No. 31: A Triangular Vertical Array

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Most beams we have discussed have been horizontal. I have not wanted to neglect fans of vertical antennas, but good designs that are not just horizontal antennas flipped 90 degrees are not easy to find.

In some areas, the local gang use vertical whips and mobile antennas. Skip contacts do not care what polarization your antenna uses, since the ionosphere skews the polarization of the original signal. So the question is whether we can find a decent vertical antenna that will serve both local and distant needs.

Well. . .how about a set of 3 vertical dipoles that require no rotator and only a simple weather sealed box with some relays inside. With a flip of a switch, you can cover the entire horizon in three broad lobes with little if any gap in coverage. The gain will not rival a long-boom Yagi, but the antenna array will give some gain and very decent a front-to-back ratio, with a direct coax feedline connection.

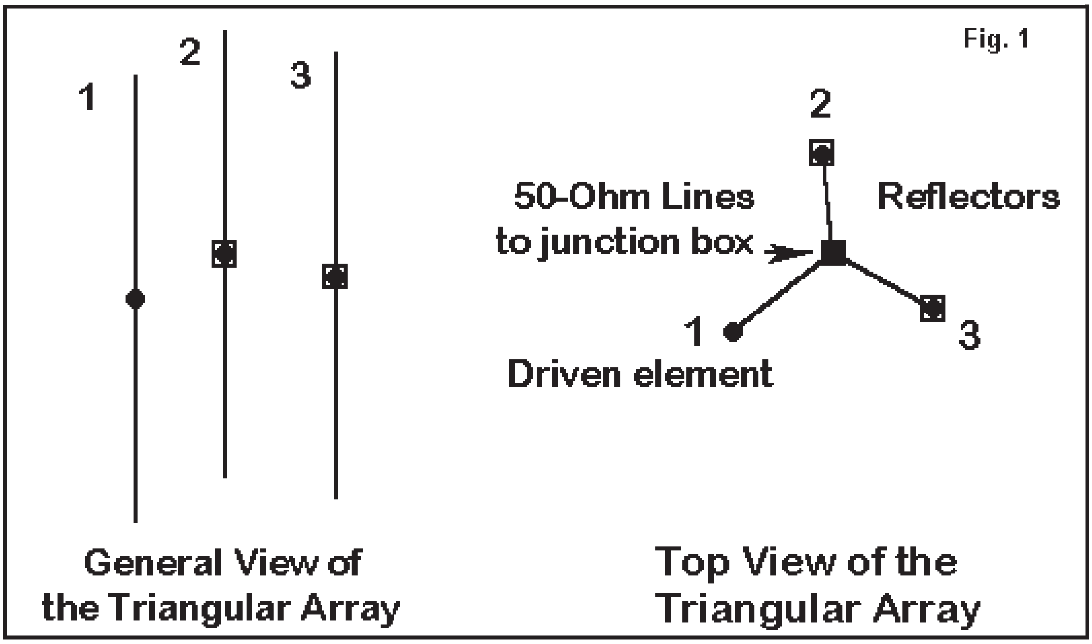


Fig. 1

Let's start with three vertical dipoles, each 15.6' long made of 3/4" hardware store aluminum tubing. See **Fig. 1**. We shall set these up in an equilateral triangle 8.6' on a side (1/4 wavelength). If we run a mast up the middle of the array, we can use PVC or other means of supporting the vertical at just about their center points, leaving the feedpoint separation free for connections. The arms for such a system would have to be just about 5' long from the center mast.

Next, we shall cut 4.97' (yes, 5.0' is OK) lengths of RG-8 foam or RG-58 foam coax. We must use the foam type to get the right velocity factor (0.78) so that the lengths are electrically correct. Each line goes from one feedpoint to a central waterproof junction box. The coax from the shack and a 12-volt DC line also enter the junction box.

