Information on Four-Square Phased Arrays

Dear Amateur:

Thank you for your interest in the Comtek ACB-4 series of Hybrid couplers for Four-Square arrays.

The Four-Square was developed in the 1980's by Fred Collins, W1FC and Dana Atchley, W1CF (SK), and in conjunction with Steve Davis, K1PEK, formed ColAtchCo. Fred and Dana jointly developed the hybrid for proper phasing. ColAtchCo offered complete systems, including verticals, radial wire, control cable and phasing lines.

In the late 1980's, Comtek took Mr. Collins' hybrid further by adding a second toroid, to replace the 180 degree coax and phase correction coax cables. The only coax required are four (4) electrical quarter wave **foam 75 ohm** and the 50 or 75 ohm line from the transmitter.

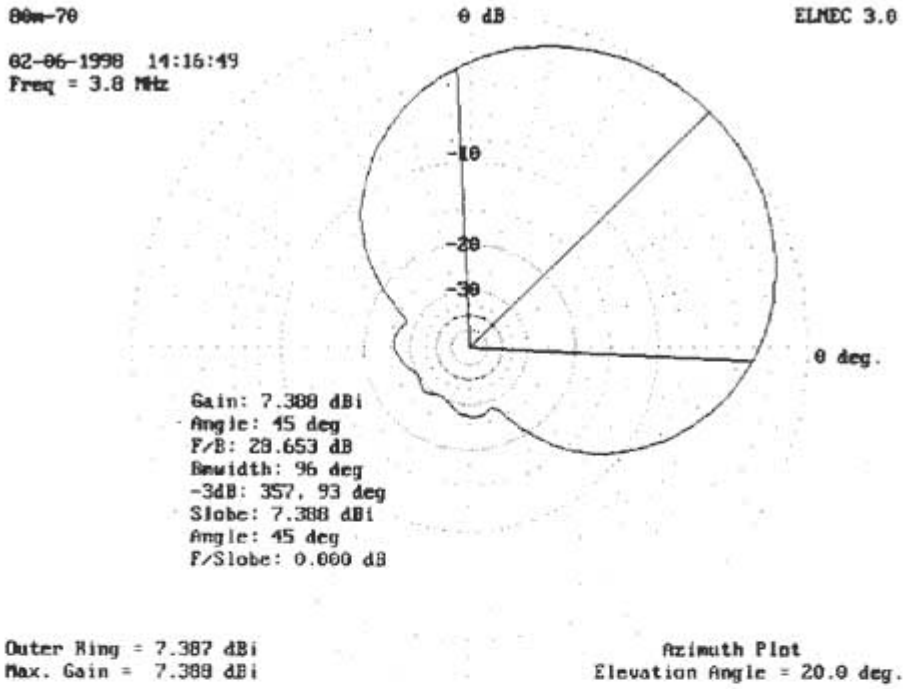
A Four-Square consists of four verticals spaced one quarter (1/4w) wavelength apart (feedpoints quarter wave apart for 1/2 wave dipole arrays) with the hybrid mounted in the center of the array. The directivity is **across the diagonals**, selectable in four directions.

