

**TELEX** *hy-gain*TELEX COMMUNICATIONS, INC.  
9600 Aldrich Ave. So., Minneapolis, MN 55420**ORDER NO. 376S**

Model 155BA-S "Long John"

5-Element, 15-Meter Beam

PN 801998-2

**INSTRUCTION MANUAL****WARNING**

Installation of this product near power lines is dangerous. For your safety, follow the installation directions.

The 155BA-S is ideal for stacking with other Hy-Gain "Long Johns", the 105BA-S and the 205BA-S, for unparalleled performance and durability. The 155BA-S now features stainless steel hardware for all electrical and most mechanical connections.

**General Description**

The Hy-Gain Model 155BA-S is an optimum spaced, 5-element, 15-meter beam. The "Long John" features five full sized elements on a 26 foot boom, a Hy-Gain Beta Match and a rugged boom-to-mast bracket.

**Specifications***Electrical*

Gain .....	12 dB
Front-to-Back .....	20 dB minimum
VSWR (at resonance) .....	less than 1.5:1
Nominal Impedance .....	50 ohms
Power Rating .....	maximum legal
Matching Method .....	beta
2:1 Bandwidth .....	400 KHz
-3 dB Beamwidth .....	57 degrees

*Mechanical*

Boom .....	2" x 26' (5.1 cm x 7.92 m)
Turning Radius .....	approximately 17' 6" (5.33 m)
Longest Element .....	25' 3" (7.69 m)
Surface Area .....	5.2 sq. ft. (.483 sq. m)
Wind Load @ 80 mph .....	133 lbs. (60.3 kg)
Max. Wind Survival .....	100 mph (160.93 kmph)
Mast Diameter Accepted .....	1 1/4" to 2 1/2" (3.2 cm to 6.4 cm)
Hardware .....	18-8 stainless steel except for 7 large bolts used in mast bracket
Clamps .....	stainless steel

## Installation

All tubing supplied with the 155BA-S antenna is taper swaged and slotted. It is held in place with compression clamps. For optimum results from the antenna, make all measurements accurate using the dimensions given in Figure 1.

## Boom Assembly

Select the cast aluminum brackets, boom-to-bracket clamp and casting-to-boom bracket and loosely assemble as shown in Figure 2. The bracket must be loose in order to finish the assembly of the boom.

Select the two center boom sections and slip the unswaged end of each into the boom-to-mast bracket. Align the holes in the boom with the holes in the bracket and secure as shown in Figure 2.

Install the outer boom section as shown in Figure 3.

## Assembly of Element-to-Boom Brackets

Select the set of large element-to-boom brackets (Item No. 4) and loosely assemble as shown in Figure 4.

