ALGONQUIN COMMUNICATIONS

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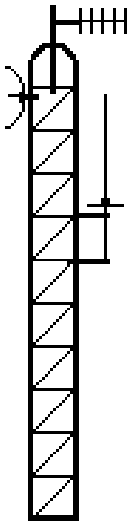


KB2KFV Proposed Tower

Monday, November 17, 2008

Mr. Kenneth T. Davis
136 Hudson Avenue
Green Island, NY 12183

"Serving Eastern New York and Western New England's Communications Needs Since 1993!"

Overview

One of the most important, basic building-blocks to any amateur radio station is its antenna system. Without a properly designed antenna system, effective communications becomes less a reality and more a desire.

Algonquin Communications was asked to review the existing conditions and understand the desires of Mr. Kenneth T. Davis, an amateur radio station bearing the Federal Communications Commission (FCC) Call-Sign ***KB2KFV***. A reference copy from the FCC database is attached hereto as Appendix A.

The requirements include the location of the communications tower, the type of tower and the compliment of antennas sought. The type of tower is a Rohn 25G. Figure 1 shows the proposed location of the tower.

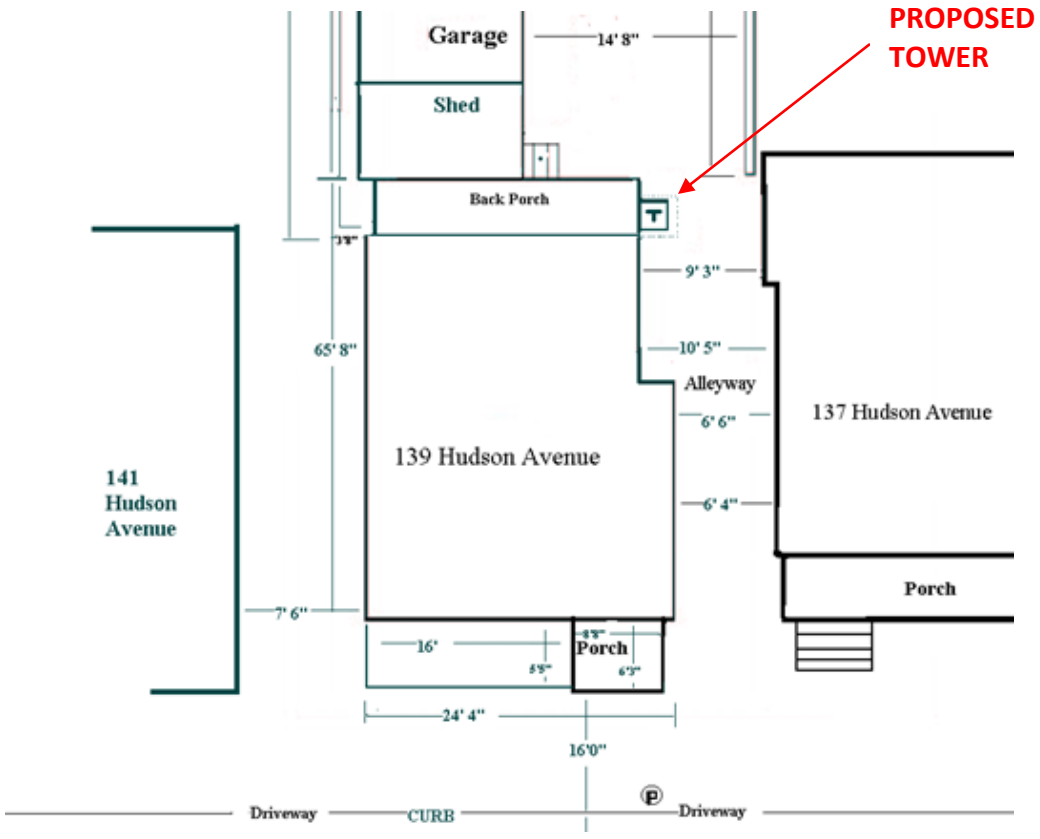


Figure 1 - Tower Layout

Details

Communications towers are available from many different manufactures and are available many different configurations. As the material for this project has already secured, the following report wholly revolves around the specifications related to the material procured. Further, because of the space limitations, the only installation option available is via bracketing to the existing structure (home).

Specifically, the tower will be installed on a concrete base and attached to the house, in two locations, using standard Rohn hardware. The brackets will be installed at 21.0 feet and 10.5 feet above ground level. The tower will be installed to a height of 42.0 feet above ground level.

Proposed Antennas

Very specific and disparate antenna functionality was requested and Table 1 is a list of the antennas desired. Appendix B is a compilation of the specification sheets for the antennas listed. The most important component of this table, created from the information found in the specification sheets, is the allowable antenna area. This allowable antenna area is the surface area - represented in square feet - which each antenna presents to moving air. This is called the wind load of the antenna. The final load is calculated to 6.68 square feet.

Antenna Manufacturer	Antenna Model	Frequency Bands	Weight (lbs.)	Wind Load (Square Feet)
Butternut	HF5B	10 Meters 12 Meters 15 Meters 17 Meters 20 Meters	22 lbs	3.00 sq. ft.
Cushcraft	A50-3S	6 Meters	7 lbs	1.80 sq. ft.
Cushcraft	A144-11H	2 Meters	6 lbs	1.21 sq. ft
Comet	KP-20	23 centimeters	2.5 lbs	0.67 sq. ft.
			Total Antenna Load:	**6.68 sq. ft.**

Table 1 – Antennas and Wind Load

Adherence to OEM Specifications

In order to comfortably utilize and interpolate the data provided by the original equipment manufacturer - Rohn Tower - it is vitally important that the installation of the tower structure is performed in accordance with OEM specifications.

Therefore, it is important to note that in order for the calculations made within this report to be valid, it is imperative to assert and affirm that the tower installation will be to Rohn specifications. Figure 2 shows the tower foundation detail and Figure 3 shows the bracketing detail.

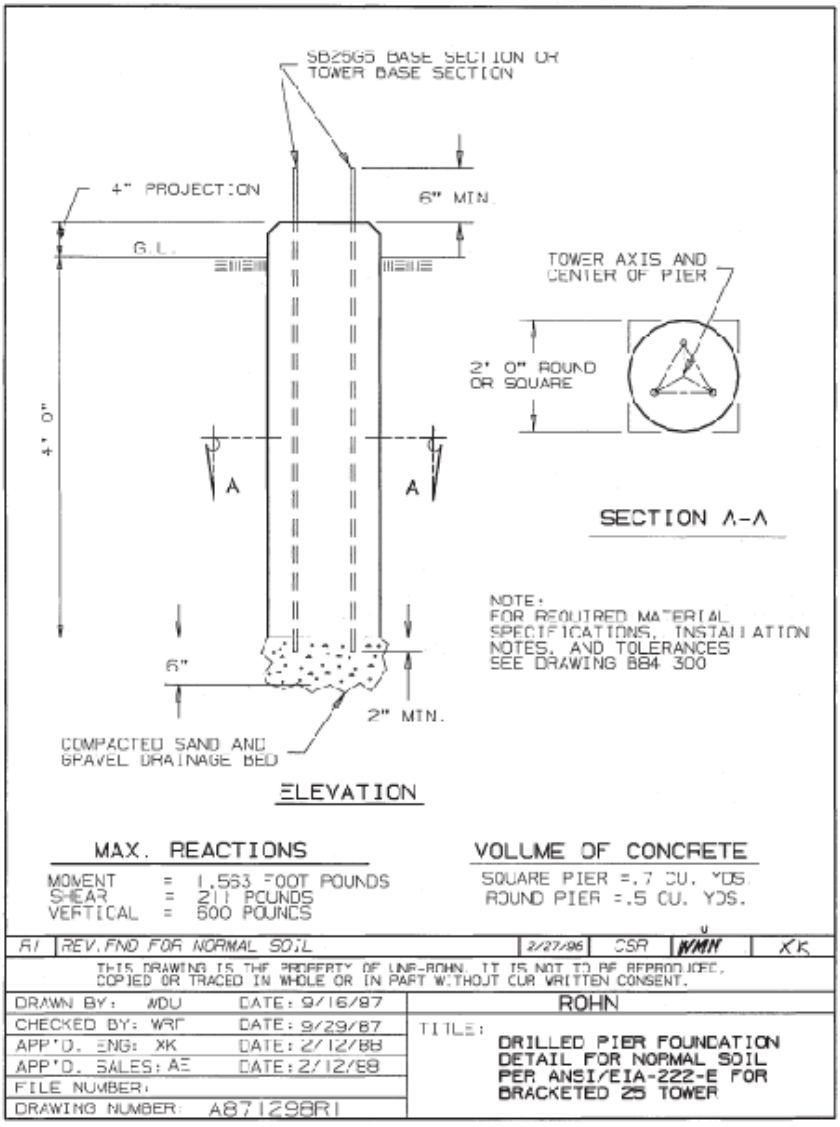


Figure 2 - Pier foundation Detail

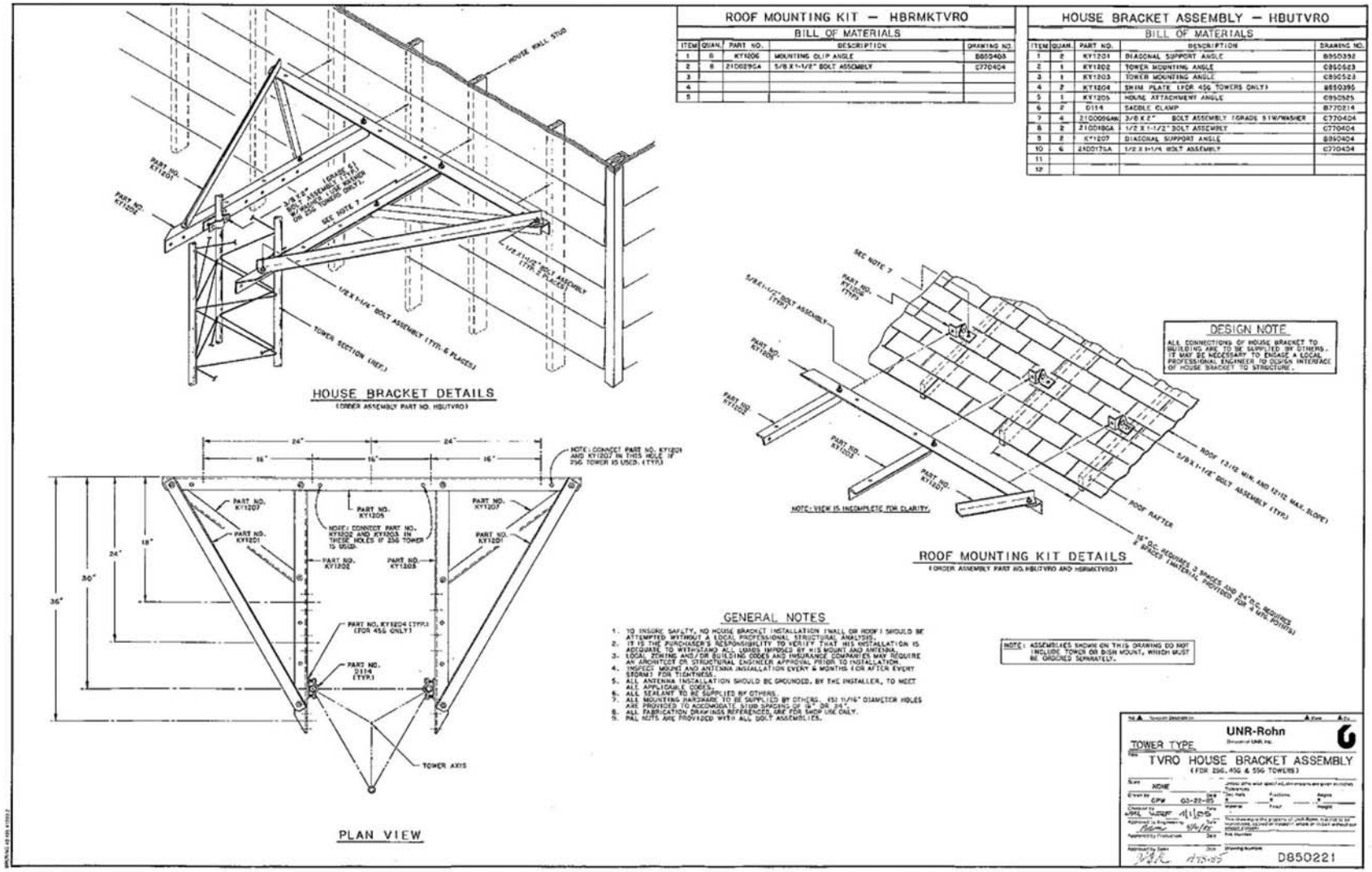


Figure 3 - Wall bracket details.

Calculations

One of the most important considerations when reviewing any communications tower is the understanding that there are no standard towers, only standard tower plans. Table 2 is an excerpt from the Rohn standard tower catalog[1] showing the allowing antenna load for bracketed Rohn model 25G towers.

ROHN
NO. 25G BRACKETED TOWERS - NO ICE

TOWER HEIGHT FT	BRACKET ELEVATION		ALLOWABLE ANTENNA AREAS (SQ.FT.)		
	UPPER (FT)	LOWER (FT)	70 MPH	80 MPH	90 MPH
40	30.0	15.0	15.3	11.3	7.7
50	36.0	18.0	14.6	10.0	6.8
60	46.0	23.0	14.0	8.9	5.9
70	56.0	28.0	13.5	8.3	5.5
80	66.0	33.0	13.1	7.7	5.0
90	66.0	33.0	6.8	4.9	---
100	66.0	33.0	1.7	---	---

Table 2 – Allowable Antenna Area for Bracketed 25G Towers

From the above allowable antenna area chart, Algonquin Communications prepared the following graph showing the relationship between available antenna loading relative to the distance between the upper mounting bracket and the top of the tower. The specific data set was chosen as it is the most applicable for the tower placement and will not be skewed by the resultant data occurring when the tower top is very near to the top bracket as well as when the tower is very far from top mounting bracket. The function with the dataset uses is linear, and therefore obvious. If the other data was used, there is a high likelihood of a non-linear and potentially result in a complex formula.

The advantage to the work described and the methodology selected is that it is straightforward and logical and easily understood.

[1] http://www.radiancorp.com/ROHNNET/rohnnet2004/html2004/index.html

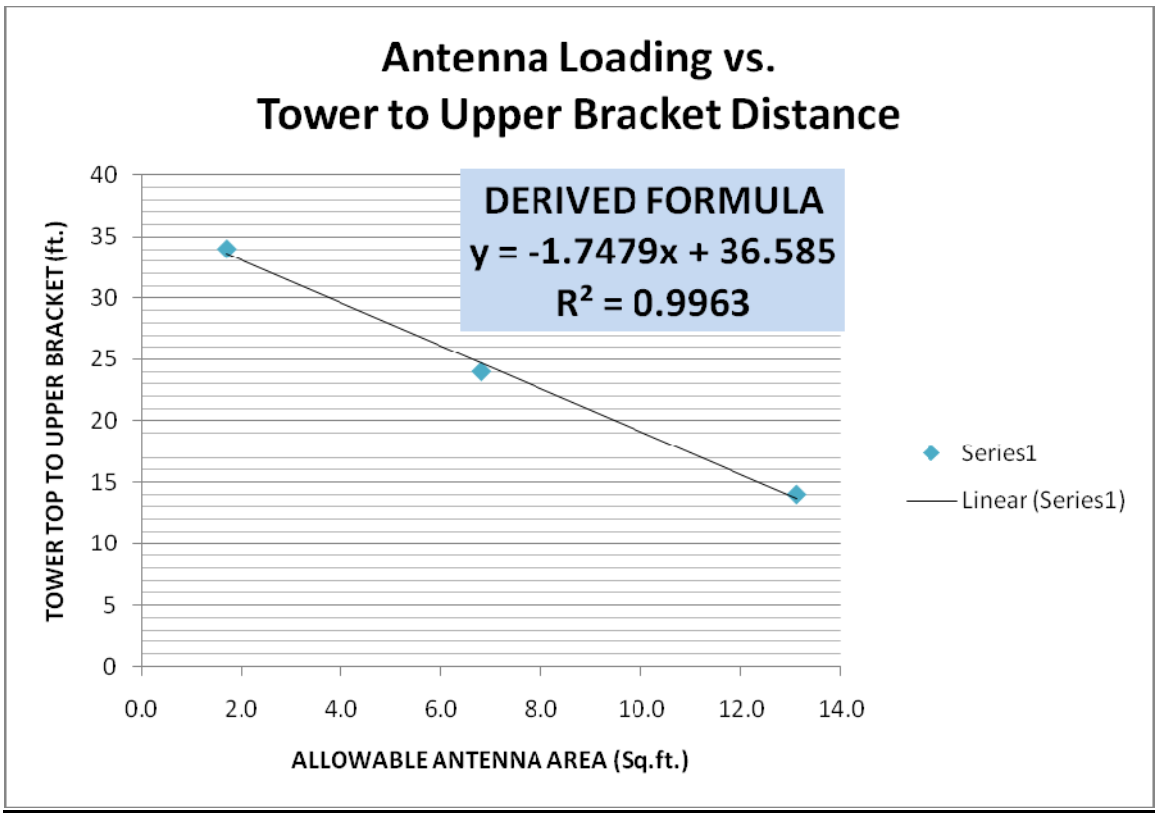


Figure 4
Antenna Loading vs. Distance between Top of Tower & Upper Mounting Bracket

Figure 4 is a graph of the applicable subset of the data found in Table 2. This data was used, in combination with the specific installation data as applicable to Mr. Davis' property and its characteristics. Table 3 is the compilation of the data indicating the calculated antenna load and excess capacity – also called tower availability.

