

VOYAGER DX-IV

Installation and Assembly Instructions



G.A.P. ANTENNA PRODUCTS, INC.

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9/72

9/73 out

Richard.

SAFETY NOTICE

WARNING! POWER LINES CAN KILL.

DO NOT ERECT THIS ANTENNA NEAR ANY OVERHEAD WIRES, UNDER ANY CIRCUMSTANCES. READ AND FOLLOW THESE INSTRUCTIONS CAREFULLY:

- 1) Do not erect this antenna near any overhead wires. Assume all such wires to be power lines and deadly.
- 2) Do not transport this antenna from an assembly location to the installation site, if you must travel near or under overhead wires.
- 3) Request advice from your local power company, if power wires are anywhere near the proposed installation.
- 4) If the antenna falls, do not try to stop it. Get out of the way.
- 5) **If any part of the antenna should touch overhead wiring, DO NOT TOUCH IT--Call the power company immediately for help.**
- 6) **In the event of an accident involving power wiring: DO NOT TOUCH THE VICTIM DIRECTLY--**Use a wooden broomstick, or similar dry, insulating material to pry the victim from the antenna or wires. Send someone for help. Administer first aid.
- 7) Select a site which limits public access to the antenna. During operation the lower tuning rods can be at High RF Potential. If any possibility exists that people or pets could contact the antenna, place a wooden fence around the antenna after installation.
- 8) Choose a calm, dry day to erect the antenna.
- 9) Always enlist the aid of at least one other person in erecting the antenna.
- 10) Do not use or stand on a ladder in the process of erecting your GAP Antenna. A ladder is not needed, and could be dangerous.
- 11) Do not connect the antenna coax until the antenna is firmly mounted.

VOYAGER DX-IV

Congratulations on your purchase of the VOYAGER DX-IV GAP Launched Antenna. You soon will enjoy the ultimate in vertical antenna technology. Your GAP antenna has been designed and manufactured to provide superior performance, and a long, trouble-free life.

The GAP technology produces highly efficient, low-Q/wide bandwidth performance. As a result, no tuning is required in most amateur installations.

This manual is organized to minimize the amount of time necessary to assemble and install your GAP vertical. It is recommended that you follow the instructions.

Before beginning assembly, take a few minutes to read through the site selection chapter, and to review the safety notices. If in doubt, refer to Figure A, the DX-IV antenna.

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READ THE SAFETY NOTICE ON PAGE 2 BEFORE TURNING THIS PAGE

CHAPTER 1: SITE CONSIDERATIONS

1.0 General

It is best to locate the antenna in a clear area, away from wires, metal buildings, fences and trees. As a practical matter, many amateurs must compromise in locating their antenna. This section contains some guidelines to assist in making those compromises.

1.1 Site Safety

A) If you have not read the safety notice, do so now! Stay away from power lines, they are life threatening.

B) Choose an antenna site such that it is not easily accessible to people or pets. Contact with the antenna is dangerous. The lower tuner rods may be at high RF potential during operation. If it is not possible to site the antenna to prevent access, then a wooden fence should be placed around the antenna after it is erected, to prevent contact.

1.2 Nearby Wires and Antennas

In general, any vertical antenna will exhibit mutual coupling with any other vertical structure or wire within a wavelength, if the structure approaches resonance at the operating frequency. The GAP is no exception. Be especially careful with wires or downleads which may be within 65 - 70 feet of the proposed GAP installation site. These may include towers, downspouts, coax from other antennas, metal pipes, or TV antenna feedlines on your property or adjoining properties.

While horizontal wires or structures can affect performance of a nearby vertical antenna, this is much less likely than the case of a vertical structure.

1.3 Buildings

A) It is best to locate the antenna as far from the house as possible, to minimize interaction with house wiring, and RFI to consumer electronics.

B) Metal-walled or roofed buildings can affect antenna operation. If you have no choice, your GAP should be located at a corner of the building, rather than broadside.

C) Stucco buildings often have mesh in their walls, and should be treated as metal structures, until proven otherwise.

CHAPTER 2: MAST ASSEMBLY

2.1 Mast Components

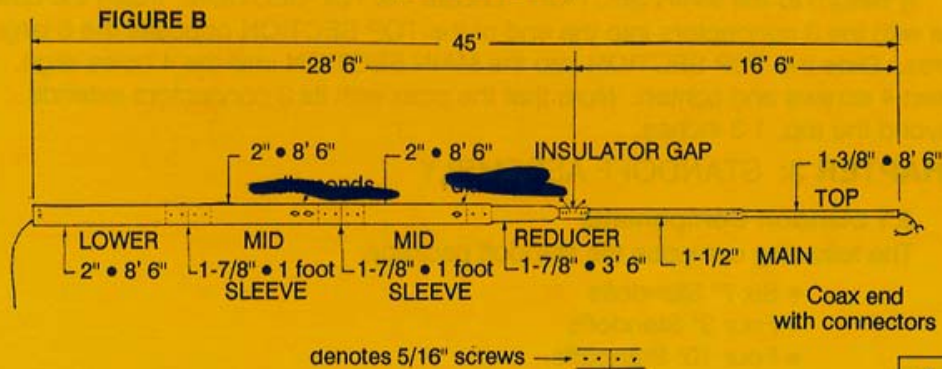
The following components comprise the mast of the Voyager DX-IV;

