α ALPHA ANTENNA®

User Guide
for the

Alpha Antenna
6-40 or 10-80 meter OCF Dipole

Manufactured by:
Alpha Antenna
1.888.482.3249

Website: http://AlphaAntenna.com

User Guide Version 3.0

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REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail or email us a marked copy to the contact information on the last page of this manual.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your Alpha antenna needs improvement, let us know. You, the user, are the only one who can tell us what you don't like about your equipment. Mail or email us an EIR to the contact information on the last page of this manual.

Safety Information

When installing or operating this antenna or any other antenna/tower, please observe the following safety tips.

NOTE – High voltages are present when transmitting, no matter how much or little power is applied. Do not touch any part of the antenna while transmitting.

WARNING: INSTALLATION OR OPERATION OF THIS PRODUCT NEAR POWER LINES IS DANGEROUS! FOR YOUR SAFETY, FOLLOW THE ENCLOSED INSTALLATION DIRECTIONS. THOUGH THIS ANTENNA IS CONSTRUCTED WITH INSULATEDMATERIALS, PROPER CARE MUST BE TAKEN DURING INSTALLATION. INSTALLER ASSUMES ALL LIABILITY FOR PROPERTY AND LIFE SAFETY.

YOU, YOUR ANTENNA, AND SAFETY

Each year, hundreds of people are killed, mutilated, or receive severe and permanent injuries when attempting to install an antenna. In many of these cases, the victim was aware of the danger of electrocution, but did not take adequate steps to avoid the hazard. For your safety, and to help you achieve a good installation, please **READ** and **FOLLOW** the safety precautions below. **THEY MAY SAVE YOUR LIFE!**

1. If you are installing an antenna for the first time, please, for your own safety as well as others, seek PROFESSIONAL ASSISTANCE.
2. Select your installation site with safety, as well as performance, in mind. **REMEMBER:** ELECTRIC POWER LINES AND PHONE LINES LOOK ALIKE. FOR YOUR SAFETY, ASSUME THAT ANY OVERHEAD LINES CAN KILL YOU.
3. Call your electric power company. Tell them your plans and ask them to come take a look at your proposed installation. This is a small inconvenience, considering **YOUR LIFE IS AT STAKE.**
4. Plan your installation procedure carefully and completely *before* you begin. Successful raising of a mast or tower is largely a matter of coordination. Each person should be assigned a specific task, and should know what to do and when to do it. One person should be designated as the leader/coordinator of the operation to call out instructions and watch for signs of trouble.
5. When installing your antenna, **REMEMBER: DO NOT USE A METAL LADDER. DO NOT WORK ON A WET OR WINDY DAY. DO DRESS PROPERLY:** shoes with rubber soles and heels, rubber gloves, long sleeved shirt or jacket.
6. If the assembly starts to drop, get away from it and let it fall. Remember, the antenna, mast, cable and metal guy wires are all excellent conductors of electrical current. Even the slightest touch of any of these parts to a power line completes an electrical path through the antenna and the installer – **THAT'S YOU!**
7. If ANY PART of the antenna system should come in contact with a power line, **DON'T TOUCH IT OR TRY TO REMOVE IT YOURSELF. CALL YOUR LOCAL POWER COMPANY.** They will remove it safely. If an accident should occur with the power lines, call for qualified emergency help **IMMEDIATELY.**

Excess RF Exposure Warning

In the United States, the Federal Communications Commission has established guidelines for human exposure to Radio Frequency (RF) electromagnetic fields. The commission's requirements are detailed in parts 1 & 2 of the FCC's rules and regulations {47 CFR, 1.1307(b), 1.1310, 22.1091, 2.1093}. It is the responsibility of the owner/operator of this device to follow all applicable warnings and precautions regarding human exposure to RF fields.

The FCC Office of Engineering Technology (OET) Bulletin 65, Supplement B, Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields directly concerns the use and operations of all Alpha Antenna systems. This bulletin establishes safe operating distances from antennas associated power levels in order to permit the operator and persons who may be impacted by operation to exist in a safe environment. Guidelines for Maximum Permissible Exposure, or MPE, are defined in Supplement B of the bulletin.