KB2KFV TOWER MEASUREMENTS AND CALCULATIONS			
Top Bracket:	21.0 feet	Formula Derived from Data:	y = (1.7479 * x) + 36.585
Top of House:	28.0 feet	Formula Reworked:	x = (y - 36.585) / 1.7479
Top to Tower:	42.0 feet	Interpolated Load:	8.92 sq. ft.
Lower Bracket:	10.5 feet[2]	Antenna Load (Table 1):	6.68 sq. ft.
Distance Between Top of Tower and Upper Bracket:	21.0 feet	Tower Availability:	2.24 sq. ft. **(25.1%)**

Table 3 – Tower Load Calculations

[2] Lower bracket height is calculated in similar fashion - exactly ½ the Height of the upper bracket height

Summary

As stated previously, seldom do communications towers fall into the status of standard. More particularly, amateur radio towers fall into the non-standard category more so than not because of the diversity of the hobby and the choices available to the radio amateur.

As discussed herein, assuming that quality materials and workmanship are utilized, the proposed tower will more than amply support the load of the antennas proposed.

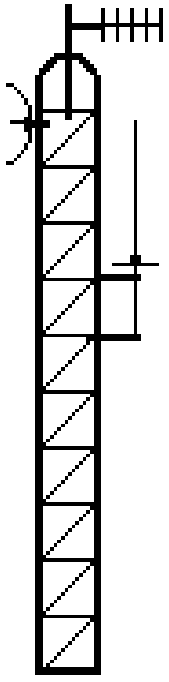
Since the materials for this project have been secured and considering that all materials are direct from Rohn, the quality of the materials is no longer a question.

The final insurance policy should revolve around the installation crew / company and the assurance of experience and quality should be assured.

Credit and thanks for the editing of this document is given to Mr. Robert E. Dillon, Jr., PE (Virginia) without whose invaluable input and time would not have afforded such a concise and professional report.

Appendix A:
KB2KFV FCC License Reference Copy

(As of November 2, 2008)



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Cut Along This Line

UNITED STATES OF AMERICA
FEDERAL COMMUNICATIONS COMMISSION

AMATEUR RADIO LICENSE

KB2KFV

DAVIS, KENNETH T
139 HUDSON AVE
GREEN ISLAND, NY 12183-1213

FCC Registration Number (FRN): 0003540192

Special Conditions / Endorsements

NONE

Grant Date	Effective Date	Print Date	Expiration Date
12-09-2000	03-04-2006		12-31-2010

File Number	Operator Privileges	Station Privileges
0002512135	General	PRIMARY

THIS LICENSE IS NOT TRANSFERABLE

(Licensee's Signature)

FCC 660 - May 2007

Cut Along This Line

Licensee: This is your radio authorization in sizes suitable for your wallet and for framing. Carefully cut the documents along the lines as indicated and sign immediately upon receipt. They are not valid until signed.

The Commission suggests that the wallet size version be laminated (or another similar document protection process) after signing. The Commission has found under certain circumstances, laser print is subject to displacement.

Cut Along This Line

Cut Along This Line

Call Sign / Number	Grant Date	Expiration Date	File Number	Print Date	Effective Date
KB2KFV	12-09-2000	12-31-2010	0002512135		03-04-2006

Operator Privileges
General

Station Privileges
PRIMARY

DAVIS, KENNETH T
139 HUDSON AVE
GREEN ISLAND, NY 12183-1213

AMATEUR RADIO LICENSE

FCC Registration Number (FRN): 0003540192

FCC 660 - May 2007

Fold Here

THIS LICENSE IS NOT TRANSFERABLE

Special Conditions / Endorsements:
NONE

(Licensee's Signature)
FEDERAL COMMUNICATIONS COMMISSION

Cut Along This Line

Cut Along This Line

Conditions:
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

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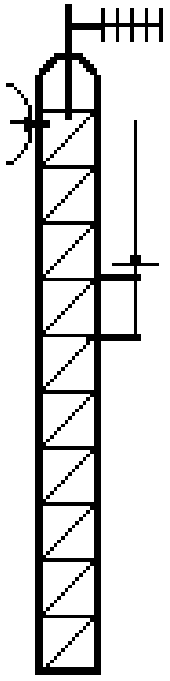
Pursuant to §309(h) of the Communications Act of 1934, as amended, 47 U.S.C. §309(h), this license is subject to the following conditions: This license shall not vest in the licensee any right to operate the station nor any right in the use of the frequencies designated in the license beyond the term thereof nor in any other manner than authorized herein. Neither the license nor the right granted thereunder shall be assigned or otherwise transferred in violation of the Communications Act of 1934, as amended. See 47 U.S.C. § 310(d). This license is subject in terms to the right of use or control conferred by §706 of the Communications Act of 1934, as amended. See 47 U.S.C. §606.

Appendix B:
KB2KFV Antenna List



Algonquin Communications
434 West Sand Lake Road
Wynantskill, New York 12198
Phone: 518.857.6792
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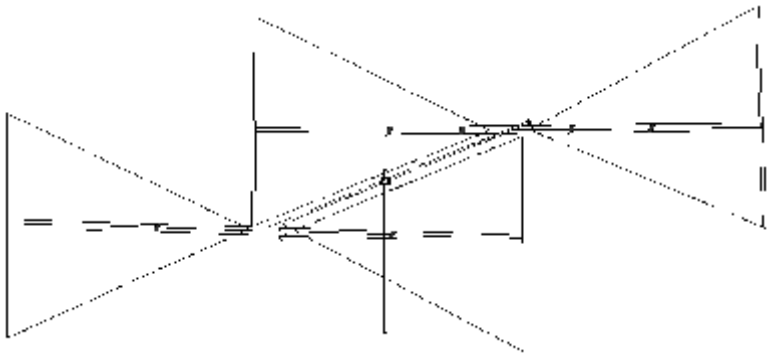
Instructions

Model HF5B



Butternut presents the model HF5B BUTTERFLY compact beam antenna for the 10, 12, 15, 17, and 20 meter amateur bands! With elements only 12 ft 6 in (3.8 m) long and a turning radius under 7 ft (2.1 m), it presents a low profile that allows it to be used in areas where other beam antennas would be restricted. High-efficiency design and broad-band BUTTERFLY elements deliver performance expected only in much larger designs.

SPECIFICATIONS

WINGSPAN:	12 ft 6 in (3.8 m)
BOOM LENGTH:	6 ft (1.8 m)
TURNING RADIUS:	6 ft 11 in (2.1 m)
VERTICAL SPREADERS:	6 ft (1.8 m)
SHIPPING WEIGHT:	22 lbs (10 kg)
FEED POINT IMPEDANCE:	Nominal 50 ohms. Includes RF connector for direct connection to any length feed line terminated in PL-259
VSWR AT RESONANCE:	1.5:1 or less on all bands
POWER RATING:	1200 W PEP
WIND LOADING:	3 ft^2 (.3 m^2)
WIND SURVIVAL:	80 mph (129 kph)
BANDWIDTH:	VSWR 2:1 or less 1.5 MHz on 10 meters; entire band on 12, 15 and 17 meters; 200 kHz on 20 meters
GAIN:	3+ dBd 20 meters, up to 5 dBd other bands except 17 meters where antenna acts as rotary dipole.
FRONT-TO-BACK:	Up to 20 dB
FRONT-TO-SIDE:	Up to 30 dB
TUNING SYSTEM:	No traps; entire element length active on all bands; no tuner required.
MINIMUM RECOMMENDED HEIGHT ABOVE GROUND:	30 ft (9.1 m)

Accepts up to 1 1/2 in (38.1 mm) mast. Light enough to be turned with a TV rotator.

BEFORE YOU START

WARNING: INSTALLATION OF THIS PRODUCT NEAR POWER LINES IS DANGEROUS. FOR YOUR SAFETY FOLLOW THE INSTALLATION INSTRUCTIONS.

WARNING: AT NO TIME DURING ASSEMBLY, INSTALLATION, ADJUSTMENT, OR OPERATION SHOULD ANY PART OF THIS PRODUCT BE ALLOWED TO COME INTO CONTACT WITH ELECTRIC POWER LINES, NOR SHOULD THIS PRODUCT BE INSTALLED IN SUCH A WAY THAT ANY PART OF IT MAY CONTACT POWER LINES DURING NORMAL OPERATION OR IN THE EVENT OF STRUCTURAL FAILURE. FAILURE TO EXERCISE EXTREME CARE IN THIS MATTER CAN RESULT IN DAMAGE TO PROPERTY, PERSONAL INJURY, OR DEATH.

Before you start assembling the antenna, read through the instructions completely, paying special attention to the pictorial diagrams. When you unpack the box, do so on a surface where you will not lose the small parts. Check the parts against the PARTS LIST, identifying each part carefully.

NOTE: Check to see that all parts are present before beginning assembly.

NOTE: 3/4" screws unless directed to use other sizes.

INSTALLATION NOTES

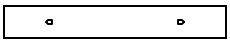
CHOOSING AN INSTALLATION SITE: As with all directional antennas, care must be taken in the choice of an installation site for your HF5B. Pick a place clear of power lines or other obstructions. The HF5B should be mounted at least 30 ft (9.1 m) above the ground for proper operation. It should be able to rotate without hitting anything. Finally, it should not be near any large masses of metal, like metal roofing or siding. Plan your installation so that metallic guy wires are broken up with compression insulators and no other antennas are nearby (like dipoles mounted right under the beam).

BALUNS: The sole purpose of the coaxial line "choke" balun shown in the instructions is to keep RF current from flowing on the outside of the coaxial feed line. It does NOT transform impedances. This form of balun has been featured in the ARRL Antenna Book for 40 years or more and it still works fine. It also costs next to nothing. If, for some reason, you wish to use a commercially manufactured 1:1 balun instead, make sure that it is installed BEFORE you do the "near ground" SWR adjustments on the driven element. Most baluns will introduce odd bits of reactance into an antenna to which they're connected, and that can throw off the tuning of a driven element that was adjusted with another balun in place or with no balun at all.

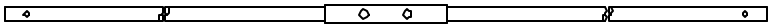
MASTS AND GUYING: In order to avoid coupling between antenna elements and guy wires that can detune the antenna it may be necessary to break up the guy wires with insulators. The typical metal "slip-up" mast calls for a set of guys every ten feet or so, and that usually means a set close to the top of the mast in order to steady the rotor and the antenna. If the separation between the antenna and the highest set of guys is less that about 15 ft (4.6 m) it would be a good idea to use insulators on each of the uppermost guys at intervals of 10 ft (3 m) or so. Place the first insulator on each guy AT THE MAST OR TOWER, for that too is a conductor that can be coupled to the antenna by any horizontal or near-horizontal guy wire connected to it. One or two insulators per guy wire should suffice because the HF5B elements extend only a little more than 6 ft (1.8m) from the mast, and any coupling to the guy wire past the second insulator will be negligible.

PARTS LIST

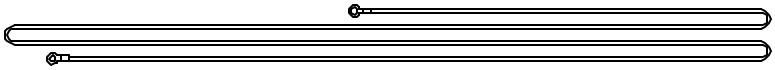
A. V00010 TUBE A — 72 in x 1 1/8 in (1.8 m x 28.6 mm) 4



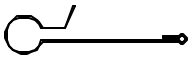
B. V00011 TUBE A INSULATOR 2



C. V00012 TUBE C — 72 in x 1/2 in (1.8 m x 12.7 mm) 4

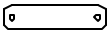


D. V00014 WIRE 8



E. V00015 BRACKET END CLAMP E — 1 1/8 in x 3/16 in (28.6 mm x 4.8 mm) 4

F. V00018 BRACKET END CLAMP F — 3/8 in x 3/16 in (9.5 mm x 4.8 mm) 4

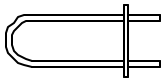


G. V00020 CLAMP SPACER G 4

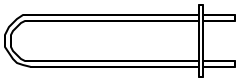
H. V00028 TUBE H — 36 in x 3/8 in (91.4 cm x 9.5 mm) 1

I. V00029 TUBE I — 24 in x 3/8 in (61 cm x 9.5 mm) 1

J. V00030 TUBE J — 72 in x 3/8 in (1.8 m x 9.5 mm) 1

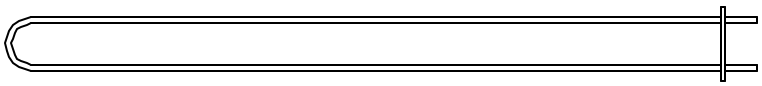


K. V00031 STUB K U-SHAPED — 4 7/8 in (12.4 cm) long 1

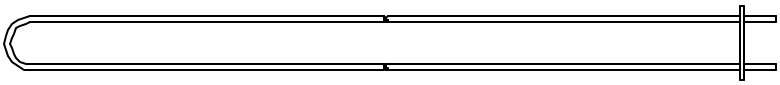


L. V00032 STUB L U-SHAPED — 7 1/4 in (18.4 cm) long 1

PARTS LIST

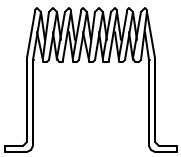


M. V00033 STUB M U-SHAPED — 23 3/8 in (59.4 cm) long 1



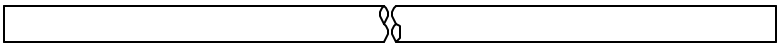
N. V00034 STUB N U-SHAPED — 26 1/4 in (66.7 cm) long 1

0. V00040 CONNECTOR ASSEMBLY 1

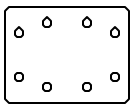


P. V00065 COIL P DRIVEN ELEMENT MATCHING 1

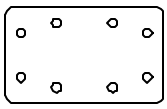
Q. V00024 COIL CLAMP Q MATCHING — 1/4 in x 3/8 in (6.4 mm x 9.5 mm) 2



R. V00059 TUBE R — 72 in x 1 1/8 in (1.83 m x 28.6 mm) 1



S. V00067 PLATE BOOM TO ELEMENT 2



T. V00068 PLATE BOOM TO MAST 1

U. V00051 U-BOLT 1 in x 1 3/4 in (25.4 mm x 44.5 mm) 4

V. V00052 U-BOLT 1 1/8 in x 2 in (28.6 mm x 50.8 mm) 10

W. V00053 U-BOLT 1 1/2 in x 2 3/4 in (38.1 mm x 69.9 mm) 2

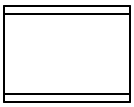
X. V00054 BACKING CLAMP 1 1/8 in #308 (28.6 mm) 10

PARTS LIST

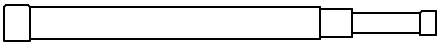
Y. V00055 BACKING CLAMP 1 1/2 in #309 (38.1 mm) 2

Z. V00057 LOCK WASHER 1/4 SPLIT RING 18-8 32

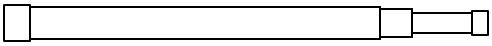
AA. V00056 NUT 1/4-20 HEX 18-8 32



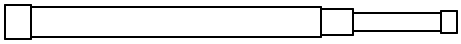
BB. V00061 BUTTER-IT'S-NOT 1



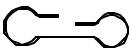
CC. V00063 CAPACITOR CC 10/15M REFLECTOR 1



EE. V00062 CAPACITOR EE 10/15/20M 3



FF. V00064 CAPACITOR FF 12/17M DRIVEN ELEMENT 2



HH. V00044 CAPACITOR CLAMP HH — 1 1/8 in x 1 in (28.6 mm x 25.4 mm) 5

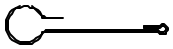
II. V00021 CAPACITOR CLAMP II — 5/8 in x 3/8 in (15.9 mm x 9.5 mm) 4

JJ. V00026 CAPACITOR CLAMP JJ — 1 in x 3/8 in (25.4 mm x 9.5 mm) 1

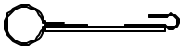
KK. V00022 CAPACITOR CLAMP KK — 3/16 in x 5/8 in (4.8 mm x 15.9 mm) 1

LL. V00060 ROD LL 12M — 28 in x 3/16 in (71.1 cm x 4.8 mm) 1

PARTS LIST



MM. V00017 ROD CLAMP — 1 1/8 in x 3/16 in (28.6 mm x 4.8 mm) 1



NN. V00045 ROD CLAMP NN — 1 1/8 in x 3/16 in (28.6 mm x 4.8 mm) 1

00. V00023 COIL/CAPACITOR CLAMP OO 17M — 1/4 in x 5/8in (6.4 mm x 15.9 mm) 1

PP. V00066 COIL PP 17M 1

QQ. V00025 COIL CLAMP QQ 17M — 1/4 in x 3/8 in (6.4 mm x 9.5 mm) 1

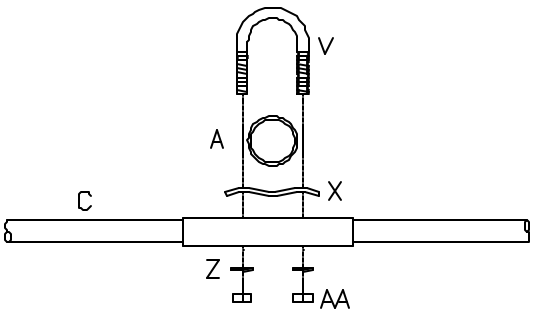
RR. V00050 KONNEKTOR-KOTE (1 X 8") .05

SS. V00082 HARDWARE PACKAGE 1

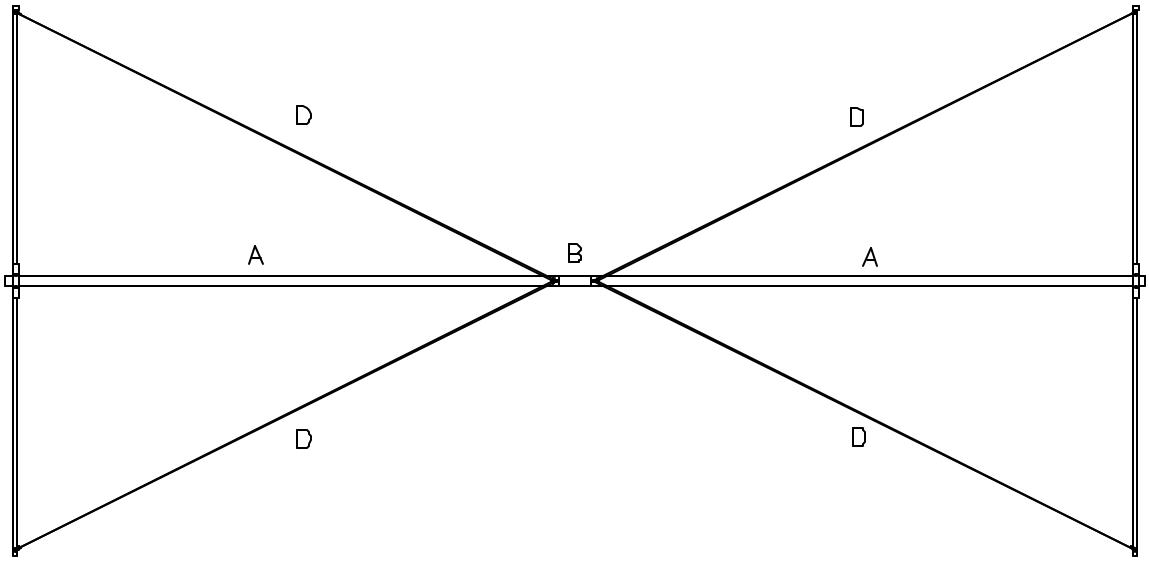
BUTTERFLY™ ELEMENT ASSEMBLY

The Butterfly™ elements will be assembled first, tuned and then attached to the boom. The fully assembled antenna may then be installed on the mast. Although the antenna may rest on the ground for a short time, it's best to have your mast and rotor in place before assembly. NOTE: Mast, rotor and supporting structure are not included with the antenna.