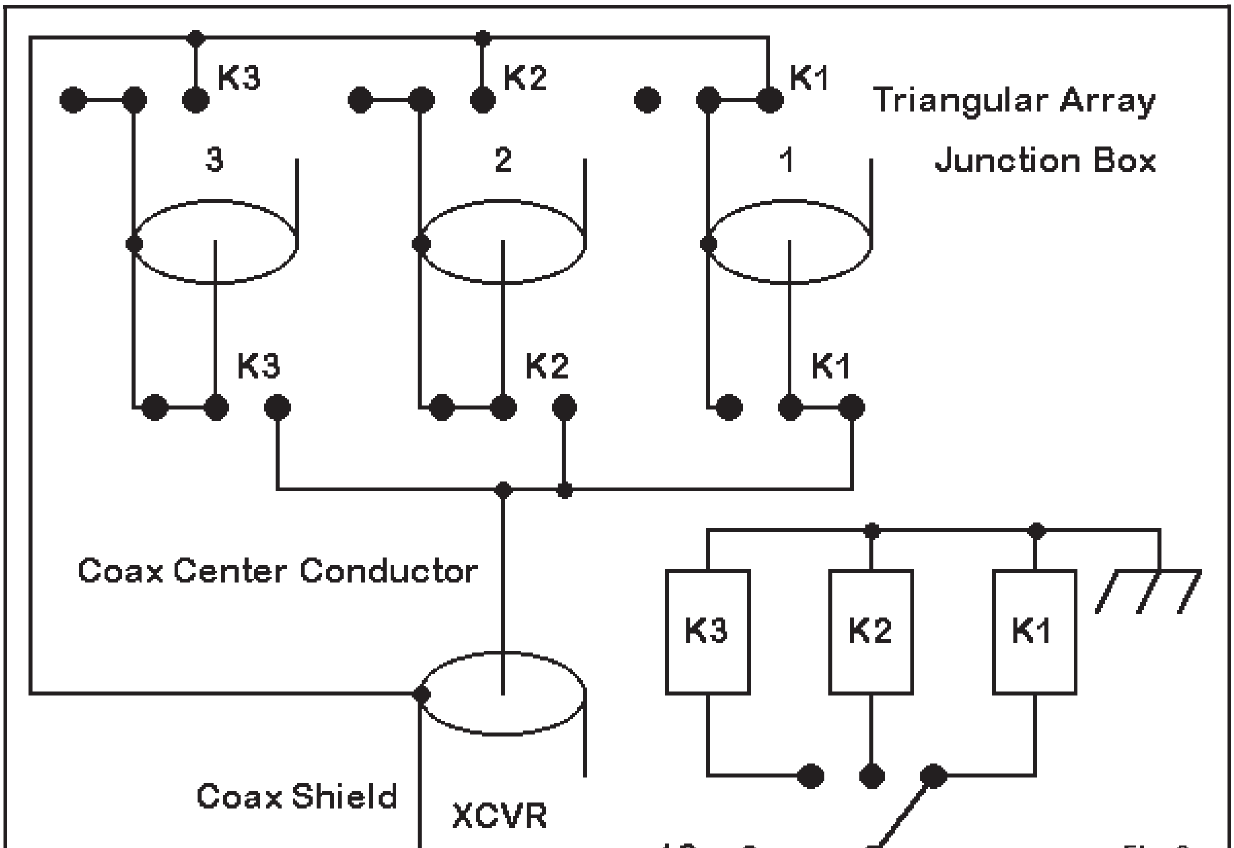
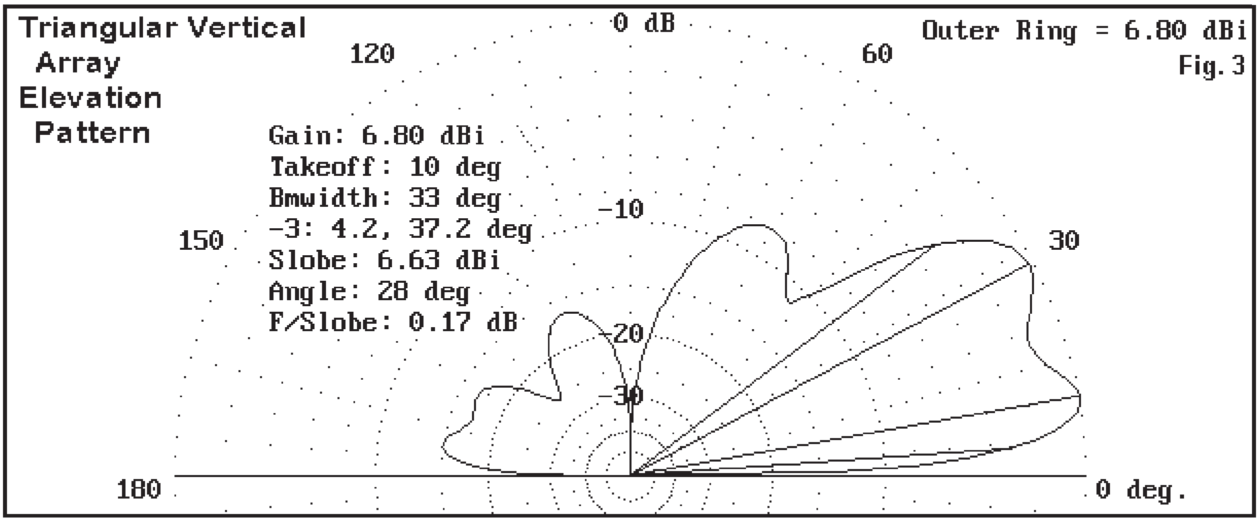


