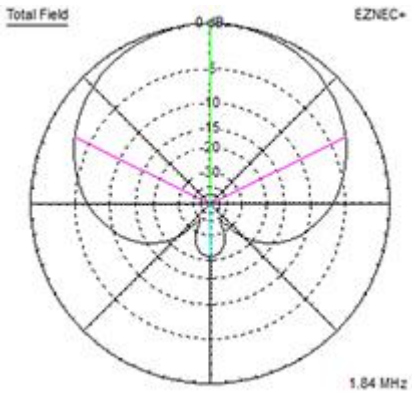
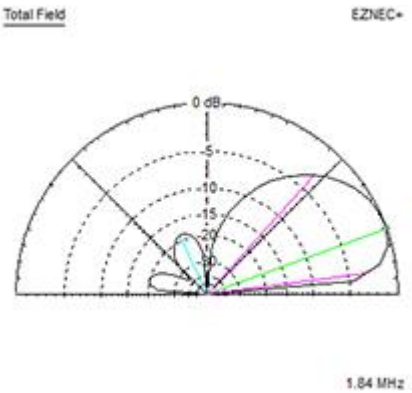
High Performance HF Receiving array Systems
And Components
Hi-Z Antennas tm Phase Controller for V2 3 Element Arrays



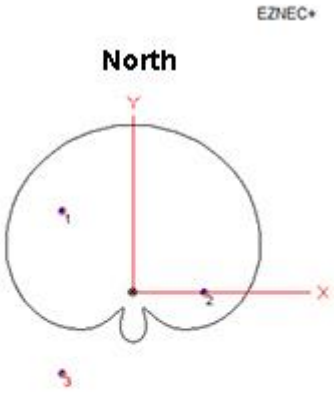


Stock Number HIZ-PC-3A
Designed for 160 meters through 40 meters and useful at 30 meters and above.

***This All New Phase Controller is the Heart of the Hi-Z 3 Element receiving Array. This phasing system allows the selection of 6 different receiving directions when used in combination with shortened vertical antennas and other Hi-Z subsystems. This controller is an all new design providing a new level of previously unobtainable accuracy. The new accuracy insures equal patterns and near equal RDF for all receiving directions.**

RDF= Relative Directivity Factor which relates to signal to noise improvement

The Hi-Z Antennas™ HIZ-PC-3A is a signal phasing system that combines the received signals from 3 different shortened vertical elements placed in a triangle making a phased array.
This phased array produces a narrow pattern selectable in 6 different directions while allowing 10 dB maximum of RDF (Relative Directivity Factor) and up to 30 dB of front to back ratio. Actual RDF and front to back depends on the array layout size, frequency, wave arrival angle, and Delay Cable values.



Notice the new element placement in relation to the compass directions This has allowed better performance in all available directions

The receiving elements can be placed anywhere between 40 and 50 feet apart depending on the user's needs. The elements need to maintain their equidistant symmetry. The array can be directionally offset if necessary. The HIZ-SS2 and HIZ-SS2-Plus Shack Switch controls can accept offset values however because of the relatively wider pattern an offset would not normally be required with this array.

All three elements must be mounted at ground level within a few inches. Mounting on a pedestal is very difficult to make work properly. The elements can be mounted on sloping ground without serious degradation unless the slope across the array becomes more than ¼ the height of the verticals. Most installations only require an element ground rod; however, some may require some short radials in very poor soil. Radial length approaching element length should suffice. Eight radials equally arranged should suffice in most really bad soil cases.

- This controller operates from 13.8 Volts DC (+11 to +14) at 250 milliamps or less.
- Power is supplied via the Screw terminals marked +13.8 and GND
- Direction Control is via 4 Screw terminals marked CTRL 1 thru CTRL4
- Direction control is achieved through grounding combinations of the CTRL terminals
- Output RF impedance is a nominal 75 ohms for feedline cable impedance matching
- The front view size is 3 3/4 X 6 1/4 inches Depth is 2 1/4 inches including input and output connectors
- The screw connectors are universal stainless-steel screw terminals
- Output, Delay, and Antenna Input connectors are high-quality RG-6 coaxial cable connectors
- Each CTRL switching line is transient protected with an MOV and a reverse diode
- The controller supply voltage is protected against overvoltage by an MOV device

Direction Control

The HIZ-SS2

The HIZ-SS2 or HIZ-SS2-Plus sold separately is normally used for Direction Switching this Phase Controller . The switch grounds to less than 1 Volt DC the CTRL lines per the table below. Just like a PTT line grounds to activate.