- 1) Lower Section - One 2" tube 8'6" long with 1/2" holes on one end and 4 small holes on the other end.
- 2) Mid Sections - Two 2" tubes 8'6" long with 4 small holes on each end.
- 3) Main Section - One 1-1/2" tube with a fiberglass insulator and coax leads coming out of both ends. Overall length 8'6".
- 4) Top Section - One 1-3/8" tube 8'6" long with six 1/2" holes on the top end.
- 5) Reducer - One 1-7/8" tube 3'6" long tapered at one end with four small holes on each end.
- 6) Sleeves - Two 1-7/8" tubes one foot long with four small holes on each end
- 7) Screws & Washers - Whenever a screw is called for, include a star washer

2.2 Assembly

The Voyager DX-IV is 45 feet long. Therefore you will need a reasonably flat clear space 45 to 50 feet in length. A level surface makes it easier to slide one tube into another. Refer to figure A as a guide and figure B for assembly.

BASIC MAST



- A)** Locate the MAIN SECTION, stretch the coax out from each end.
- B)** Locate the REDUCER. Take the long end of the coax, nearest the fiberglass insulator, and thread it through the REDUCER. Narrow end first.
- C)** Slide the REDUCER into the fiberglass end of the MAIN SECTION until the 4 holes align. Insert 4 screws and tighten all but the one closest to the yellow GAP lead. This one will be fully secured later in assembly process.
- D)** Locate the MID SECTION with the number 6 and 7 on it. Slide the end closest to #6 over the coax and REDUCER until the MID sections holes align with the 4 holes in the REDUCER. Insert 4 screws and tighten.
- E)** Locate one of the two sleeves. Slide one end over the coax from the MID SECTION and continue to slide the SLEEVE into the MID SECTION until the holes align. Insert 4 screws and tighten.
- F)** Locate the remaining MID SECTION numbered 8, 9 and 10. Slide the end closest to #8 over the coax and SLEEVE until the 4 holes align. The two MID SECTIONS will be close to each other. Insert 4 screws and tighten.
- G)** Locate the remaining SLEEVE. Slide one end over the coax from the last MID SECTION. Continue to slide the SLEEVE into the MID SECTION until the 4 holes align. Insert 4 screws and tighten.
- H)** Locate the LOWER SECTION. Slide the end opposite the 1/2" holes over the coax from the SLEEVE. Continue to slide the LOWER SECTION over the SLEEVE until the 4 holes align. The LOWER SECTION and MID SECTION will be very close to each other. Insert 4 screws and tighten. Insert a screw in the small hole at the base of the tube.
- I)** Return to the MAIN SECTION. Locate the TOP SECTION. Insert the coax line with the 3 connectors into the end of the TOP SECTION opposite the 6 large holes. Slide the TOP SECTION into the MAIN SECTION until the 4 holes align. Insert 4 screws and tighten. Note that the coax with its 3 connectors extends beyond the top, 1-3 inches.

CHAPTER 3: STANDOFF ASSEMBLY

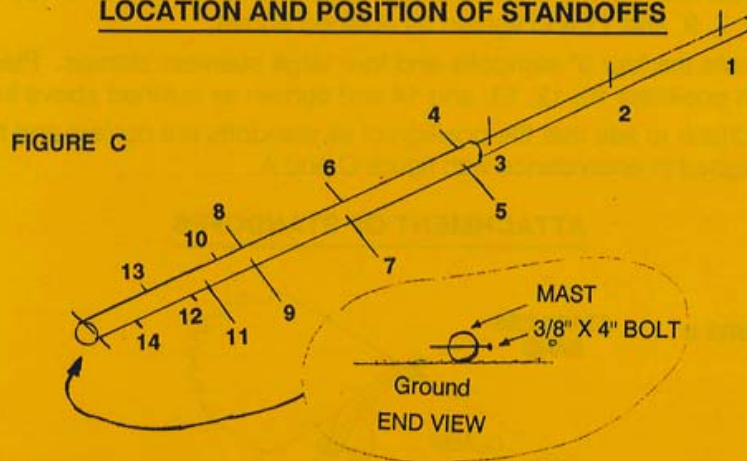
3.1 Standoff Components

The following comprise the standoff package;

- Six 7" Standoffs
- Four 3" Standoffs
- Four 10" Standoffs
- Fourteen Stainless Steel Clamps (11 large, 3 small)

These standoffs are to be attached to the MAST ASSEMBLY. Refer to figure C for the orientation of each standoff. You will see that the same numbers are on the mast. The method to secure the standoff is depicted in figure D.

LOCATION AND POSITION OF STANDOFFS



3.2 Assembly

A) Locate the 3/8" stainless steel bolt. Insert into the large 1/2" holes at the base of the mast. See figure C.