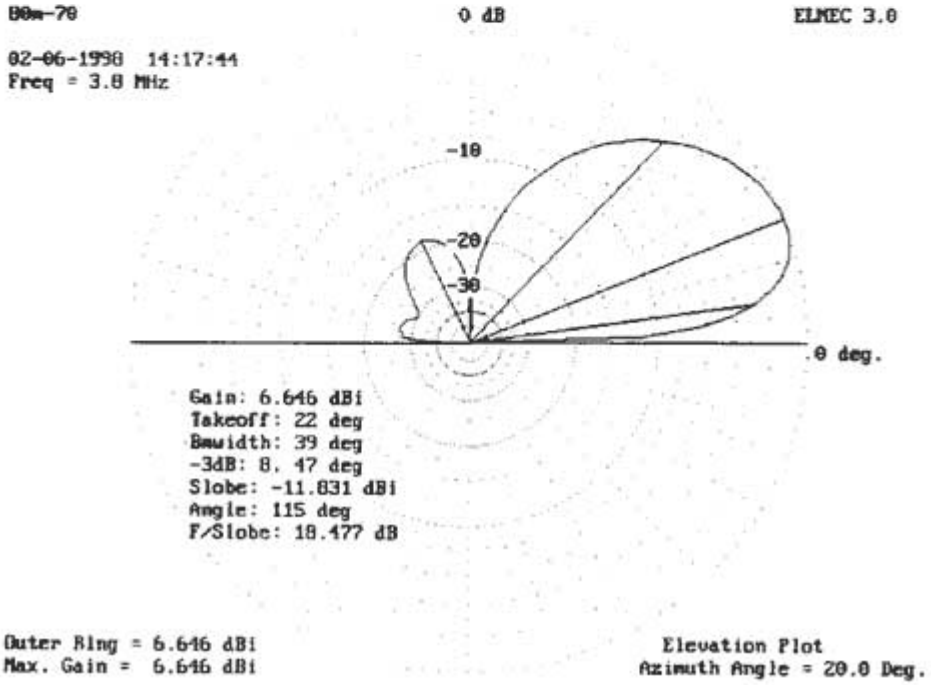
Since new ownership of the company in 1993, numerous improvements have been made to both the power supply/switch control and the hybrid relay unit. The Instruction Manual numbers twenty-five pages with schematics.

Although the three "Low Bands" of 40, 80, and 160 meters are the most popular models sold, we have seen an increase in 20 meter models for those unable to install a tri-band beam on a fifty (50') tower during the past two years. ACB-20 customers report good results using the array on 17 meters in addition to the excellent 20 meter performance.

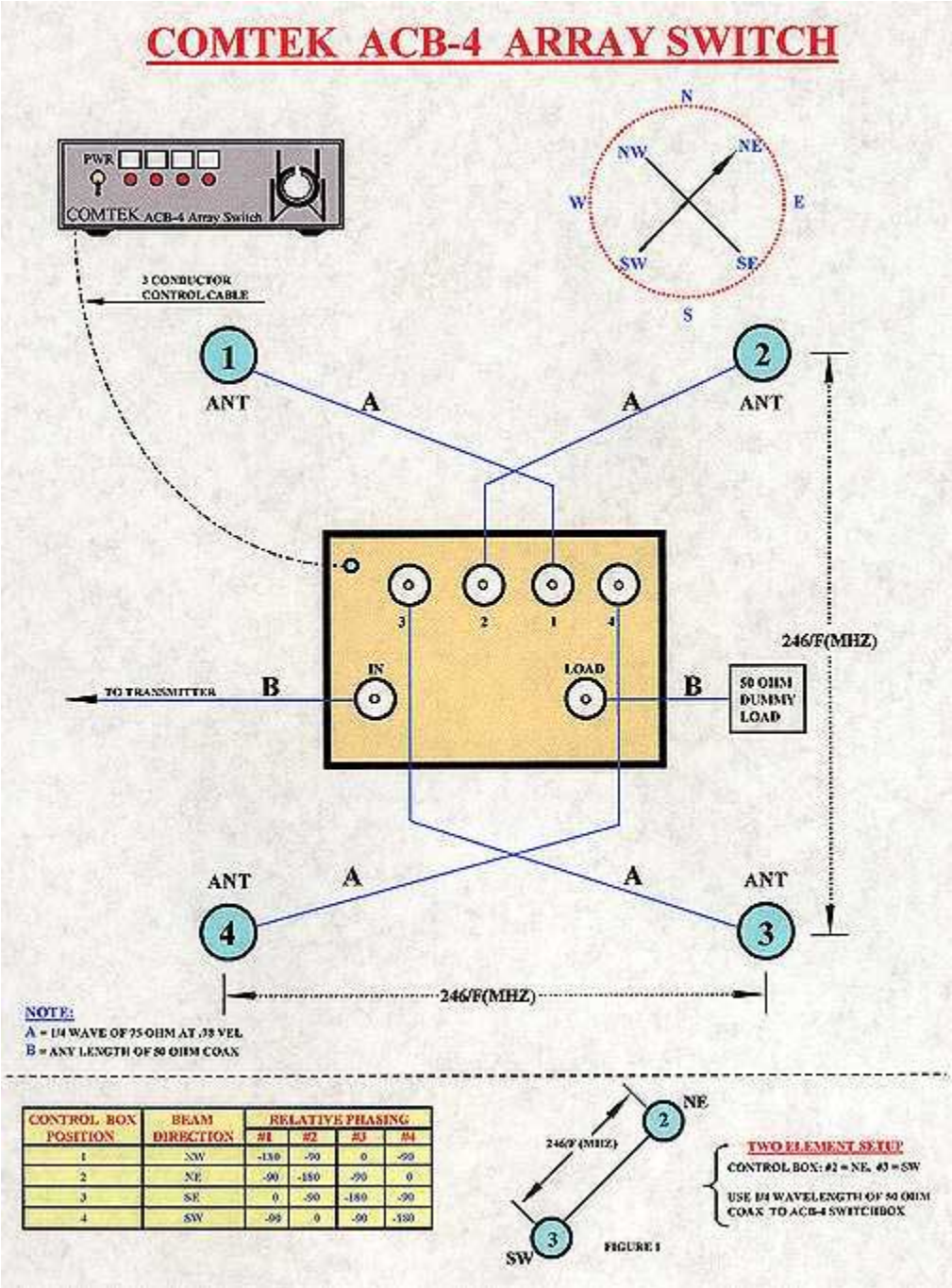
Comtek Systems Hybrids are in use world wide by serious contesters. DX'ers and the serious ham in general. Our hybrids with properly installed arrays offer 20 dB F/B and up to 5dB gain, at a lower cost than most low band beams at proper heights.