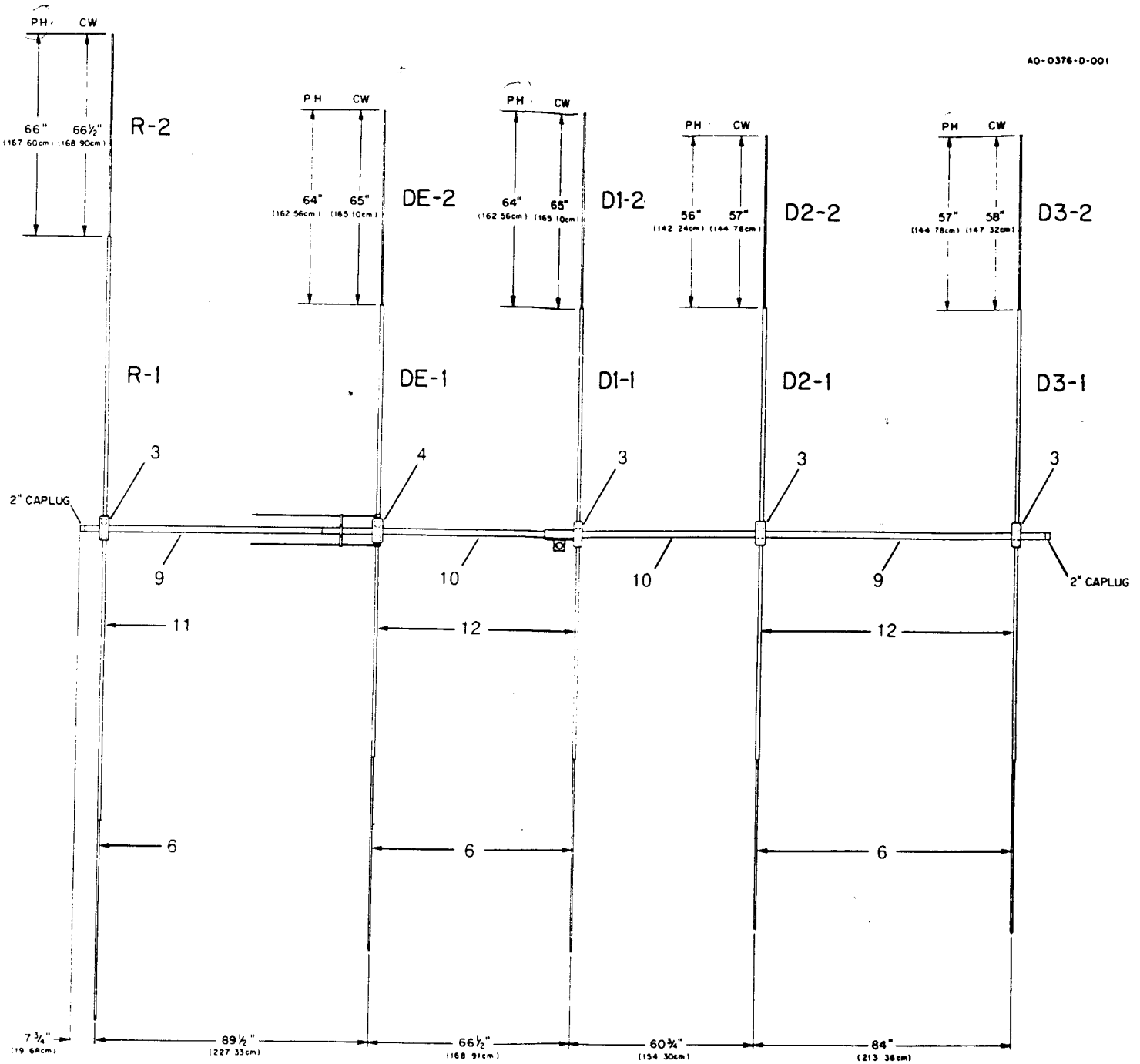
Select the remaining four sets of element-to-boom brackets (Item No. 3) and loosely assemble as shown in Figure 4.

Slide each assembled bracket over a boom end and position them as shown in Figure 1.

At this time, you must decide which mode of transmission you will use - either CW or Phone.

