



HIGH PERFORMANCE

HF RECEIVING SYSTEMS & COMPONENTS

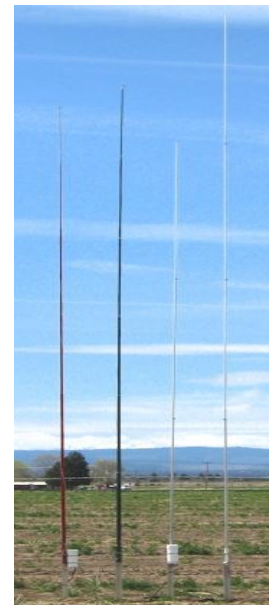
Hi-Z Antennas™ Hi-Z 2 / Hi-Z 2-3 Element Array Manual



Hi-Z 2, Hi-Z 2-3 Phase controller –left and Shack Switch - right



Hi-Z 2-3 Shack Switch



Hi-Z Verticals

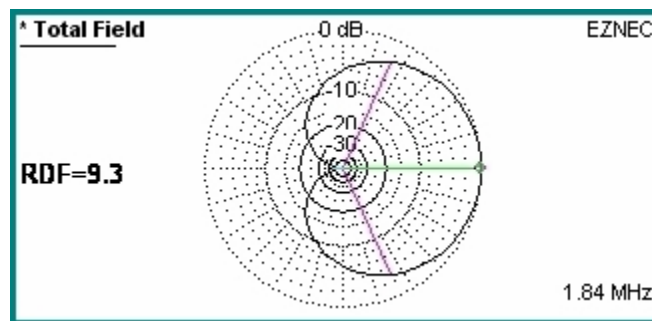
Congratulations and Thank You for the purchase of our system. We recommend that you read this manual and fully understand the requirements for the proper installation of your system.

Specifications

- Maximum RDF 9.1db
- Directions 2 (Hi-2) or 4 (Hi-Z 2-3)
- Hi-Z 2 requires two verticals and is upgradeable to four directions – Hi-Z 2-4 (add one more vertical)
- Standard Hi-Z 2 system comes with a 4 direction shack switch, for ease in later upgrade to 4 direction Hi-Z 2-4
- Power Requirements 13.8 VDC, 4 conductor cable (13.8, GND, CTRL1, CTRL2)
- Delay cable can be ordered for either 40 or 50 foot element spacing

This new product was conceived as requirement to deploy a phased receiving array in a small piece of property. For example, a city lot or a very cramped location.

Pattern



Component List for the Hi-Z 2 / Hi-Z 2-3 Systems

- 1- Hi-Z 2 or Hi-Z 2-3 phase controller
- 1 – Hi-Z 2 shack switch
- 2 or 3 – Hi-Z Amps -- Hi-Z 2 =2 Hi-Z Amps, Hi-Z 2-3 = 3 Hi-Z Amps
- 1 – Hi-Z 75Ω In-line Pre-amp
- 1 – Hi-Z 75Ω to 50Ω Transformer
- 1 – 2 foot long RG6 cables (connect phased controller to in-line pre-amp)
- 1 – 2 foot long wire with terminals (power to Inline pre-amp)

Material That the Customer Supplies -

1. Control cable (4 conductor – two wires for control and 2 for power)
2. Short two conductor cable for DC power. Hi-Z supplies the connector for the shack switch.
3. 2 verticals 20 feet tall for Hi-Z 2 or three verticals for the Hi-Z 2-3.
4. Three short ground rods. Depending on soil type, in the range of 2 - 3 feet long.
5. RG6 coax and connectors (connecting the verticals to the phase controller and from phase controller / in-line pre-amp to shack receiver location. RG6 coax is more than adequate to lengths out to 1000 feet long.
6. Make 4 (for Hi-Z 2) or 6 (for the Hi-Z 2-3) 9-10" long wires. Wire size can be made from 18 – 20 gauge wire. Terminate each end with #6 ring terminals. Recommend that after the terminals are crimped, that these terminals are soldered for reliability. For Hi-Z Amp terminations.