B) Rotate the mast until the bolt is parallel to the ground and the yellow leads at the GAP face up.

C) Locate the position of the 7" standoffs. Each position is numbered. If a mark is not visible, remark the top side or refer to figure C for the location of the standoff.

D) Locate the three small stainless clamps and three 7" standoffs. Unscrew the clamp totally. Thread the open end of the clamp through the smaller hole on one end of the standoff. Place these three standoffs at positions 1, 2, and 3. Refer to figures C and D. Locate the appropriate mark on the mast and circle the mast at that point with the open end of the clamp. Place the open end of the clamp in its connector and tighten, 2-3 turns. Twist the clamp until the screw housing resides inside the standoff and further tighten.

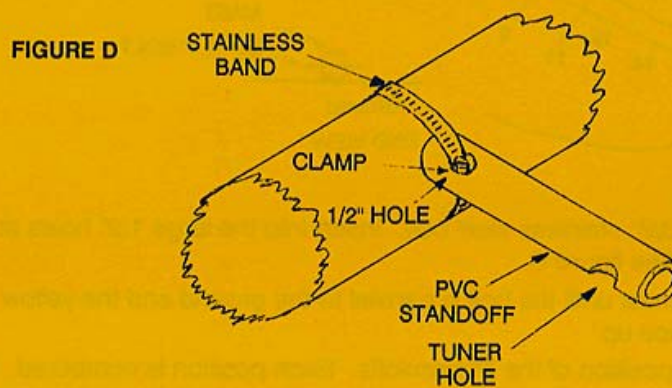
E) Locate the remaining three 7" standoffs and three large stainless clamps. Repeat the steps outlined in D and place these at positions 4, 6 and 8 and tighten.

F) Locate four 10" standoffs and four large stainless clamps. Place these at positions 5, 7, 9, and 11 and tighten as outlined above.

G) Locate the four 3" standoffs and four large stainless clamps. Place these standoffs in positions 10, 12, 13, and 14 and tighten as outlined above in D.

H) Recheck to see that the position of all standoffs are correct and they are properly aligned in accordance with figure C and A.

ATTACHMENT OF STANDOFFS



CHAPTER 4: TUNER ROD ASSEMBLY

4.1 Tuner Rod Components

The following components comprise the tuner rod package:

- Six 1/2" rods 102" in length
- One 1/2" rod 90" in length
- Two 1/2" rods 65" in length
- Four 5/8" rods 4" in length, referred to as Joiners
- Three transition wires (yellow - 1 long, 2 short)
- Two jumper wires (black - 1 long, 1 short)
- Fifteen 5/16" screws and washers

4.2 Assembly

At this point, the MAIN MAST ASSEMBLY is complete and fourteen standoffs have been attached to this mast. Use figure E as a guide. Note drill holes in the 1/2" tubes are referred to as singular, but they are thru-drilled to provide a spare hole. Rods B, C, D, F, G, and H are all the same or 102" long.

A) Select rod A which is 90" long. Slide a Joiner over rod A. Insert a single screw and tighten. Slide rod through top standoff 1.

B) Slide rod B through standoffs 2 and 3 and into the rod A Joiner. Insert one screw and tighten.

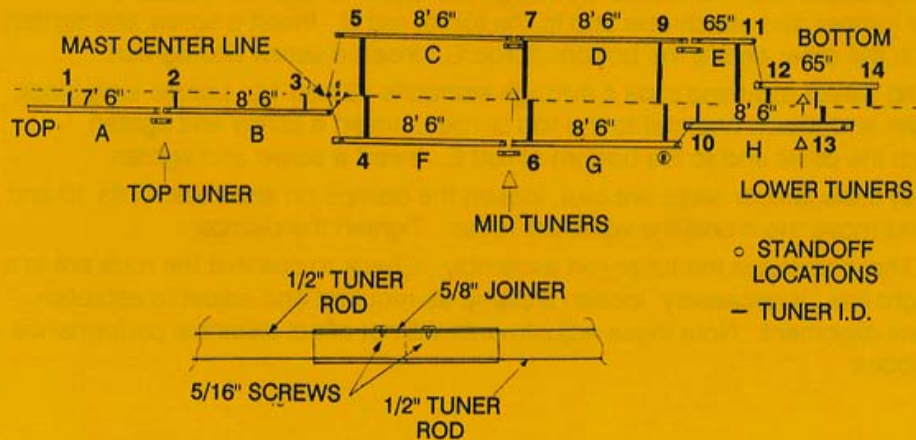
C) Slide assembled rod AB toward the GAP until opposite. If the low end is not opposite the GAP, loosen the clamp on center standoff 2 and slide until opposite.

D) Select rod C. Slide a Joiner over rod C. Insert a single screw and tighten. Slide rod C through standoff 5 just below the GAP.

E) Select rod D and slide it through standoffs 7 and 9 into the Joiner on rod C. Insert a single screw and tighten.

TUNER ASSEMBLY

FIGURE E



F) Place a Joiner on the other end of rod D. Insert a single screw and tighten.