1. Insert a 1 1/8" U-bolt (V) through backing clamp (X), then through the center holes of spreader tube (C). Slide the U-bolt over the end of element tube (A) that does not have the hole in it. The backing clamp (X) should now be sandwiched between element tube (A) and spreader tube (C). Position the edge of backing clamp (X) 3/4 in (19 mm) from the end of element tube (A). Secure the assembly with two 1/4" lock washers (Z) and two 1/4" hex nuts (AA) finger tight.



Place the "T" formed in step 1 on a flat surface with the threaded end of U-bolt (V) facing up. A couple of wood blocks may be used under spreader tube (C) to provide support.



2. Insert one end of element tube insulator (B) into element tube (A) and align the holes. Insert a 1 1/2" bolt, from the bottom, through element tube (A) and element tube insulator (B). Lay out two spreader wires (D) and place one lug of each over the 1 1/2" bolt. Secure with a lock washer and hex nut.

3. Insert a 3/4" bolt from the bottom of spreader tube (C). Place the remaining lug of one of the previously attached spreader wires (D) over the 3/4" bolt and secure with a lock washer and hex nut.

4. Repeat step 3 for the remaining spreader wire (D) for the other end of spreader tube (C). Make a final alignment of tubes, U-bolt and spreader wires. Both spreader wires (D) should be on the same side of element tube (A) as spreader tube (C). A slight bowing of spreader tube (C) should be expected and will not hurt anything.

NOTE: BE SURE THAT THE ALIGNMENT OF ELEMENT TUBE (A) AND SPREADER TUBE (C) IS CORRECT BEFORE PROCEEDING BECAUSE WHEN THE U-bolt IS FINALLY TIGHTENED, ELEMENT TUBE (A) WILL DISTORT JUST ENOUGH TO FIX SPREADER TUBE (C) INTO PLACE!

Tighten 1/4" hex nuts (AA) until they are flush with the end of U-bolt (V). Tighten the three hex nuts securing spreader wires (D).

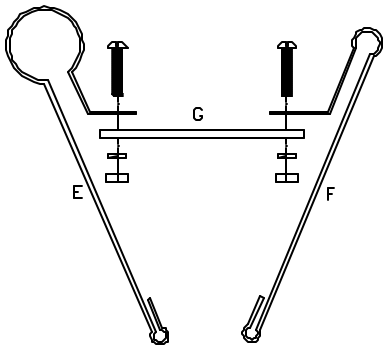
5. Assemble a second element tube (A), spreader tube (C), U-bolt (V) and spreader wires (D) as in steps 1 through 4, attaching it to the other end of element tube insulator (B). This will form a complete Butterfly™ element.

NOTE: MAKE SURE THE CAPPED ENDS OF SPREADER TUBE (C) ARE BOTH POINTING IN THE SAME DIRECTION.

6. Repeat steps 1 through 5 to assemble a second Butterfly™ element.

This completes the first part of the assembly process. Check your work to see that all parts are properly aligned and all hardware is tight.

FOUR-WAY CLAMP ASSEMBLY



1. Using 3/4" bolt, attach plastic spacer (G) to bracket end clamp (E) and secure with lock washer and hex nut.

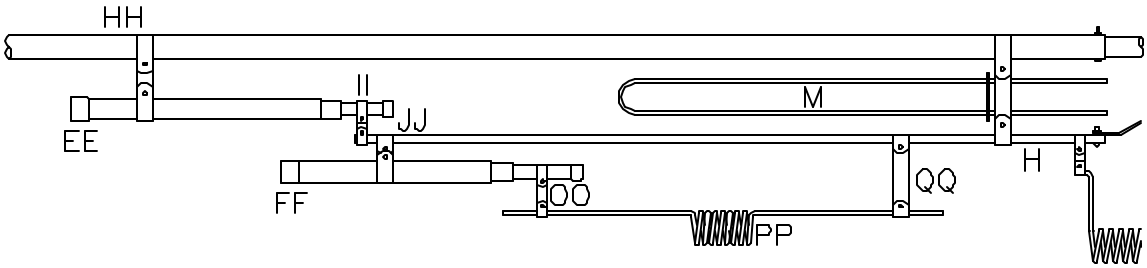
2. Attach the other end of plastic spacer (G) to end clamp (F) with a 3/4" bolt and secure with lock washer and hex nut as shown.

3. Repeat steps 1 through 3 for the remaining 3 clamp assemblies.

DRIVEN ELEMENT ASSEMBLY

When you install clamps in the following steps, apply a light coating of Butter-It's-Not™ anti-seize/oxide paste at the spot where the clamp attaches to the tubing. A paper towel or cotton swab may be used for this purpose. Do not overdo it! Too much will cause problems later on.

1. Take either of the completed Butterfly™ elements and place it on a flat surface, using wood blocks for support at the ends. The threaded end of U-bolt (V) and spreader wire (D) should be facing down.



2. Place a 4-way clamp around the left element tube (A) 4 1/2 in (11.4 cm) from element tube insulator (B). Secure with a 1" bolt, lock washer and hex nut.

3. Install tube (H) on the left side of the element as shown making sure that the end with the hole is facing element tube insulator (B). Secure it with 3/4" bolt, lock washer and hex nut finger tight.

4. Position capacitor clamp (HH) 41 in (1 m) from 4-way clamp on the left element and secure it with 1" bolt, lock washer and hex nut.

5. Position capacitor clamp (II) 30 in (76.2 cm) from 4-way clamp on tube (H) and secure it with 3/4" bolt, lock washer and nut.

6. Install capacitor (EE) into the capacitor clamps installed above and secure it with 3/4" bolts, lock washers and hex nuts.

7. Using the chart below, position the u-shaped stub (M) on the 4-way clamp located on the left element and secure with 3/4" bolts, lock washers and hex nuts.

Band Segment (20 Meters)	**Spacing**
Low (CW) Segment	18 3/4 in (47.6 cm)
Middle Segment	18 in (45.7 cm)
High (Phone) Segment	18 in (45.7 cm)

DRIVEN ELEMENT ASSEMBLY

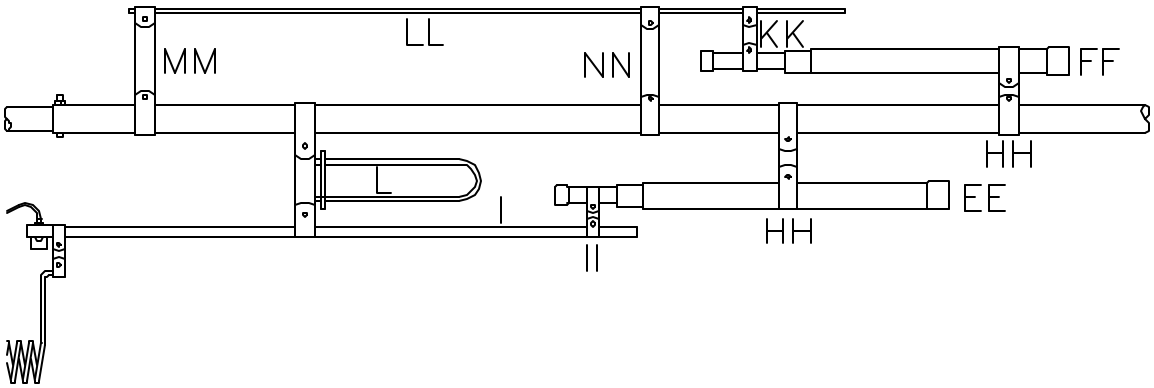
8. Center 17M coil to cap clamp (OO) on the small tube of capacitor (FF) and secure with 3/4" bolt, lock washer and hex nut.

9. Position capacitor clamp (JJ) 6 7/8 in (17.5 cm) from 17M coil to cap clamp (OO) on capacitor (FF) and secure with 1" bolt, lock washer and hex nut.

10. Install the above assembly on tube (H) as shown. Secure with 3/4" bolt, lock washer and hex nut.

11. Position 17M coil clamp (QQ) 16 1/2 (41.9 cm) from 17M coil to cap clamp (OO) on tube (H) and secure with 3/4" bolt, lock washer and hex nut.

12. Install 17M coil (PP) between 17M coil clamp (QQ) and 17M coil to cap clamp (OO) and secure with 3/4" bolts, lock washers and hex nuts.



13. Place a second 4-way clamp around the right element tube (A). Using the chart below, position it from element tube insulator (B). Secure with a 1" bolt, lock washer and hex nut.

Band Segment (15 & 10 Meters)	**Spacing**
Low (CW) Segment	9 3/8 in (23.8 cm)
Middle Segment	9 1/2 in (24.1 cm)
High (Phone) Segment	10 1/8 in (25.7 cm)

14. Install tube (I) on the right side of the element as shown. Secure it with 3/4" bolt, lock washer and hex nut finger tight.

15. Center capacitor clamp (II) on the small tube of capacitor (EE) securing it with 3/4" bolt, lock washer and hex nut.

16. Attach capacitor clamp (HH) to capacitor (EE) and position it 7 in (17.8 cm) from capacitor clamp (II). Secure it with 3/4" bolt, lock washer and hex nut.

17. Attach the above assembly to element tube (A) and position capacitor clamp (HH) 28 3/8 in (72.1 cm) from the element tube insulator (B). Secure capacitor clamp (II) with 3/4" bolt, lock washer and hex nut and capacitor clamp (HH) with 1" bolt, lock washer and hex nut.

18. Install u-shaped stub (L) on the 4-way clamp located on the right element and secure with 3/4" bolts, lock washers and hex nuts.

19. Position 12M rod clamp (MM) on the right element tube (A) 3 1/4 in (8.3 cm) from element tube insulator (B) and secure with 3/4" bolt, lock washer and hex nut.

DRIVEN ELEMENT ASSEMBLY

20. Install 12M rod clamp (NN) to the right of 12M rod clamp (MM) and secure with 1" bolt, lock washer and hex nut.

21. Position the 12M rod (LL) in 12M rod clamps (NN) and (MM), securing it with 3/4" bolts, lock washers and hex nuts.

22. Center capacitor clamp (KK) on the small tube of capacitor (FF) and secure with 3/4" bolt, lock washer and hex nut.

23. Position capacitor clamp (HH) 9 1/2 in (24.1 cm) from capacitor clamp (KK) and secure with 3/4" bolt, lock washer and hex nut.

24. Attach the above assembly to 12M rod (LL) and position capacitor clamp (KK) 23 in (58.4 cm) from 12M rod clamp (MM) and secure with 3/4" bolt, lock washer and hex nut.

25. Secure the other capacitor clamp (HH) on above assembly to element tube (A) with 1" bolt, lock washer and hex nut.

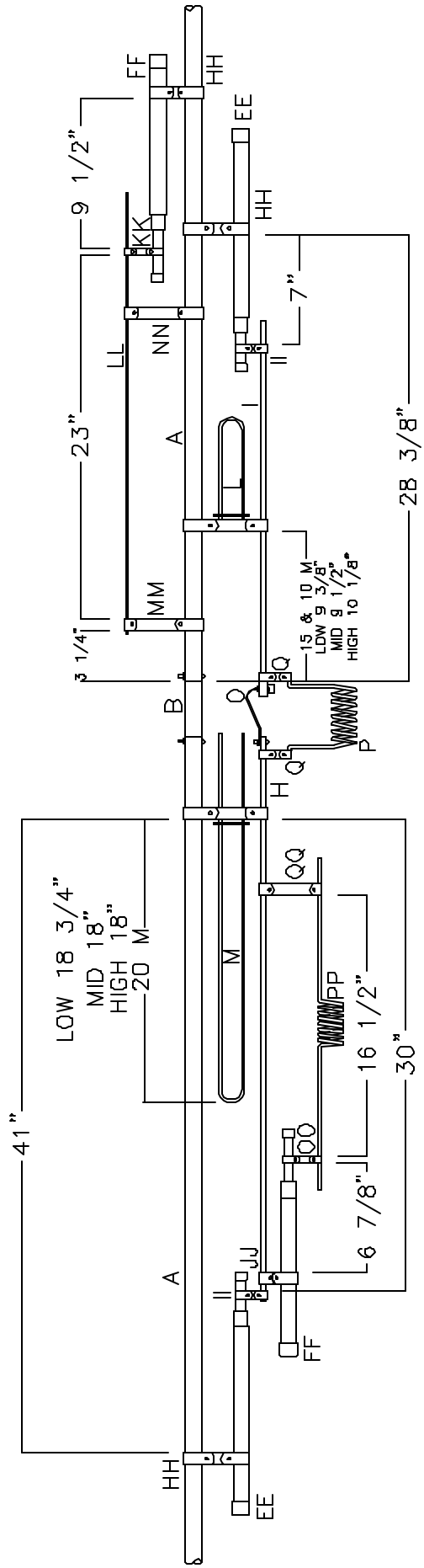
26. Install SO-239 connector (O) to tube (I) and secure it with 3/4" bolt, lock washer and hex nut. Attach the free end of SO-239 connector (O) to tube (H) and secure it with 3/4" bolt, lock washer and hex nut.

27. Install the matching coil clamps (Q), one on tube (I) and the other on tube (H) and secure both with 3/4" bolts, lock washers and hex nuts.

NOTE: The gap between tube (H) and tube (I) is not critical but must be greater than 1".

28. Position driven element matching coil (P) between matching coil clamps (Q) and secure with 3/4" bolts, lock washers and hex nuts.

This completes assembly of the driven element. Carefully check initial set-up dimensions making sure everything is tight and set assembly aside.



Driven Element

REFLECTOR ELEMENT ASSEMBLY

1. Take the remaining Butterfly™ element and place it on a flat surface, using wood blocks for support at the ends. The threaded end of U-bolt (V) and spreader wire (D) should be facing down.

2. Place a 4-way clamp around the left element tube (A) 5 1/2 in (14 cm) from element tube insulator (B). Secure with a 1" bolt, lock washer and hex nut.

3. Place the remaining 4-way clamp around the right element tube (A) 9 3/8 in (23.8 cm) from the element tube insulator (B). Secure with a 1" bolt, lock washer and hex nut.

4. Attach tube (J) to the 4-way clamps and center over element tube insulator (B). Secure with 3/4" bolts, lock washers and hex nuts.

5. Install u-shaped stub (K) on the 4-way clamp located on the right element and secure with 3/4" bolts, lock washers and hex nuts.

6. Using the chart below, position the u-shaped stub (N) on the 4-way clamp located on the left element and secure with 3/4" bolts, lock washers and hex nuts.

Band Segment (20 Meters)	**Spacing**
Low (CW) Segment	24 3/4 in (62.9 cm)
Middle Segment	24 1/8 in (61.3 cm)
High (Phone) Segment	24 in (61 cm)

7. Center capacitor clamp (II) on the small tube of capacitor (EE) securing it with 3/4" bolt, lock washer and hex nut.

8. Attach capacitor clamp (HH) to capacitor (EE) and position it 10 in (25.4 cm) from capacitor clamp (II). Secure it with 3/4" bolt, lock washer and hex nut.

9. Attach the above assembly to the left element tube “A” and position capacitor clamp (HH) 33 1/4 in (84.5 cm) from the 4-way clamp. Secure with 1" bolt, lock washer and hex nut.

10. Install capacitor clamp (II) over tube (J) and secure with 3/4" bolt, lock washer and hex nut.

11. Center capacitor clamp (II) on the small tube of capacitor (CC) securing it with 3/4" bolt, lock washer and hex nut.

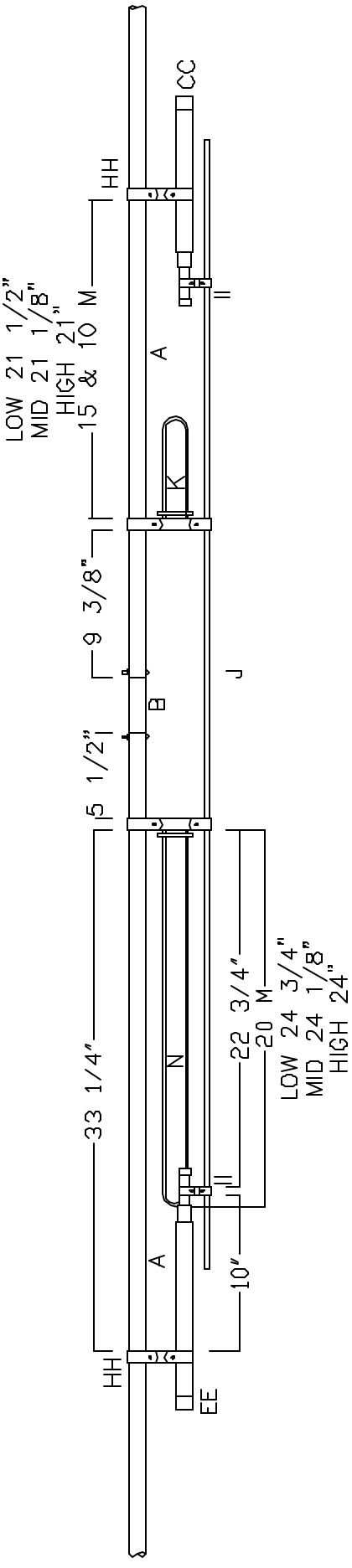
12. Attach capacitor clamp (HH) to capacitor (CC) and position it 5 in (12.7 cm) from capacitor clamp (II). Secure it with 3/4" bolt, lock washer and hex nut.