This SS2 or SS2-Plus unit is purchased separately as needed.

The switching table for this array

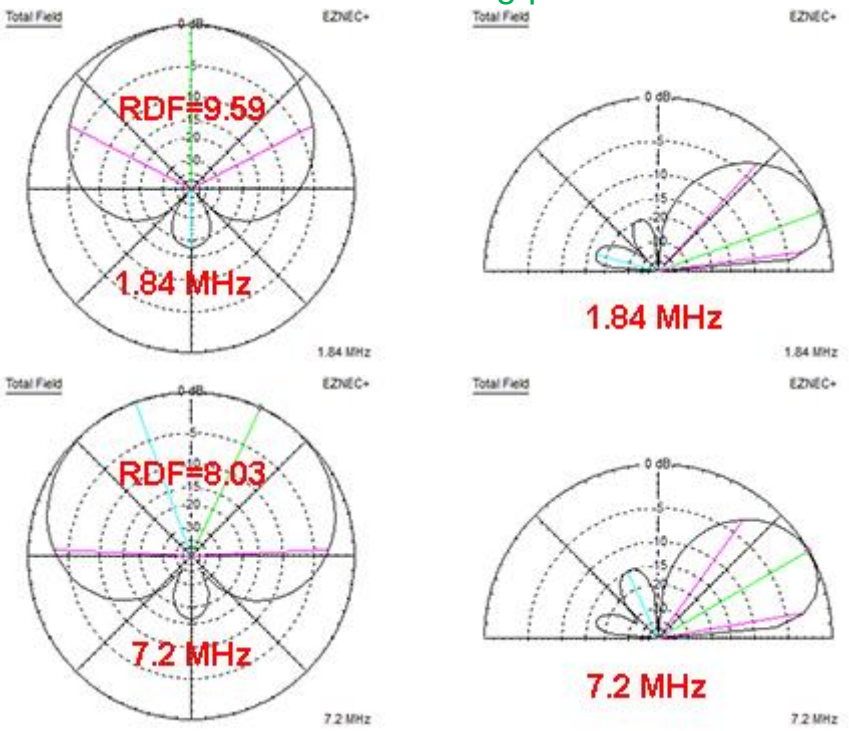
Direction	CTRL 1	CTRL 2	CTRL 3	CTRL 4
N	<1 VDC	11-14 VDC	11-14 VDC	11-14 VDC
NE	11-14 VDC	11-14 VDC	<1 VDC	<1 VDC
SE	11-14 VDC	<1 VDC	11-14 VDC	11-14 VDC
S	<1 VDC	11-14 VDC	11-14 VDC	<1 VDC
SW	11-14 VDC	11-14 VDC	<1 VDC	11-14 VDC
NW	11-14 VDC	<1 VDC	11-14 VDC	<1 VDC

Control wires from the shack to the array need to be 6 wires customer supplied. Two for Ground and +13.8 Supply that are heavy enough to carry 250 milliamps the full distance your array is from the supply. The other 4 wires for the CTRL lines carry less current at about 40 milliamp max. Typically 17 gauge direct bury

sprinkler wire works well out to several hundred feet. There are many varieties of wire suitable for this array. Users should think about their array distance and voltage drop as a result of current flow to ensure voltage at the Phase Controller in the field is 11 to 14 VDC for proper operation. It is possible to raise the voltage at the shack above 14 VDC as long as the array only sees 11 to 14 VDC at this phase controller. These arrays are quite compatible with wireless solutions including the Hi-Z Wireless system for eliminating multiple wires.

Choosing an Array Side Dimension and Delay Cable

Making these array choices for Dimension and Delay values are considerably complicated. For the person not wanting to make this decision we offer our “go to” all-purpose dimension and delay value. Making changes later is easily accomplished using different phase delay values or moving the elements. We offer 45 feet per side and 22 degrees delay cable as a very good starting point. These result in the following performance.

