of the dipole will be about the same as any other type of dipole and should be cut for the low end of the band. The 40 meter section can be tuned by moving the jumper as shown in Fig. 2b. Move both jumpers – one at each end – the same amount toward the center to shorten the antenna. To shorten the 20 meter section just trim both ends. There will be little

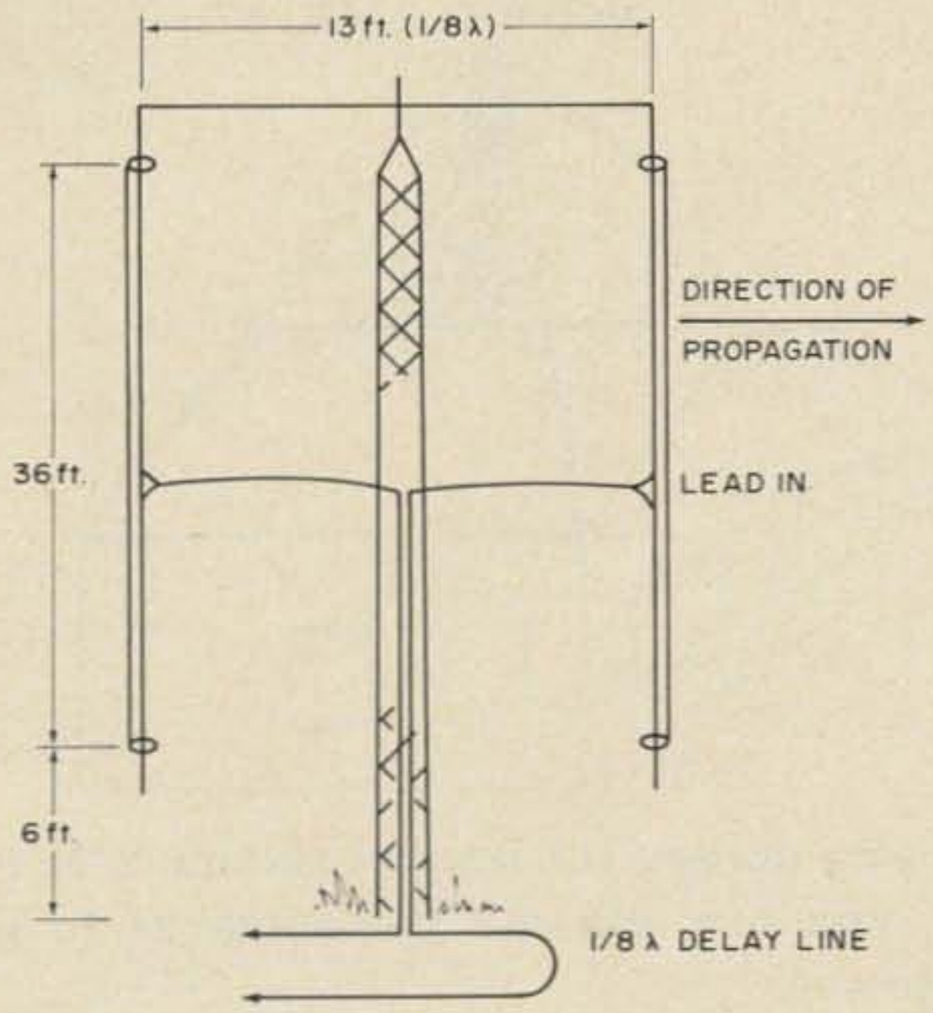


Fig. 3. Alternate antenna array for one tower. This array is 1/8 wave spacing on 40 meters and ¼ wave spacing on 20 meters – a very good combination. A little imagination would show you that this could be made to rotate.

reaction between the antennas. The spreaders can be made of 3" lengths of 1/2" plastic tubing, with holes spacing the outside wires about 2" apart, and the other antenna between them. Space the spreaders about 6 ft. apart and fasten them either with epoxy cement or by making the holes slightly small so they won't slide. The wire can be #16 or #14, prestretched.

The tops of the antennas are about 33 ft. high, and the bottoms are about 6 ft. off the ground out of the reach of children.

Do not use a balun, and connect the coax shield to the lowest side of the dipole. It is easier to understand this antenna if you think of it as a ground plane with one radial.

A prominent antenna manufacturer told me that this array with the slope probably had a gain of about 10 dB.

I used RG59 for the lead in. The current is divided between two antennas, and RG59 has ample capacity for full legal power this way. I used 3/4 wavelength in each lead in. This makes a transformer match and gives me close to unity swr. Run the lead in at right angles from the antenna as far as possible. Keep the vertical angle less than 45° if possible to get maximum vertical polarization. You will be pleased with the absence of noise because of the nulls on the side of the array, and the lack of interference.

If you do not have two towers, try Fig. 3 for a one tower array. This is a cardioid array, with no slope, but takes advantage of the shortened antenna and phasing. By changing the delay section to the other lead in the direction of the array will be reversed.

There is one more array which this combination makes possible. This is shown in Fig. 4. Going back to my comments about the directive effect on my two antennas in different directions, a new idea comes up.