Fig. 2

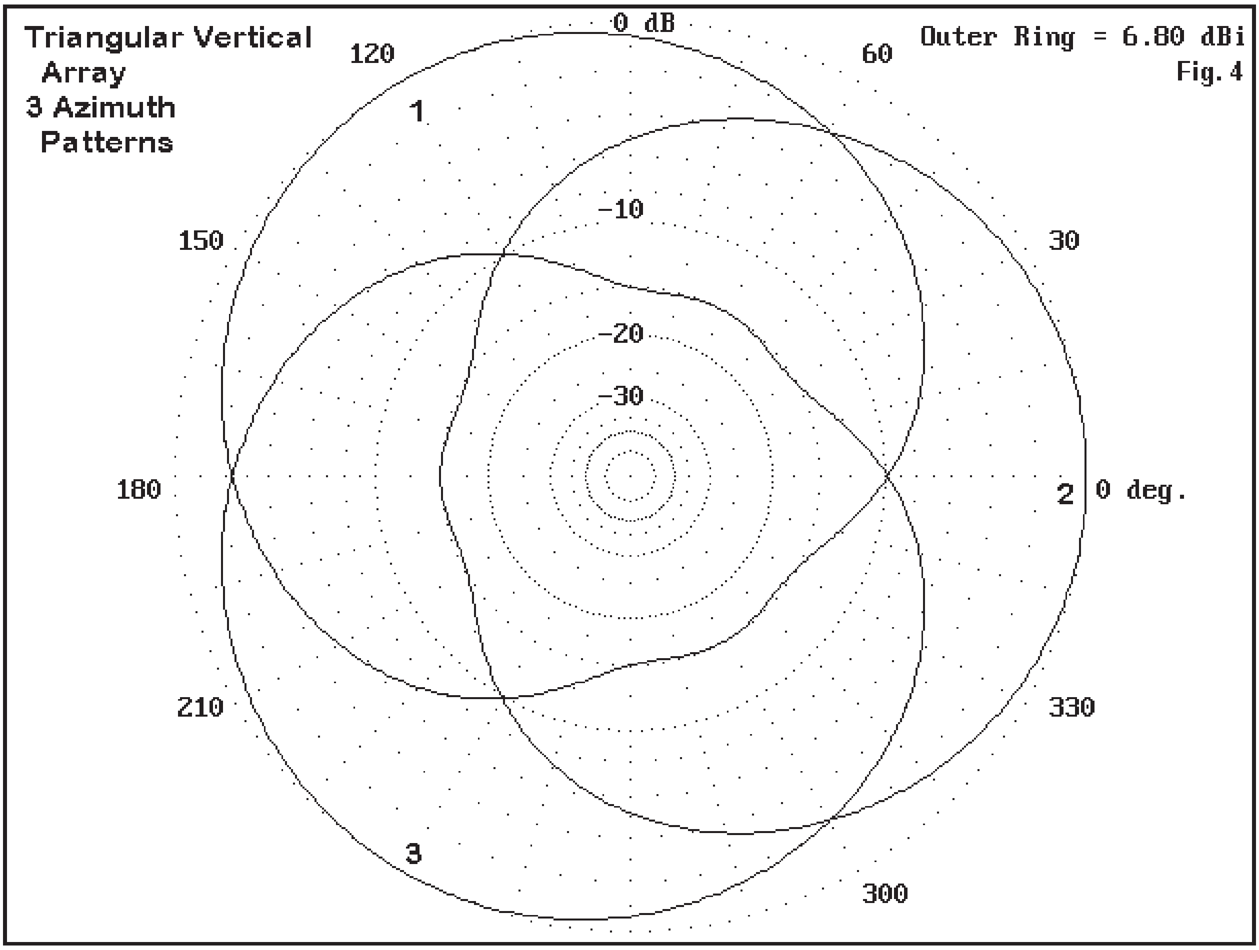
The schematic diagram in **Fig. 2** shows the hook-up for 3 DPDT 12-volt relays in the box. (The switch is shown in the box, but it will be in the shack.) As we change positions on the switch, we activate one relay, moving the connectors so that the center of the coax from one antenna goes to the RF cable and the shield goes to the shack coax shield. The inactive relays let the coax from the other two antennas simply be shorted out.

