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Technical Manual

For Alpha Antenna

Model: Multiband

Inclusions: All Optional Accessories

User Guide Version 2.1.1
June 21, 2016

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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 Multiband 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.

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SECTION 1 – Concept of Operation

The Alpha Multiband Antenna provides a multipurpose antenna system, which can be configured to launch your signal in the manner as circumstances require.

Many short-range HF communication circuits use vertical whip antennas. 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 is 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 manpack, 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 Alpha Multiband Antenna as depicted on Pages 14 &

15. Radiation characteristics of the NVIS type are achieved through the use of horizontal antennas mounted above ground up to a height of about one-quarter wavelength. 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 in the direction off the EMCOMM wire ends. 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 horizontal ECOMM 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 ECOMM mode as the ECOMM height is varied. As the height increases, a larger part of the input signal is radiated in the ECOMM mode. These resistances are typical of these encountered over average ground.

For example, an antenna at an effective height of 0.035 wavelength is about 10 feet at 3.5 MHz. The result of this example enables an effective height for a signal at 0.035 wavelength to be achieved by elevating the horizontal ECOMM element so that is mounted between two 10-foot supports or by a sloping the ECOMM element so that it is mounted from a taller single mast at its feed-point. An advantage of the sloping ECOMM configuration is the vertically polarized component, which produces desired affects at low frequencies and also permits compatibility with whip antennas where propagation conditions permit.

DX (Long Distance Communications) and ground-wave (surface-wave propagation) are primarily accomplished by deploying the Alpha Multiband Antenna as depicted on Page 11, 12, & 13.

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SECTION 2 – System Overview

This instruction manual contains technical data, installation procedures, theory of operation, maintenance instructions, and an illustrated parts list *covering* the Alpha Multiband Antenna and optional components. The antenna was designed to be used with HF radios.

The instruction manual is divided into three sections. These sections provide the user with an Introduction, General Information, and Specific Deployments for the Alpha Multiband Antenna.

Table 1-1 SUMMARY OF AVAILABLE EQUIPMENT	
PART NUMBER	DESCRIPTION OF EQUIPMENT
MTCH-2.1	A matching network in a stainless steel housing fitted for mounting the MLSTK-2.1 antenna on vehicles, shelters, or manpacks equipped with HF radios.
MLSTK-2.1	A heavy duty 13 foot long MilStick whip antenna that mounts upon the MTCH-2.1, which may be used directly with HF radios.
TRPDLTWGHT-2.1	The optional lightweight tripod that the MTCH2.1 can mount upon.
TRPDHDTY-2.1	The optional heavy duty tripod that the MTCH2.1 can mount upon.
EMCOMM	An optional element that attaches to the top bolt on MTCH-2.1 when used as a standalone radiator.
NVIS-2.1	An optional element that connects to the bottom of MTCH-2.1 that is placed upon the ground to increase the (NVIS) reflectivity of EMCOMM-2.1
JWMNT-2.1	The optional stainless steel Jaw Mount that the MTCH2.1 can mount upon.
CNTRPS-2.1	Counterpoise wire that attaches to the bottom bolt of MTCH-2.1
MSTMNT-2.1	The optional top of mast that the MTCH2.1 can mount upon.
FLDBG40-2.1	The optional black 600D nylon Field Bag, in which the following can be placed: MTCH-2.1 MLSTK-2.1 TRPDLTWGHT-2.1 EMCOMM-2.1 NVIS-2.1 JWMNT-2.1 MSTMNT-2.1

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Equipment Description

The Alpha Multiband Antenna and all Optional Accessories are represented in Figure 1-1. Physically the MLSTK-2.1 antenna consists of eight lightweight aluminum mast sections and MTCH-2.1 matching network. The total weight of the core system (MLSTK-2.1 and MTCH-2.1) is 2.00 pounds. The antenna can be transported in an optional field bag (FLDBG40-2.1). Deployment is accomplished in 5 minutes.