IMPORTANT NOTE:
Refer to the above mentioned Supplement B along with FCC OET Bulletin 65, Version 97-01. The information in the supplement provides additional details that are used for evaluating compliance of amateur radio stations with FCC guidelines for exposure to radio frequency electromagnetic fields. Supplement B users should, however, also consult Bulletin 65 for complete information on FCC policies, guidelines, and compliance related issues. Definitions of terms used in this supplements appear in Bulletin 65. Bulletin 65 can be viewed and downloaded from the FCC's Office of Engineering and Technology's web site at: http://www.fcc.gov/oet/rfsafety

SECTION 1 – Introduction

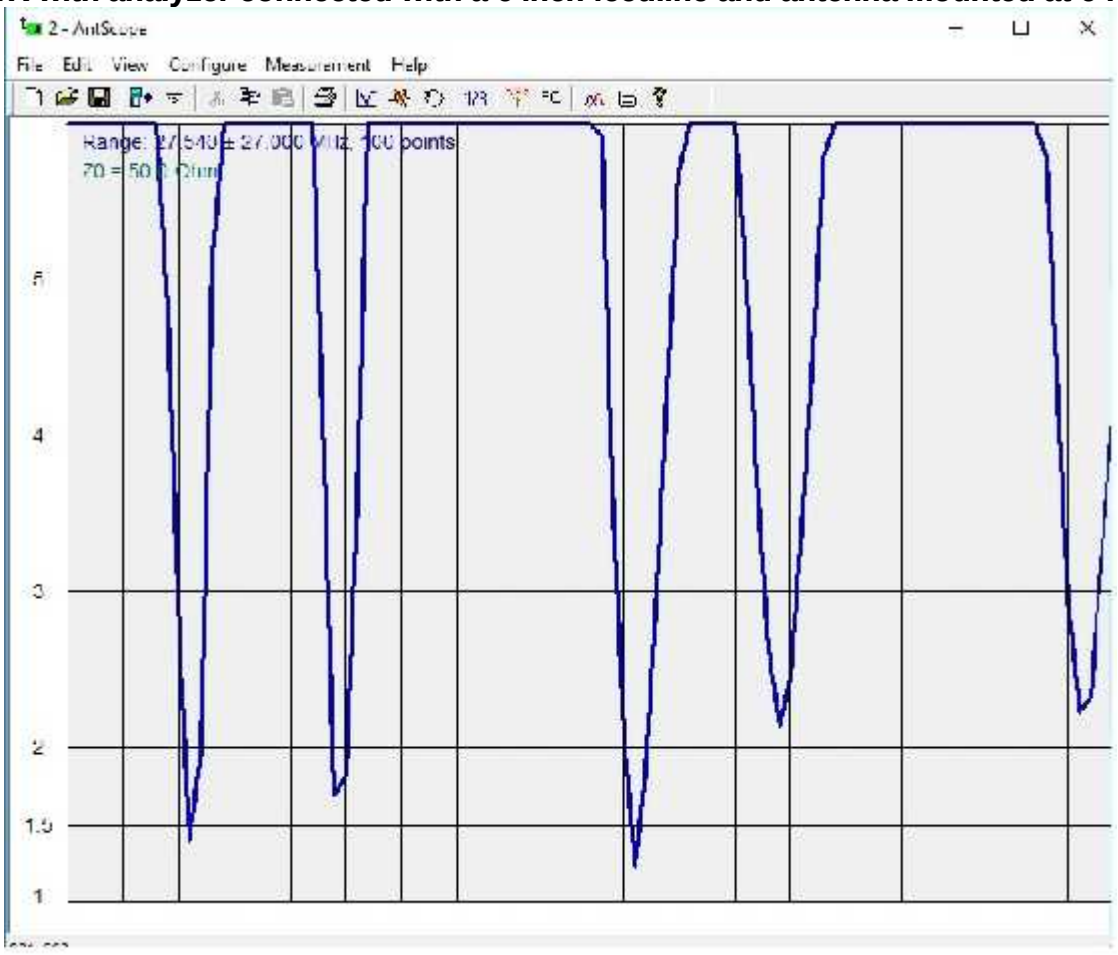
The Alpha Antenna 6-40 or 10-80 meter portable OCF (Off Center Fed) Dipole is respectively 67 foot or 136 feet long and handles 200W PEP SSB. Both wire elements of each antenna come with wiring that is slightly longer so you can fine tune it.

The recommended deployments include;

1) Deployment at the ideal height, where the feed point is around 30-35 feet.
2) Mounting it an acceptable height of 20 to 40 feet.
3) Installing the antenna as an Inverted V.
4) Between 6 to 20 feet (see NVIS information below regarding these mounting heights).