G) Select rod E and slide it through standoff 11 and into the Joiner of rod D. Insert a single screw and tighten. The top end of this assembly should be opposite the GAP. If not, loosen the clamp on standoff 7 and relocate it until opposite. Tighten the clamp.

H) Select rod F and slide a Joiner over rod F. Insert a single screw and tighten. Slide this rod through standoff 4.

I) Select rod G and slide it through standoffs 6 and 8 and into the Joiner on rod F. Insert a single screw and tighten. Adjust as in step G.

J) Attach one yellow transition wire to each of the three rod ends opposite the GAP. Secure each with a screw and tighten. The longest transition wire attaches to the top of rod C. The other two transitions are interchangeable.

K) Take the single transition wire attached to the Top tuner rod. Remove the screw just **below** the GAP. Place the lower GAP lead and Top tuner transition lead over the screw hole. Reinsert screw and tighten.

L) Take both transition wires from the Mid tuners. Remove the screw just **above** the GAP. Place the two transition leads and the upper GAP lead over the screw hole. Reinsert screw and tighten.

M) Select rod H and slide it through standoffs 10 and 13. Locate short black jumper and attach one end to the top of rod H. Insert a screw and tighten. Attach the other end to the bottom of rod G. Insert a screw and tighten.

N) Select rod I and slide it through standoffs 12 and 14. Locate long black jumper and attach one end to the top of rod I. Insert a screw and tighten. Attach the other end to the bottom of rod E. Insert a screw and tighten.

O) If the jumper wires are taut, loosen the clamps on short standoffs 10 and 12 and move them until the wires are loose. Tighten the clamps.

This completes the tuner rod assembly. Check to see that the rods are in a straight line. If necessary, loosen a clamp as required and adjust to establish proper alignment. Note these adjustments will not affect electrical performance - just looks.

CHAPTER 5: TOP HAT - CAP UNIT ASSEMBLY

5.1 Top Hat - Cap Unit Components

The following elements comprise the Top Hat & CAP Unit Package;

- Three 80" long 1/2" aluminum tubes
- One 1" long hex head screw
- One 240" long ring wire with six flag terminals attached
- One encapsulated CAP Unit
- One 4" long 1-1/2" aluminum dust cover
- Eight 5/16" stainless screws and washers

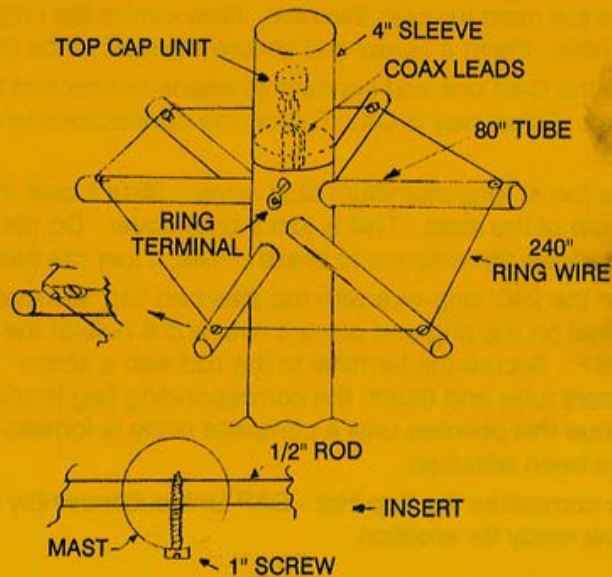
Additional items required - A step ladder or equivalent and a short length of cord.

Note - the drill holes in the 1/2" tubing are referred to as singular but are through-drilled. This permits the tube to be still used if one set of holes is accidentally stripped.

TOP HAT - DX-IV

Tubes are shown fore shortened

FIGURE F



5.2 Assembly

A) Obtain a step ladder or equivalent support. Raise the top end of the antenna mast and place it on the ladder such that the mast extends two feet beyond the ladder. Secure the mast to the top of the ladder with the short cord. You do not want the mast to fall off and damage the Top Hat.

B) Refer to figure F. Take one 80" rod and insert one end into the pair of 1/2" holes farthest from the top. Push the tube halfway into the mast. Rotate the 1/2" tube until the drill hole in the center of the tube, faces the small hole between the 1/2" holes in the mast. Locate the 1" long screw and insert it through the small hole in the mast and into the small drill hole in the middle of the 1/2" rod. Tighten, but take care not to over tighten. See insert Figure F.

C) Take a second 80" rod and place this rod in the pair of 1/2" holes directly above the rod you just inserted. You will need to push the coax out of the way to slide the rod through so it is centered on the mast.

D) Take the remaining 80" rod and repeat step C placing the rod in the last set of 1/2" holes. Again you will need to push the coax out of the way.

E) Locate the lead at the end of coax cable with the ring terminal. Route lead through the 3/8" hole near the top of the mast. See Figure F. The terminal will stick out of the mast through this hole. Now center the ring terminal over the adjacent 1/8" hole. Insert a screw and secure the lead to the mast.