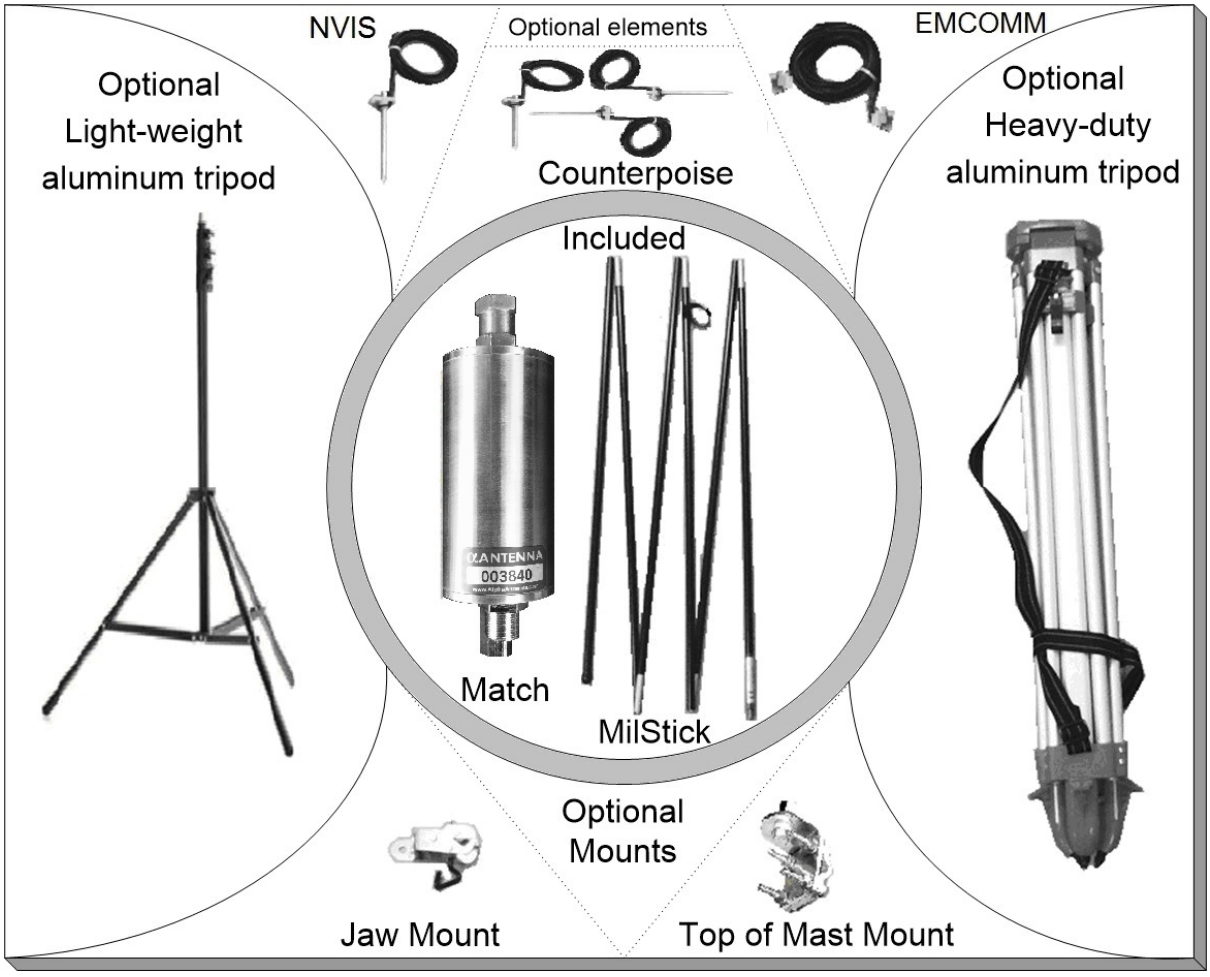

Figure 1-1. Multiband-2.1 HF Antenna

Equipment Characteristics

The Alpha Multiband Antenna is designed to provide either high-angle radiation (near vertical incidence – NVIS) or low-angle radiation (long-range and DX) propagation to be enhanced, based upon how the antenna is deployed. NVIS short-range sky wave propagation varies from 0 to 300 miles. Long-range & DX propagation enables communications at distances greater than 300 miles. The Alpha Multiband Antenna may be used with tactical HF (high frequency) radios on the frequency range of 7.0 to 54.0

MHz with a maximum RF power of 300 watts pep SSB, 200 watts CW, or 100 watts digital.