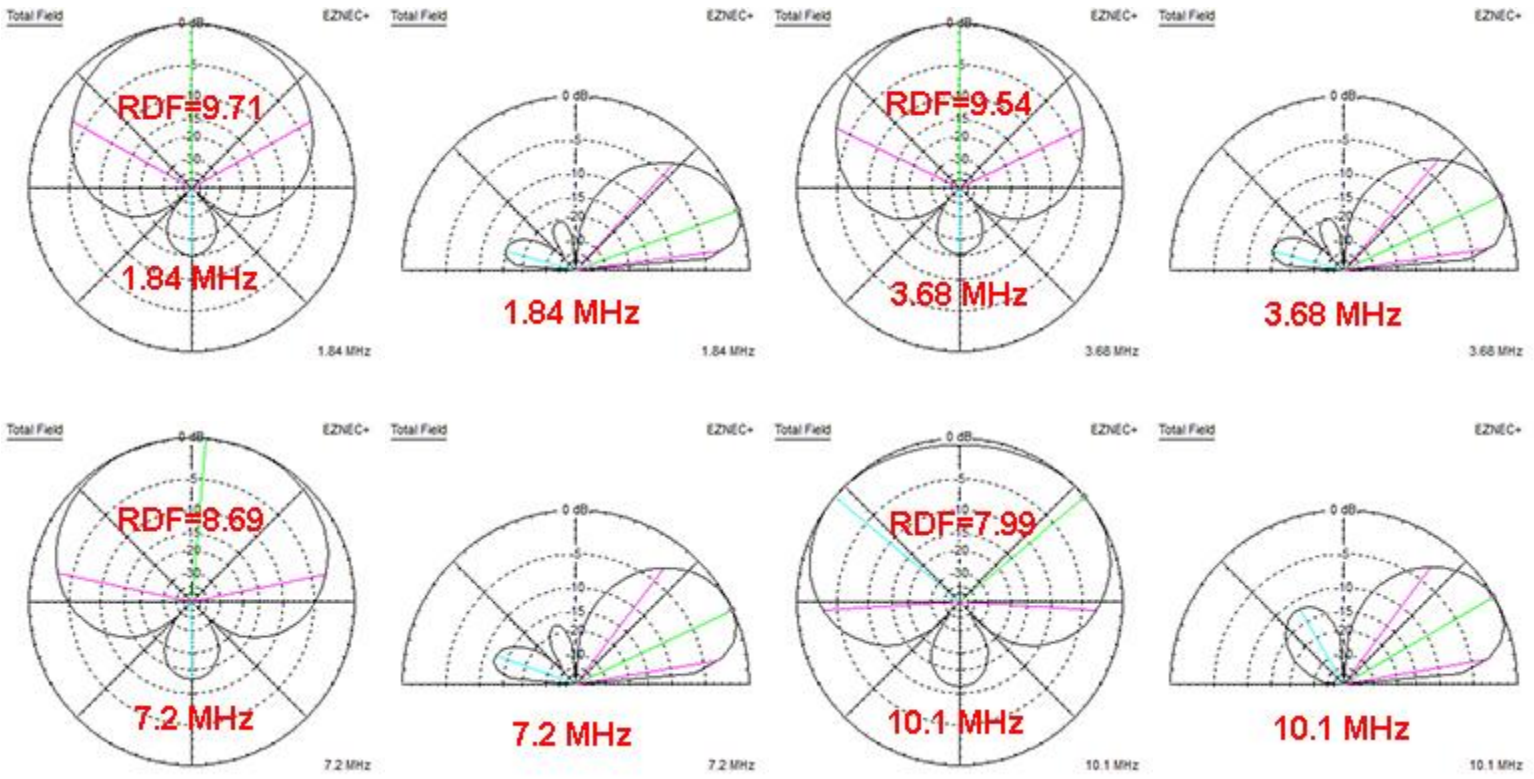


A single delay cable calibrated at 1.84 MHz provides this wide-band performance. The following page shows the performance at 80 meters and 30 meters for this array at 45 feet per side dimension.