Each of these deployments change the characteristics of a well-designed OCF Dipole that has a high-Q (high-Q = narrower bandwidth = greater efficiency). In consideration for the changes in impedance for options 1, 2, 3, & 4 above, we have included an additional 6 inches of wiring that can be trimmed when necessary. Option 4 will provide the worst case SWR scenario, which is represented by the following chart.

SWR with analyzer connected with a 6 inch feedline and antenna mounted at 6 feet



SECTION 2 – Concept of Operation

Many short-range HF communication circuits use vertical whip antennas that are not directional. With these antennas, communications are achieved on very short ranges by ground-wave (surface-wave propagation), and longer paths are achieved by sky-wave propagation. An inherent characteristic of radio-wave propagation, using whip antennas, is the zone of silence (skip zone) between the point where the ground-wave signal becomes unusable and the sky-wave signal starts to become usable (Ref. Radio Amateur's Handbook, Ionospheric Propagation, most editions). Depending upon terrain, ground conductivity, operating frequency, noise levels, etc., ground-wave signals are usable up to about 70 miles over average soil. Also, minimum distances for sky-wave paths, using whips, are generally 200 miles (E-layer) during the day and 400 miles (F-layer) at night.

While the skip zone, described above, severely limits the usefulness of whip antennas for short-range communications, conditions become even worse in an adverse environment, such as a hilly or forest-type terrain. This occurs because of the restricted range of ground-wave signals in these environments.

The inverse distance field is the field that would be present if there were no attenuation due to the surface over which the signal is propagated. The strongest practical signals occur over seawater.

As the soil conductivity decreases or as the foliage increases, the signal strength at a distance decreases rapidly. The important consideration for communications is not the value of signal level, but the signal-to-noise ratio.

Good ground-wave communications are expected at 25 miles at any time of the day for good ground conditions, and the range may be as much as 100 miles for a couple of hours at midday. However, if the environment is dense forest instead of good ground, the maximum ground-wave communication range may be 1 mile or less.

From the above discussion, it is clear that a skip zone is present when vertical whip antennas are used. The extent of the skip zone is dependent upon soil conditions. For average environments, the skip zone lies between 70 and 200/300 miles; however, in extreme environments, it may include the range from 1 to 200/300 miles. The skip zone is of a very critical range for most tactical communication systems including man-pack, vehicular, and shelter equipment. Most tactical requirements necessitate good communications in the 0 to 300-mile range. If HF communications are to be effective in this range, different antennas and propagation modes are necessary.

The solution to the short-range communication problem is the use of sky-wave instead of ground-wave propagation on the short paths. This requires radiation from the antenna at very high elevation angles NVIS (near vertical incidence sky-wave). This is accomplished by deploying the 6-40 or 10-80 meter OCF Dipole a heights lower than 20 feet. Such radiation characteristics are omnidirectional in azimuth and provide an l-hop range of about 300 miles. The antenna gain varies mainly with the height of the antenna above ground.

Because it is highly desirable to have minimum height and weight for tactical antennas, the immediate problem becomes one of determining the minimum effective antenna height required. In order to determine the required antenna height, a minimum acceptable level of performance is established as necessary to permit communications.

The required effective height of the antenna is found by considering the following; when a horizontal antenna is close to ground, energy is radiated in two modes. The desired NVIS mode produces radiation with a maximum in the vertical direction. The undesirable Beverage mode creates a vertical electric field between the conductor and ground, producing vertically polarized ground-wave signal with a maximum pattern in the direction off the NVIS wire end. Due to the proximity of the antenna to ground, this latter mode has an efficiency that is generally poorer than a whip.

The shape of the radiation pattern of the horizontally mounted element is essentially constant for heights not exceeding one-quarter wavelength. For a fixed height above ground, the amount of the input power radiated proportionately in each of these modes is a function of the relative percentage of the antenna input resistance characterizing each mode. Each of these, in turn, is a function of the height above ground. The total input resistance is that portion due to the NVIS mode as the NVIS height is varied. As the height increases, a larger part of the input signal is radiated in the NVIS mode. These resistances are typical of these encountered over average ground.

For example, an antenna at an effective height of 0.070 wavelength is about 5 feet at 7.000 MHz. The result of this example enables an effective height for a signal at 0.070 wavelength to be achieved by elevating the horizontal NVIS element so that is mounted between two 5-foot supports where the element is horizontally mounted.

SECTION 3 – System Overview

This instruction manual contains technical data, installation procedures, theory of operation, and an illustrated parts list *covering* the Alpha Antenna 6-40 or 10-80 meter OCF Dipole antenna system. The antenna was designed to be used with HF radios.