Leading Particulars

Leading particulars and equipment for the Alpha Multiband Antenna 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	1.8-54 MHz (Accessory dependent)
Polarization	Horizontal or Vertical polarization
RF power capacity (watts)	300 PEP SSB, 200 CW, or 100 digital
Input impedance	50 ohms
Radiation Pattern:	
Azimuth	Omnidirectional/Semi-Directional
Elevation	NVIS through DX
Physical Characteristics:	
Wind and ice	Survives 70 MPH wind with no ice
Maximum Height erected	19 feet
Minimum foot-print required	3 foot by 3 foot
Minimum Weight	2.00 pounds (MTCH-2.1 & MLSTK-2.1)
Packed Dimensions:	
Maximum Length	27 inches
Maximum Diameter	Less than 7 inches

Table 1-3 Supplied Equipment		
ITEM	PART NUMBER	QUANTITY
Matching Network	MTCH-2.1	1
MilStick	MLSTK-2.1	1

Table 1-4 Optional Equipment	
ITEM	PART NUMBER
Heavy Duty 6 Section MilStick	MLSTK-2.1
Light weight tripod	TRPDLTWGHT-2.1
Heavy Duty tripod	TRPDHDTY-2.1
(EMCOMM) Emergency Communications element	EMCOMM-2.1
NVIS enhancement element	NVIS-2.1
Counterpoise wire	CNTRPS-2.1
Top of mast mount	MSTMNT-2.1
600D nylon field bag for 40 inch accessories	40FLDBG40-2.1
Door jamb mount for mobile installations	MOTOJAM-2.1
5 foot stainless steel whip for mobile installations	MOTOWHIP-2.1
Ferrule for mobile installation that mounts below MOTOWHIP-2.1	MOTOFRL-2.1
Stainless Steel Spring that mounts under MOTOFRL-2.1 and above MTCH-2.1	MOTOSPRG-2.1
The optional stainless steel Jaw Mount that the MTCH2.1 can mount upon.	JWMNT-2.1

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SECTION 3 – General Information

Erection and disassembly procedures for the Alpha Multiband Antenna are given in the following paragraphs. Erection can be accomplished in 5 minutes. See Figures 2-1 through 2-4 for pictorial sequence of transporting, unpacking, and erection. Figure 2-5 illustrates the use of optional equipment MOTO-2.1 for use with vehicular mounted radios.

Site Selection

For maximum antenna operating efficiency, the Alpha Multiband Antenna 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 Procedures

WARNING

Be sure transmitter power is off before proceeding with antenna assembly. Electrical burns or death will result if contact is made with the antenna when the transmitter is keyed. Electrical burns will result if contact is made with the antenna mast of metal portion of antenna.

WARNING

Antenna must be installed a distance equal to at least twice the height of the antenna from power lines.

a. Open antenna pack and remove Matching Network MTCH-2.1. Install MTCH-2.1 on a mount. Connect low–loss coaxial cable from the MTCH-2.1 to the radio.

b. Remove top MilStick assembly MLSTK-2.1, deploy all but the bottom sections, and screw the bottom section element into the Matching Network (see Figures 2-1A and 2-1D). Note that the antenna elements are secured in place with the internal shock cord.