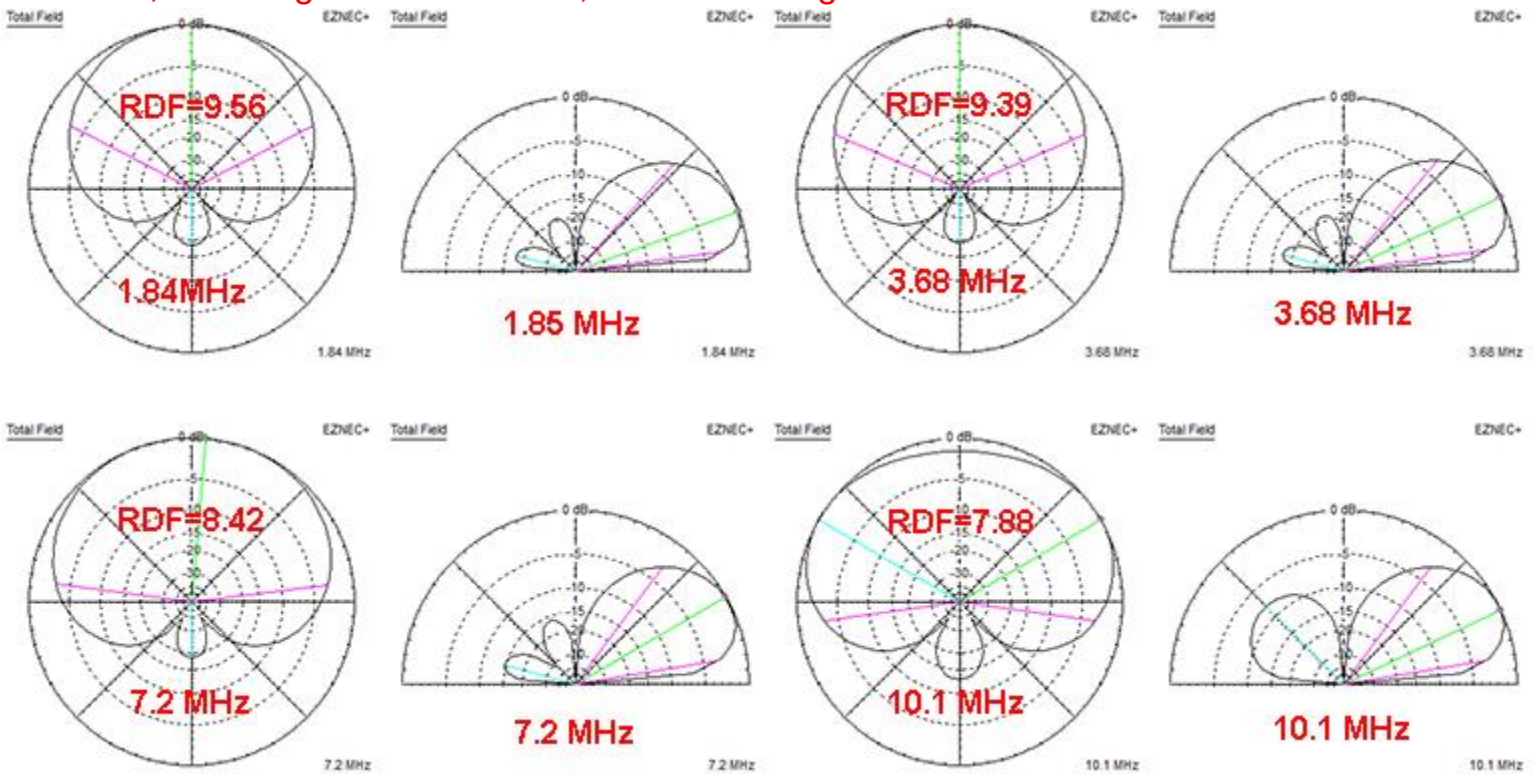
From these plots one can conclude that for a given array dimension the pattern worsens as the frequency goes up. This leaves one with decisions to make depending on the user’s preferences of frequency bands and signal to noise improvement as referenced by RDF (Relative Directivity Factor). In addition generally the 160 meter performance increases with the 50 foot per side dimension while the 40 meter performance degrades some.