Table 1-1 SUMMARY OF AVAILABLE EQUIPMENT	
PART NUMBER	DESCRIPTION OF AVAILABLE EQUIPMENT
MTCH-3.1	A housing that includes a stacked 4:1 Guanella balun.
OCF-3.1.xx	A heavy duty 18 gauge wire with ring connector.
INSLTR-3.1	A lightweight end insulator.

Equipment Description

Physically the antenna consists of one each of the OCF-3.1.xx elements, which are constructed of poly sheath around stranded copper-clad steel wiring, MTCH-3.1 is a stacked 4:1 Guanella balun constructed of type 43 material that is incased in custom built and insulated housing before wiring is wrapped around them, INSLTR.3.1 is a custom constructed lightweight insulator that installs at the end of each OCF-3.1.xx element (Ref. descriptions in Table 1-1). The antenna can be transported and deployment is accomplished in approximately 5 minutes.

Equipment Characteristics

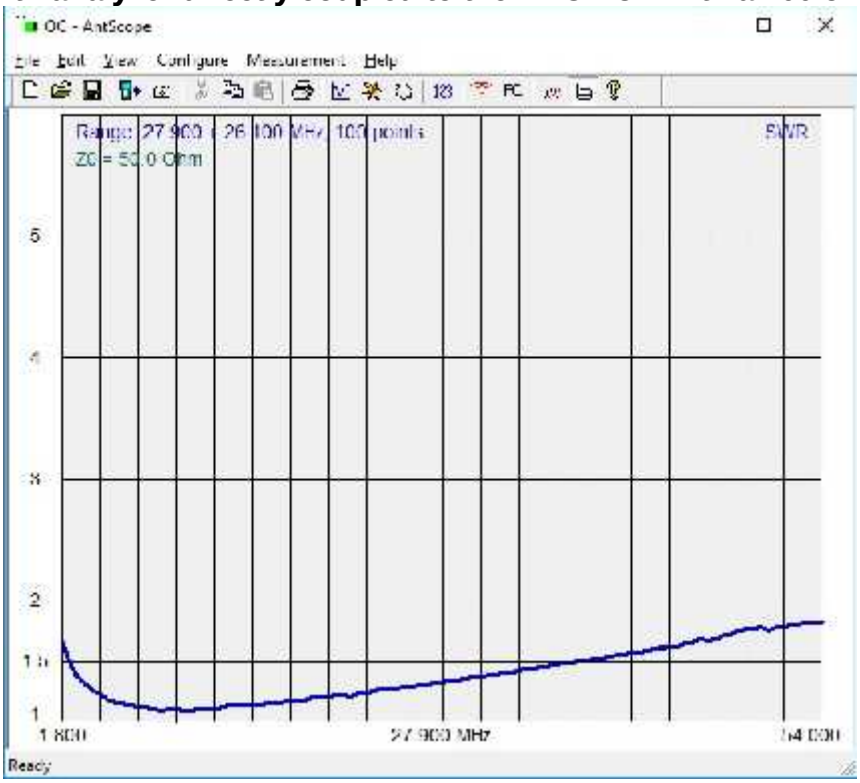
The Alpha Antenna 6-40 or 10-80 meter OCF dipole is designed to provide either high-angle radiation (near vertical incidence – NVIS) or dipole characteristics when mounted above 20 feet to provide a lower-angle radiation to enhance long-range and DX propagation. Your signal will launch in a figure eight pattern when deployed using options 1 and 2. Targeted deployment variable includes the ability to launch your signal in the direction your target station is located. While deployed using option 4, the NVIS is enhanced for short-range sky wave propagation, which varies from 0 to 300 miles. Deployment using option 3 will enable a DX propagation pattern for distances greater than 300 miles. The 6-40 or 10-80 meter OCF Dipole may be used with tactical HF (high frequency) radios on the frequency ***resonant frequencies*** with a maximum RF power of 200 watts PEP SSB, 100 watts CW, or 50 watts digital.

You may also need to use an external antenna tuner if your antenna is installed over a poor ground or not placed in a clear area.

