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# User Guide
# for the
# Tuner Free & Directional
# Alpha Multiband Antenna

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User Guide Version 2.2

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# Table of Contents



**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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# 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.**

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## 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

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## SECTION 1 – Concept of Operation

The tuner free & directional Alpha Multiband Antenna is a multipurpose antenna system, which can be configured to launch your signal at your target.

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 MilStick vertical element simultaneously with the horizontally sloped NVIS element. Radiation characteristics of the vertical element enhance DX, while radiation characteristics of the NVIS type are achieved through the use of the NVIS element mounted

above ground. 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. To negate the undesirable mode, the vertical MilStick whip is deployed simultaneously with the NVIS element.

The shape of the radiation pattern of the horizontally sloped NVIS 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 NVIS element is horizontally mounted, or by a sloping the NVIS element so that it is connected on the top bolt of the Alpha Match and sloped down to the ground in the same manner that a guy wire would be deployed. An advantage of the sloping NVIS configuration is the vertically polarized component, which produces desired affects at low frequencies and also permits compatibility with whip antennas where DX propagation conditions permit.

Using the above examples, you will be able to derive then that the optimum NVIS and DX characteristics are exhibited when the Alpha Match is placed at a height of between 5-7 feet. Adding or retracting from the default configuration of this balanced antenna system will change the performance characteristics for the frequencies it is designed to operate on.

# SECTION 2 – System Overview

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

| Table 1-1 SUMMARY OF AVAILABLE EQUIPMENT | |
|---|---|
| PART NUMBER | DESCRIPTION OF AVAILABLE EQUIPMENT |
| MTCH-2.1 | A capacitive induction matching network in a 316 Stainless Steel housing fitted for mounting the MLSTK-2.1.XX antenna on vehicles, shelters, or man-packs equipped with HF radios. |
| MLSTK-2.1.13 | A heavy duty 13 foot long MilStick whip antenna that breaks down into 13 inch sections and mounts upon the MTCH-2.1, which may be used directly with HF radios. |
| MLSTK-2.1.26 | A heavy duty 13 foot long MilStick whip antenna that breaks down into 26 inch sections and mounts upon the MTCH-2.1, which may be used directly with HF radios. |
| TRPDLTWGHT-2.1 | The lightweight tripod that the MTCH2.1 can mount upon. |
| TPD-HD-FMJ-2.1 | The heavy duty tripod that the MTCH2.1 can mount upon, which when collapsed can encapsulate the entire antenna system in a full metal jacket enclosure. |
| NVIS-2.1 | A 25’ element that connects to the top of MTCH-2.1 that is placed in a sloped orientation to enhance NVIS characteristics. |
| JWMNT-2.1 | The stainless steel Jaw Mount that the MTCH2.1 can mount upon. |
| GND-2.1 | Ground wire that attaches to the bottom bolt of MTCH-2.1 |
| MSTMNT-2.1 | The top of mast mount that the MTCH2.1 can mount upon. |
| FLDBG40-2.1, FLDBG30-2.1, or FLDBG16-2.1 | The optional black 600D nylon Heavy Duty Field Bag, |

## Equipment Description

Physically the Multiband antenna consists of one each of the MLSTK-2.1.xx MilStick whip constructed of 7075-T9 lightweight aluminum mast sections, MTCH-2.1 capacitive induction matching network in a 316 Stainless Steel housing, NVIS-2.1 horizontal memory free wire element with a tensile strength of 500 pounds that is rated for temperatures from -40°C to +75°C, FLDBGxx-2.1, and at least one of the following TPD-HD-FMJ-2.1, TRPDLTWGHT-2.1 or JWMNT-2.1 (Ref. descriptions in Table 1-1). The antenna can be transported and deployment is accomplished in approximately 5 minutes.

## Equipment Characteristics

The Alpha Multiband Antenna is designed to simultaneously provide high-angle radiation (near vertical incidence – NVIS) and low-angle radiation (long-range and DX) propagation. The targeted deployment variable includes the ability to launch your signal in the opposite direction the NVIS element is run away from the base of the antenna. Based upon how the tripod is tilted & NVIS element is deployed, this can provide directional propagation between 0 to 90 degrees above the horizon. While the NVIS element enhances short-range sky

wave propagation, which varies from 0 to 300 miles, the Vertical element in tandem with the NVIS element enables long-range & DX propagation for distances greater than 300 miles. The Alpha Multiband Antenna may be used with tactical HF (high frequency) radios on the frequency range of 3.5 to 29.7 MHz (54.0 MHz when mounted on the tripod options) with a maximum RF power of 500 watts PEP SSB, 250 watts CW, or 100 watts digital.