Vehicular Installation

6-40 Meter mobile operations is enabled by installing MOTOFRL-2.1 and MOTOWHIP-2.1 on MTCH-2.1, which is then installed on vehicular mount JAM-2.1. This is the same antenna as described in above, except the vehicular whip, ferrule, and mount is used rather than any other mount assembly. When parked, MOTOFRL-2.1 and MOTOWHIP-2.1 can be removed, and MLSTK-2.1 can be installed upon the MTCH-2.1.

Disassembly Procedures

Disassembly is performed in the reverse order of assembly. Remove MLSTK-2.1 from MTCH-2.1 and remove MTCH-2.1 from mount. When wire elements are used and when recoiling those radiating elements, first pull the anchor stakes and leave them on the ground. Return to the distill end of the stakes and coil each element, pulling the stakes

towards you as it is coiled. Otherwise kinks in the wire may result and the elements may become entangled. Secure the elements in place with Velcro strap.

Repackaging Procedures

When 40FLDBG40-2.1 field bag is used, insert MTCH-2.1 in the front zipper pocket and secure it closed with the zipper. The larger zippered compartment will hold all other items except MOTOWHIP-2.1. Insert all items, except MOTOWHIP-2.1, into the larger of the two zippered compartments in the bag and secure it closed with the zipper.

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SECTION 4 – Specific Deployments

Tripod Deployment Instructions

6-80 Meter Operations

Step 1 – On the tripod, loosen the leg braces, extend the legs, & secure the legs

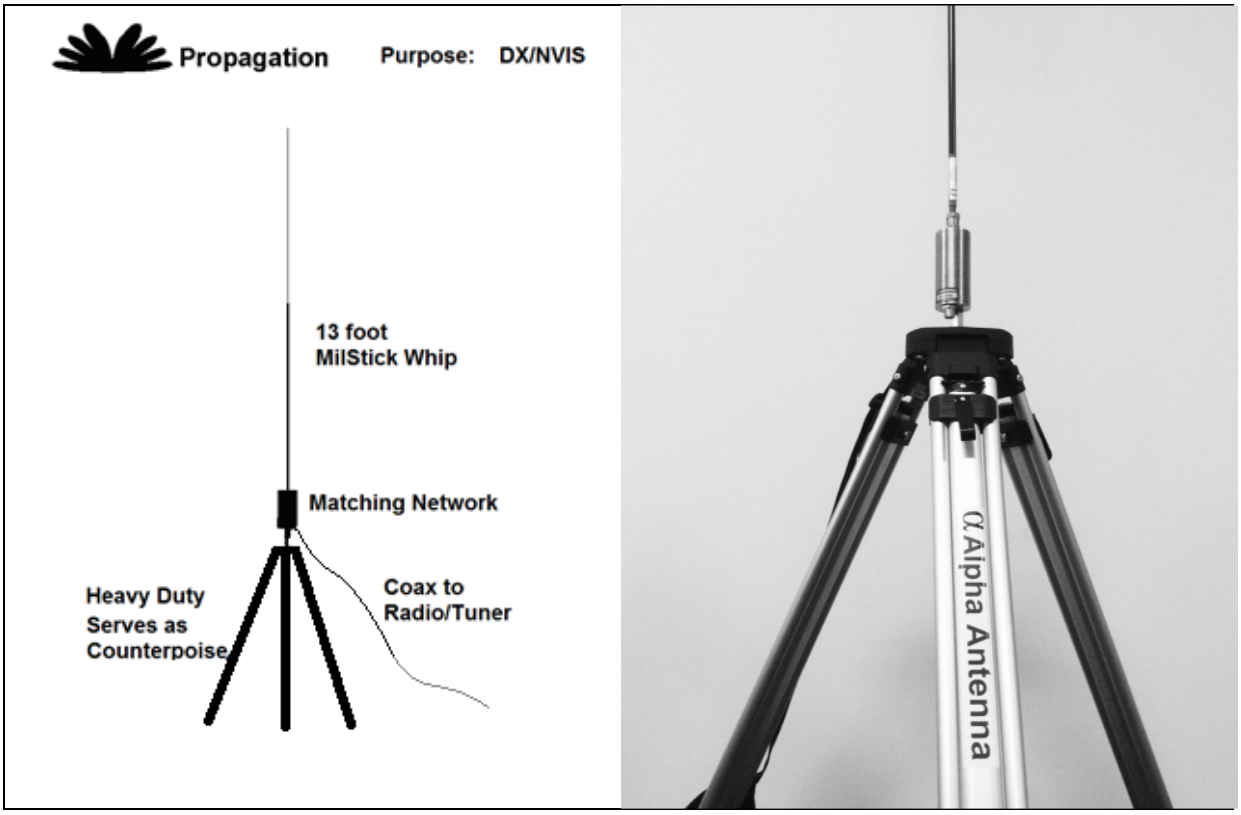
Step 2 – Mount tripod on a flat stable surface. (Note – If erected when windy conditions are present, secure the tripod with your own guy ropes)