F) Locate the CAP unit and connect its spade connectors to those on the end of the coax. Either way is OK. Tug on the connections to insure they are firmly secured.

G) Locate the 4" long aluminum dust cover. Slide it over the CAP unit and in turn over the top of the mast. This is just a dust cover. Do not seal the top of this sleeve. It allows the antenna to breath. Yes, it just sits there.

H) Locate the 240" ring wire with the attached flag terminals. Pick any tube and any terminal on the ring and place it over a drill hole at the end of a rod. See blowup Figure F. Secure the terminal to the rod with a screw. Circle the ring to the next adjacent tube and attach the corresponding flag terminal with another screw. Continue this process until a complete circle is formed and all six terminals have been attached.

This now completes the Top Hat - CAP Unit subassembly operation. The antenna is now ready for erection.

PARTS LIST - DX-IV

() denotes quantity



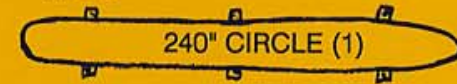
STANDOFFS



CLAMP - SS



HOOP



JOINER



TRANSITION - yellow



JUMPER - black



CONNECTOR



TOP CAP UNIT (1)



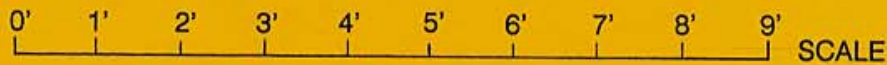
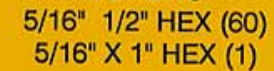
NUT DRIVER 5/16 inch (1)

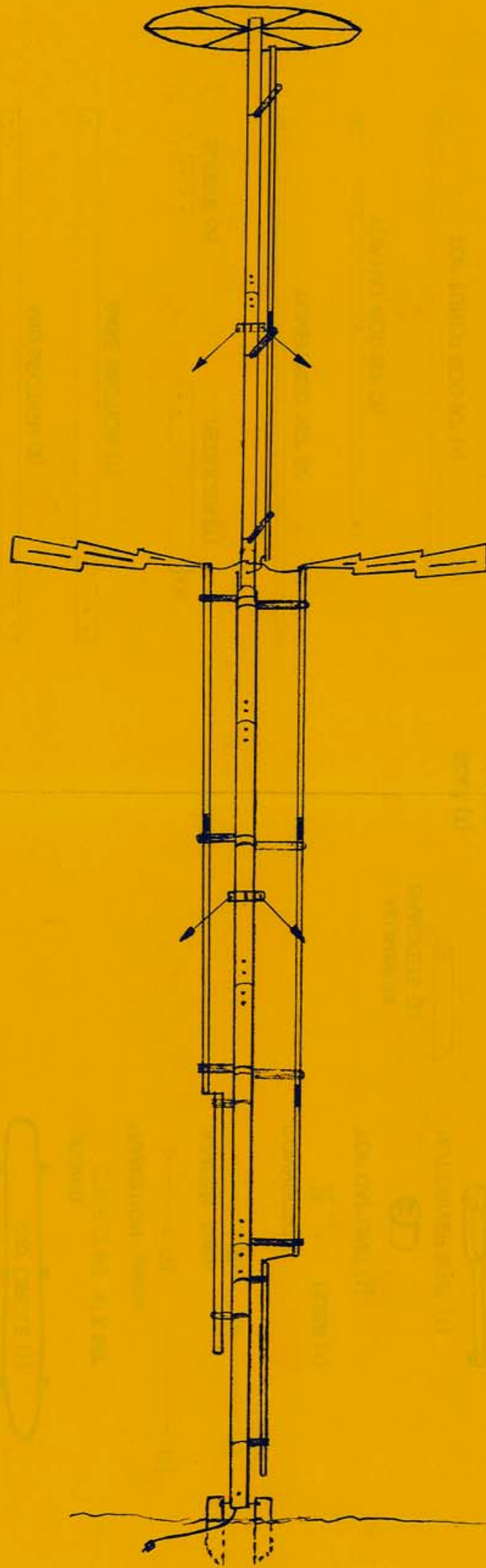


GUY ANCHOR (2)



SCREWS





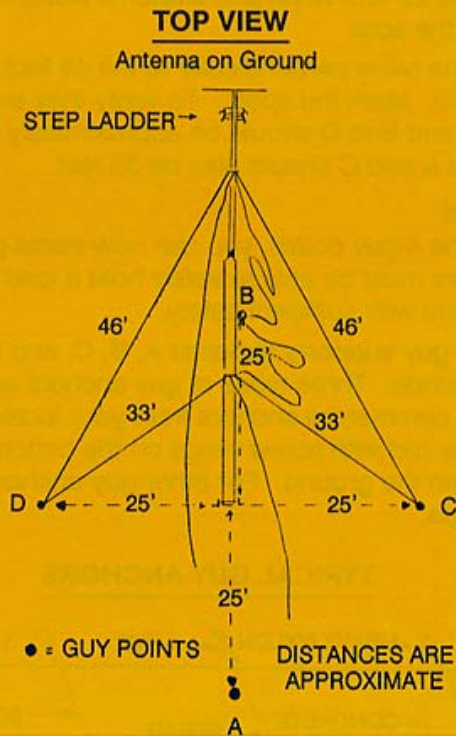
CHAPTER 6: ERECTING THE ANTENNA

Putting up a 45 foot antenna is not a task to take lightly. It requires very careful planning on your part. First study the section on SAFETY. This section is very important and should be paramount to all the decisions and actions concerning the positioning and erection of the Voyager DX-IV.