Azimuth and Elevation model plots





Comtek ACB-4 Wiring Diagram



CONTROL BOX POSITION	BEAM DIRECTION	RELATIVE PHASING			
		#1	#2	#3	#4
1	NW	-135	-90	0	-90
2	NE	-90	-180	-90	0
3	SE	0	-90	-180	-90
4	SW	-90	0	-90	-180

FIGURE 1

TWO ELEMENT SETUP

CONTROL BOX: #2 = NE, #3 = SW

USE 1/4 WAVELENGTH OF 50 OHM COAX TO ACB-4 SWITCHBOX

What to use as a vertical

The following describe typical 4-Square successful installations, in use world-wide with the Comtek ACB-4 series Hybrid Phasing Coupler for 4-Squares and 2 element arrays.

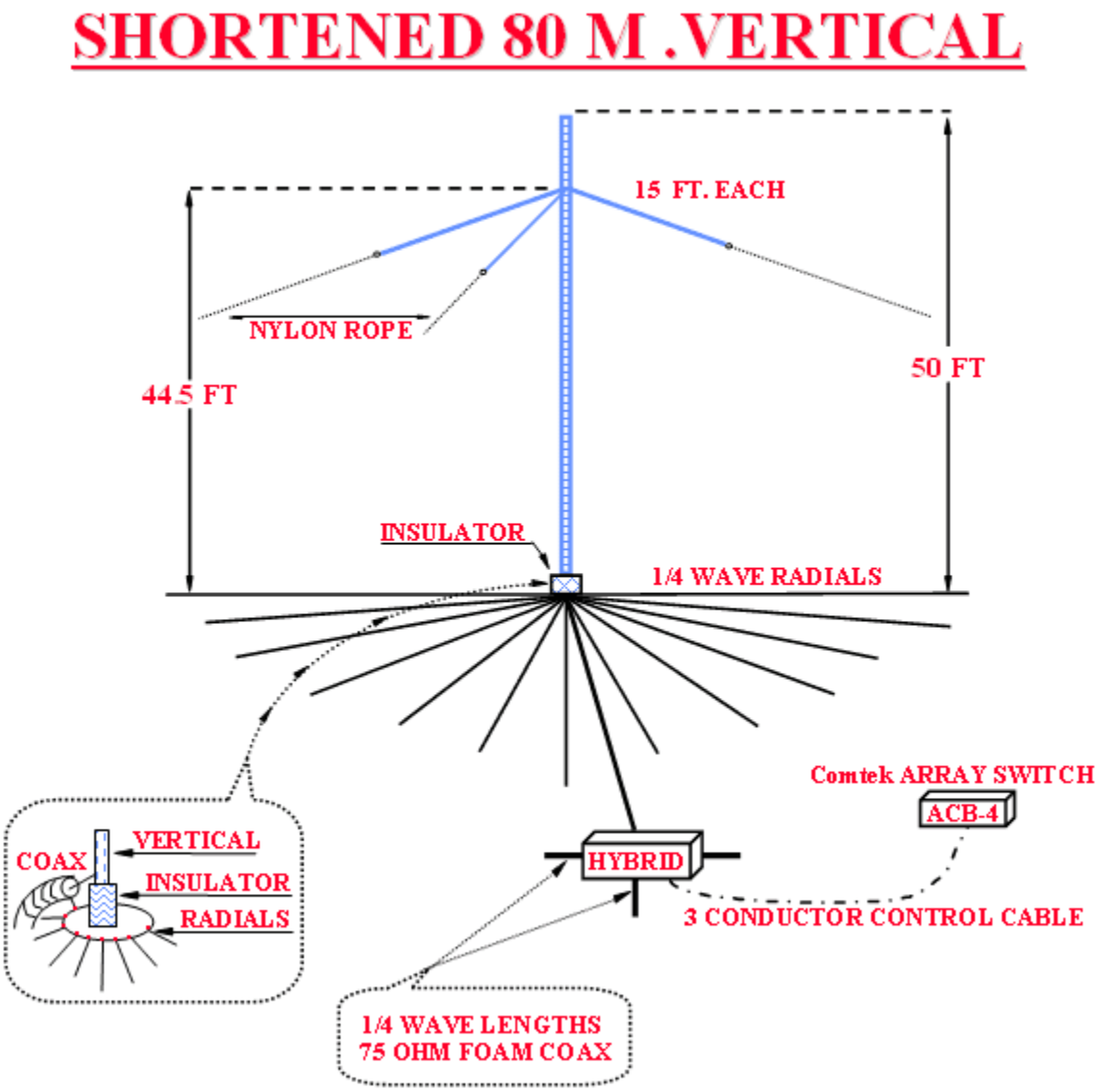
1. Rohn 20/25G tower on insulated bases for 80 and 160 meter verticals. Non-conductive guying or steel guys broken with insulators required to minimize distorting patterns. See our tower insulators page for heavy duty insulators for Rohn 25G, 45G and other tower verticals.
2. Aluminum irrigation tubing. 3" to 5" o/d., 30 foot lengths. Nine (9) sections required. The 9th piece is cut to 3' lengths and slotted to make a splice for two 30' pieces. Average is 64 feet for resonance at 3.650, preferred by contest and DX stations to cover 3.5-3.8MHz without retuning the array from CW to SSB (DX window) operation.
3. Wire elements supported from ropes tied to tops of towers. Pulling feedpoints to specified distances is very important. The "inward sloping" is permissible, i.e., "slanted Inverted L's" supported by a central tower. The vertical leg should be two-thirds (67%) of the total length.
4. Modified Hy-Gain Hy-Towers. All other band stubs removed and aluminum "stinger" extended for a total height of about 75 feet self supporting.
5. 5. Home-brew short top-loaded verticals for 80 and 160 meters. See Comtek diagram. The recommended vertical leg is two thirds (67%) of the overall length.
6. 6. Shortened commercial verticals with narrow bandwidths include, but are not limited to Butternut HF-2V, Force 12, Hy-Gain and MFJ-1792.