## SWR

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 recommended deployment scenarios in Section 4, per the scenario indicated on the heading for each graphic.

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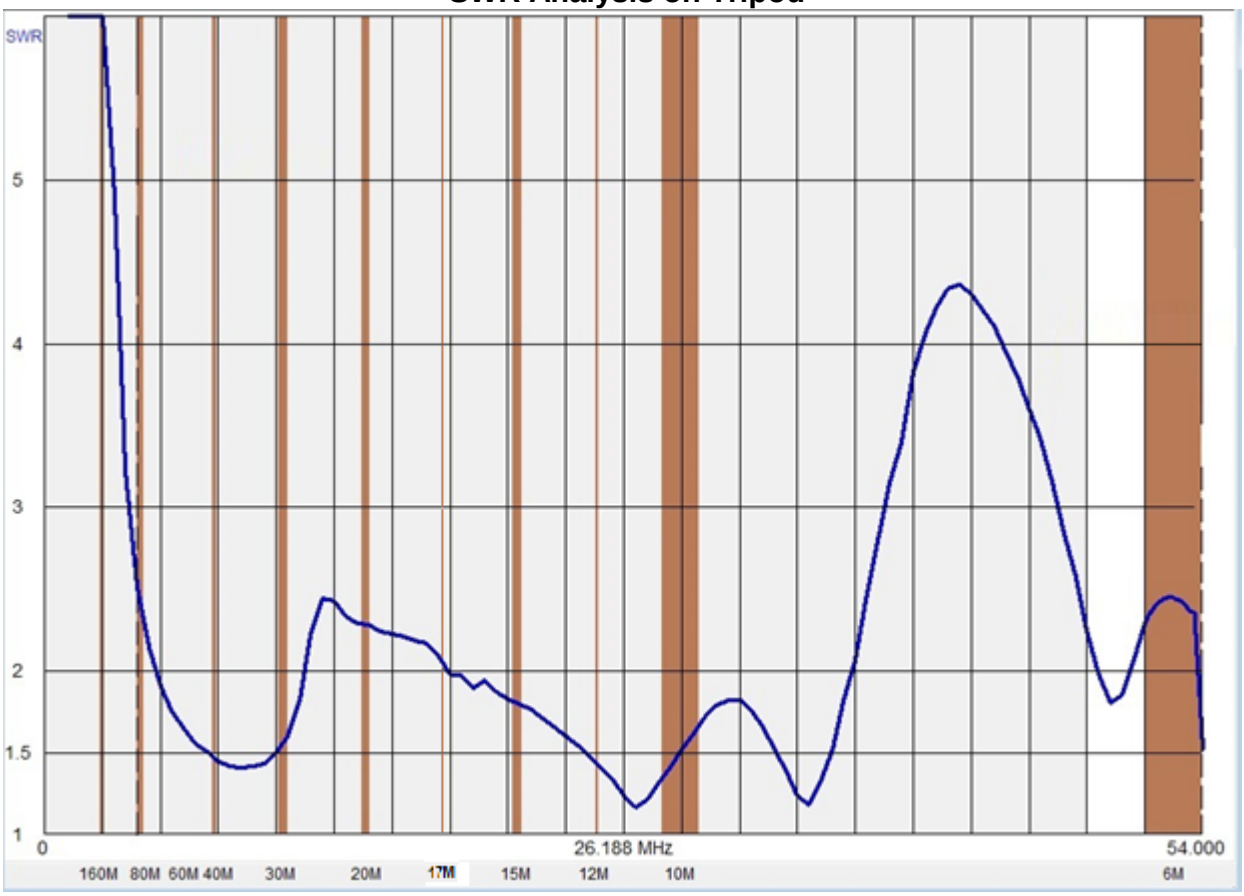
**SWR Analysis on Tripod**