7. **Weatherproofing the electronics.** You will need an adequate cover or enclosure that will keep rain and snow off the phase controller, in-line pre-amp and filters if installed, and the Hi-Z Amps at the base of each vertical. Water getting inside of these enclosures WILL cause DAMAGE.

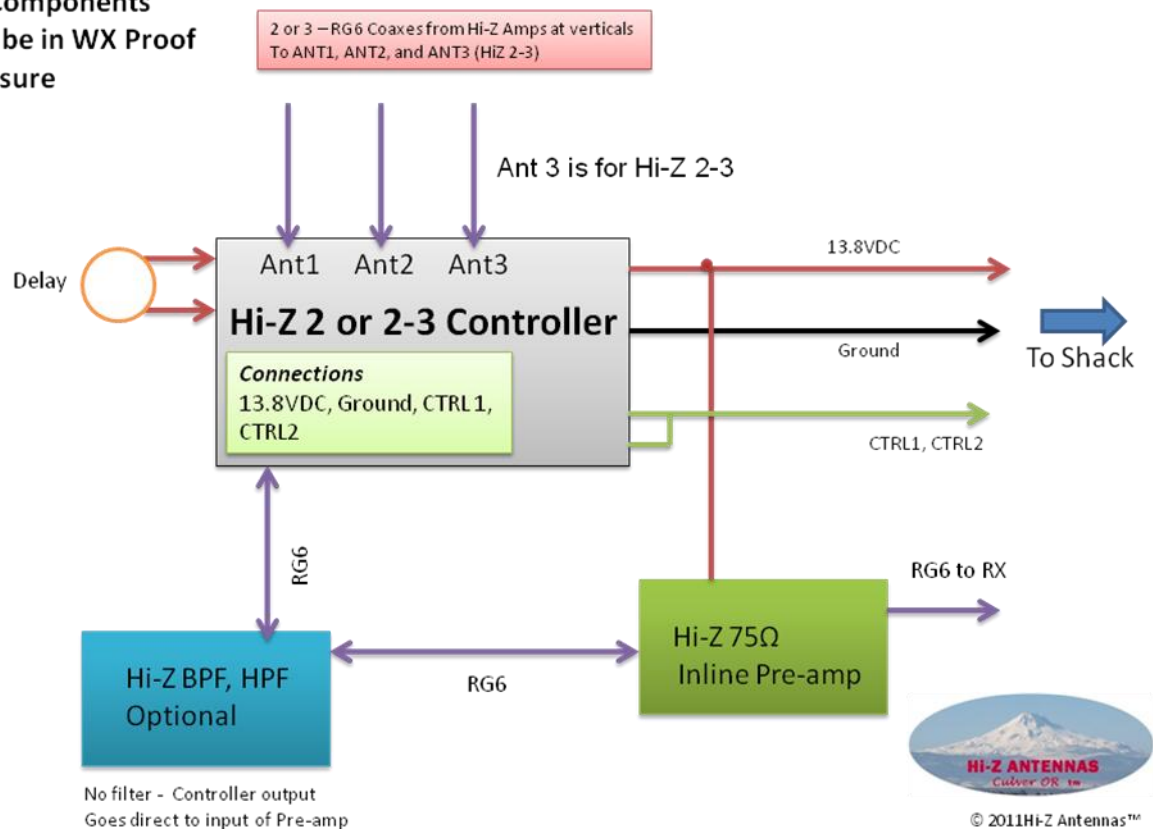
OPTIONS

Filters for site specific issues, for example local and or high power AM broadcast stations. Hi-Z Antennas™ makes a BPF look at http://www.hizantennas.com/band_pass.htm and a HPF look at http://www.hizantennas.com/high_pass.htm

SITE PREPARATION

Place the verticals as far away from metallic structures or other towers and antennas as possible, especially resonant antennas. The farther the better. Keep away from field fencing at least 10-20 feet. Keep the verticals more than 10 feet from trees and heavy vegetation.