13. Using the chart below, position the above assembly element tube “A”. Secure with 1" bolt, lock washer and hex nut.

Band Segment (15 & 10 Meters)	**Spacing**
Low (CW) Segment	21 1/2 in (54.6 cm)
Middle Segment	21 1/8 in (53.7 cm)
High (Phone) Segment	21 in (53.3 cm)

14. Install capacitor clamp (II) over tube (J) and secure with 3/4" bolt, lock washer and hex nut.

This completes assembly of the reflector element. Carefully check initial set-up dimensions making sure everything is tight and set assembly aside.


LOW 21 1/2"
MID 21 1/8"
HIGH 21"
15 & 10 M
HH
CC
A
K
9 3/8"
B
5 1/2"
J
33 1/4"
N
22 3/4"
20 M
LOW 24 3/4"
MID 24 1/8"
HIGH 24"
10"
A
HH
EE

Reflector

PRELIMINARY TUNING PROCEDURE

It is not always convenient or even possible to adjust the antenna at its full height above ground, so it is suggested that the following "Near-Ground" tuning procedure be used. Even if further tunning is contemplated once the antenna is raised to its full height, this procedure can greatly reduce the time one must spend on the tower.

IMPORTANT: This procedure calls for the reflector element to be set aside during the adjustment of the driven element. This means far enough away from the latter that it can't possibly exert any influence on the driven element tuning. Any attempt to adjust the driven element close to the earth with the reflector element in place will be a total waste of time and effort. Be sure not to place the driven element any higher than seven feet off the ground because resonance on all bands will increase rapidly at much greater heights. The SWR information below was gathered during examination of the driven element of an HF5B that had been carefully (and tediously) adjusted at a height of 50 feet for lowest SWR consistent with good F/B ratio.

The initial adjustment height of seven feet was chosen because it's not too hard to erect a simple and temporary mast of that height for adjustment purposes and because the earth itself will take the place of the reflector at that height, at least as far as driven-element resonance is concerned.

Remember that the height above ground and the mutual impedance between elements will have a lot to do with antenna resonance, feed point impedance, SWR, and F/B. The advantage of this tuning procedure is that if it's done properly you need not readjust the driven element once the antenna is raised to its final position. If later adjustments are needed for better F/B ratio or SWR they can be confined to the REFLECTOR element,

Be sure that the feed line approaches the driven element at right angles and that the driven element is well away from other conductors. Use good quality coax in runs that are no longer than necessary. Long runs of inexpensive RG-58 are to be avoided because the losses that go with it can produce abnormally broad SWR curves that make it difficult to find the frequency of lowest SWR with any accuracy.

A final thought or two for the perfectionist: it is all but impossible to adjust a parasitic array so that the maximum gain, maximum F/B rejection and lowest SWR will all occur at some particular frequency on a given band. Finally, the dimensions for the driven element given are only approximate. They MAY produce the desired resonances without further adjustment, but the likelihood is that they will not. The HF5B element is reduced to about 41% of normal size on 20 meters, so slight errors in measurement and the effect of nearby conductors will have greater effect on the tuning that with dipole element of more normal size. The key is to adjust the driven element for lowest SWR (not necessarily 1:1) at one of the frequencies given, and to set the reflector as described below.

For arrangement of components along the main tube of the driven element be guided by the pictorials, and if you find that one component interferes with the free travel of another simply reset that clamp to the other side of the obstruction and resume tuning. There are countless tuning combinations that will produce the desired resonances, but you need to find only one. The 17 meter coil adjustment is more critical than most, so adjustments must be made slowly and carefully.

The SWR bridge may be placed anywhere along the transmission line, but for the sake of convenience it may be left near the transmitter and monitored while another person makes tuning adjustments out at the driven element.

PRELIMINARY TUNING - DRIVEN ELEMENT

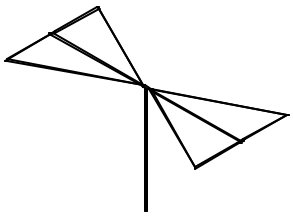
Please note that in the following steps you will be tuning only the driven element. Set the reflector element aside during this procedure. Note too that you may be asked to tune the driven element for resonance or lowest SWR at frequencies far removed from those on which you intend to operate. No matter, for the resonances will change considerably when both elements are in place at their operating height.

PRELIMINARY TUNING - DRIVEN ELEMENT

As always, the antenna should be clear of wires and other conductors to which it might become coupled.

1. Begin with the initial dimensions shown in the pictorial diagram. After these adjustments are complete, set the reflector element aside and out of the way.

2. Position the driven element as shown below so that the plane of the element is approximately 7 ft (2.1 m). above the earth and roughly parallel to it.



3. Connect an SWR bridge and a calibrated signal source (or a transmitter) to the driven element, making sure that the chassis is GROUNDED before plugging it into the power line in order to avoid electrical shock.

4. Make SWR measurements over the 20 meter band and compare them to the SWR data listed below. If your measurements, particularly the point at which your SWR is lowest, do not resemble those listed below it will be necessary to readjust the length of stub (M) until your lowest SWR reading occurs at or very near that shown below. To move your lowest SWR to a higher frequency shorten stub (M) by loosening the lower clamps of the 4-way assembly and pushing the open end of stub (M) closer to the center of the element; to move your lowest SWR point to a lower frequency increase the length of stub (M) by moving it in the opposite direction. Tighten the clamps and check the SWR again, repeating this adjustment until your frequency of lowest SWR is the same as shown below.

Band Segment (20 Meters)	**Tuning**
Low (CW) Segment	tune for lowest SWR at 14,140 kHz
Middle Segment	tune for lowest SWR at 14,285 kHz
High (Phone) Segment	tune for lowest SWR at 14,400 kHz

5. Your 20 meter adjustments should not be significantly affected by adjustments made for the other bands, so proceed to the 15/10 meter adjustment by noting your SWR readings over the 15 meter band and compare them to the information given below. For 15 and 10 meters the 4-way assembly, stub and all, on the other side of the element are moved toward the element center to lower the frequency of the lowest SWR and away from the element center to raise the frequency of the lowest SWR. Again, try to make your frequency of lowest SWR, coincide with that listed below.

Band Segment (15 Meters)	**Tuning**
Low (CW) Segment	tune for lowest SWR at 21,000 kHz
Middle Segment	tune for lowest SWR at 21,100 kHz
High (Phone) Segment	tune for lowest SWR at 21,225 kHz

6. Check your 10 meter SWR. This is determined by the previous 15 meter adjustment, but it should be reasonably close to the values given below. In any case, 10 meter tuning is quite broad, and your frequency of lowest SWR should not differ significantly from that shown in the following chart.

Band Segment (10 Meters)	**Tuning**
Low (CW) Segment	tune for lowest SWR at 28,300 kHz
Middle Segment	tune for lowest SWR at 28,475 kHz
High (Phone) Segment	tune for lowest SWR at 28,725 kHz

PRELIMINARY TUNING - DRIVEN ELEMENT

7. Check SWR on 12 meters. Adjust for lowest SWR at 24.900 MHz. This adjustment involves sliding double clamp (KK) along rod (LL) and capacitor (FF) to find the right amount of inductance and to raise or lower 12 meter resonance. If more travel along rod (LL) is required, loosen the end of double-clamp (HH) and slide capacitor (FF) and clamp (KK) as needed towards the element center to raise the lowest SWR frequency, or away from the center to lower it.

8. Check the SWR on 17 meters. Tuning on this band is accomplished by varying the inductance of the coil by sliding double-clamp (00) along capacitor (FF) and the coil lead, toward the center of the element to raise frequency and in the opposite direction to lower frequency. Adjust for lowest SWR at 18.070 MHz. If more travel is needed along the coil lead for clamp (00), loosen the large clamp on capacitor (FF), and move capacitor (FF) in or out as needed.

9. Re-check SWR on the other bands to make sure that nothing has changed, and readjust as required. This completes the near-ground tuning procedure for the driven element.

PRELIMINARY TUNING - REFLECTOR

The reflector element does not usually require any special attention because there are fewer circuits to adjust and because the capacitors am carefully selected with respect to tolerance. The preliminary settings given in the pictorial should suffice in most cases. On the other hand, miniature antennas are inherently much more critical with regard to adjustment for best F/B ratio and SWR. On all but 20 meters the HF5B would have to be adjusted in place for best possible F/B over a particular band segment, but the consensus is that even with full size arrays of only two elements such exertions are seldom warranted because the possible improvement is not too great to begin with.

If however, one wishes to adjust the 20 meter reflector tuning for lowest SWR at some particular frequency refer to the pictorial diagram of the reflector. If tubular capacitor (EE) is moved closer to the center of the element, the reflector will resonate at a higher frequency and the lower of the two dips in the 20 meter SWR pattern will similarly move higher in the band. If capacitor (EE) is moved out to the end of the clement, the resonance will drop to a lower frequency as will the lower dip in the 20 meter SWR pattern.

A change of approximately 1/2 inch in the position of capacitor (EE) will shift the 20 meter resonance approximately 50 kHz. Remember, however, that the two dips on 20 meters should be remain from 150 to 200 kHz apart for reasonably good F/B rejection and that similar readjustment to the driven element may then become necessary.

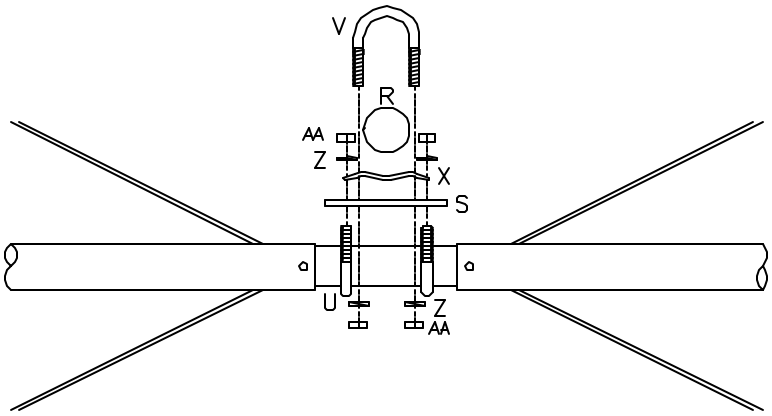
FINAL ASSEMBLY

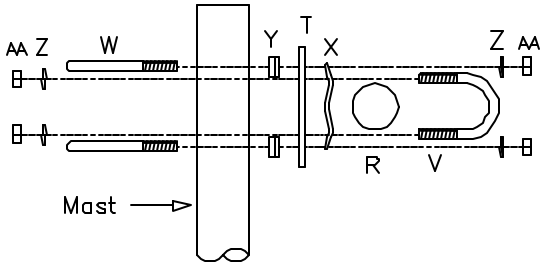
In the final assembly, the two elements will be installed on boom tube (R).

1. Attach one boom to element plate (S) to each element using two 1" U-bolt (U), four 1/4" lock washer (Z) and four 1/4" hex nut (AA) per element. Do not use backing clamp (X) with the 1" U-bolt (U).

NOTE: BE SURE THAT BOOM TO ELEMENT PLATE (S) IS CENTERED ON THE ELEMENT TUBE INSULATOR (B) AND DOES NOT SHORT TO EITHER ELEMENT TUBE (A)!

FINAL ASSEMBLY





2. Install boom to mast plate (T) on boom tube (R) using two 1 1/8" U-bolt (V), two 1-1/8" backing clamp (X), four 1/4" lock washer (Z) and four 1/4" hex nut (AA).

3. Install two 1 1/2" U-bolt (W) on the opposite side of boom to mast plate (T) using two 1 1/2" backing clamp, four 1/4" lock washer (Z) and four 1/4" hex nut (AA). Do not tighten until the antenna is installed on the mast (not provided).

IMPORTANT! READ THE FOLLOWING STEP THROUGH TO THE END BEFORE PROCEEDING!

4. Install the driven element on the end of boom tube (R) using two 1 1/8" U-bolt (V), two 1-1/8" backing clamp (X), four 1/4" lock washer (Z) and four 1/4" hex nut (AA). Position the driven element so the SO-239 connector (O) and u-shaped stub (L) are on the RIGHT side as viewed from the center of the antenna.

5. Install the reflector element on the other end of boom tube (R) using two 1 1/8" U-bolt (V), two 1-1/8" backing clamp (X), four 1/4" lock washer (Z) and four 1/4" hex nut (AA). Position the reflector element so the u-shaped stub (K) is on the RIGHT side as viewed from the center of the antenna.

This completes the final assembly. Both elements should be on the boom, with the boom to mast plate (T) mounted in the center. The edges of the boom to element plates (S) should be within 1/4" of the plastic end caps on boom tube (R). The spreader tubes (C) and boom to mast plate (T) should be aligned 90° to the ground.

INSTALLATION NOTES

The antenna may be installed as a unit atop the mast, or it may be installed one element at a time. Be sure that the 10/15 meter side of each element is on your right as you face it from the tower. Either way watch out for POWER LINES, guy wires, or other obstructions that may catch the antenna as it is going up, causing damage, injury, or even death.

If you am using a small rotor, it must either be used with a thrust bearing or be mounted right under the boom. A long mast above the rotor will result in damage to the rotor and antenna unless a thrust bearing is used.

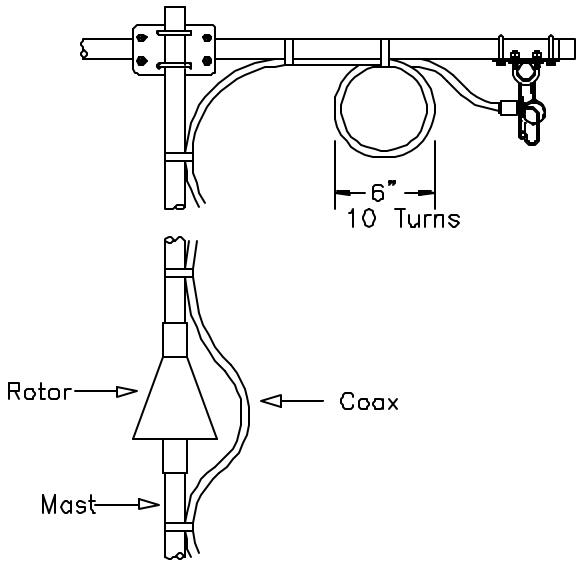
Guy wires must either be out of the immediate field of the antenna, nonconductive, or broken up by compression insulators into non resonant lengths.

Do not hang dipoles below the beam! They will detune it.

The HF5B like any other 20 meter beam, must be AT LEAST 30 FT (9.1 M) above ground and "in the clear" to work properly. If you do not heed this instruction, do not be surprised if there are tuning problems.

CONNECTING THE FEED LINE

1. The HF5Bshould be fed with any good quality 50 ohm coaxial cable terminated in a PL-259 plug.



Install the coax feedline as shown. Make a 10 turn coil of coax 6 in (15.2 cm) in diameter and tape it to the boom. This takes place of a balun and keeps RF off of the feedline and tower. Then tape the feedline to the boom and mast. Be sure that the coax is not free to swing in the wind, putting stress on the coax connector!

2. A 1:1 balun (not included) may be used at the feed point but is not necessary. If you are not planning to use a balun, construct an RF choke by winding about 10 turns of the coax feed line in a 6 inch (15.2 cm) diameter coil, tape the coil together, and hang it from the boom with tape or wire. This device will help to keep RF off of the feed line and tower.

3. Dress the coax along the boom, down and around the rotor in a loop loose enough to allow 360 degrees of rotation, and along the tower. Avoid loose, dangling feed lines, as this can cause tuning problems.

4. Use the small roll of coax sealer (PP) to cover the junction of the PL-259 and the SO-239. Do not place the sealer on the opposite side of the SO-239 where the wire is soldered.

NOTE: THE COAX BRAID WILL BE AT GROUND POTENTIAL IF THE ANTENNA IS INSTALLED ON A GROUNDED SUPPORT! BEFORE CONNECTING THE COAX TO YOUR EQUIPMENT, DISCONNECT THE EQUIPMENT FROM THE AC MAINS TO AVOID SHOCK!

FINAL TUNING

The HF5B is an efficient, short, high-Q circuit. As such, bandwidth tends to be a bit narrow on 20

meters, where the 12 ft 6 in (3.8 m) elements represent only a small fraction of a wavelength. When bandwidth is narrow, it is impossible "cookbook" the antenna by setting it according to the suggested starting dimensions, then installing it on a push-up mast, where it will be unreachable for tuning! Be prepared to do some tuning, even though you have set the antenna up per the instructions!

Note: Tuning adjustments for the driven element on 20 meters are made by changing the length of the 20 meter stub (M). Tuning for 15 and 10 meters involves moving the 4-way clamp assembly on the other side of the element. Tuning on 17 and 12 meters is largely a matter of choosing the right length of rod or coil lead where indicated, although slight compression or expansion of the 17 meter coil may be a more convenient way to change circuit inductance on that band. All other driven clement dimensions should be considered fixed for all bands and tuning conditions. Please read the following material carefully before attempting to install the HF5B atop a tall mast where it cannot be reached for final adjustment.

Using low power, start with the 20 meter band, making an SWR curve. Make curves for 17, 15, 12, & 10 meters. If high SWR is encountered on all bands, suspect feed line or connector problems. Test the feed line for shorts or opens.

Ideally, your SWR, curves should look like the ones you see in Figure 1, for 20, 15, and 10 meters.