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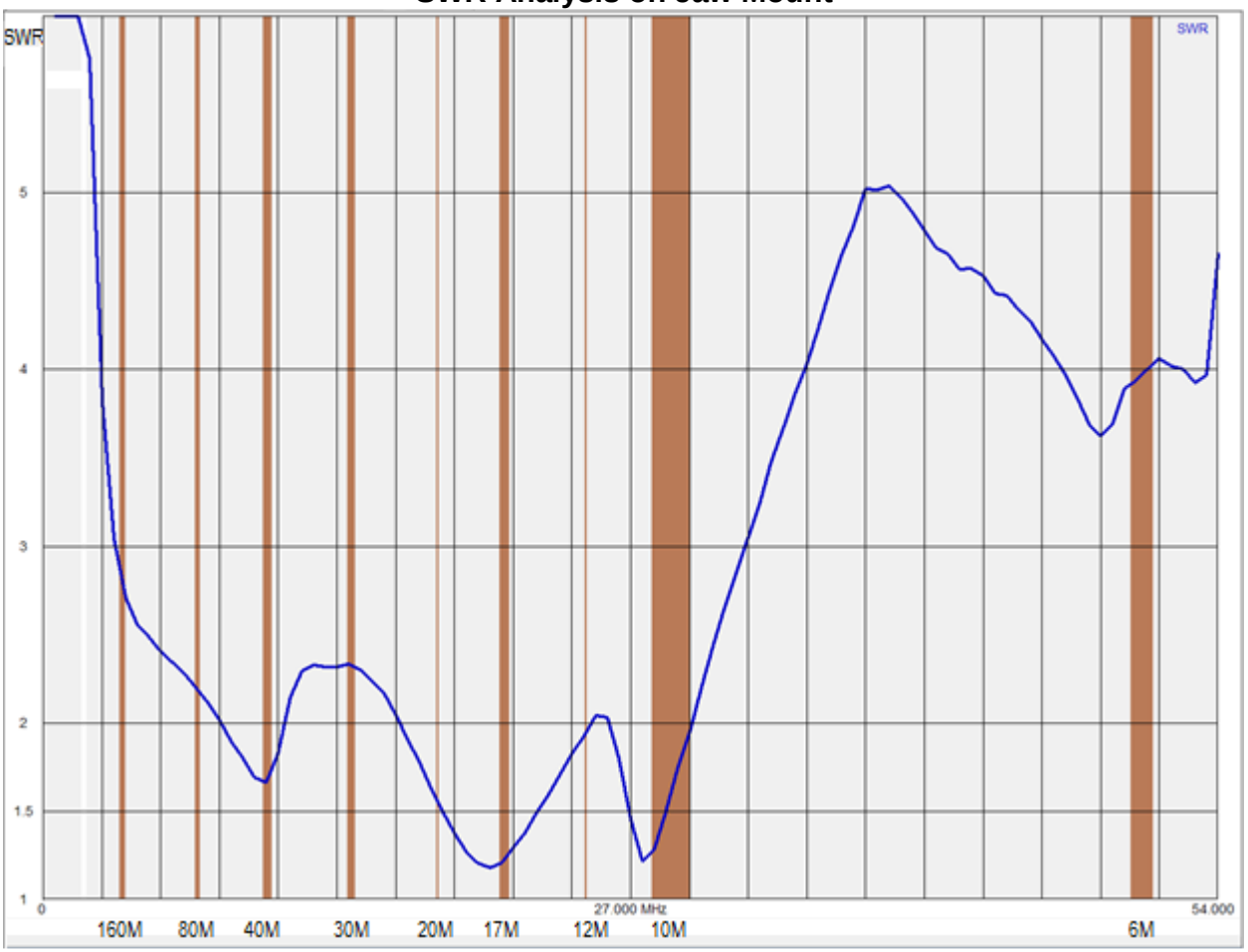
**SWR Analysis on Jaw Mount**