Remote Location –
Hi-Z Components
Must be in WX Proof
Enclosure



Control Cable and Coax Considerations

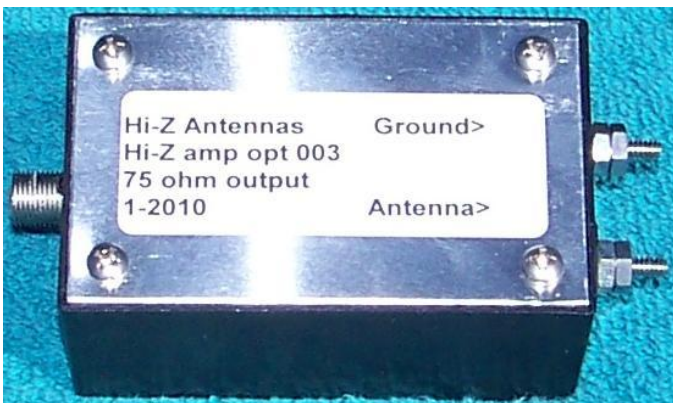
1. Conductor wire gauge size is a function of the length of the control cable. 18 gauge wires are adequate out to 500 feet. Any longer will need to increase wire gauge size to accommodate the voltage drop over the run of cable length. An inexpensive source of cable is from Lowe's, Home Depot, etc in their electrical department. They have 5, 7, 9 conductor, 18 gauge direct burial sprinkler control cable. Usually they will have it on large spools and can be cut to the length you require. Always get extra.
2. Make sure that the RG6 connectors are tight. Use only good quality connectors. **See the Tech Note on the last page. Appendix A**

3. If you crimp on terminals on the control cable, go the extra step and solder each terminal for reliability.

Vertical Placement and Installation of the Hi-Z Amplifiers

1. See the vertical placement table at the end of the manual.

2. Typically the phase controller is mounted in the center of the array, but that is not necessary as long as ALL two RG6 cables (Hi-Z 2) or three RG6 coaxes (Hi-Z 2-3) are cut to the same length and can reach from the controller to all two or three verticals.
3. Determine where the array (verticals) will be mounted.
4. The verticals need to be as far away as possible from other antennas, tower and other metallic structures. Especially if the other antennas are resonant, this will lower performance.
5. Determine the direction orientation. You have 2 directions (Hi-Z 2) or 4 (Hi-Z 2-3). So orientation of the verticals is critical to achieving the directional performance you require and can be different in locations around the world.
6. See the diagram on the last page. This will assist you in laying out the accurate placement of your three verticals.
7. Acquire control cable (4 conductor) long enough to get from the shack switch to the phase controller.
8. You will need a length of RG6 coax about the same length to connect the output of the in-line pre-amp (at the phase controller) to your receiver port through the 75 to 50Ω Hi-Z transformer.
9. Locate the ground rods close to the base of each vertical.
10. The phase controller is located in the center of the array. That is not necessary. However where ever the phase controller is located so the two (Hi-Z 2) or three (Hi-Z 2-3) RG6 coaxes from the controller to the base of each vertical **MUST** be cut and terminated to the same length
11. Mount the 2 or 3 verticals (either homebrew or Hi-Z verticals).
12. Mount the Hi-Z Amplifiers at the base of each vertical. Connect one wire from the Antenna terminal to the base of the vertical. Connect another wire from the Ground terminal to the ground rod. See Hi-Z Amplifier.
13. Connect a RG6 coax from output of Hi-Z amp to the correct Ant 1, 2 or **3 (Hi-Z 2-3 ONLY)** at the controller.
14. Weatherproofing the Hi-Z Amp. Place a cover over (or other such enclosure) the Hi-Z Amp to insure that rain or snow does not fall on or get trapped with the enclosure. See our website under vertical for ideas on weatherproofing - http://www.hizantennas.com/hiz_verticals.htm