The following next page plots should help in optimizing the array to your individual needs assuming you desire something other than the recommended 45-foot side dimension. One must keep in mind that at the higher frequencies you receive there can be varying incoming signal arrival angles. This can greatly affect the observed front to back ratio.

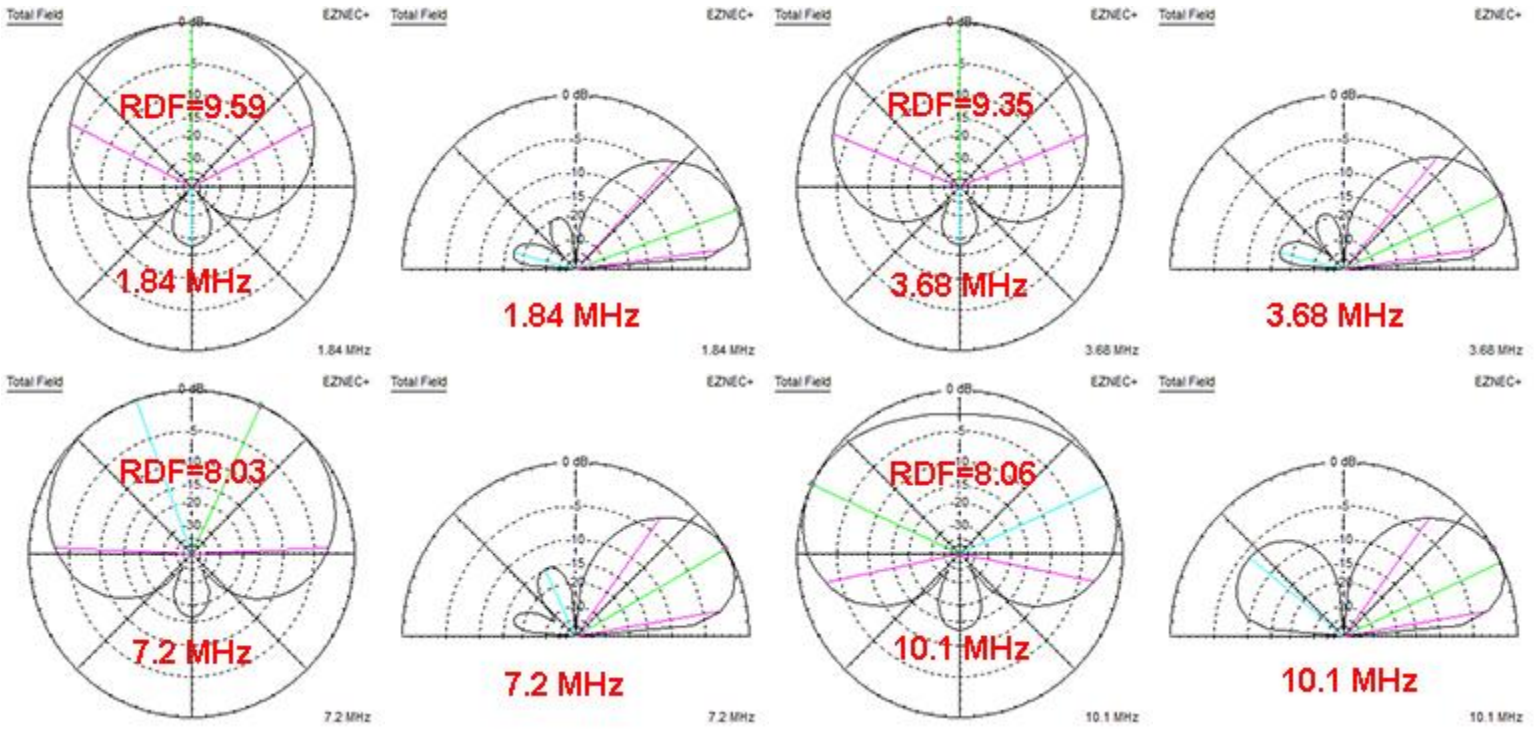
40 Foot per Side. One single delay cable of 18 degrees at 1.84 MHz for 36 degrees at 3.68 MHz, 70.4 degrees at 7.2 MHz , and 98.8 degrees at 10.1 MHz.