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## 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:<br>Frequency range<br>Polarization<br>RF power capacity (watts)<br>Input impedance | <br>3.5-29.7 MHz (54 MHz when mounted upon an optional tripod)<br>Horizontal and Vertical polarization<br>500 PEP SSB, 250 CW, or 100 digital<br>50 ohms |
| Radiation Pattern:<br>Azimuth<br>Elevation | <br>Omnidirectional/Semi-Directional<br>NVIS & DX |
| Physical Characteristics:<br>Wind and ice<br>Maximum Height erected<br>Minimum foot-print required<br>Minimum Weight | <br>MilStick survives 70 MPH wind with no ice<br>13 feet when mounted on the Jaw Mount and 19 feet when mounted upon an optional tripod<br>3 foot by 3 foot + 25 foot NVIS-2.1<br>2.00 pounds (MTCH-2.1 & MLSTK-2.1.XX) |
| Packed Dimensions:<br>Maximum Length<br>Maximum Diameter | <br>30 inches<br>Less than 7 inches |

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# SECTION 3 – General Information

## 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 Overview

Assembly procedures for the Alpha Multiband Antenna are given in the following paragraphs. Erection can be accomplished in 5 minutes.

## Vehicular Installation

6-40 Meter mobile operations requires an external broad-band antenna tuner is enabled by installing optional MOTOSPRG-2.1, MOTOFRL-2.1 and MOTOWHIP-2.1 on MTCH-2.1, all of which is then installed on the optional vehicular mount JAM-2.1. When parked, MOTOFRL-2.1 and MOTOWHIP-2.1 can be removed, and MLSTK-2.1.XX and/or NVIS-2.1 can be installed on the top bolt of MTCH-2.1 to enhance your operating experience.

## 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 pull the anchor stakes and leave them on the ground. b) 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. c) Secure the elements in place with a Velcro strap.

## Repackaging Procedures

When a 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.

## Maintenance

Apply electrical joint compounds to each silver colored insert to protect against oxidation and ensure a proper electrical connection between aluminum, such as OxGuard, Noalax, or Penetrox.

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# SECTION 4 – Specific Deployments

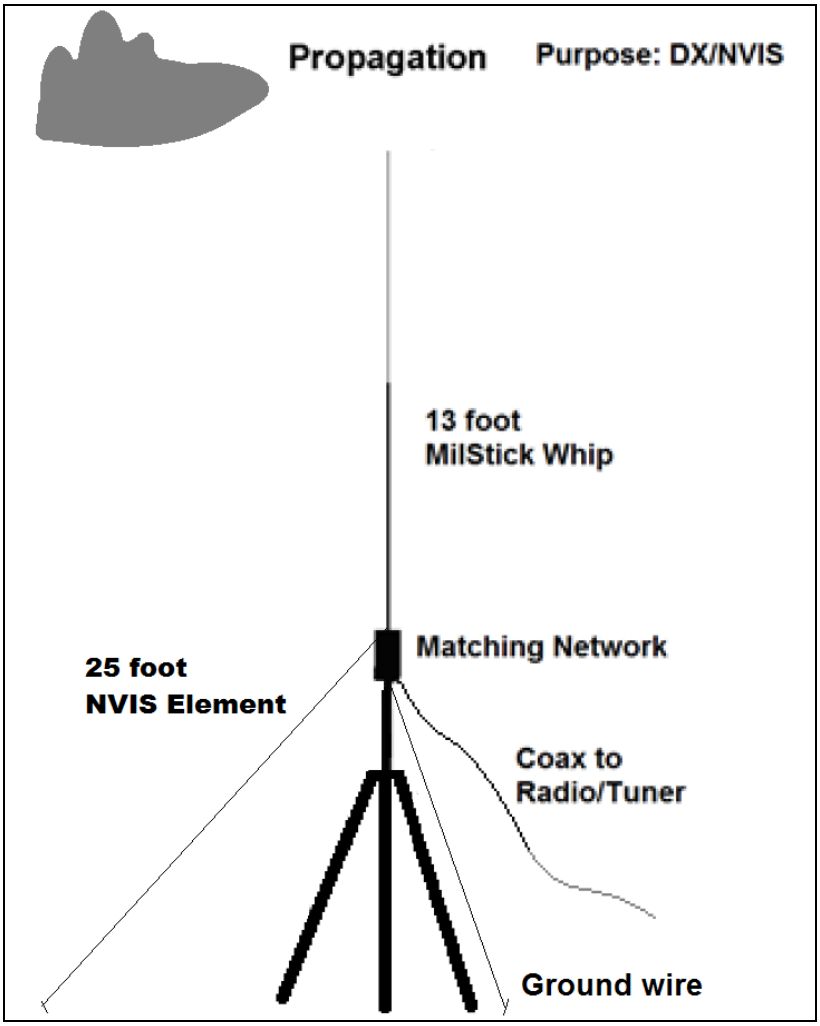
Options A through C represent the various Specific Deployment options.