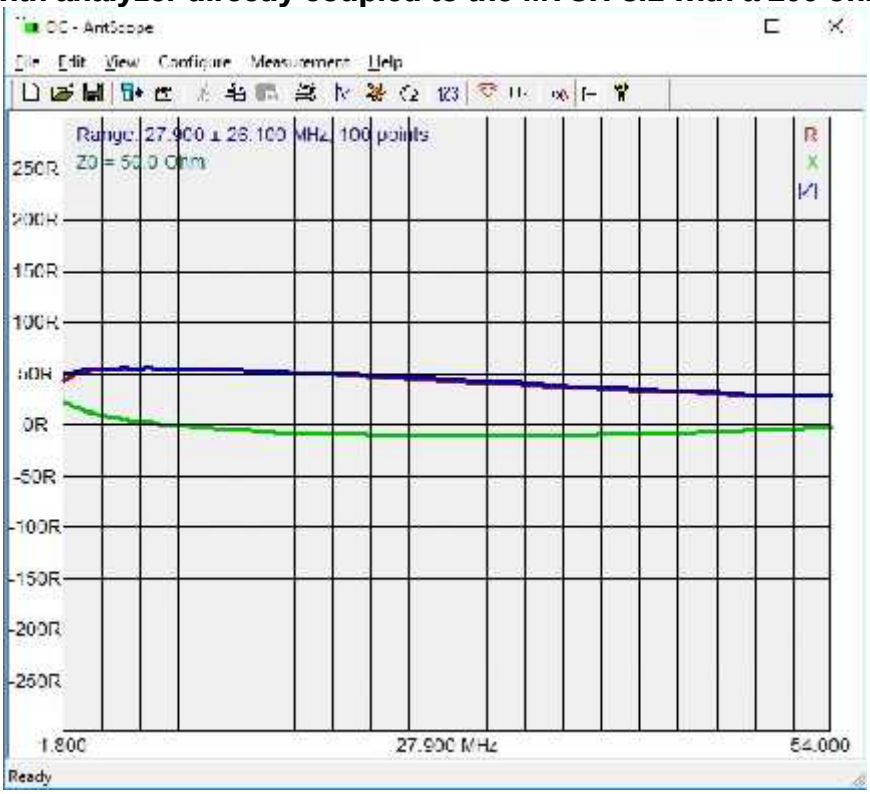
200 ohm load characteristics

The following two analysis are certified as accurate using a calibrated AIM 4300 from Array Solutions and Rig Expert AA-54. These results are categorically based upon the bridging of a 200 ohm resistor in lieu of antenna elements.

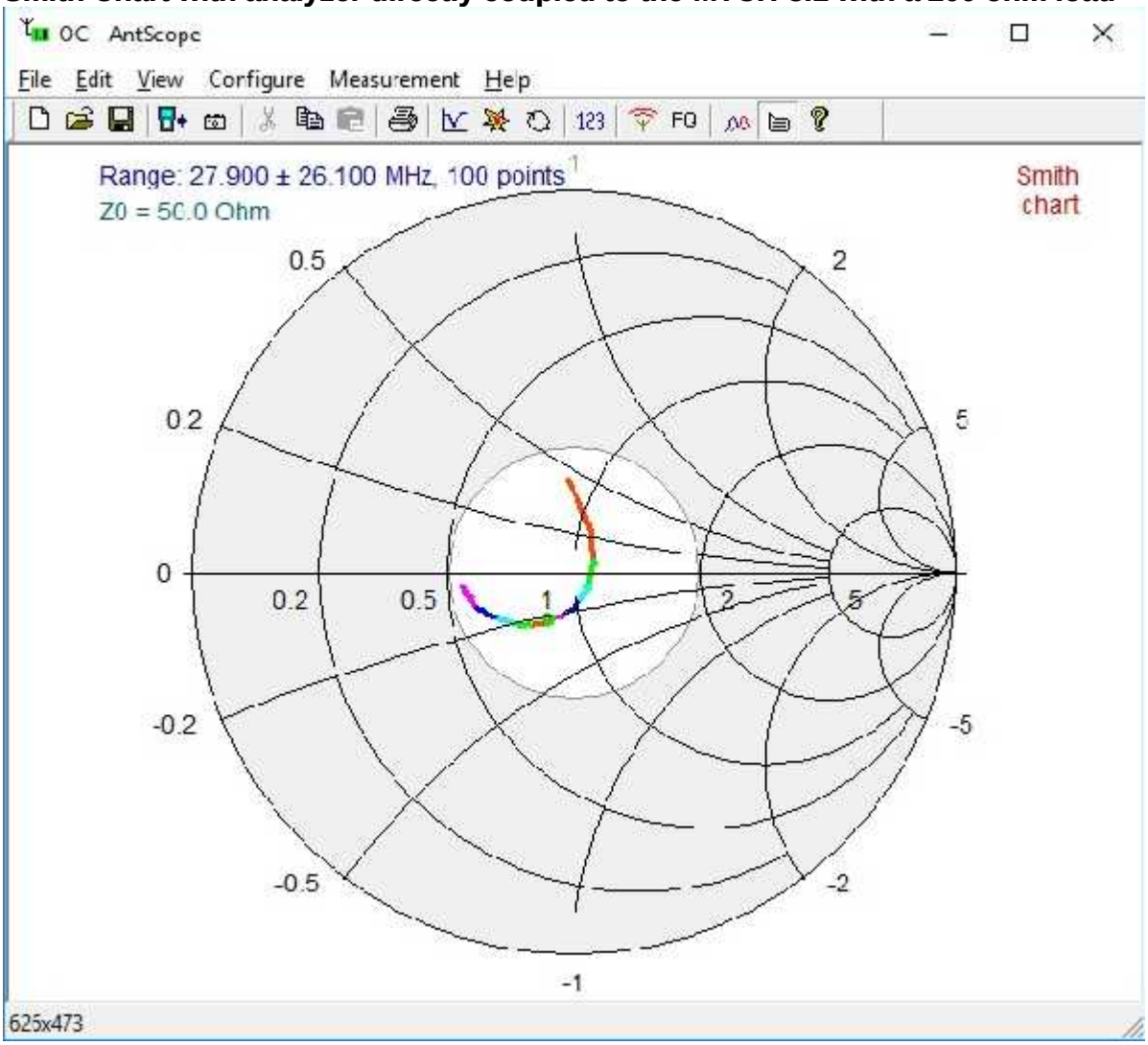
SWR with analyzer directly coupled to the MTCH-3.1 with a 200 ohm load