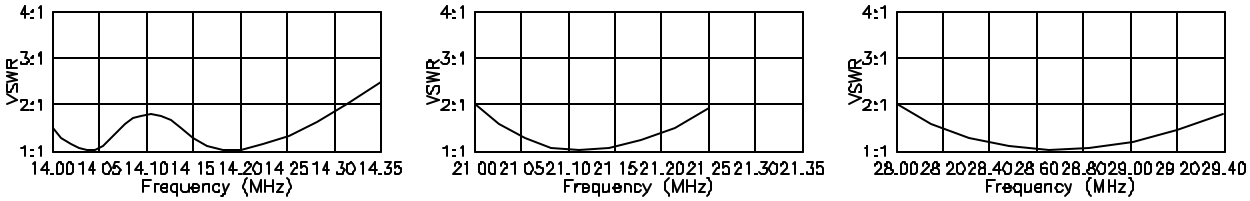


Figure 1

The "dips" in the 20 meter curve should be 150-200 kHz apart. The higher frequency "dip" (on the right) is from the driven element. The lower frequency dip is from the reflector. CHANGING ONE WILL AFFECT THE OTHER!

EXPLANATION OF FIGURE 1

Please note that there were three sets of measurements given for 20 meter tuning depending on whether you want the best SWR bandwidth and front-to-back ratio at the low, middle, or high end of the band. 15 and 10 meter tuning "track", and it is generally not possible to tune for absolute lowest SWR at the low end of 10 meters without pulling the 15 meter resonance below 21 MHz. If, however, you wish to operate over the low end of 10 meters with SWR no greater that 1.5 you should be able to do so and still keep the minimum SWR above 21 MHz.

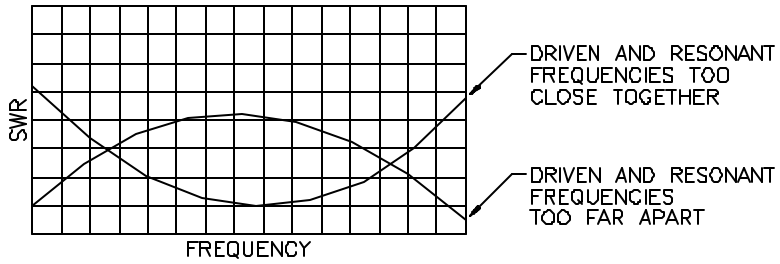
Pay special attention to the 20 meter SWR curve in Figure 1. This "double-dip" curve is characteristic of tightly-coupled short elements and indicates that the parasitic reflector element is tuned only slightly below the driven element on this band. The lower of the two dips represents reflector resonance, and the upper dip (on the right) represents driven element resonance. The SWR curves in Figure 1 were obtained when the antenna was mounted at a height of 50 ft (15.2 m) and in the clear; at heights below about 30 ft (9.1 m) you may see very different curves, especially if there are other conductors in the antenna's field.

The 20 meter SWR curve in Figure 1 shows a difference in element tuning of about 160 kHz. Suppose that the reflector element were adjusted for resonance at a slightly higher frequency or that the driven element were adjusted for a slightly lower frequency. In such a case the two dips would tend to blend into a single broad one. This arrangement is a common tuning error and will not yield very good F/B ratio. If, on the other hand, the two dips are too far apart, one or even both dips may lie outside the band edges, in which case both SWR and F/B will suffer. Luckily, forward gain is much less critical and should not vary more than a decibel.

FINAL TUNING

F/B rejection will occur only over the LOWER, part of the SWR curve (the dip on the left), and will be greatest when the difference between the dips is 150-200kHz. When the two dips are close together, they tend to blend into a single broad dip, especially when the antenna is close to the ground. The advantages of seeking the "double-dip" SWR curve is that its presence indicates a condition where the antenna is tuned for reasonably good F/B rejection and that the operator may observe the effect of adjustments made to the elements.

In any case, the proper procedure is to adjust for 20 meters first, then for 15 meters, 10 meters, 12 meters and finally 17 meters. Remember, as before, it is assumed that you are viewing the element from the tower, sighting along the boom from the mast. Tuning adjustments for 20 meters are made to the LEFT side of each element while those for 15/10 meters are made on the RIGHT side. 15/10 meter tuning is interlocked to some extent, but separate adjustments for 10 is usually not necessary as tuning is quite broad on that band.



If the preliminary settings do not produce SWR curves on 10, 15, and 20 meters similar to those in Table 1, it may be necessary to modify those settings. Remember, however, that the evils of SWR greater that 1:1 have been grossly exaggerated in recent years and that time and effort spent in tedious adjustments to achieve the lowest possible SWR on a given band will usually produce no noticeable improvement in one's signal at a distant point! If the preliminary settings result in an SWR of, say 2:l or less over the intended operating range, and if the transmitter is capable of delivering its rated power to the load represented by the feed line and antenna system, adjustment for lower SWR will probably not be worth the extra time and effort.

ROOFTOP INSTALLATIONS

Even though one has a high roof that seems suitable for the purpose of installing antennas, some cautions should be observed. Wiring or other conductors in the attic or immediately under the roof covering can become coupled to the antenna and affect its performance to a marked extent. Metal flashing under shingles, rain gutters and other antennas and their feedlines, can all cause problems such as high SWR and loss of F/B rejection, as can the beam's feed line if it can’t be run straight down from the antenna for a quarter-wavelength or more before it has to run off in another direction. Unfortunately, some of these problems can remain unseen or inaccessible, and there may be no cure for them short of relocating the beam. If SWR changes significantly as the beam is rotated you should suspect some conductor or mass of metal that you've overlooked.

USING HIGH POWER

The HF5B is rated at 1,200 watts PEP input power to the final amplifier. Exceeding this power level can cause serious damage to the antenna. Avoid "pushing" this limit by a few hundred watts. To avoid exceeding power limits, calculate INPUT power by multiplying AMPS times VOLTS on the amplifier's meter, and adding feedthrough power for grounded-grid operation. THIS TOTAL SHOULD NOT BE MORE THAN 1000 WATTS D.C.! DO NOT RELY ON A WATTMETER PLACED IN THE LINE

OPERATION

AFTER THE AMPLIFIER TO MEASURE POWER! IT IS EASY TO EXCEED LEGAL LIMITS AND FAR EXCEED THE RATED LIMITS OF THE HF5B BY DOING SO.

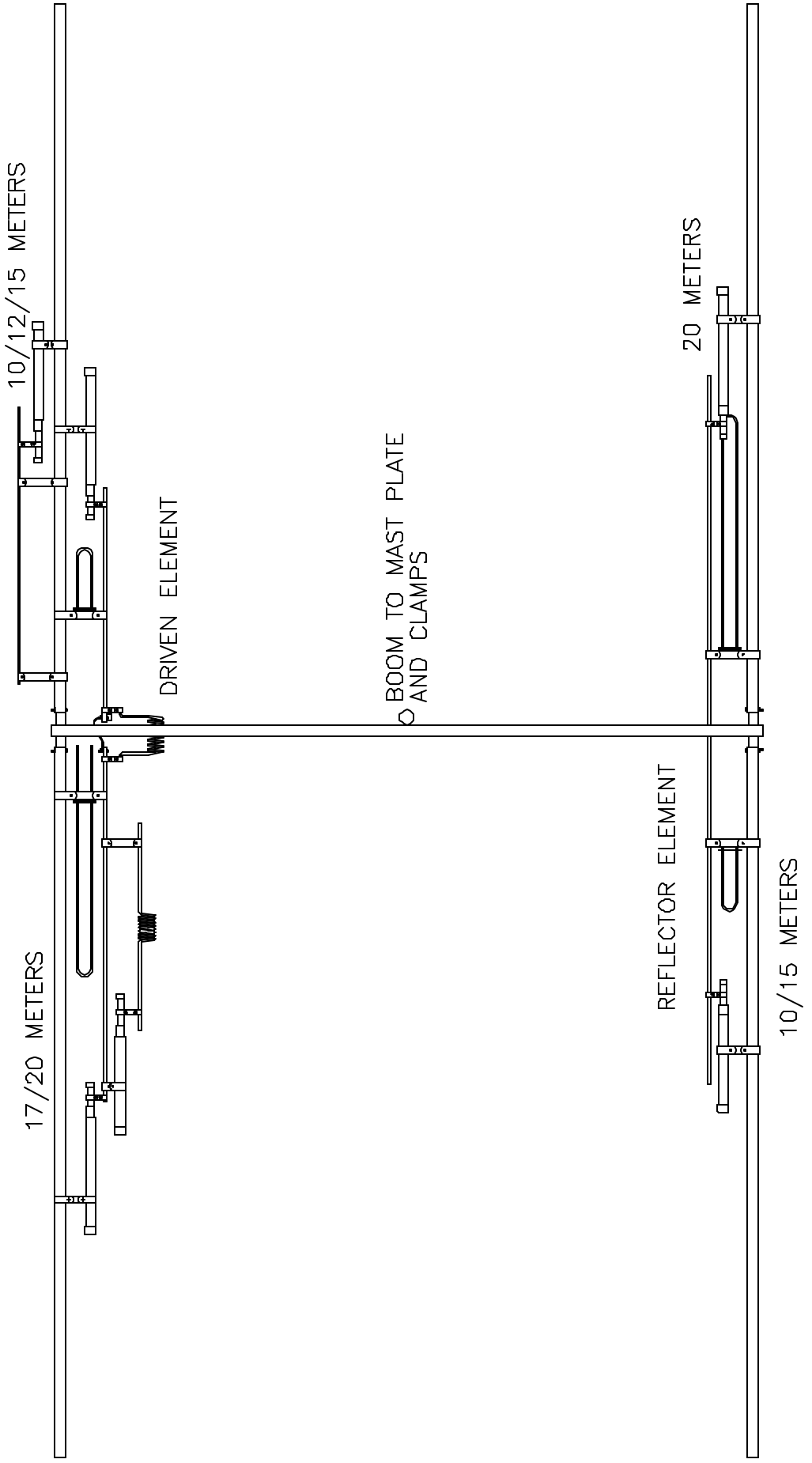
The HF5B operates as a two element beam antenna on 10, 12, 15, and 20 meters. On 17 meters only the driven element is active, and the element operates as a dipole. The direction of maximum signal on 10, 15, and 20 meters is off the driven element, with the second element acting as a reflector. On 12 meters however, the second element is self-resonant above the driven element and acts as a director. Therefore, maximum signal on 12 meters is off the back of the antenna. Because the second element is not in the circuit on 17 meters, the driven element alone is active on that band, and no "front-to-back" will be observed, although there will be noticeable "front-to-side" difference in signal strength.

There are no high impedance "traps" used to isolate sections of the elements in the HF5B design. As a result, the entire element is active on all bands, except for the reflector, which is not used for 17 meter operation. The U-shaped stubs and 3/8 inch tubes provide variable inductive reactance on their respective bands, while the capacitors contribute fixed capacitive reactance on their respective bands. The values of reactance are chosen to allow simultaneous resonances of the element on five bands without the need for external tuners or mechanical switching. On 12 and 17 meters, the rod and coil take the place of U-shaped stubs to provide the necessary inductive reactance. Impedance matching to the short element on 20 meters is accomplished by placing a coil across the feed point. Fine tuning for the best match is accomplished by compressing or expanding this coil slightly. To achieve maximum bandwidth, the element "diameter" is increased by terminating the element in 6 foot spreaders and connecting the spreads tips to the element’s center with the twisted wires.

Although the elements are only 12 feet 6 inches, efficiency is maintained by using the entire element length and high-Q circuitry. Therefore, performance compared to a larger two-element beam is barely compromised. Gain, front-to-back ratio, and front-to-side ratio are maintained in comparison to larger beams, assuming the dual requirements of adequate operating height and a clear "field" are met. The major compromises in a short antenna like the HF5B are a narrowed SWR bandwidth and a limited power handling capacity.

CUSTOMER SERVICE

For service, please write to us including ALL PERTINENT INFORMATION. This means SWR CURVES, COMPLETE DESCRIPTION OF YOUR INSTALLATION, AND DESCRIPTION OF SYMPTOMS.


10/12/15 METERS
DRIVEN ELEMENT
BOOM TO MAST PLATE
AND CLAMPS
20 METERS
17/20 METERS
REFLECTOR ELEMENT
10/15 METERS

Top View

NOTES

LIMITED WARRANTY

Butternut Manufacturing Co. warrants on the terms hereof, to a Customer who has purchased a Product from a Seller, for a period of one year from the date of the purchase, that the Product was not Defective, but this warranty is void if the Product has been subjected to improper or abnormal installation or usage, or a serial number on the Product has been defaced or removed.

If a Customer believes that a Product is Defective, the customer may, within such one-year period, return the entire product to Butternut at Butternut's factory, all shipping charges pre-paid by the Customer. If the Product was Defective, Butternut will at its option and expense repair or replace the Product and will at its expense return the repaired or replaced Product to the customer, in a manner selected by Butternut, at the address from which the Customer sent the Product to Butternut.

THE ABOVE WARRANTY AND REMEDY ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

NO SELLER WILL BE LIABLE FOR ANY LOSS, INCONVENIENCE OR DAMAGE, INCLUDING DIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF OR INABILITY TO USE A PRODUCT, WHETHER THE LIABILITY WOULD RESULT FROM BREACH OF WARRANTY OR UNDER ANY OTHER LEGAL THEORY.

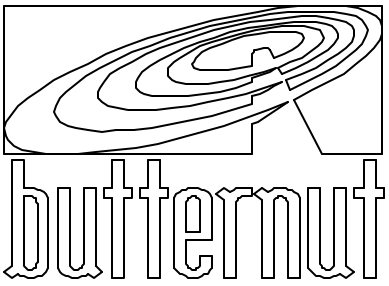
For instance, this warranty does not cover damage to or caused by an antenna (a) by reason of the antenna acting as a lighting rod, (b) by reason of corrosion or strain from exposure of an antenna to wind or weather, (c) from improper assembly, installation or use of an antenna, or (d) from failure periodically to inspect and maintain an antenna and its installation. The Customer is responsible to insure that installation and use of an antenna complies with applicable laws (such as zoning laws) and regulations (such as condominium regulations).

SOME LAWS DO NOT ALLOW THE EXCLUSION OF IMPLIED WARRANTIES, AND IF THESE LAWS APPLY, THEN ALL EXPRESS AND IMPLIED WARRANTIES ARE LIMITED IN DURATION TO SUCH ONE-YEAR PERIOD. NO WARRANTIES OF ANY KIND APPLY AFTER THAT PERIOD.

Such repair or replacement is the Customer's sole and exclusive remedy for a Defective Product. Specifically, Butternut is not liable (to the Customer or otherwise) for (a) any loss or damage arising in any way from a Product or from actual or anticipated sale, lease, license or use of a Product, or involving any matter such as interruption of service, loss of business or anticipated profits, or delay in receiving, repairing, replacing or returning a Product, or (b) any incidental, indirect, special or consequential damages.

No other person (such as an employee, agent or dealer) is authorized to change this warranty in any way, or to give any other warranties of any kind on behalf of Butternut. This warranty gives a Customer specific legal rights, and a Customer may also have other rights, which vary from state to state.

As used herein the *Customer* is the initial end-use purchaser of a Product from a Seller, a *Product* is an antenna or accessory therefor manufactured by Butternut, a Product is *Defective* if and only if the Product was not free of defects of material and workmanship when manufactured, and a *Seller* is Butternut and any authorized Butternut dealer.



Butternut Manufacturing Co.
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Telephone 630 238 1183 Facsimile 630 238 1186 http://www.bencher.com

ASSEMBLY AND INSTALLATION

A50-3S

3 ELEMENT
6 METER BEAM

CUSHCRAFT
COMMUNICATIONS ANTENNAS

951364 (12/94)

WARNING

THIS ANTENNA IS AN ELECTRICAL CONDUCTOR. CONTACT WITH POWER LINES CAN RESULT IN DEATH, OR SERIOUS INJURY. DO NOT INSTALL THIS ANTENNA WHERE THERE IS ANY POSSIBILITY OF CONTACT WITH OR HIGH VOLTAGE ARC-OVER FROM POWER CABLES OR SERVICE DROPS TO BUILDINGS. THE ANTENNA, SUPPORTING MAST AND/OR TOWER MUST NOT BE CLOSE TO ANY POWER LINES DURING INSTALLATION, REMOVAL OR IN THE EVENT PART OF THE SYSTEM SHOULD ACCIDENTALLY FALL. FOLLOW THE GUIDELINES FOR ANTENNA INSTALLATIONS RECOMMENDED BY THE U.S. CONSUMER PRODUCT SAFETY COMMISSION AND LISTED IN THE ENCLOSED PAMPHLET.

Your Cushcraft 6 meter beam is designed and manufactured to give top performance and trouble free service. The antenna will perform as specified if the instructions and suggestions are followed and care is used in assembly and installation. When checking the components received in your antenna package use the parts lists in each section. It is easiest to identify the various dimensions of tubing by separating them into groups of the same diameter and length. If you are unable to locate any tube or component, check the inside of all tubing. IMPORTANT: save the weight label from the outside of the carton. Each antenna is weighed at the factory to verify the parts count. If you claim a missing part, you will be asked for the weight verification label. There is a master parts list on page 2.

LOCATION

Location of the antenna is very important. Surrounding objects such as trees, power lines, other antennas, etc. will seriously reduce efficiency. To minimize the effects of surrounding objects, mount the antenna as high and in the clear as possible. If metal guy wires are used, they should be broken with strain insulators. YOU MUST INSURE THAT NEITHER PEOPLE NOR PETS CAN COME IN CONTACT WITH YOUR ANTENNA WHILE IT IS IN OPERATION. DEADLY VOLTAGES AND CURRENTS MAY EXIST. ALSO, SINCE THE EFFECTS OF EXPOSURE TO RF ARE NOT FULLY UNDERSTOOD, LONG TERM EXPOSURE TO INTENSE RF FIELDS IS NOT RECOMMENDED. THERE IS A WARNING STICKER WHICH MUST BE ATTACHED TO THE BOOM AS SHOWN IN FIGURE E.

Plan your installation carefully. If you use volunteer helpers be sure that they are qualified to assist you. Make certain that everyone involved understands that you are in charge and that they must follow your instructions. If you have any doubts at all employ a professional antenna installation company to install your antenna.

MOUNTING

The mast mount bracket will accommodate up to a 2" OD (5.1 cm) mast. A 1-1/2" OD (3.8 cm) or larger heavy wall tubing mast should be used. A good heavy duty antenna rotator will provide the best service and longest life. Often it is desirable to mount several antennas on one mast. To keep possible interaction to a minimum, place your antennas as far apart as you can.