DX Engineering is a complete source for antenna information and products. Items include vertical antennas, aluminum tubing, radial kits and plates, baluns, copper strap, etc. - everything you need for a complete installation. See www.dxengineering.com

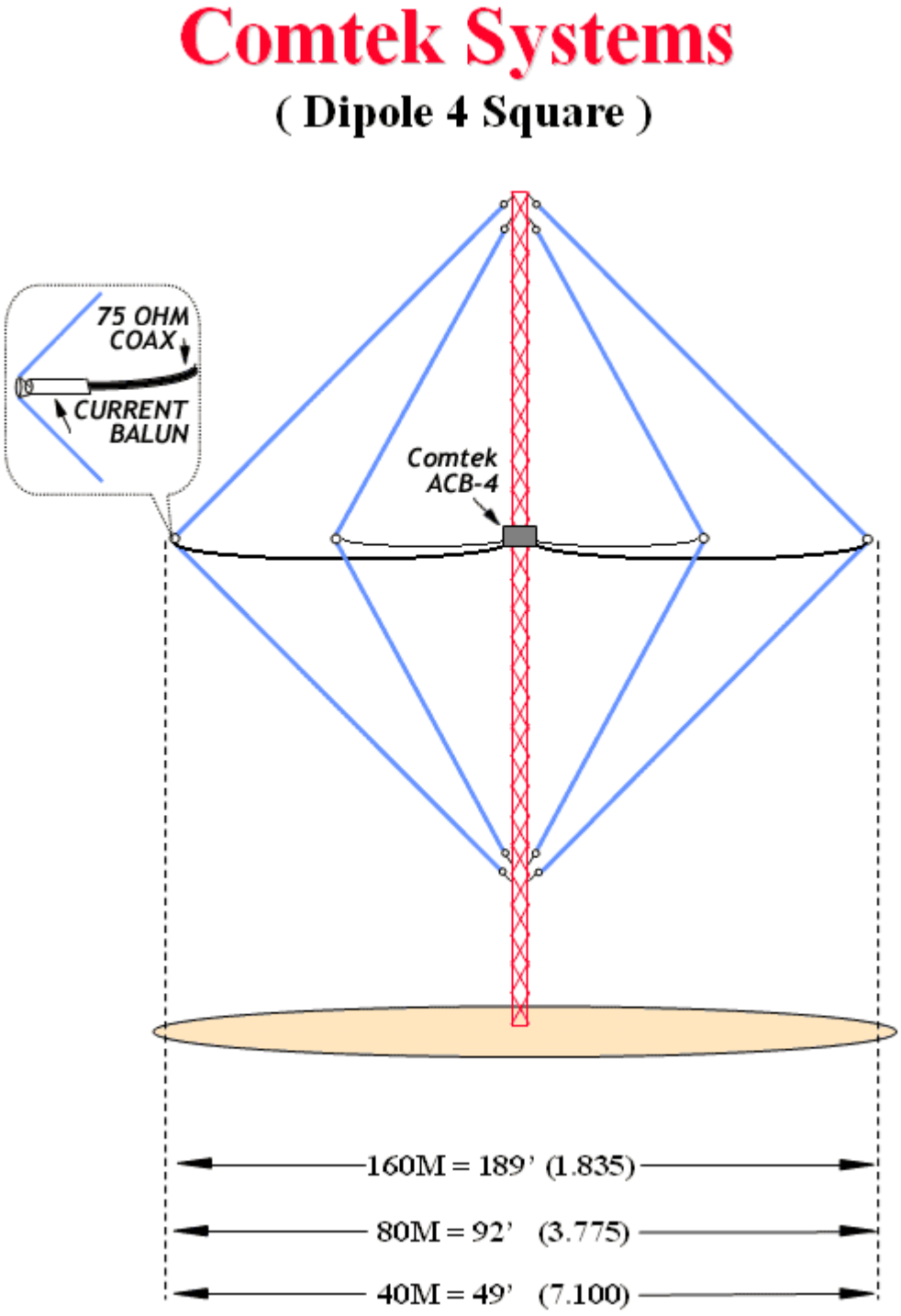
Additional References:

Antennas and Techniques for Low-Band DX'ing, John Devoldere, ON4UN, ARRL
The Amateur Radio Vertical Antenna Handbook, Capt. Paul H. Lee, N6PL (SK)
All about Vertical Antennas, William I. Orr, W6SAI & Stuart D. Cowan, W2LX
DX'ing On The Edge, Jeff Briggs, K1ZM, ARRL

80M shortened vertical example



Comtek Dipole 4-Square Diagrams



Comtek Systems

W7DD 80m INSTALLATION