6.1 Locating the Base

Read the section on SITE CONSIDERATIONS which discusses the influence of vertical metal structures such as metal poles, wires, and aluminum sided houses. Spend an adequate time surveying the environment before choosing a site. It may save you hours of extra work relocating the antenna. Refer to figure G.

FIGURE G



A) Select a tentative base mounting site and place a screwdriver in the ground at this point. Obtain a ball of twine and measure a length of 45 feet. Attach one end of the twine to the screwdriver and stretch the other end out in the direction you have chosen to place the antenna. Verify that adequate room is available to place the Voyager DX-IV flat on the ground. Carefully confirm that **NO OBSTRUCTIONS EXIST ABOVE THE TWINE**. If the area is not clear move the screwdriver and repeat the process. When a clear area has been found leave the line stretched out on the ground.

B) Having found a clear location, now measure and cut a 25 foot length of twine. Attach it also to the screwdriver. Stretch the twine in the opposite direction from the 45' length of twine. Again **CHECK THE OVERHEAD CLEARANCE**. Mark this point as guy point A.

C) Take this same 25 foot twine and stretch it along the 45 foot twine. This is guy point B. Mark the spot.

D) Now stretch the twine perpendicular to the 45 foot twine line. This defines points C and D. Mark the spots. To verify they are perpendicular, the distance from C to B and B to D should be approximately 35 feet. The distance between A and D and A and C should also be 35 feet.

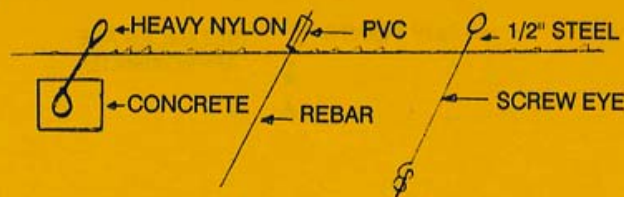
6.2 Guy Anchors

Having located the 4 guy points, you can now install guy anchors at these points. These anchors must be able to safely hold a load of 300 pounds to sustain an 80 mph wind with sufficient safety.

If you place dual guy supports at points A, B, C, and D, you can divide the load in half or 150 pounds. Three types of guy anchors are depicted in figure H or you can purchase commercial anchors from your local hardware store or Ham outlet. A 3/8" eye rod with screw wings on the bottom is acceptable if screwed until flush with the ground. For other guy anchors see the ARRL Handbook of Antennas.

TYPICAL GUY ANCHORS

FIGURE H



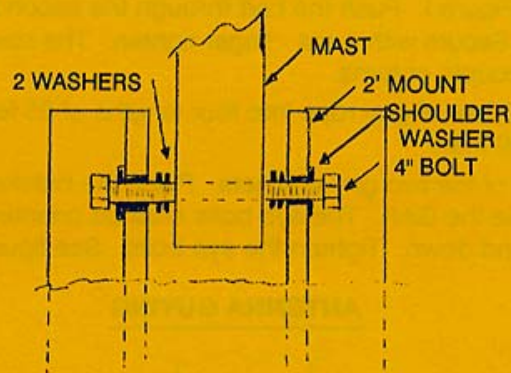
6.3 Assembling the Base Mount

Refer to Figure I. Locate the two aluminum angle brackets. Locate the 4" x 3/8" stainless steel bolt and nut which is in the mast of the antenna. Refer to Step 3.2 A. Place the brackets as shown in Figure I. Remember that the end of the bracket with the 3/8" hole must be up.

You will have to dig a 20" hole. Place the brackets in the hole and fill the hole with concrete or depending upon your soil condition you can probably just drive them into the ground. Make sure the 3/8" bolt slides readily through both holes in the angle brackets. The separation between brackets should be 3". Be careful not to dislodge the shoulder washers.

INSULATED BASE MOUNT

FIGURE I



6.4 Assembly of the Guy Ropes

The following is required to raise the antenna;

- Three people plus yourself
- 350 feet of UV protected Dacron guy rope capable of supporting a load of 300 pounds or equivalent. It is not advisable to use nylon because it stretches or polypropylene because it degrades through exposure.
- Six foot step ladder, which is currently supporting the Voyager DX-IV and its Top Hat (optional)
- Two aluminum guy brackets with eye bolts.

A) Enlist the help of three people. One person grasps one end of the antenna, one the middle, one the other end, and the fourth brings the ladder. Pick up the antenna and carry it out to the site unless it is already there. Place the antenna over the 45' twine line with the base of the antenna. Support the Top Hat end with the step ladder or carefully rest it on the ground. It is recommended that you temporarily secure the mast to the top of the ladder to avoid having it fall off and damage the antenna.