SWR with analyzer directly coupled to the MTCH-3.1 with a 200 ohm load



Smith Chart with analyzer directly coupled to the MTCH-3.1 with a 200 ohm load



Leading Particulars

Leading particulars and equipment for the Alpha Antenna 6-40 or 10-80 meter OCF Dipole are listed in Tables 1-2 through 1-4. Personnel should become thoroughly familiar with data and procedures contained in the entire technical manual before working on or using the antenna.

Table 1-2 Leading Particulars

ITEM	LEADING PARTICULARS
Electrical Characteristics: Frequency range Polarization RF power capacity (watts) Input impedance	 6.5-54 MHz Horizontal polarization 200W PEP SSB, 100W CW, or 50W for sporadic use of digital modes (20W for continuous use of digital modes) 50 ohms
Radiation Pattern: Azimuth Propagation	 Omnidirectional/Semi-Directional NVIS & DX
Physical Characteristics: Wind and ice Minimum Deployed Length Maximum Deployed Length Minimum Weight	 70 MPH wind with no ice 67 feet (6-40 Meter OCF Dipole) 136 feet (10-80 Meter OCF Dipole) 1.00 pound
Packed Dimensions: Length – Width – Height	 7.5 x 5 x 3 inches

SECTION 4 – General Information

Site Selection

For maximum antenna operating efficiency, the Alpha Antenna 6-40 or 10-80 meter OCF Dipole should be located in the center of a clear area. Installation of the antenna near any tall metal object or under heavy foliage should be avoided. Under no circumstances should structures come in contact with the antenna.

Assembly Overview

Assembly procedures for the Alpha Antenna 6-40 or 10-80 meter OCF Dipole are given in the following paragraphs. Erection can be accomplished in 5 minutes.

Assembly

Deploy the wiring from either side and away from the MTCH-3.1 (Alpha Match). Connect a Dacron or similar rope to both end INSLTR-3.1. To further secure your MTCH-3.1, there are two holes on both the top and bottom of the match, either of which can be used to support the center of the antenna when conditions require it. When installing with a center support, attach this point and raise the antenna to deployment height. Now, attach the end of each element to their respective supports, and raise each to their deployed heights.

Disassembly Procedures

Disassembly is performed in the reverse order of assembly. Wire elements should be disassembled by recoiling those radiating elements using the following steps; a) First, disconnect the insulators from their supports. b) Return to the match end of the elements, and coil each element, pulling the insulators towards you as it is coiled. Otherwise kinks in the wire may result and the elements may become entangled. c) Secure the elements in place to the match.

Maintenance

Periodically inspect all connection points for the elements, ensuring that no fraying of the wires has occurs. If the wires show signs of needing repaired, do so by cutting as little wire off before replacing the ring connector, which should also be soldered in place.

Support

If you have questions about your antenna, please feel free to email us at alphaantenna@gmail.com