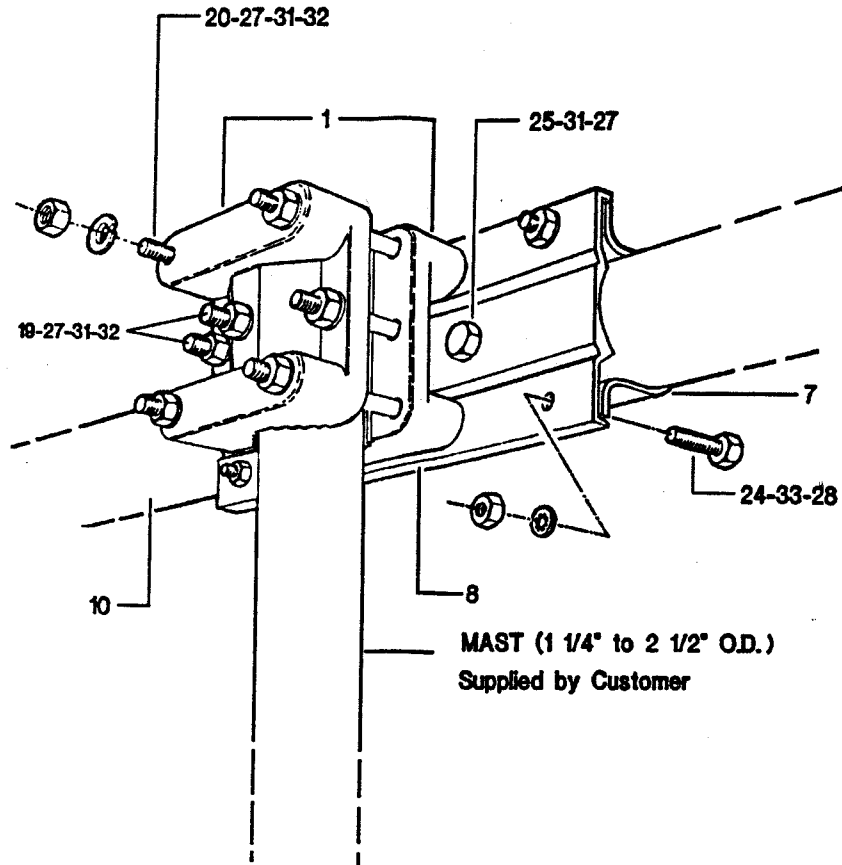
### CAUTION

*When you have selected your mode of transmission, you must use the same mode for the remaining measurement. DO NOT try to use averages or various combinations of measurement settings on the same element or serious deterioration in the antenna performance will result. The VSWR Chart shown in Figure 6 should help you decide which mode to select.*



Item No.	Description
3	Bracket, Element-to-Boom, #4
4	Bracket, Element-to-Boom, #13
6	Tube, 7/16" x 68"
9	Tube, Boom Section, 2" x 79"
10	Tube, Inner Boom, 2" x 81"
11	Tube, Swaged, 7/8" x 84"
12	Tube, Swaged, 7/8" x 72"

Figure 1  
Overall View



Item No.	Description	Item No.	Description
1	Bracket, cast aluminum	25	Bolt, hex, cap, 5/16"-18 x 2 3/4"
7	Clamp, Boom-to-Bracket	27	Nut, hex, 5/16"-18
8	Clamp, Casting-to-Boom	28	Nut, hex, 1/4"-20
10	Tube, Boom Section, 2" x 81"	31	Lockwasher, split, 5/16"
19	Bolt, hex head, 5/16"-18 x 3 1/2"	32	Flatwasher, 5/16"
20	Bolt, hex head, 5/16"-18 x 5"	33	Lockwasher, internal, 1/4"
24	Bolt, hex head, 1/4"-20 x 3/4"		