Hi-Z Amplifier



Hi-Z 75 to 50Ω Transformer

Connecting the Verticals and Delay Cable to the Phase Controller



Fig. 1



Fig. 2

1. Run equal lengths of RG6 from the controller to each vertical. This connects to the controller Ant 1, 2 (Hi-Z 2) or 1, 2, 3 (Hi-Z 2-3) to verticals 1, 2 or 1, 2, 3, respectively. Be certain to observe these connections based on the orientation or placement of verticals for correct aiming. Fig.1
2. Connect the Hi-Z supplied Delay cable at Short Delay connectors on the phase controller. Fig.2

Connecting the Phase Controller to the Shack Switch and Receiver Fig. 3

1. Connect CNTL 1, CNTL2 between controller and shack switch. Fig. 3, Fig. 5
2. Wire the power (13.8 VDC and Ground) from shack switch to the controller.
3. Connect a short length of RG6 (supplied with this system) from the phase controller output to the input of the 75Ω inline pre-amp. Fig. 3
4. OPTIONS. If a HPF or BPF filter was purchased or customer supplied, the filter MUST be inserted between the controller output and before the inline preamp (best IMD).
5. Connect a short wire (a 3 foot wire is supplied) from the 13.8 VDC controller terminal to the 13.8 VDC terminal at the inline pre-amp. Fig. 3, Fig.6
6. Connect RG6 from the output of the 75Ω inline pre-amp to your receiver through the Hi-Z transformer. Fig. 3

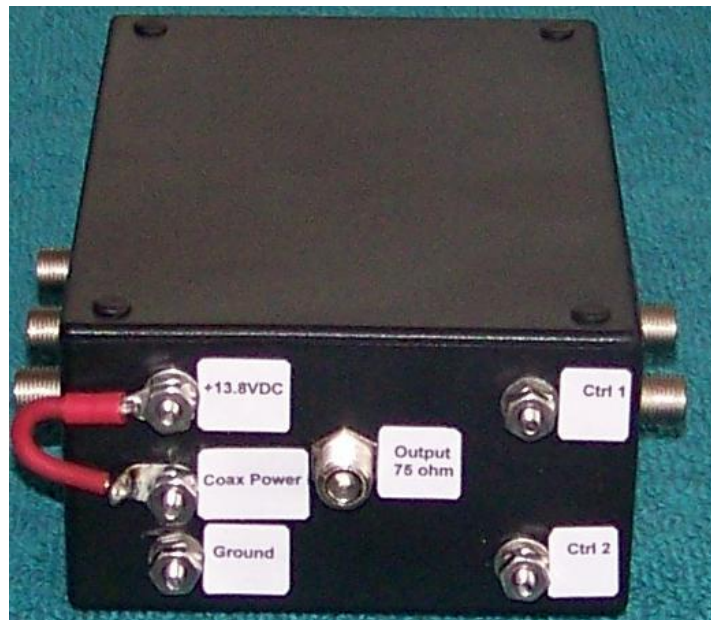


Fig. 3



Fig. 5



Fig. 6

Shack Preparation and Basic Operation

1. Locate the placement of the shack switch.
2. Hi-Z Antennas™ provides a power connector, on the back of the switch (array power). Build a power cable to suit your needs and connect to your DC power supply. Center connector is +13.8VDC and the shield is Ground. Fig.5
3. Verify the voltage level is in the 13.8 VDC areas. Depending on the length of the control cable this voltage may need to be adjusted upwards to compensate for any voltage drop.
4. Direction control. The top yellow LED (at 12 o'clock) position is direction 1 (North). LEDs in order in the clockwise direction will select directions 2 (East), 3 (South) and 4 (West). Typically direction number 1 is oriented to North. Hi-Z 2-4 then in order position 3 is south and 4 is West and East. This is dependent on vertical placement, this is for reference only.