SYSTEM GROUNDING

Direct grounding of the antenna, mast and tower is very important. This serves as protection from lightning strikes and static buildup, and from high voltage which is present in the radio equipment connected to the antenna. A good electrical connection should be made to one or more ground rods (or other extensive ground system) directly at the base of the tower or mast, using at least #10AWG ground wire and non-corrosive hardware. For details and safety standards, consult the National Electrical Code. You should also use a coaxial lightning arrester. Cushcraft offers several different models, such as LAC-1, LAC-2 and the LAC-4 series.

ASSEMBLY

Assemble your antenna by following the directions and illustrations in steps 1 through 5. Vertical polarization is normally used FM. After the antenna is completely assembled, verify dimensions and element spacings for accuracy. Then, return to the section below for final tuning.

TUNING PROCEDURE

The A50-3S does not normally require tuning after assembly. However, if you wish to check the VSWR before installation, please observe the following procedures. To prevent detuning the antenna, it should be tuned in place or at least 20 feet (6.1 meters) above ground and clear of surrounding objects. Keep all metal obstructions such as guy wires and other antennas at least 20 feet (6.1 m) away since they will nullify any adjustment and degraded performance will result.

Run the coax cable from your transmitter to the area in which the antenna is going to be tested. The length of this cable or your feedline is not critical. Connect a good quality VSWR bridge to the end of this cable. Connect a short length of cable [10 ft (305 cm) or less] from the VSWR bridge to the antenna. Set the transmitter to your center operating frequency. When you read VSWR, be sure you move far enough away from the antenna so that your body does not effect the reading.

Measure the VSWR. If it is high, move the Reddi-Match clamp (69) by 1/4" (.6 cm) in one direction and check the VSWR. If the VSWR improved, then continue moving the Reddi-Match clamp in the same direction. If the VSWR deteriorated then move the Reddi-Match clamp in the opposite direction. Repeat this procedure until no further improvement can be made. You have matched your antenna to 50 Ohms. Then tighten all connections. Tape the feedline to the mast as shown in figure G.

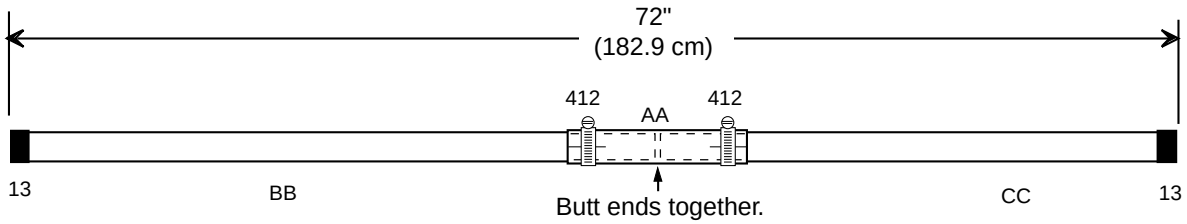
MASTER PARTS LIST

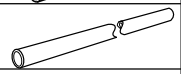
KEY	P/N	DESCRIPTION	QUANTITY
9	010009	8-32 x 5/8" (1.59 cm) stainless steel machine screw	2
11	010011	8-32 stainless steel hex nut	3
13	050013	1-1/4" (3.17 cm) plastic cap	2
27	050027	5/8" (1.59 cm) plastic caps	6
32	190032	1-1/2" (3.8 cm) heavy duty U-bolt brackets	3
33	190033	1-1/2" (3.8 cm) U-bolt backing plate	2
69	200069	Formed aluminum tuning strap	1
70	190070	4" x 6" (10.2 x 15.2 cm) formed mast plate	1
84	010084	1/4" (.63 cm) stainless steel lock washer	6
85	010085	1/4" (.63 cm) stainless steel hex nut	6
115	050115	Connector boot	1
116	240116	Silicone package	1
118	010118	5/16" (.8 cm) stainless steel hex nut	8
119	010119	5/16" (.8 cm) stainless steel lock washers	8
326	290326	Danger label	1
402	010402	1-1/2" (3.8 cm) stainless steel U-bolt	3
403	010403	1-5/8" (4.13 cm) stainless steel U-bolt	2
404	010404	2-1/8" (5.4 cm) stainless steel U-bolt	2
409	030409	3/4" (1.9 cm) stainless steel worm clamps	6
412	030412	1-3/8" (3.49 cm)stainless steel worm clamps	2
941	011941	#8 stainless steel internal tooth lock washer	3
AA		1-3/8" x 8" (3.49 x 20.3 cm) aluminum tubing, slotted both ends	1
BB		1-1/4" x 42"(3.17 x 106.7 cm) aluminum tubing	1
CC		1-1/4" x 30" (3.17 x 76.2 cm) aluminum tubing	1
EA		3/4" x 48" (1.9 x 121.9 cm) aluminum tubing slotted both ends, drilled for U-bolt	3
EB		5/8" x 37-1/2" (1.6 x 95.2 cm) aluminum tubing	2
EC		5/8" x 34-1/4" (1.6 x 87.0 cm) aluminum tubing	2
ED		5/8" x 31-1/2" (1.6 x 80.0 cm) aluminum tubing	2
CB		Connector bracket	1
RM		Reddi Match tube	1

#1 - BOOM ASSEMBLY

Place telescope clamps (412) over the slotted ends of tube AA. Slide BB and CC 3 inches (7.62 cm) into AA so that they butt in the middle. Tighten clamps and attach end caps (13).

FIGURE A



KEY	P/N	DISPLAY	DESC	SIZE	QTY
AA			ALUM TUBE	1-3/8" X 8" (3.5 x 20.3 cm)	1
BB			ALUM TUBING	1-1/4" x 42" (3.17 x 106.7 cm)	1
CC			ALUM TUBE	1-1/4" x 30" (3.17 x 76.2 cm)	1

KEY	P/N	DISPLAY	DESC	SIZE	QTY
13	050013		PLASTIC CAP	1-1/4" (3.2 cm)	2
412	030412		SS WORM CLAMP	1-3/8" (3.5 cm)	2

#2 - ELEMENT ASSEMBLY & MOUNTING (For Vertical or Horizontal Polarization)

The elements are made up of one pre-drilled and slotted 3/4" (1.9 cm) O.D. center tube and two pre-cut 5/8" (1.59 cm) O.D. end tubes. Assemble the elements using Figure B for horizontal polarization or Figure B-2 for vertical polarization. Slide the tuning strap (69) on one of the EA tubes. This will be the driven element #2. Place telescope clamps (409) loosely on the slotted ends of all EA tubes. Note that the EC tubes must be used with the EA tube on which you placed the tuning strap (69). Attach caps (27) to the end of each element. Mount the elements to the boom (Figure C). Refer to figure D for mounting the driven element with the connector bracket. Mount the connector with the threads (socket) pointing to the mast mount. Adjust the antenna to your preferred portion of the 6 meter band using Table 1 if you've chosen horizontal polarization or Table 2 for vertical polarization. Tighten all connections.

FIGURE B (Horizontal Polarization)

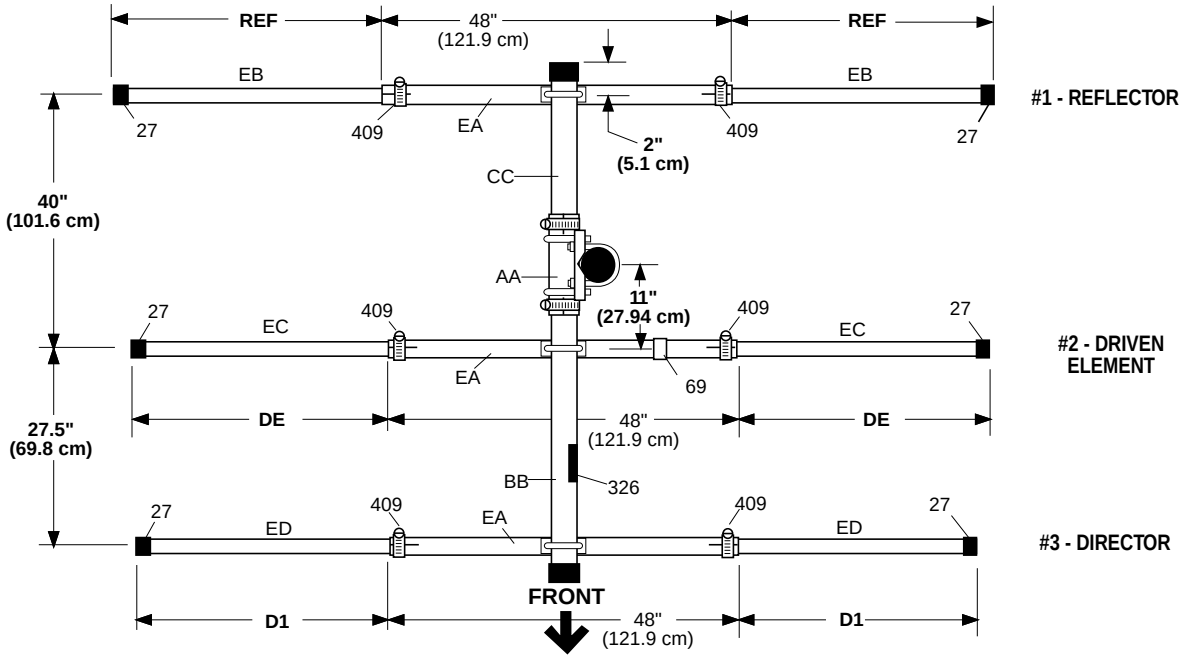


Table 1

Horizontal Polarization					
	50 MHz	**51 MHz**	**52 MHz**	**53 MHz**	**54 MHz**
REF in.	34-1/2	34-1/2	32-1/2	32-1/2	30-1/2
(cm)	(87.63)	(87.63)	(82.55)	(82.55)	(77.5)
DE in.	31-1/4	30-1/4	29-1/4	28-1/4	27-1/4
(cm)	(79.37)	(76.83)	(74.29)	(71.75)	(69.21)
D1 in.	28-1/2	26-1/2	26-1/2	26-1/2	24-1/2
(cm)	(72.39)	(67.31)	(67.31)	(67.31)	(62.23)
Set in.	17	15-5/8	15-3/8	15-1/4	15-1/4
(cm)	(43.18)	(39.69)	(39.05)	(38.73)	(38.73)
X in.	4-3/4	4-3/4	4-3/8	4-3/4	4-3/4
(cm)	(12.06)	(12.06)	(11.11)	(12.06)	(12.06)

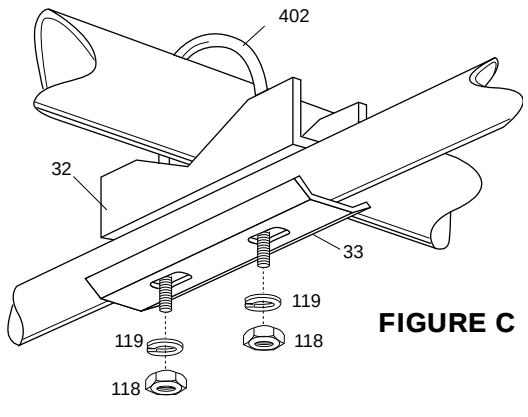
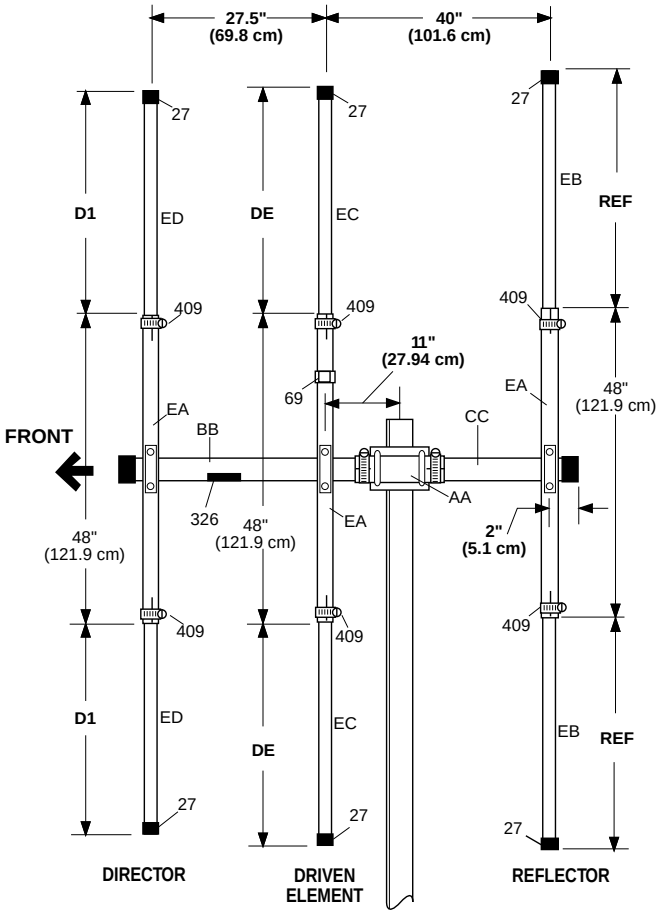


FIGURE C

FIGURE B-2
Vertical Polarization



KEY	P/N	DISPLAY	DESC	SIZE	QTY
EA			ALUM TUBING	3/4" x 48" (1.9 x 121.9 cm)	3
EB			ALUM TUBING	5/8" x 37-1/2" (1.6 x 95.2 cm)	2
EC			ALUM TUBING	5/8" x 34-1/4" (1.6 x 87.0 cm)	2
ED			ALUM TUBING	5/8" x 31-1/2" (1.6 x 80.0cm)	2
27	050027		PLASTIC CAP	5/8" (1.6 cm)	6
32	190032		U-BOLT BRACKET	1-1/2" (3.8 cm)	3
33	190033		BACKING PLATE	1-1/2" (3.8 cm)	2
69	200069		TUNING STRAP		1
84	010084		LOCK WASHER	1/4" (.63 cm)	4
85	010085		HEX NUT	1/4" (.63 cm)	4
402	010402		U-BOLT	1-1/2" (3.8 cm)	2
409	030409		SS WORM CLAMP	3/4" (1.9 cm)	6

Table 2

Vertical Polarization						
		50 MHz	51 MHz	52 MHz	53 MHz	54 MHz
REF	in.	34-1/2	34-1/2	32-1/2	32-1/2	30-1/2
	(cm)	(87.63)	(87.63)	(82.55)	(82.55)	(77.5)
DE	in.	31-1/4	31-1/4	31-1/4	29-3/8	28-3/8
	(cm)	(79.37)	(79.37)	(79.37)	(74.61)	(72.07)
D1	in.	28-1/2	28-1/2	26-1/2	26-1/2	24-1/2
	(cm)	(72.39)	(72.39)	(67.31)	(67.31)	(62.23)
Set	in.	17	16	17	17-1/2	17-1/2
	(cm)	(43.18)	(40.64)	(43.18)	(44.45)	(44.45)
X	in.	4	3	4-1/4	5-1/2	5
	(cm)	(10.16)	(7.62)	(10.79)	(13.97)	(12.7)

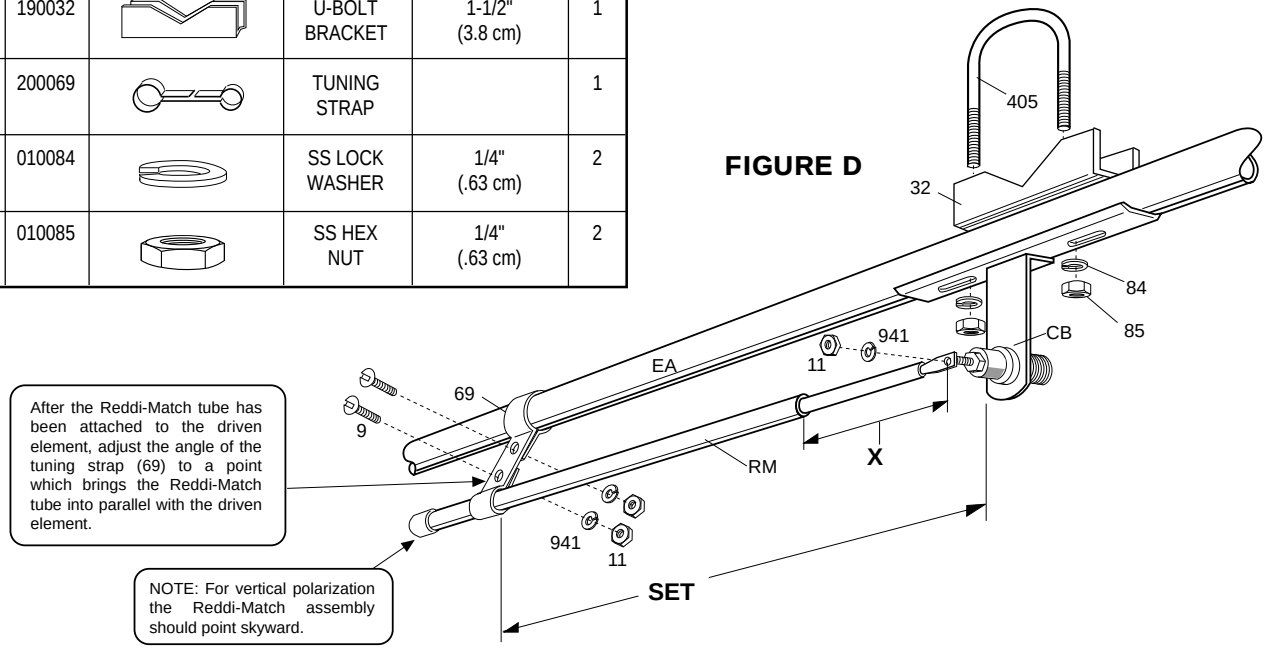
#3 - REDDI MATCH ASSEMBLY

Slide the Reddi Match tube (RM) through the tuning strap (69). Connect the flattened rod to the screw on the connector (figure D). Slide the poly tube over the rod up to the flattened end. Adjust to the dimensions shown in Table 1 for horizontal polarization or Table 2 for vertical polarization. Tighten all connections.