Step 3 – Screw the MTCH-2.1 in place onto the Tripod

Step 4 – Assemble MLSTK-2.1 & screw it into the top of MTCH-2.1

Step 5 – Attach your coax from your tuner to the SO-239 on MTCH-2.1

Tripod Deployment Image



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Tripod with Counterpoise Instructions

6-80 Meter Operations

Step 1 – On the tripod, loosen the leg braces, extend the legs, & secure the legs

Step 2 – Mount tripod on a flat stable surface. (Note – If erected when windy conditions are present, secure the tripod with your own guy ropes)

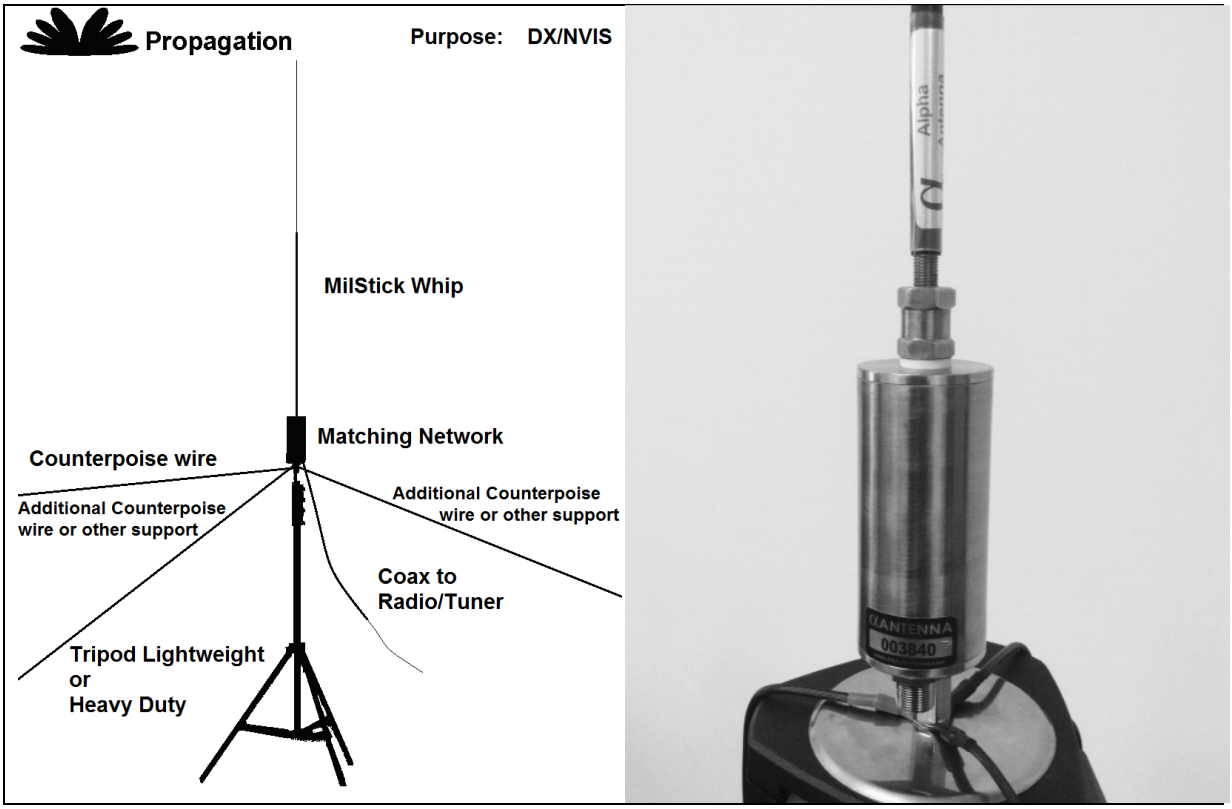
Step 3 – Place the ring connector terminals over the bolt on top of the tripod