Position	LED ON	Reverser Switch	Axis Switch	
North	Top	Off	Off	
East	Right	Off	On	
South	Bottom	On	Off	
West	Left	On	On	

Power Up and System Checks

1. **Turn power on at the shack switch. One yellow direction LED should be ON.**
2. Measure the voltage at the phase controller. 13.8VDC is ideal. Voltage must be ≥ 12.0 VDC.
3. Check the RED LEDs at the Hi-Z Amps at the base of each vertical, they should ALL be ON.
4. Connect to receiver (through optional Hi-Z 75 to 50 Ω transformer, recommended).
5. Tune to 160 or 80 meters. Switch On and off the power at the Hi-Z shack switch and you should hear the noise floor increase when switched ON. If able, compare to existing antennas, the noise floor on the Hi-Z system will likely be lower.
6. Test the directivity by tuning the top end of the AM broadcast band (with no HPF or BPF filter installed). When pointed at a station and the signal is peaked, turn the control to other directions and observe the F/B and F/S.
7. On the air, especially low angle DX, you will observe best performance in terms of pattern. When a signal is peaked in one direction, try switching in the direction either side you will see the signal decrease considerably. As you continue to turn the direction control and observing the signal level, the F/S and F/B performance will become apparent.
8. The advantage is the S/N that our system produces. Good DX'ing.

TROUBLESHOOTING also see http://www.hizantennas.com/hiz_faq.htm

Symptom:

Spurs every 10 KHz across 160 meters. Check the Hi-Z Amp connections One of the Hi-Z Amp has the two wires (Antenna, Ground) backwards, verify these connections are wired correctly.

Measure the DC voltage on the vertical. From ground to the vertical with a DVM you should measure ~ 4 volts VDC.

Some switching power supplies can cause this symptom.

Low IMD. Verify that the voltage at the +13.8VDC and Ground terminals at the phase controller measures ≥ 12.0 VDC. Sometimes due to control cable lengths one may need to consider a separate adjustable voltage power supply to insure correct operation voltage for the Hi-Z system.

Hi-Z Amps – No RED LED ON

Verify that there is a jumper on the phase controller between the 13.8 VDC and Coax Power In terminals.

Birdies, Heterodyning

Causes include close proximity to broadcast stations.

Solutions: One the source of this problem is located, the insertion of either a Hi-Z BPF or Hi-Z HPF, depending on the source of interference, should be inserted between the output of the phase controller and the input to the 75 Ω in-line pre-amp.