How about a rotating beam made of three or four antennas sloping from the top of a 35 ft. TV tower? You can either use separate feedlines or a Dow Key relay. If you use the relay, which grounds the unused lines, make the lead from the antenna to the relay 1/4 wave. This will open the center of the unused antennas and detune them. If you have a switch which leaves the lines ungrounded, then use half wave lines and they

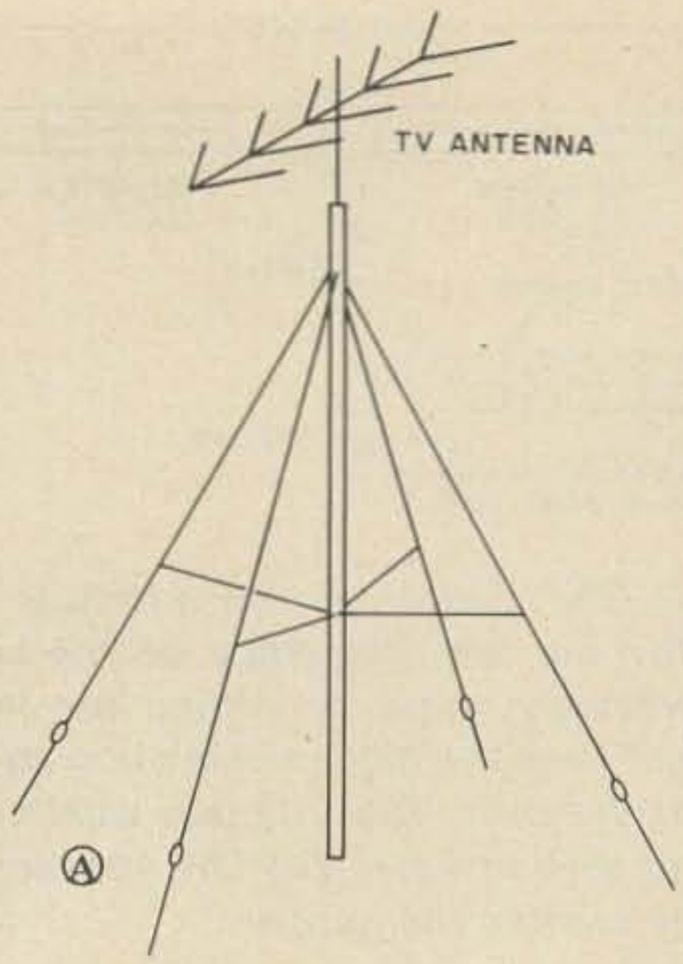
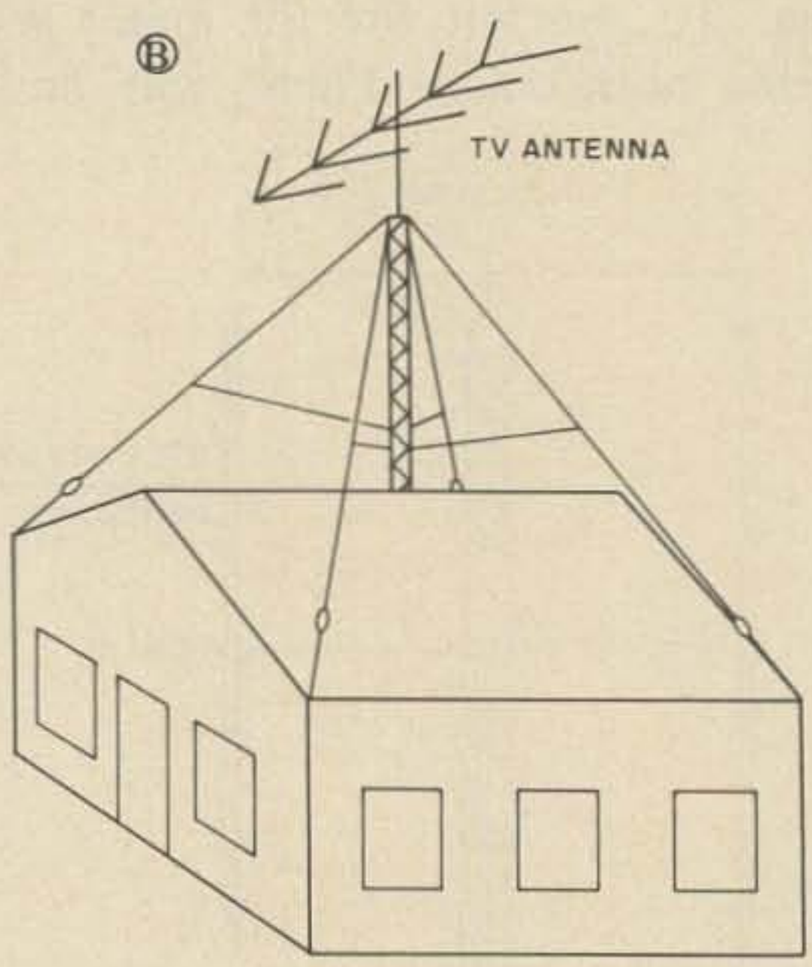


Fig. 4. (a) Rotating wire beam. You can either use four feedlines or use a relay. If you use a Dow Key relay, which grounds the unused lines, make the lead from the antenna one quarter wavelength to the relay. Then, when grounded, the antenna will be open in the center and detuned. If you use a coaxial switch, use half wavelengths from the antenna to the switch, and when the lead in is dropped from the switch the center of the antenna will be opened and thus detuned, by the rule that a half wave repeats the open impedance at the other end of the line. If you use a Dow Key relay with three positions, you can use just 3 antennas with nearly the same results. Naturally, you can also use the three antennas as guys for the tower. (b) Antenna mounted atop the TV tower.



will also detune the unused antennas. Naturally, you can also use the antennas to guy the tower.

Last but not least, how about a tower on top of the house with antennas to each corner of the house, for a NO SPACE antenna array?

...W8HXR