Step 3 – Screw the MTCH-2.1 in place onto the Tripod

Step 4 – Assemble MLSTK-2.1 & screw it into the top of MTCH-2.1

Step 5 – Attach your coax from your tuner to the SO-239 on MTCH-2.1

Tripod with Counterpoise Deployment Image



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Jaw Mount Deployment Instructions

6-80 Meter Operations

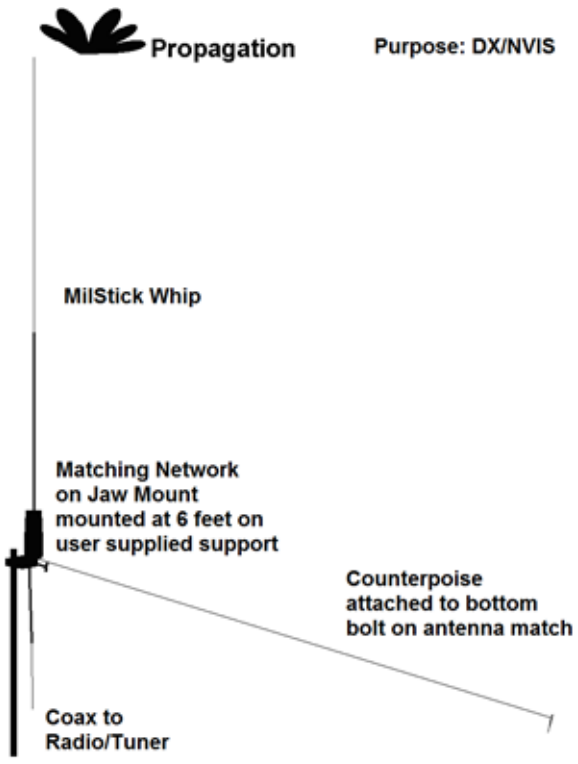
Step 1 – Install JWMNT-2.1 on a stable support

Step 2 – Place and secure the Ring Connector of CNTRPS-2.1 onto the bottom stainless steel bolt of MTCH-2.1

Step 3 – Assemble MLSTK-2.1 & screw it into the top of MTCH-2.1

Step 4 – Attach your coax to the SO-239 on MTCH-2.1

Jaw Mount Deployment Image



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End-fed Deployment Instructions

