α ALPHA ANTENNA®

Guide
for the
Model - ProMaster

Manufactured by:
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User Guide Version 3.3

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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 ProMaster 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. 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.

NOTE – Never Loosen any of the Bolts, Washers, Nuts, or Caps on the Alpha Match.

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 – Concept of Operation

The ProMaster is a balanced limited space (permanent base or transportable) antenna that maximizes effective radiated power (ERP) while maintaining an acceptable SWR.

a) The system will cover 3.5-29.7 MHz when deployed in the default configuration using 1 NVIS, 1 Vertical and 1 Grounded counterpoise element.
b) For an omnidirectional signal pattern, to improve low band performance, and to enhance NVIS characteristics from 1.8 to 30 MHz, four optional 35 foot NVIS elements can be installed in place of the single 25 foot NVIS element.
c) Alternatively, these optional four (or even 3 of the 4) 35 foot elements can be used as counterpoise elements. This configuration will lower the take-off angle of the radiated signals on 7-29.7MHz, which will thereby enhance the DX characteristics.

DETAILS
Many short-range HF communication system use vertical elements 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 that is missing when vertical antennas are used is the zone of silence (skip zone) between the point where the ground-wave signal becomes unusable and where 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 when using vertical elements 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 vertical antennas for short-range communications, conditions become even worse for the skip zone in an adverse environment, such as a hilly or forest-type terrain. This occurs because of the restricted range for ground-wave signals in these environments.

Additional considerations should include soil conductivity, where the soil conductivity decreases or as the foliage increases, the signal strength at a distance decreases rapidly. The strongest practical signals occur over seawater. The important consideration for signal strength is not the value of signal level, but the signal-to-noise ratio, which is an important characteristic of this antenna. 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 antennas are used. The extent of the skip zone is dependent upon soil conditions and the surrounding physical environment. For average conditions, 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. 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 patterns from the antenna at very high elevation angles NVIS (near vertical incidence sky-wave). This is accomplished by deploying the vertical element

simultaneously with the horizontally sloped NVIS element. Radiation pattern characteristics of the vertical element enhance DX, while radiation pattern characteristics of the NVIS type are achieved through the use of the NVIS element. 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 minimum 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. 1) The desired NVIS mode produces radiation with a maximum in the vertical direction. 2) 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 element 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 at between 5-7 feet 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 the vertical element to enable DX propagation.

SECTION 2 – System Overview

Equipment Description

Deployable by one person in less than 10 minutes, the ProMaster system is a complete wide-band transportable base antenna systems that provide for low noise receive and supports wide-band transmission that is useful for spread-spectrum communications or quickly switching between bands.

Equipment Characteristics

Low noise receive characteristics occur due to the entire antenna system being placed close to the earth. This balanced system requires no additional components be added to maintain a maximum SWR of 3:1 during transmission when measured at the antenna, no coax insertion. Once coax is connected, operators may find that a choke balun can be useful, but do not add one unless it is determined that it's needed.

The ProMaster antenna is designed to simultaneously provide directional high-angle radiation (near vertical incidence – NVIS) and low-angle radiation (long-range and DX) propagation. The directionality of the default system is controlled by the placement of your NVIS element. Where your signal will launch opposite the direction of the NVIS element, which will be in the direction your Ground wire is run. The NVIS element also 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.

For an omnidirectional signal pattern, you may replace the 25 foot NVIS element with four 35 foot NVIS elements, which may alternatively be used as counterpoise elements. Each configuration has its' own frequency coverage and signal pattern discussed earlier in this document. No matter which configuration you deploy, an external antenna tuner can be used if your antenna is installed over a poor ground or not placed in a clear area.

Site Selection

For maximum antenna operating efficiency, the ProMaster 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.

Maintenance

Yearly – Inspect connection points and tighten any loose connections.
Triennially – Disassemble and clean all connection points of corrosion and reassemble.

Maintenance Log	1	2	3	4	5	6	7	8	9	10	11	12
Yearly												
Triennial												

Leading Particulars

Leading particulars and equipment for the ProMaster antenna are listed in Tables 1-2. Operators should become thoroughly familiar with data and procedures contained in the entire technical manual before working on or using the antenna.