## Option A – Tripod Deployment

### Option A.1 – Instructions

Step 1 – On the tripod, loosen the leg braces, extend the legs, & secure the legs
Step 2 – Mount tripod on a flat stable surface. (Important Note – We recommend supporting the tripod with your own guy ropes)
Step 3 – Place the GND-2.1 ring connector over the bottom bolt on MTCH-2.1
Step 4 – Screw the MTCH-2.1 in place onto adapter on the Tripod
Step 5 – Push the stake on GND-2.1 into an earth ground.
Step 6 – Place the NVIS-2.1 ring connector over the top bolt on MTCH-2.1
Step 7 – Assemble MLSTK-2.1.XX & screw it into the top of MTCH-2.1
Step 8 – Attach your coax from your tuner to the SO-239 on MTCH-2.1

### Option A.2 – Image



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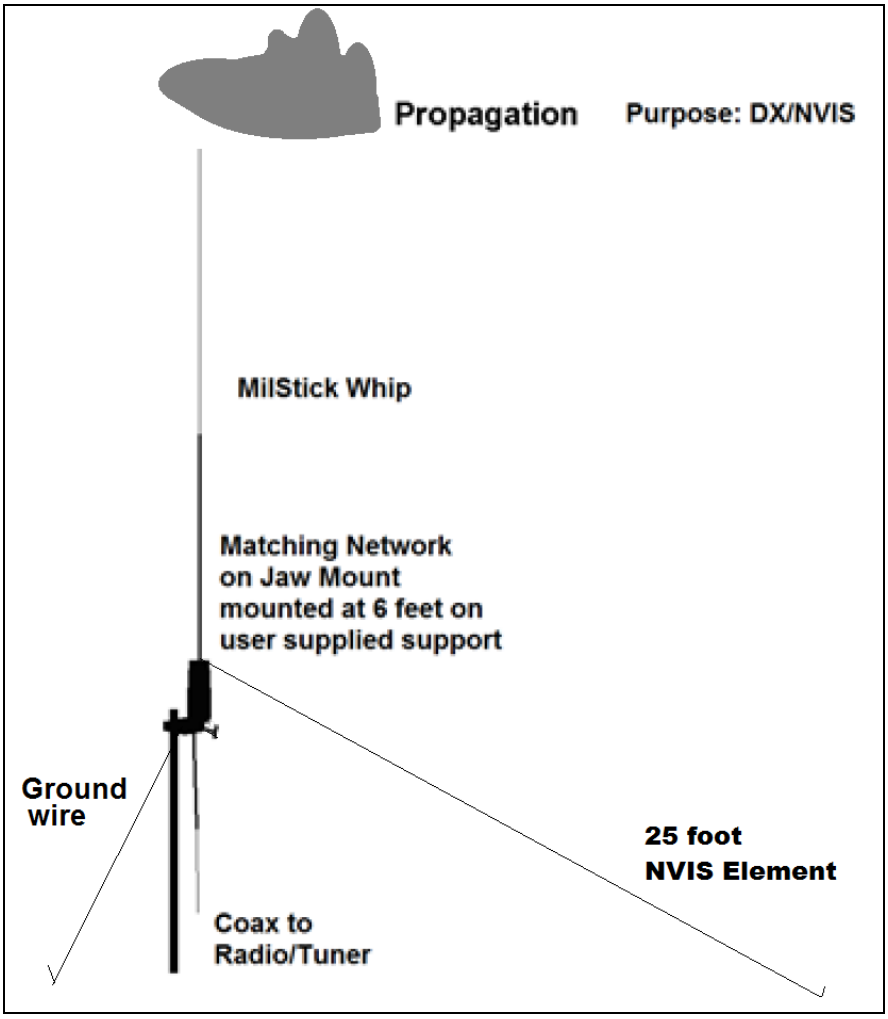
# Option B – Jaw Mount Deployment