The shorted lengths of coax are stubs that electrically lengthen the other two antenna elements so that they work better as reflectors. Now we have 2 reflectors and one driven element in a vertical array.



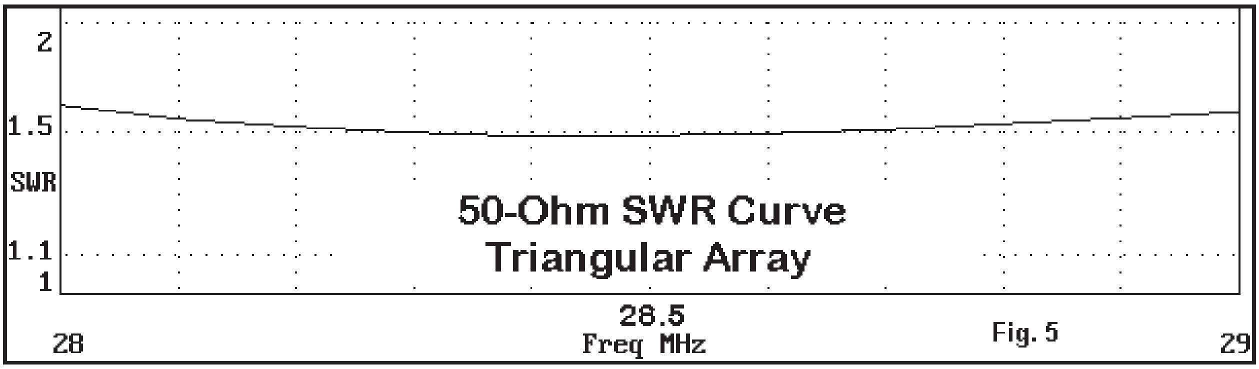
The elevation pattern created by this system and shown in **Fig. 3** gives us a low angle pattern, good for both local and dx contacts. The front-to-back ratio varies between 12.5 and 15 dB across the first MHz of 10 meters. The gain is very usable, but not world beating. However, remember that we saved the cost of a rotator with this array, and we can work the vertical locals with ease.

In addition to all having gain and appreciable front-to- back ratio, we can cover the entire horizon just be changing the switch position. The switch simply converts one element from a reflector into a driven element, changing the overall heading of the array. The beamwidth of a vertical antenna is very large--well over 120 degrees between -3 dB points. Hence, three headings are enough to cover the world.



The composite azimuth patterns in **Fig. 4** give you a good idea of how large the beam width is and how good the overall coverage is. If you construct the basic support system well enough, you will have an antenna with no moving parts other than the relays in the box. Servicing a relay at the top of the tower is easier than servicing a rotator.

The array can be fed directly with coaxial cable, as the SWR curve in **Fig. 5** shows.



All of the figures shown are modeled with the antenna at 35' at its center. The higher, the better, but the antenna will still work quite well with its lowest point at least 20' off the ground.

Verticals acquit themselves very well on 10 meters, and this vertical array will add some directional gain and some QRM nulling. Relative to a beam, the cost will be low, and the maintenance should be easy. Possibly, it is time to think vertical.