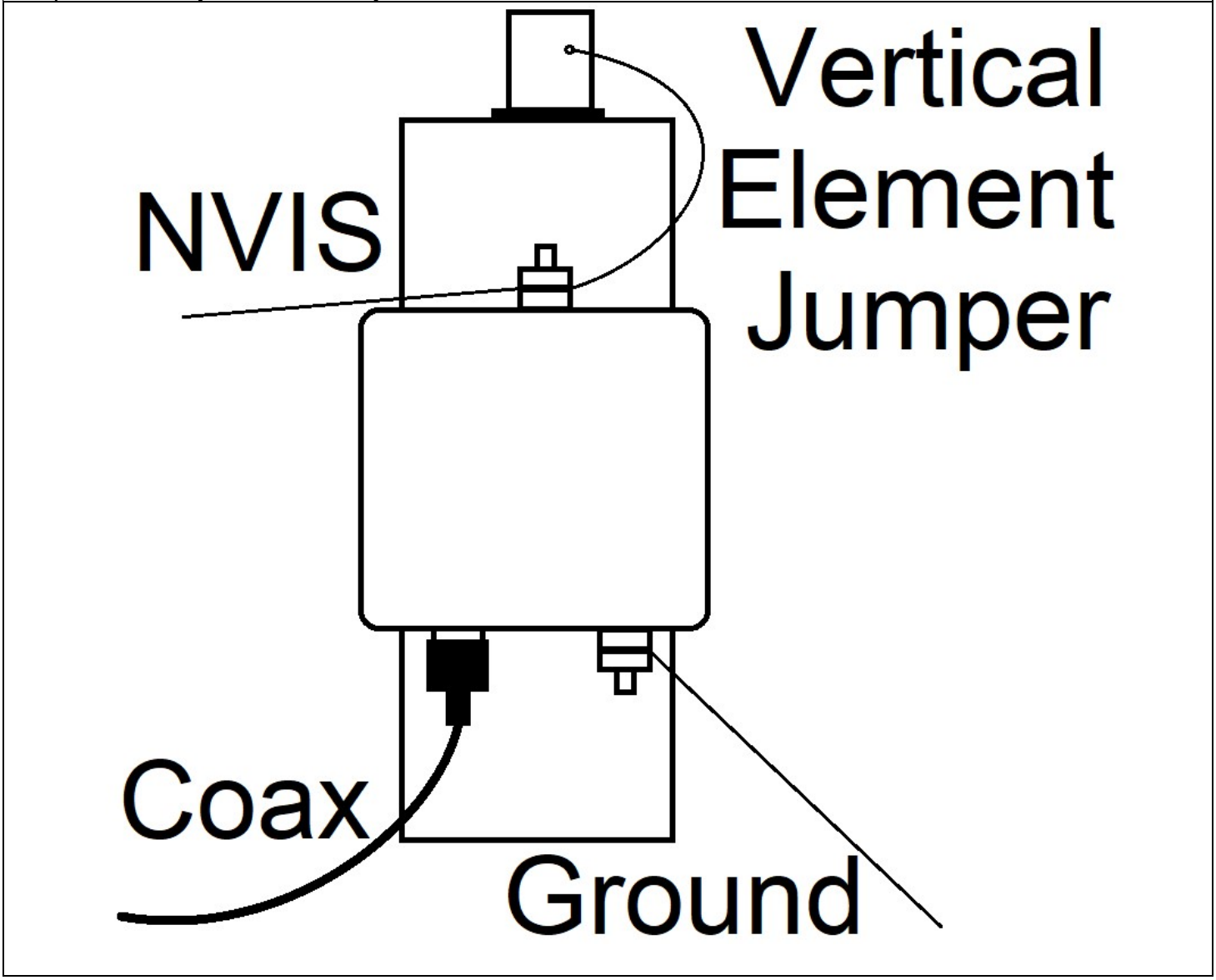
Table 1-2 Leading Particulars

ITEM	LEADING PARTICULARS
ProMaster Frequency range/Power rating in watts When deployed with one 25 foot NVIS element and one 8 foot grounded counterpoise element. When deployed with for 25 foot NVIS elements and one 8 foot grounded counterpoise element. Polarization Input impedance	 3.5-30 MHz , 250 PEP SSB, 125 CW, or 25 watts for digital modes 1.8-30MHz, 250 PEP SSB, 125 CW, or 25 watts for digital modes Horizontal and Vertical polarization 50 ohms
Azimuth Elevation	Omnidirectional/Semi-Directional NVIS & DX
Wind and ice Maximum Height erected	System survives 85 MPH wind with no ice. 24 Feet when mounted on the optional tripod or user supplied mast.
Maximum Length Maximum Diameter	42 inches Less than 9 inches