KEY	P/N	DISPLAY	DESC	SIZE	QTY
9	010009		SS MACHINE SCREW	8-32 X 5/8" (1.59 cm)	2
941	011941		SS LOCK WASHER	#8	3
11	010011		SS HEX NUT	8-32	3
32	190032		U-BOLT BRACKET	1-1/2" (3.8 cm)	1
69	200069		TUNING STRAP		1
84	010084		SS LOCK WASHER	1/4" (.63 cm)	2
85	010085		SS HEX NUT	1/4" (.63 cm)	2

KEY	P/N	DISPLAY	DESC	SIZE	QTY
402	010402		U-BOLT	1-1/2" (3.8 cm)	1
CB			CONNECTOR BRACKET		1
RM			REDDI MATCH ASSEMBLY	17" (41.2 cm)	1

FIGURE D



After the Reddi-Match tube has been attached to the driven element, adjust the angle of the tuning strap (69) to a point which brings the Reddi-Match tube into parallel with the driven element.

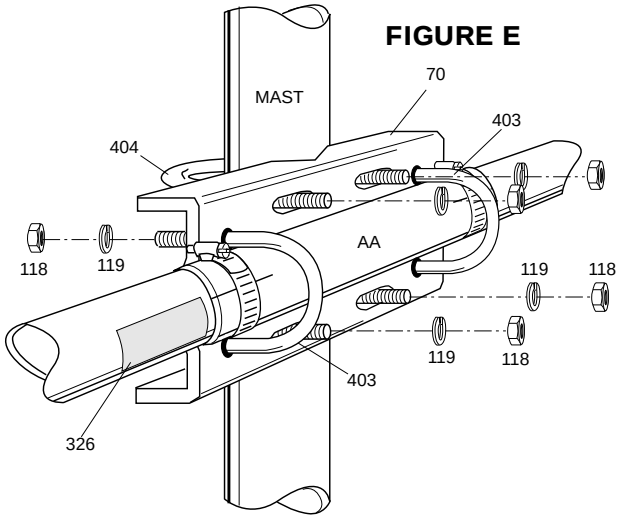
NOTE: For vertical polarization the Reddi-Match assembly should point skyward.

KEY	P/N	DISPLAY	DESC	SIZE	QTY
70	190070		MAST MT. PLATE	4" X 6" (10.16 x 15.2 cm)	1
118	010118		HEX NUT	5/16" (.8 cm)	8
119	010119		LOCK WASHER	5/16" (.8 cm)	8
326	290326		DANGER LABEL		1
403	010403		U-BOLT	1-5/8" (4.13 cm)	2
404	010404		U-BOLT	2-1/8" (5.4 cm)	2

#4 - BOOM TO MAST ASSEMBLY

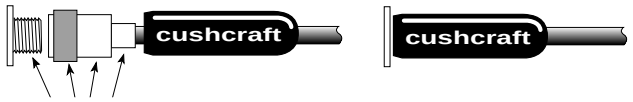
Assemble and mount the mast bracket to the boom centered over the AA tube. Refer to figure E for assembly.

FIGURE E



KEY	P/N	DISPLAY	DESC	SIZE	QTY
115	050115	cushcraft	CONNECTOR BOOT		1
116	240116	SILICONE GREASE	SILICONE PACKAGE		1

FIGURE F



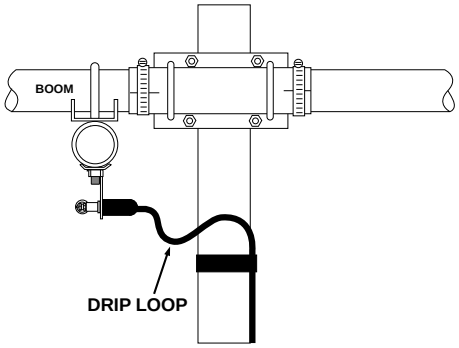
COAT WITH SILICONE GREASE

(DO NOT coat the center pin or socket!)

#5 - FEEDLINE ASSEMBLY

Before attaching the feedline permanently, tune the antenna as outlined on page 2. The antenna is designed for use with 50 Ohm coaxial cable terminated with a PL-259 connector. Any length of feedline can be used with your A50-3S. The shortest length of cable will have the least loss. A connector boot is included for use with your new antenna. (Figure F) Slide the boot over the cable before attaching your PL-259. Coat only the outside connector threads and shell with silicone grease. *Do not coat the center pin or receptacle.* After the PL-259 is firmly screwed on to the antenna connector, slide the vinyl boot over the connector and against the mast bracket. When taping the feedline to the mast it's a good idea to form a drip loop in the coax to help protect the connector from water damage (figure G).

FIGURE G



SPECIFICATIONS

Frequency, MHz	50-54
Number Elements	3
Forward Gain	8 dBd
Front to Back Ratio	20 dB
SWR Typical	1.2:1
2:1 Bandwidth MHz	>1
Power, Watts PEP	1000
Boom Length	6 ft. (1.8 m)
Longest Element	117 in. (300 cm)
Turning Radius	6 ft. (1.8 m)
Mast Size Range	1.5-2 in. (3.8-5.1cm)
Wind Surface Area	1.80 ft^2. (0.17 m^2)
Weight	7 lb. (3.2 kg)

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

CUSHCRAFT
COMMUNICATIONS ANTENNAS

48 PERIMETER ROAD, MANCHESTER, NH 03108 • 603-627-7877 / FAX 603-627-1764

ASSEMBLY AND INSTALLATION

A144-11

2 METER YAGI ANTENNA
144-146 MHz

CUSHCRAFT
COMMUNICATIONS ANTENNAS

951427 (8/92)

A144-11

WARNING

THIS ANTENNA IS AN ELECTRICAL CONDUCTOR. CONTACT WITH POWER LINES CAN RESULT IN DEATH, OR SERIOUS INJURY. DO NOT INSTALL THIS ANTENNA WHERE THERE IS ANY POSSIBILITY OF CONTACT WITH OR HIGH VOLTAGE ARC-OVER FROM POWER CABLES OR SERVICE DROPS TO BUILDINGS. THE ANTENNA, SUPPORTING MAST AND/OR TOWER MUST NOT BE CLOSE TO ANY POWER LINES DURING INSTALLATION, REMOVAL OR IN THE EVENT PART OF THE SYSTEM SHOULD ACCIDENTALLY FALL. FOLLOW THE GUIDELINES FOR ANTENNA INSTALLATIONS RECOMMENDED BY THE U.S. CONSUMER PRODUCT SAFETY COMMISSION AND LISTED IN THE ENCLOSED PAMPHLET.

Your Cushcraft VHF antenna is designed and manufactured to give top performance and trouble free service. The antenna will perform as specified if the instructions and suggestions are followed and care is used in assembly and installation. When checking the components received in your antenna package use the parts lists in each section. It is easiest to identify the various dimensions of tubing by separating them into groups of the same diameter and length. If you are unable to locate any tube or component, check the inside of all tubing. *IMPORTANT: save the weight label from the outside of the carton. Each antenna is weighed at the factory to verify the parts count. If you claim a missing part, you will be asked for the weight verification label.* There is a master parts list on page 2.

LOCATION

Location of the antenna is very important. Surrounding objects such as trees, power lines, other antennas, etc. will seriously reduce efficiency. To minimize the effects of surrounding objects, mount the antenna as high and in the clear as possible. If metal guy wires are used, they should be broken with strain insulators. YOU MUST INSURE THAT NEITHER PEOPLE NOR PETS CAN COME IN CONTACT WITH YOUR ANTENNA WHILE IT IS IN OPERATION. DEADLY VOLTAGES AND CURRENTS MAY EXIST. ALSO, SINCE THE EFFECTS OF EXPOSURE TO RF ARE NOT FULLY UNDERSTOOD, LONG TERM EXPOSURE TO INTENSE RF FIELDS IS NOT RECOMMENDED. THERE IS A WARNING STICKER WHICH MUST BE ATTACHED TO THE BOOM AS SHOWN IN FIGURE E.

Plan your installation carefully. If you use volunteer helpers be sure that they are qualified to assist you. Make certain that everyone involved understands that you are in charge and that they must follow your instructions. If you have any doubts at all employ a professional antenna installation company to install your antenna.

MOUNTING

The A144-11 mast mount bracket will take up to a 1-1/2" (3.8 cm) O.D. mast. A 1-1/4" (3.17 cm) television type tubing is satisfactory for any of the *single* beams. A good heavy-duty antenna rotator will provide the best service and longest life. Often it is desirable to mount several antennas on one mast. To keep possible interaction to minimum, place your antennas as far apart as you can. Mount the A144-11 with the *Reddi-Match rods pointing up.* Keep the mast mount bracket on the opposite side of the boom from the elements. This will help to minimize pattern distortion from the mast. See page 5 for suggested dual and quad array configurations.

SYSTEM GROUNDING

Direct grounding of the antenna, mast and tower is very important. This serves as protection from lightning strikes, static buildup and high voltage which is present in the radio equipment connected to the antenna. A good electrical connection should be made to one or more ground rods (or other extensive ground system) directly at the base of the tower or mast, using at least #10AWG ground wire and non-corrosive hardware. For details and safety standards, consult the National Electrical Code. You should also use a coaxial lightning arrester. Cushcraft offers several different models, such as LAC-1, LAC-2 and the LAC-4 series.

ASSEMBLY

Assemble your antenna by following the directions and illustrations in steps 1 through 5. After the antenna is completely assembled, verify dimensions and element spacings for accuracy. Then, return to the section below for final tuning.

TUNING PROCEDURE

The A144-11 does not normally require tuning after assembly. However, if you wish to check the VSWR before installation, please observe the following procedures. To prevent detuning the antenna, it should be tuned in place or at least 7 feet (2.1 m) above ground and clear of surrounding objects. Keep all metal obstructions such as guy wires and other antennas at least 7 feet (2.1 m) away since they will nullify any adjustment and degraded performance will result.

Run the coax cable from your transmitter to the area in which the antenna is going to be tested. The length of this cable or your feedline is not critical. Connect a good quality VSWR bridge to the end of this cable. Connect a short length of cable [10 ft (3 m) or less] from the VSWR bridge to the antenna. Set the transmitter to your center operating frequency. When you read VSWR, be sure you move far enough away from the antenna so that your body does not effect the reading.

Measure the VSWR. If it is high, move the tuning strap by 1/4" (.6 cm) in one direction and check the VSWR. If the VSWR improves, then continue moving the tuning strap in the same direction. If the VSWR deteriorates then move the tuning strap in the opposite direction. Repeat this procedure until no further improvement can be made. You have matched your antenna to 50 Ohms. Tighten all connections making sure to keep the Reddi-Match assembly parallel to the element (EB) above. Tape the feedline to the boom and mast (figure G).

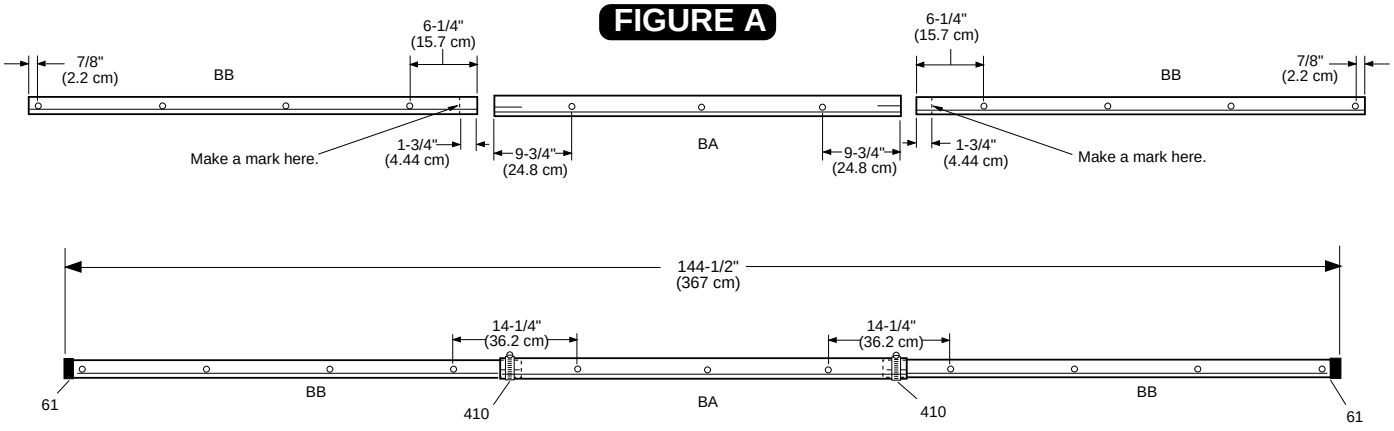
MASTER PARTS LIST

KEY	PART #	DESCRIPTION	QUANTITY
11	010011	8-32 stainless steel hex nut	14
26	190026	7/8" x 1-1/2" (2.2 x 3.8 cm) mounting bracket	11
28	190028	Aluminum half washer	10
41	011941	#8 stainless steel lock washer	14
45	321045	Aluminum spacer	4
53	050053	1/2" (1.3 cm) black plastic cap	2
61	050061	7/8" (2.2 cm) black plastic cap	2
70	190070	4" x 6" (10.2 x 15.2 cm) formed mast plate	1
79	010079	8-32 x 1/2" (1.3 cm) stainless steel machine screw	2
84	010084	1/4" (.63 cm) stainless steel split lock washer	8
85	010085	1/4" (.63 cm) stainless stee lhex nut	8
115	050115	Connector boot	1
116	240116	Silicone package	1
120	010120	8-32 x 2" (5.1 cm) stainless steel machine screw	1
125	200125	Tuning strap	1
231	010231	8-32 x 1-3/4" (4.4 cm) stainless steel machine screw	10
251	050251	3/8" (.9 cm) white plastic cap	1
326	290326	Danger label	1
401	010401	3" x 1-3/4" (7.6 x 4.4 cm) stainless steel U-bolt	4
402	013402	5/16" (.8 cm) stainless steel flat washer	4
410	030410	1" (2.5 cm) stainless steel worm clamp	2
BA		1" x 48" (2.5 x 122 cm) aluminum tubing slotted both ends	1
BB		7/8" x 50" (2.2 x 127 cm) aluminum tubing	2
CB		Connector bracket	1
EA		40-1/4" (102.2 cm) element rod	1
EB		38-7/16" (97.6 cm) element tube, drilled in center	1
EC		36-3/4" (93.3 cm) element rod	1
ED		36-1/4" (92.1 cm) element rod	1
EE		35-3/4" (90.8 cm) element rod	1
EF		35-1/4" (89.5 cm) element rod	1
EG		34-3/4" (88.3 cm) element rod	1
EH		34-1/4" (87.0 cm) element rod	1
EI		33-3/4" (85.7 cm) element rod	1
EJ		33-1/4" (84.4 cm) element rod	1
EK		32-3/4" (83.2 cm) element rod	1
PT		3/16" x 4-1/2" (.5 x 11.4 cm)Poly tube	1
RR		3/16" x 4" (.5 x 10.2 cm) Reddi-Match rod	1
RT		3/8" x 6-1/2" (.9 x 16.5 cm) aluminum tube	1

#1 - BOOM ASSEMBLY

Assemble the boom as shown below. Make a mark 1-3/4" (4.4 cm) in from the ends of the BB tubes as shown. Be sure to mark the correct end of the tube. Slide worm clamps (410) onto the slotted ends of tube BA. Insert both BB tubes up to the marks you made. Align the element holes and tighten the worm clamps. Push the end caps (61) onto the ends of the boom. The assembled boom is symmetrical so either end can be the front.

FIGURE A



KEY	P/N	DISPLAY	DESC	SIZE	QTY
BA			ALUM TUBE	1" x 48" (2.5 x 122 cm)	1
BB			ALUM TUBE	7/8" x 50" (2.2 x 127 cm)	2

KEY	P/N	DISPLAY	DESC	SIZE	QTY
61	050061		PLASTIC CAP	7/8" (2.2 cm)	2
410	030410		WORM CLAMP	1" (2.5 cm)	2

#2 - ELEMENT ASSEMBLY

Slide the four pieces of the Reddi-Match assembly (PT, RR, RT, 251) together (figure B). Slide the tuning strap (125) onto the driven element (EB) and secure loosely with screws (79), nuts (11) and lock washers (41). Press on end caps (53). Slide the Reddi-Match assembly through the tuning strap. Connect the flattened rod end to the screw on the connector bracket (CB) with nut (11) and washer (41). Attach the entire driven element assembly shown below to the boom with hardware provided referring to figure D for the proper location. Slide the poly tube (PT) on the Reddi-Match assembly over the rod (RR) up to the flattened end of that rod (figure B-2). Adjust to the dimensions indicated and tighten all connections. Be sure that the connector is pointed towards the center of the boom and the Reddi-Match assembly is parallel to the element above.

Check all element lengths using table A. The cutting tolerance on these elements is ±1/16" (.16 cm). The elements are progressively shorter as you proceed toward the front end of the boom. Attach each element to the boom per figure C referring to figure D for proper location.