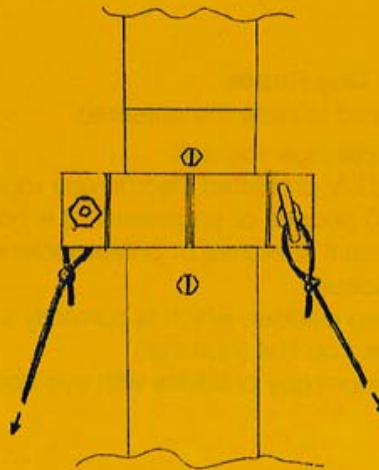
B) Orient, by rotating the antenna mast, such that the Top tuner rod is facing up. Remove the 3/8" bolt from the mount and slide the lower end of the antenna between the angle base mounts such that the holes in the antenna are in line with the holes in the brackets. Slide the 3/8" bolt through the first hole in the bracket. Now place two nylon washers over the bolt. Push the bolt through the mast and insert two more washers between the mast and the second bracket. Refer to Figure I. Push the bolt through the second bracket and shoulder washer. Secure with a nut - finger tighten. The base is now hinged. Tighten the nut a couple of turns.

C) Cut the 350 feet of guy rope into four lengths of 35 feet and four lengths of approximately 50 feet.

D) Select one of the two guy brackets. Place the bracket around the mast at a point 90" above the GAP. The eye bolts shall be oriented to either side of the mast, not up and down. Tighten the eye bolts. See figure J.

ANTENNA GUYING

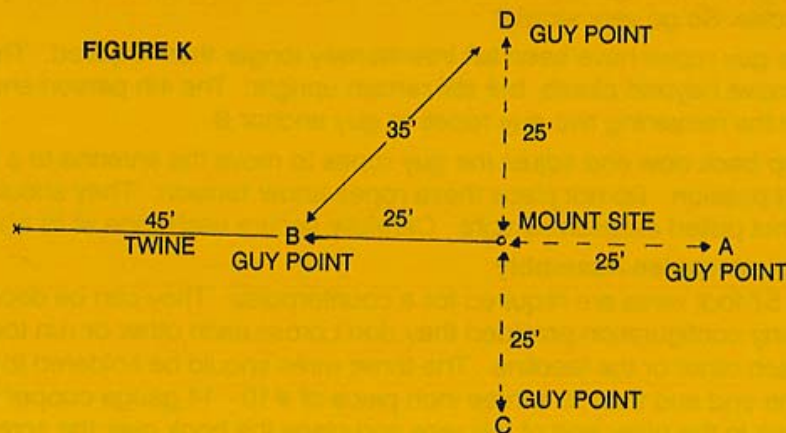
FIGURE J



- E) Firmly attach two 50 foot lengths of guy rope to each eye bolt.
- F) Select the second guy bracket. Attach the bracket 90" below the GAP. Align the eye bolts up and down. Tighten the eye bolts.
- G) Firmly attach two 35 foot lengths of guy rope to each eye bolt.
- H) At the top guy bracket locate a guy rope nearest guy anchor C. Stretch the rope to anchor C. Extend the rope by one foot, to add slack and secure to the anchor. Make sure this rope is clear of the upper tuner rod.
- I) At the top bracket, locate a rope nearest guy anchor D. Repeat Step H.
- J) At the top bracket, locate a guy rope near the underside of the mast. Stretch this rope to anchor C or D. Add the one foot slack. Mark this point. Now attach this point of the guy rope to anchor point A.
- K) At the lower guy bracket, repeat steps H, I, and J. **Make sure they are free of the tuner rods and under.**

NOTE - The lengths of rope have been intentionally left with 1 foot of slack to insure that as the antenna is raised, a short guy rope will not inhibit raising the antenna. Check Figure K.

PRE-ERECTION OF ANTENNA



6.5 Raising the Antenna

You are now ready to raise the antenna. At this time very carefully recheck each and every electrical and mechanical connection. Recheck each guy rope knot to be certain it is secure. If you wish, you may seal the electrical connections by coating with a high quality silicone adhesive or "Goop" which is available in most hardware stores. Do not solder the solderless connections.

To raise the antenna you will need the services of yourself and three additional people at a minimum. Additional observers would be helpful to watch and alert you if something doesn't look right. It is important that the antenna not catch on anything as it is raised because it could damage the antenna or make the force necessary to raise the antenna excessive.

A) Assign one person to remove the Top Hat from the support ladder and hold it off the ground.

B) The remaining three people should now grasp the antenna about 20 feet from the base of the antenna. **LIFT VERY SLOWLY.** The antenna mast is quite flexible. When it is first lifted, it will bend. This is normal. Push the antenna up until everyone has their hands above their heads. Now walk **SLOWLY** toward the base shifting your hands along the mast as you move. The antenna will rotate on its base hinge until it is upright. **GO VERY SLOWLY!** If you go too fast either raising or lowering the antenna, you could "whip" the top and cause the mast to buckle. So go very slowly!