SECTION 3 – Deployment

Quick Installation Overview

NOTE - Never loosen any of the bolts, washers, nuts, or caps on the match.
Step 1 – Install your mast or optional tripod away from power lines.
Step 3 – Place the ground wire ring connector over the bottom bolt on the match
Step 4 – Install the mounting plate on your mast.
Step 5 – Push the stake on the ground wire into an earth ground.
Step 6 – Place the NVIS element's ring connector(s) over the top bolt on the match.
Step 7 – Assemble the vertical element, and install it on the mounting plate.
Step 8 – Attach your coax from your tuner to the SO-239 on the match.



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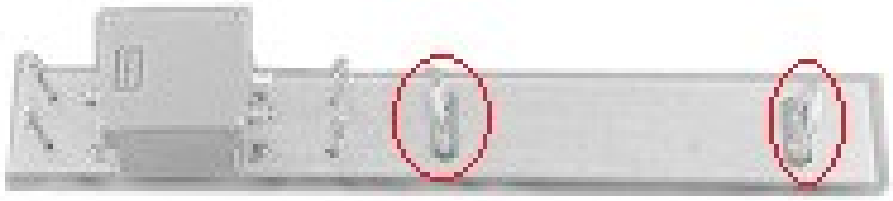
Detailed Assembly Instructions

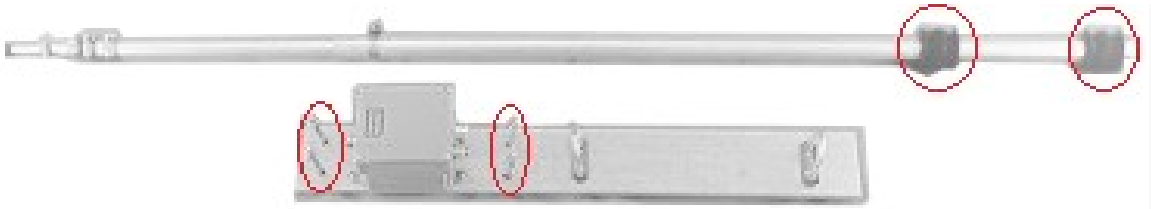
Step 1 – Prepare your mounting installation with a) galvanized 1 3/8” fence rail placed 3-4 feet in ground, b) Steel tripod from Alpha Antenna, or c) any other similar conductive or non-conductive mast that is no larger than 1 3/8” in diameter.

Step 2 – Lay the 6 tapered vertical antenna elements end to end flat on the ground. Insert each section into the next until each element passes the slit of the other by ¼ inch, and secure each section with a stainless steel clamp.

Step 3 – Place aluminum mounting plate hardware onto the supporting item in Step 1 & tighten the U-Bolts that are circled below.

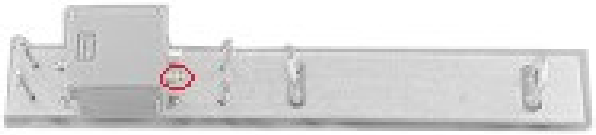


Step 4 – Mount the vertical antenna element into the U-Bolts opposite of those used to mount the aluminum mounting plate. Here is where you will place the included rubber offsets circled around the vertical element and under the associated U-Bolts on the mounting plate that are circled below.



Step 5 –
A) Place the o-ring connector that has red shrink tube, which feeds the Vertical element, over the top bolt on the Alpha Match.
B) Place the o-ring connector that has red shrink tube, which feeds the single 25’ NVIS element (or four 35’ NVIS elements, but without the 25’ NVIS element), over the top bolt on the Alpha Match.
C) Secure the ring connectors in place with the included nut. Then pull these out as though they were guy wires, and do not allow them the lay flat on the ground.

Step 6 – a) Attach the 1 o-ring connector of the Grounded Counterpoise element that has black shrink tube to the bottom bolt on the Alpha Match, as circled below. b) Secure the ring connector in place with the included nut.



Step 7 – Mount the aluminum hardware with fully assembled vertical element onto the mounting installation that was prepared in Step 1, then drive the Ground wire's stake into the ground at least 4 inches.

Step 8 – Attach your coaxial feedline to the SO-239 on the Alpha Match.

Support

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