FIGURE B-2

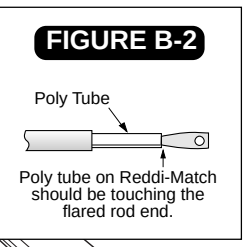
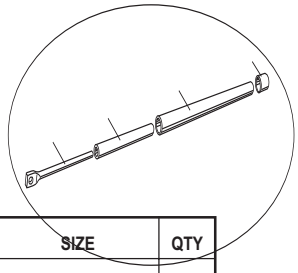
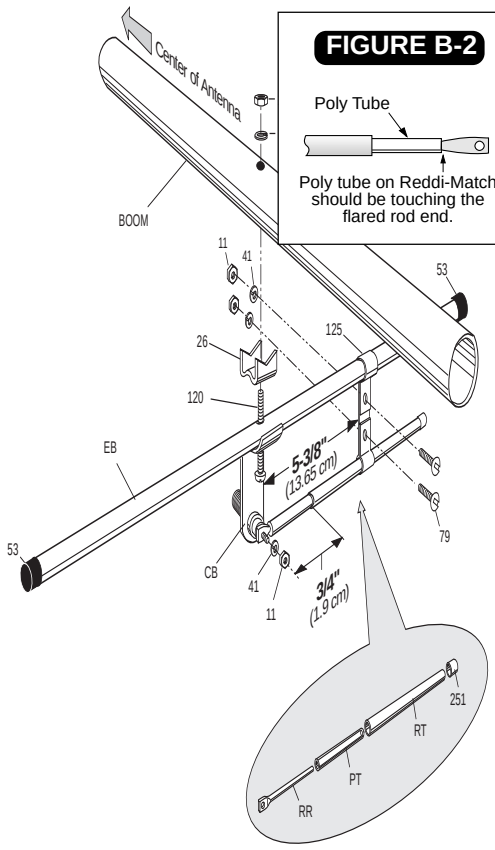


TABLE A

KEY	ELEMENT NO.	LENGTH INCHES	LENGTH CM
EA	1	40-1/4	102.2
EB	2	38-7/16	97.6
EC	3	36-3/4	93.3
ED	4	36-1/4	92.1
EE	5	35-3/4	90.8
EF	6	35-1/4	89.5
EG	7	34-3/4	88.3
EH	8	34-1/4	87.0
EI	9	33-3/4	85.7
EJ	10	33-1/4	84.4
EK	11	32-3/4	83.2

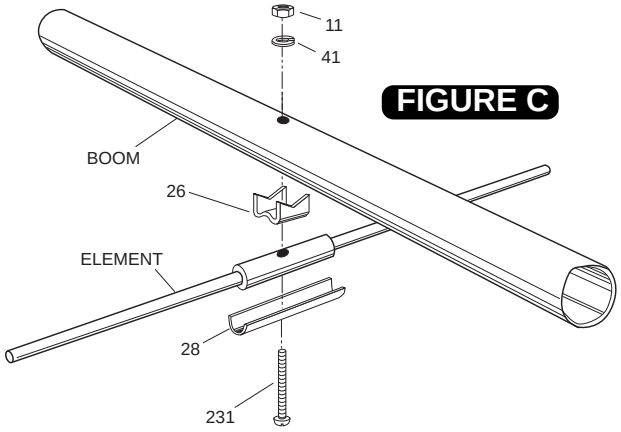
FIGURE B





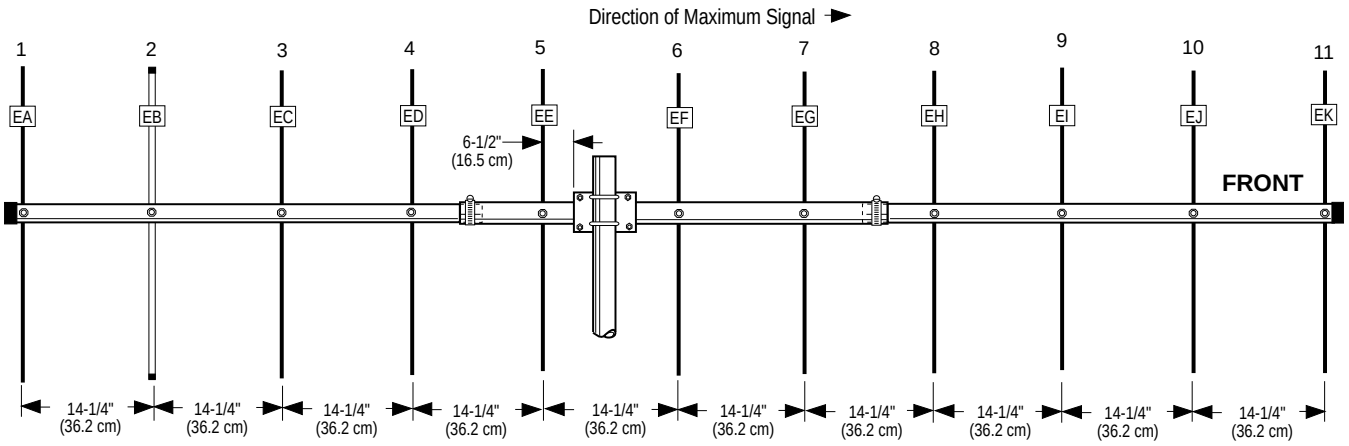
KEY	P/N	DISPLAY	DESC	SIZE	QTY
11	010011		SS HEX NUT	8-32	14
26	190026		ALUMINUM BRACKET	7/8" (2.2 cm)	11
28	190028		ALUMINUM HALF WASHER		10
41	011941		SS LOCK WASHER	#8	14
53	050053		PLASTIC CAP	1/2" (1.3 cm)	2
79	010079		SS MACHINE SCREW	8-32 x 1/2" (1.3 cm)	2
120	010120		SS MACHINE SCREW	8-32 x 2" (5.1 cm)	1
125	200125		TUNING STRAP		1
231	010231		SS MACHINE SCREW	8-32 x 1-3/4" (4.4 cm)	10
251	050251		PLASTIC CAP	3/8" (.9 cm)	1
CB			CONNECTOR BRACKET		1
EB			ALUMINUM TUBE	1/2 x 38-7/16" (1.3 x 97.6 cm)	1

FIGURE C



KEY	P/N	DISPLAY	DESC	SIZE	QTY
PT			POLY TUBE	3/16" x 4-1/2" (.5 x 11.4 cm)	1
RR			REDDI-MATCH ROD	3/16" x 4" (.5 x 10.2 cm)	1
RT			ALUMINUM TUBE	3/8" x 6-1/2" (.9 x 16.5 cm)	1

FIGURE D

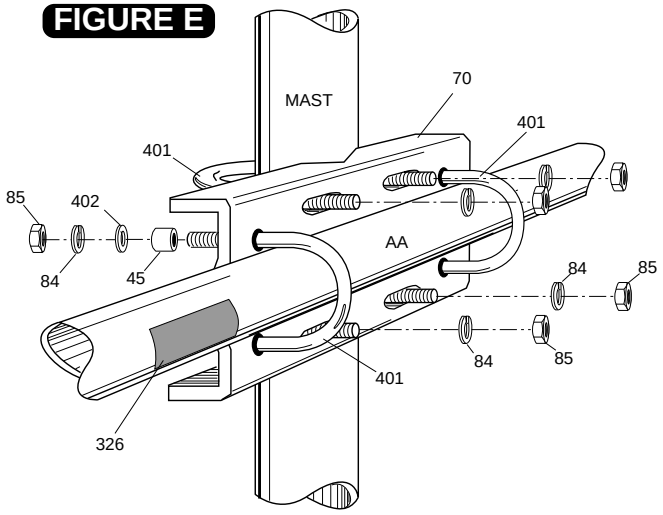


#3 - MAST MOUNT

Mount the antenna to your mast using the mounting plate (70) and the hardware provided per figure E. Refer to figure D for the balance point. Tighten the U-bolts taking care not to crush the boom.

KEY	P/N	DISPLAY	DESC	SIZE	QTY
45	321045		ALUMINUM SPACER	1/2" x 1/2" (1.3 x 1.3 cm)	4
70	190070		FORMED MAST PLATE	4" x 6" (10.1 x 15.2 cm)	1
84	010084		SS LOCK WASHER	1/4" (.63 cm)	8
85	010085		SS HEX NUT	1/4" (.63 cm)	8
402	013402		SS FLAT WASHER	5/16" (.8 cm)	4
326	290326		DANGER LABEL		1
401	010401		SS U-BOLT	3" x 1-3/4" (7.6 x 4.4 cm)	4

FIGURE E



#4 - CONNECTOR ASSEMBLY

This antenna is designed for use with 50 Ohm coaxial cable terminated with a PL-259 connector. Any length of feedline can be used with your A144-11. The shortest length of cable will have the least loss. A connector boot is included for use with your new antenna. Slide the boot over the cable before attaching your PL-259 (figure F). Spread silicone on the outer threads of the Reddi-Match and PL-259 connector. DO NOT COAT THE CENTER PINS OF THE PL-259. Attach the connector to the Reddi-Match. Apply the remaining silicone to the outside of the connector. Slip the vinyl boot over the connector and against the mast bracket for a weather tight connection.

KEY	P/N	DISPLAY	DESC	SIZE	QTY
115	050115	cushcraft	CONN BOOT		1
116	240116	SILICONE GREASE	SILICONE PACKAGE		1

FIGURE F

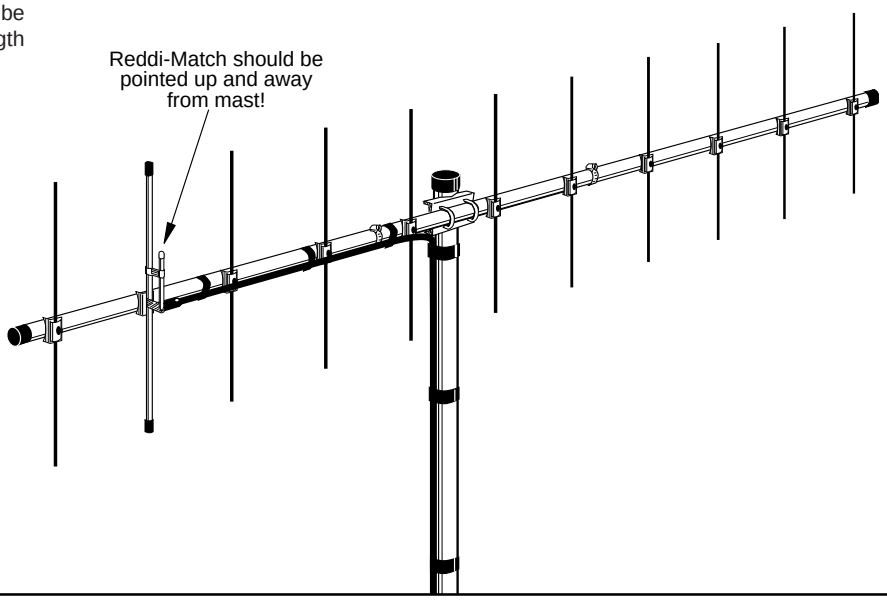
COAT WITH SILICONE GREASE

(DO NOT coat the center pin or socket!)

#5 - FEEDLINE

Tape your feedline along the boom and down mast (figure G). Any length of feed line can be used with your A144-11. The shortest length cable will have the least loss.

FIGURE G



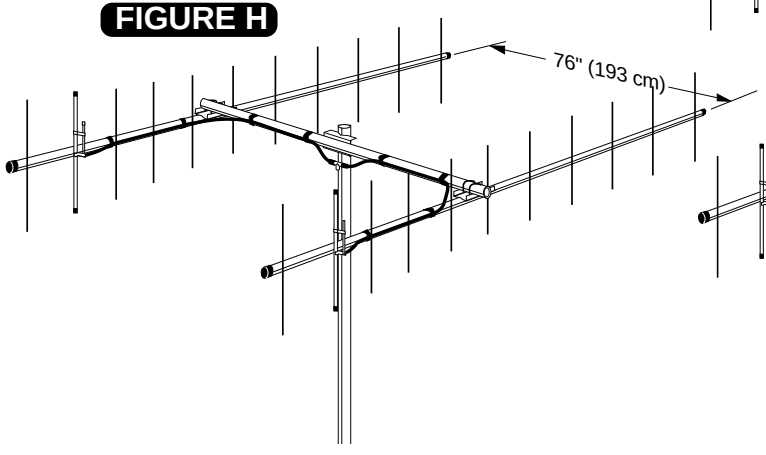
#6 - STACKING OPTIONS

The A144-11 may be stacked in arrays for increased gain and improved radiation patterns. When stacking two A144-11's use the A147-VPK stacking kit, figure H. When stacking four antennas use two A147-22 antennas and one A147-SK harness, figure I.

DUAL STACKING KIT
A14-VPK

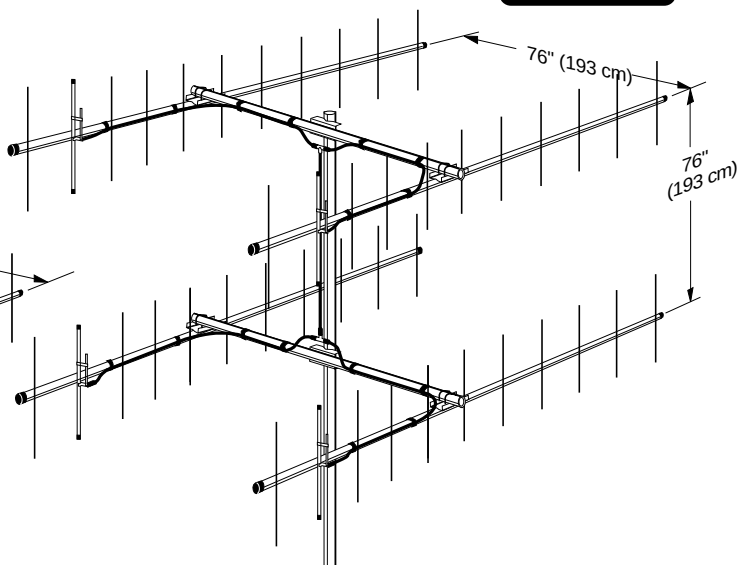
HARNESS ONLY
A147-SK

FIGURE H



QUAD ARRAY
(2) A147-22 & A147-SK HARNESS

FIGURE I



SPECIFICATIONS

MODEL	**A144-11**	**Boom Length, ft (m)**	12 (3.6)
Frequency, MHz	144-146	**Longest Element, in(cm)**	40 (101.6)
No. Elements	11	**Turning Radius, ft (m)**	6.75 (2.0)
Forward Gain, dBd	13.2	**Mast Size Range, in (cm)**	1.25-1.5
Front to Back Ratio, dB	20		(3.2-3.8)
SWR 1.2:1 Typical		**Wind Load, ft^2 (m^2)**	1.21 (0.11)
2:1 Bandwidth MHz	>3	**Weight, lb (kg)**	6 (2.7)
Power Rating, Watts PEP	1000		
3 dB Beamwidth, Degrees			
E Plane	38		

LIMITED WARRANTY

Cushcraft Corporation, P.O. Box 4680, Manchester, New Hampshire 03108, warrants to the original consumer purchaser for one year from date of purchase that each Cushcraft antenna is free of defects in material or workmanship. If, in the judgement of Cushcraft, any such antenna is defective, then Cushcraft Corporation will, at its option, repair or replace the antenna at its expense within thirty days of the date the antenna is returned (at purchasers expense) to Cushcraft or one of its authorized representatives. This warranty is in lieu of all other expressed warranties, any implied warranty is limited in duration to one year. Cushcraft Corporation shall not be liable for any incidental or consequential damages which may result from a defect. Some states do not allow limitations on how long an implied warranty lasts or exclusions or limitations of incidental or consequential damages, so the above limitation and exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. This warranty does not extend to any products which have been subject to misuse, neglect, accident or improper installation. Any repairs or alterations outside of the Cushcraft factory will nullify this warranty.

48 PERIMETER ROAD, MANCHESTER, NH 03108
603-627-7877 / TELEX 4949472 / FAX 603-627-1764

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

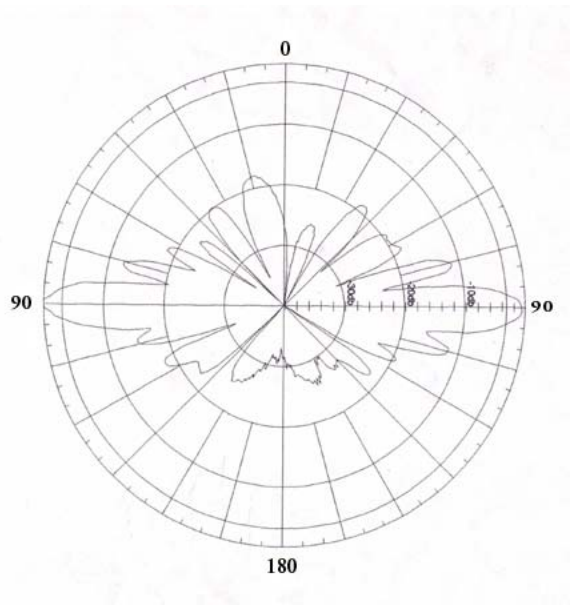
KP-20

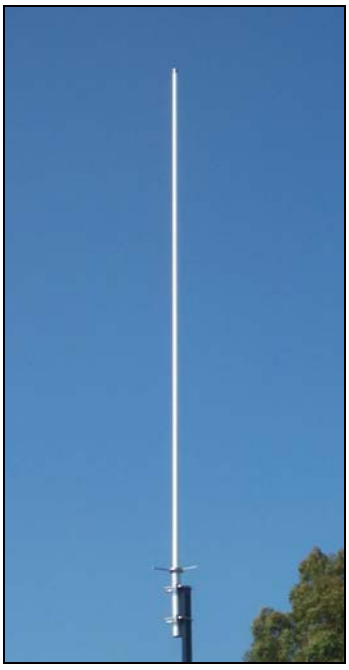
900-928MHz Omnidirectional Antenna

Specifications:

- **900-928MHz**
- **Gain: 9.2dBi**
- **Length: 96 inches**
- **Weight: 2lb 8oz (inc brackets)**
- **Max Power: 100 watts**
- **VSWR: 1.5:1 or less**
- **Mast req'd 1.25—2.50 inches**
- **Connector: Integral N-female**
- **Radome: One piece UV stabilized fiberglass**
- **Mounting hardware included**

Vertical radiation pattern





FEATURES:

- **High gain omnidirectional pattern for long-range communications**
- **Heavy duty, one-piece fiberglass radome, 112 MPH wind survival**
- **Mounting pipe acts as a shroud, protecting the coax to antenna connection from moisture/wind etc.**
- **Extruded aluminum brackets and stainless steel hardware included**
- **Ideal for the license free 900MHz ISM band**

NCG COMPANY

NCG Company 1275 N. Grove St. Anaheim, CA 92806-2114
Phone: 800.962-2611 Fax: 714.630-4541
email: micks@cometantenna.com

END OF REPORT

KB2KFV Proposed Tower

November 17, 2008

ALGONQUIN COMMUNICATIONS

Robert H. Isby, Jr.; Owner
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Wynantskill, New York 12198

Insured Tower and Pole Work
New and Used Radio Sales and Service
E-Mail: algnquin@nycap.rr.com

Phone: 518.857.6792

"Serving Eastern New York and Western New England's Communications Needs Since 1993!"