C) The guy ropes have been left intentionally longer than required. The antenna will move beyond plumb, but still remain upright. The 4th person should now attach the remaining two guy ropes to guy anchor B.

D) Step back now and adjust the guy ropes to move the antenna to a perfect upright position. Do not place these ropes under tension. They should be snug, but not pulled excessively tight. Carefully secure each rope at its anchor.

6.6 Counterpoise Assembly

Three 57 foot wires are required for a counterpoise. They can be deployed in almost any configuration provided they don't cross each other or run too close to each other or the feedline. The three wires should be soldered to each other at one end and then to a three inch piece of #10 - 14 gauge copper wire. Bend a hook in the other end of this wire and place the hook over the screw at the base of the antenna. The counterpoise must be insulated and it can be buried or left above ground.

Attach the PL259 connector to the coax following the instructions in the ARRL Handbook or equivalent.

HURRAH! YOU'RE FINISHED.

CHAPTER 7

7.1 First Operation

A) If the GAP Voyager DX-IV has been assembled properly, it will resonate close to the center frequency selected for 160m. You should also see a useable bandwidth of about 90 KHz between the 2.0 : 1 VSWR points. Record the following data, using a pencil:

VSWR center freq: _____ VSWR at center 1. _____ : 1
2.0 : 1 lower freq: _____ 2.0 : 1 upper freq: _____

B) Next, move to 80 meters. Using the MINIMUM power possible, record the following data. The GAP vertical is especially low Q, and should be below 2.0 : 1 across the entire band.

Freq: 3.5MHz VSWR: _____
3.75MHz _____
4.0MHz _____

C) 40 meters is next.

Freq: 7.0MHz VSWR: _____
7.1MHz _____
7.2MHz _____
7.3MHz _____

D) 20 Meters.

Freq: 14.0MHz VSWR: _____
14.1MHz _____
14.2MHz _____
14.3 MHz _____

E) The antenna should provide 2.0 : 1 VSWR or less over the bands indicated, so long as nothing in the immediate environment is coupled to it.

CHAPTER 8: Tips and Troubleshooting should help you diagnose the situation, if your performance is other than expected.

CHAPTER 8: TIPS AND TROUBLESHOOTING

8.1 General

The Voyager DX-IV antenna has been designed to operate on the 4 bands specified. Operation outside the specified bands with power greater than 100 watts may damage the antenna.

Use of an antenna tuner is not required and not recommended. Tuners will not improve the performance of the antenna, although they may permit some solid state transmitters to put out more power.

Operation of the antenna using a tuner on any frequency where the VSWR exceeds 2.0:1 may damage the antenna.

8.2 Malfunction

A) If one or more of the bands exhibits VSWR in excess of 2.0:1, the following possibilities should be eliminated:

- 1) Bad coaxial feedline. If the coax has been in use for some time, it may be contaminated. Place a dummy load at the far end of the line, in place of the antenna. Any indication of varying VSWR with frequency, or VSWR above 1.0:1 suggests a defective coax.
- 2) Mutual coupling with nearby vertical metal objects may detune the antenna. The most common vertical metal is the feedline from other antennas especially dipoles. Relocate the antenna further from such objects. Towers will also affect the antenna.
- 3) Transceivers with built in SWR bridges may not correctly indicate when their power reduction circuits take over. Retest with a separate VSWR.
- 4) The transceiver or transmitter may be emitting a spurious signal in addition to the desired signal. Retest using the lowest possible power level. Try using a friend's rig.

If you are unable to solve the problem, contact the factory for assistance. Please have the VSWR data at hand when you call. The factory does not charge for technical assistance.

8.3 Burying the Counterpoise

If you need to bury the counterpoise, but want to avoid digging trenches, try this. Collect some wire coat hangers. Cut them into 6" pieces and bend them in the middle to form large staples. Place these over the wire and push them into the ground. The grass will grow up and around the counterpoise and your mower will be unable to lift them up.

WARRANTY

GAP Antenna Products, Inc. provides a limited warranty on its products against any defects in material and workmanship for a period of 90 days after date of purchase/shipment. This warranty applies to the original purchaser only. Purchaser should contact the factory and then return defective product freight prepaid. GAP Antenna Products, Inc. reserves the right to repair or replace product, at its discretion. Repaired or replaced product will be shipped freight prepaid within 30 days of customer return. This warranty is provided in lieu of any other warranty expressed or implied. The warranty is void if the product is subject to misuse, improper installation, accident, neglect, modification, repairs, or act of God.

GAP Antenna Products, Inc. shall assume NO LIABILITY for incidental or consequential damages resulting from the purchaser's ownership of its products.

REPLACEMENT PARTS

Replacement parts are available for any portion of the antenna. Contact factory for details.

DESIGN BASELINE

GAP Antenna Products, Inc. reserves the right to incorporate improvements and changes in the design without an obligation to update previously manufactured units.