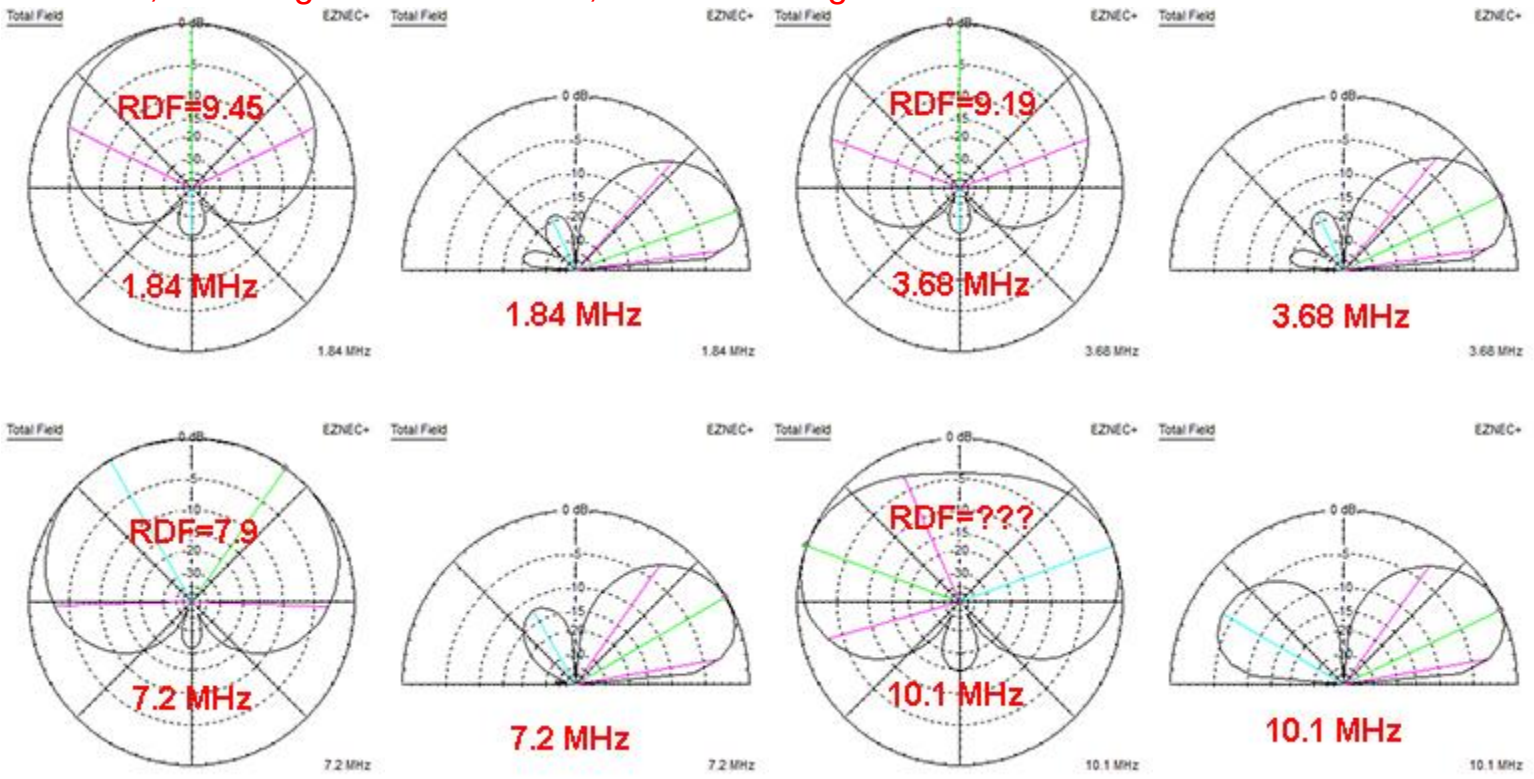
40 Foot per Side. One single delay cable of 20 degrees at 1.84 MHz for 40 degrees at 3.68 MHz, 78.3 degrees at 7.2 MHz, and 109.8 degrees at 10.1 MHz.