Directions Seem Wrong

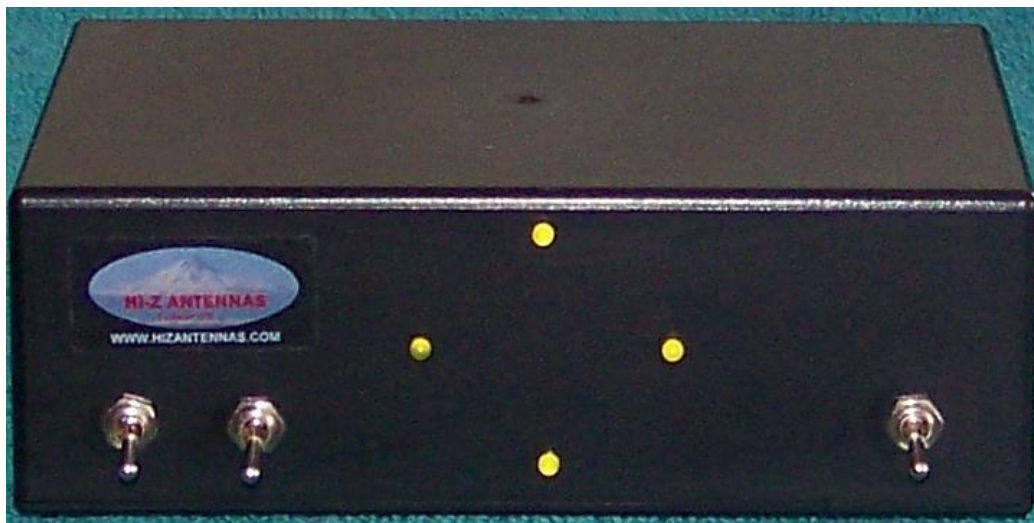
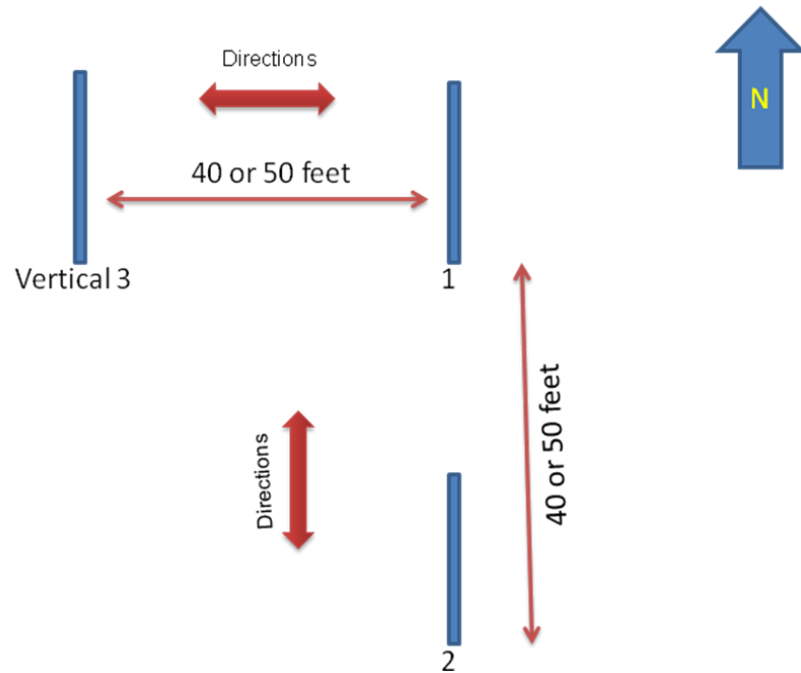
Verify that you connected vertical 1 to controller Ant1, vertical 2 to controller Ant 2 and so on.

For other topics see technical & application notes at http://www.hizantennas.com/application_notes.htm

Vertical Placement and Layout Procedure

Assumes Direction 1 = North

1. Perpendicular to North heading, measure and mark 2 points 40 or 50 feet apart
2. This marks the placement of vertical 1 and 2
3. Hi-Z 2-4 Add vertical 3 as shown below and is perpendicular, forming a right angle



ON/OFF REVERSER

AXIS Switch

Position	LED ON	Reverser Switch	Axis Switch	
North	Top	Off	Off	
East	Right	Off	On	
South	Bottom	On	Off	
West	Left	On	On	

HIGH PERFORMANCE

HF RECEIVING SYSTEMS & COMPONENTS

Hi-Z Antennas™ Hi-Z Amplifier



Hi-Z Amplifier

The Hi-Z Amplifier was designed to provide amplification and matching between the short verticals and the phase controller in the Hi-Z phased array control systems. This amplifier is used on ALL Hi-Z phased array products. The amp is located at the base of each short vertical. The connecting wires must be short, in the range or 8-10 inches long. When dressing or routing the wires between the vertical and ground rod to the Hi-Z Amps, maintain as much separation between the ground and antenna wires as possible. If these wires are too close it will degrade the system performance. The Hi-Z Amp MUST be Weatherproofed!! Please review our application and technical notes to gain ideas for mounting the Hi-Z amplifiers near the base of the verticals. See: http://www.hizantennas.com/hiz_verticals.htm

Features:

- Relay input (lightning and static protection, when power is off)
- Easy connections to the base of the vertical and ground



Terminals to Ground and Vertical



Hi-Z Amp RG6 Output

APPENDIX A

TECH NOTE - Correct Procedure To Tighten F- Connectors

F connector tightening procedure. Placing a 7/16" wrench on the chassis connector while holding it tight, place another 7/16" wrench over the Male connector housing and tighten until snug. Do not over tighten this F connector. View pictures below.