6-160 Meter Operations

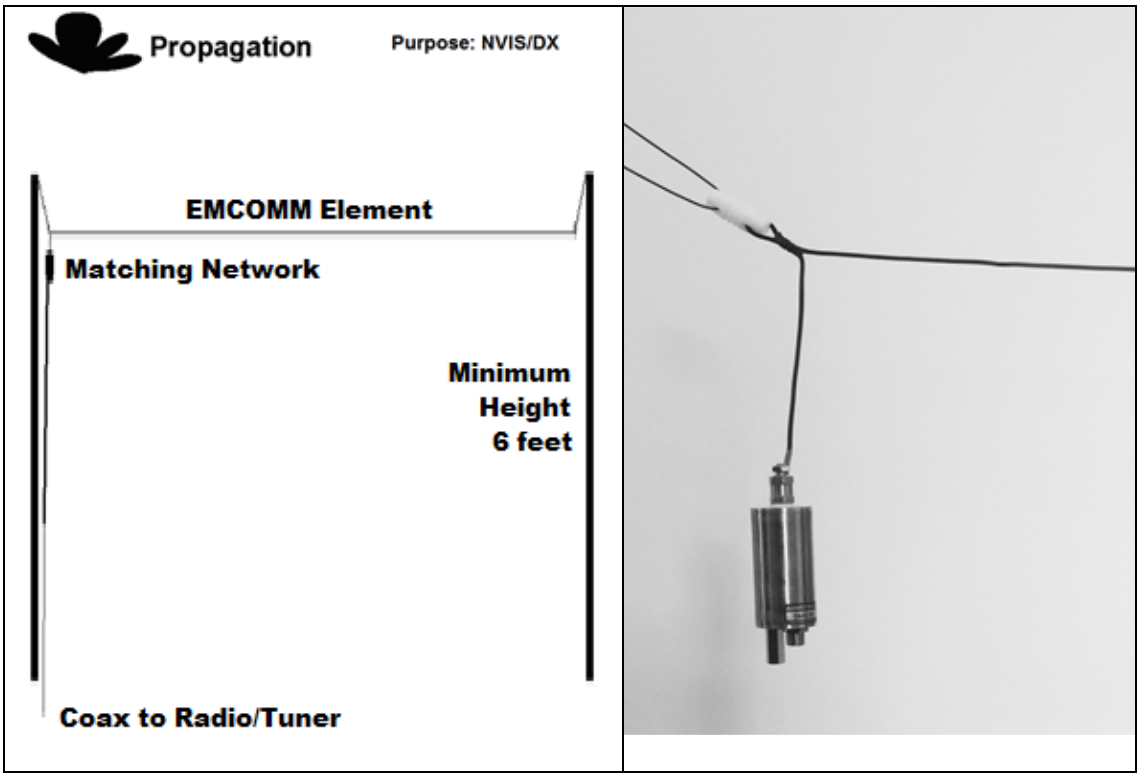
Step 1 – Attach and secure the 3/8 ring connector on the EMCOMM-2.1 element to the Top Bolt on MTCH-2.1 with 3/8x24 bolt.

Step 2 – Secure the insulator on both ends of the EMCOMM-2.1 so that no part of element EMCOMM-2.1 is lower than 6 feet.

Step 3 – Attach your coax from your tuner to the SO-239 on the MTCH-2.1.

NOTE – Increasing the slope of the elements and raising the antenna on will enhance DX propagation.

End-fed Deployment Image



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Mobile Deployment Instructions

6-40 Meter Operations Step 1 – Install MOTOJAM-2.1 to a high stable metal part of your vehicle. Step 2 – Insert MOTOWHIP-2.1 into MOTOFRL-2.1 and tighten the hex nuts on MOTOFRL-2.1. Screw MOTOFRL-2.1 into MOTOSPRG-2.1. Screw MOTOSPRG-2.1 onto MTCH-2.1. Step 3 – Remove the extra stainless steel nut located at the bottom of the MTCH-2.1 with your hand. Insert the 24x3/8 stud in the hole of the Alpha Antenna Jam Mount and replace the nut. Use two wrenches to ensure the bottom nut is tight & DO NOT twist the MTCH-2.1 while tightening. Step 4 – Attach your coax from your tuner to the SO-239 on the MTCH-2.1.
6-80 Meter Operations Step 1 – When operating stationary mobile install only MLSTK-2.1 on MTCH-2.1 to enable 80 meters and enhance higher frequency performance.
6-160 Meter Operations Step 1 – When operating stationary mobile install only EMCOMM-2.1 on MTCH-2.1 to enable 160 meters and enhance higher frequency performance.

Mobile Deployment Image

6-40 Meter	6-80 Meter
	

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Support Contacts

If you have questions about your antenna, please feel free to contact us.
Email: support@AlphaAntenna.com
Phone: 1-888-482-3249
WEB: www.AlphaAntenna.com