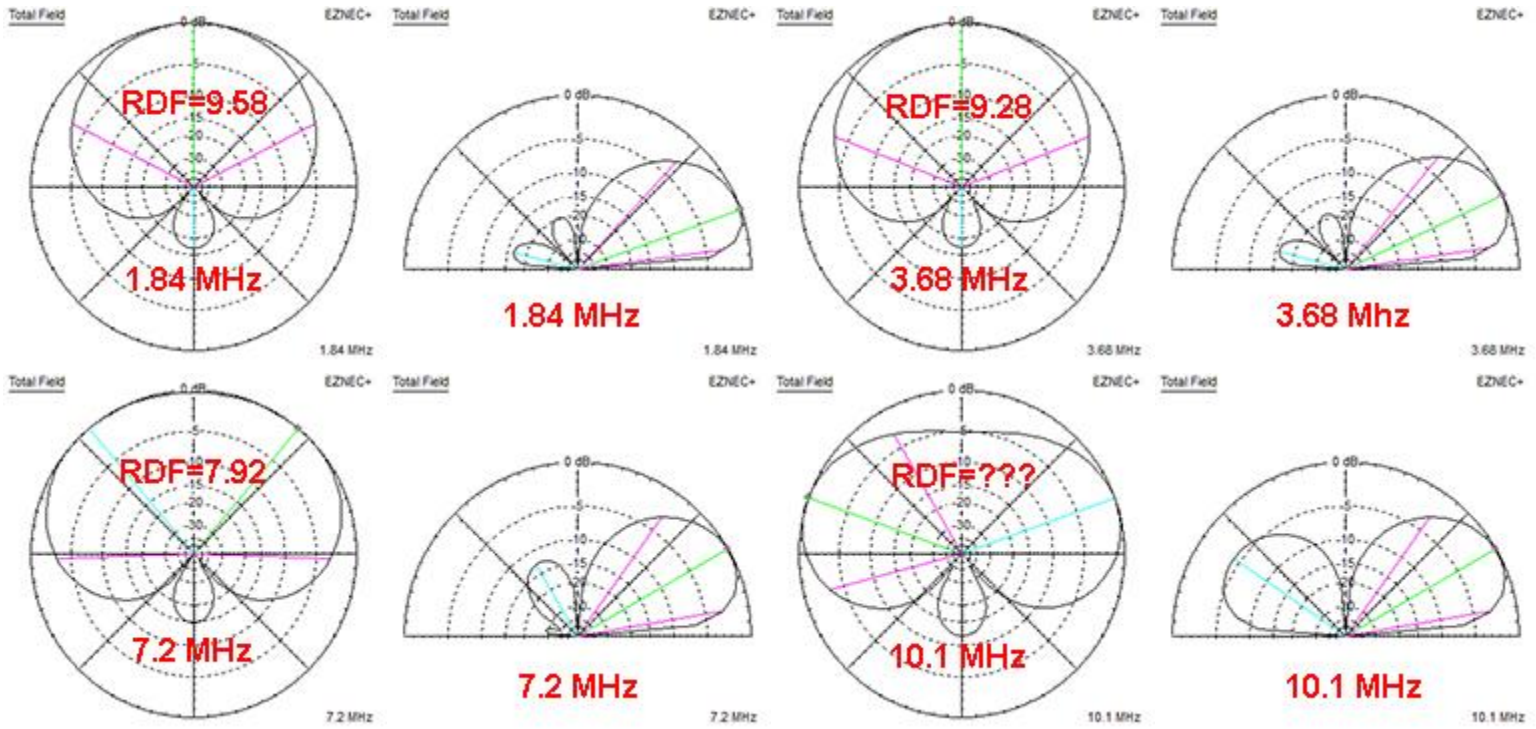
45 Foot per Side. One single delay cable of 22 degrees at 1.84 MHz for 44 degrees at 3.68 MHz, 86.2 degrees at 7.2 MHz , and 109.8 degrees at 10.1 MHz.