## Option B.1 – Instructions

Step 1 – Install JWMNT-2.1 on a stable support
Step 2 – Place and secure the Ring Connector of GND-2.1 onto the bottom stainless steel bolt of MTCH-2.1
Step 3 – Screw the MTCH-2.1 in place onto JWMNT-2.1
Step 4 – Push the stake on GND-2.1 into an earth ground.
Step 5 – Place the NVIS-2.1 ring connector over the top bolt on MTCH-2.1
Step 6 – Assemble MLSTK-2.1.XX & screw it into the top of MTCH-2.1
Step 7 – Attach your coax from your tuner to the SO-239 on MTCH-2.1

## Option B.2 – Image



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# Option C – Mobile Deployment

When mobile or stationary mobile HF communications are required, these Mobile Deployment options can be used.

## Option C.1 – Instructions

| |
|---|
| Configuration a) When operating mobile:<br>Step 1 – Install JAM-2.1 to a high stable metal part of your vehicle.<br>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.<br>Step 3 – Remove the extra stainless steel nut located at the bottom of the MTCH-2.1. 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; all the while holding the other nut with the other wrench.<br>Step 4 – Attach your coax from your wide-band tuner to the SO-239 on the MTCH-2.1. |
| Configuration b) When operating stationary mobile:<br>Step 1 – Install JAM-2.1 to a high stable metal part of your vehicle.<br>Step 2 – Remove the stainless steel nut located at the bottom of the MTCH-2.1. 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; all the while holding the other nut with the other wrench.<br>Step 3 – Place the GND-2.1 ring connector over the bottom bolt on MTCH-2.1<br>Step 4 – Place the NVIS-2.1 ring connector over the top bolt on MTCH-2.1<br>Step 5 – Assemble MLSTK-2.1.XX & screw it into the top of MTCH-2.1<br>Step 6 – Attach your coax from your wide-band tuner to the SO-239 on the MTCH-2.1. |

## Option C.2 – Image

| Configuration a) | Configuration b) |
|---|---|

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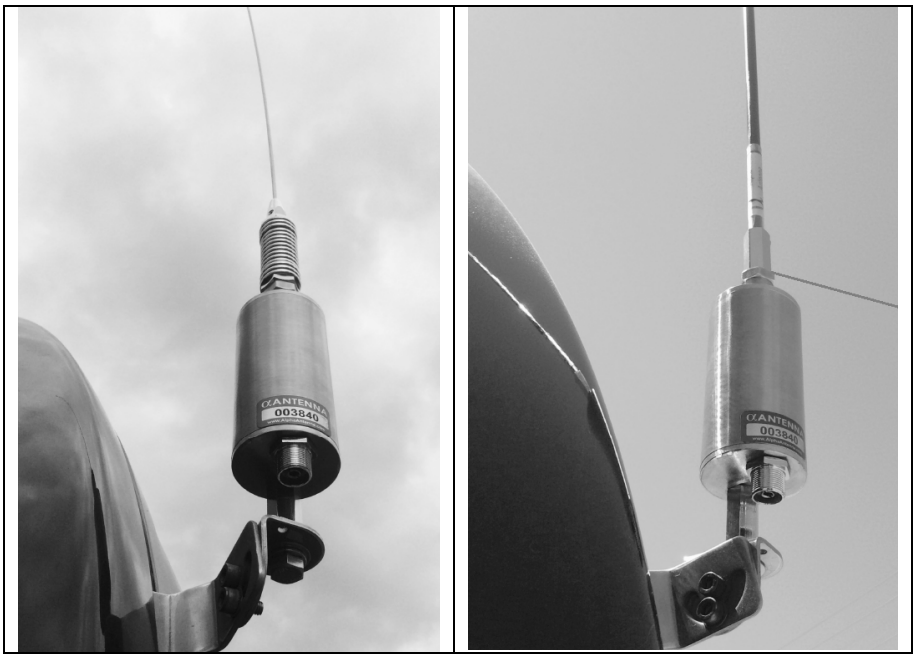

## Support

If you have any questions or problems with your Alpha Antenna, please contact us.

You can reach us via:
Email – support@AlphaAntenna.com
Phone – 1-888-482-3249
Web – www.AlphaAntenna.com

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