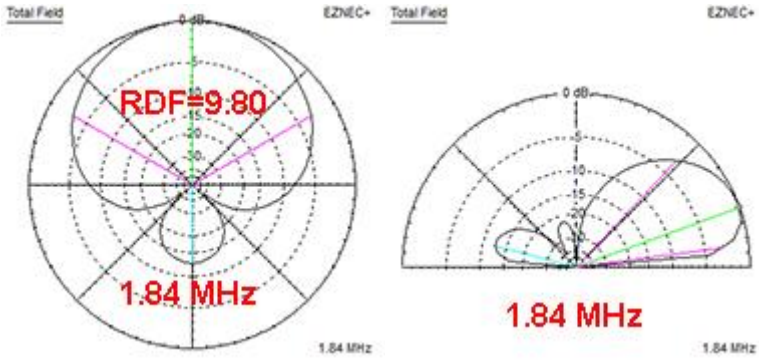
45 Foot per Side. One single delay cable of 24 degrees at 1.84 MHz for 48 degrees at 3.68 MHz, 86.2 degrees at 7.2 MHz , and 109.8 degrees at 10.1 MHz.



50 Foot per Side. One single delay cable of 24 degrees at 1.84 MHz for 48 degrees at 3.68 MHz, 86.2 degrees at 7.2 MHz , and 109.8 degrees at 10.1 MHz.

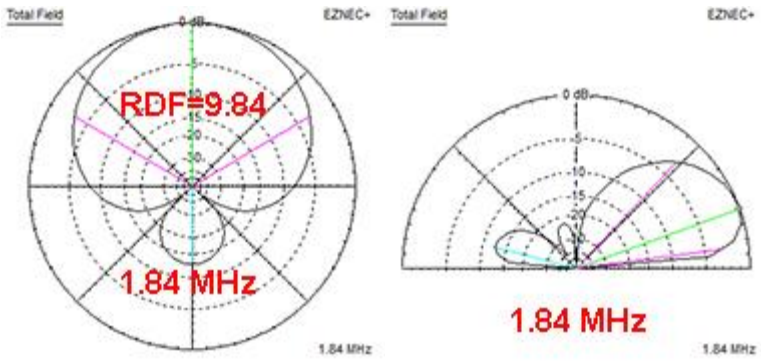


In general, it can be said that higher frequency (40 meters and above) arrays must use the smaller spacing to maintain good RDF and acceptable pattern. Also, in general it can be said that the RDF is greater when the Eznec front to back ratio nears -13 dB which is a really horrible ratio. It can also be said that as the array size gets smaller the array output level decreases. For an acceptable front to back ratio on all frequencies one must begin with a middle size array which is 45 feet per side and 20 to 22 degrees delay at 1.84 MHz. The only good reason to use the 40 foot per side array is to enhance 30-meter performance. Not withstanding any physical real estate issues dictating array size.



50 foot array with 20 degree delay.

This produces very good RDF at 160 meters but is the worst array at 30 meters. With the best RDF you do not get the best front to back ratios.



40 foot array with 16 degree delay.

This produces very good RDF on 160 meters and very good performance up to 30 meters. However, the front to back at 160 meters is compromised. More delay would reduce RDF while increasing the front to back ratio on 160 meters.

Each individual must decide which bands will be used the most for high performance receiving by studying the previous charts. We recommend starting with a 45 foot per side array and a 20 to 22-degree delay cable. Compare the 20- or 22-degree values in the following plots. This will give you a good front to back ratio on all the lower bands which will help you know that the array is really working. With our segmented delay cable, it is quite easy to change delays for experimentation.

To PLAN and Build the complete HIZ-3A-V2 triangular array please refer to the Three Element Triangular Array Purchasing and Assembly Document located on the www.hizantennas.com website here or by e-mail request at contact@hizantennas.com

THANK YOU for selecting Hi-Z Antennas™.

Hi-Z Service Department

We do maintain a service area where we try to provide very rapid turn around of repairs. Typically we can return repaired equipment within a few business days. Our GOAL is to keep your array uptime maximized. All repairs are returned as designed and thoroughly tested to meet our advanced internal specifications.

More information is available at
www.hizantennas.com or e-mail contact@hizantennas.com

Hi-Z Antennas™
8125 SW Larch Drive
Culver, OR 97734 USA
www.hizantennas.com