Figure 2  
Boom-to-Mast Detail

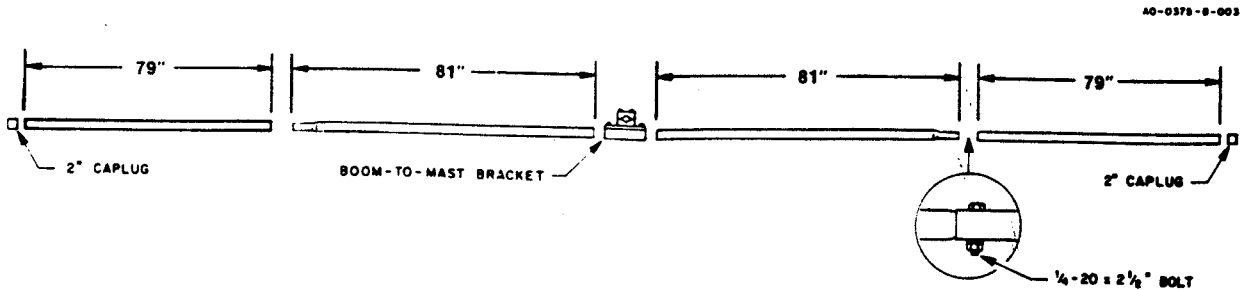
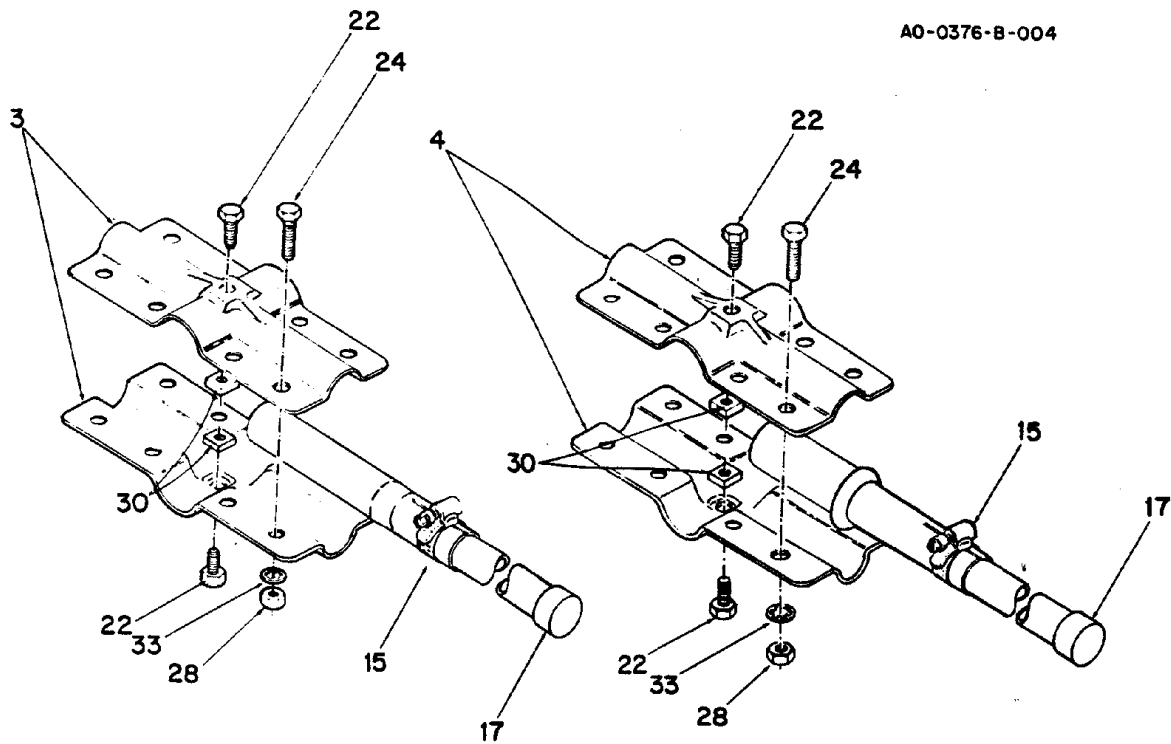


Figure 3  
Boom Assembly and Bracket Detail



Item No.	Description
3	Bracket, Element-to-Boom, #4
4	Bracket, Element-to-Boom, #13
15	Clamp, #6 Tubing
17	Caplug, 7/16"
22	Bolt, hex head, 1/4"-20 x 3/8"

Item No.	Description
24	Bolt, hex head, 1/4"-20 x 3/4"
28	Nut, hex, 1/4"-20
30	Nut, square, 1/4"-2-0
33	Lockwasher, internal, 1/4"

**Figure 4**  
**Element-to-Boom Brackets**

## Assembly of Driven Element and Beta Match

**NOTE:** The following steps will have to be done first for one side of the boom then repeated for the other side.

Select the DE1 section of tubing. Slip the unswaged end of the DE1 into a Driven Element insulator as shown in Figure 4. Slip the insulated end of the DE1 into the bracket assembly on the boom. Tighten the bolts to hold the element securely in the center of the bracket at this time.

Select the 1/4" beta rods. Attach the Beta Match to the boom as shown in Figure 7. Loosely attach the opposite ends of the beta rods to the tubing clamps on the Driven Element.

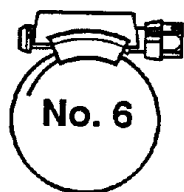
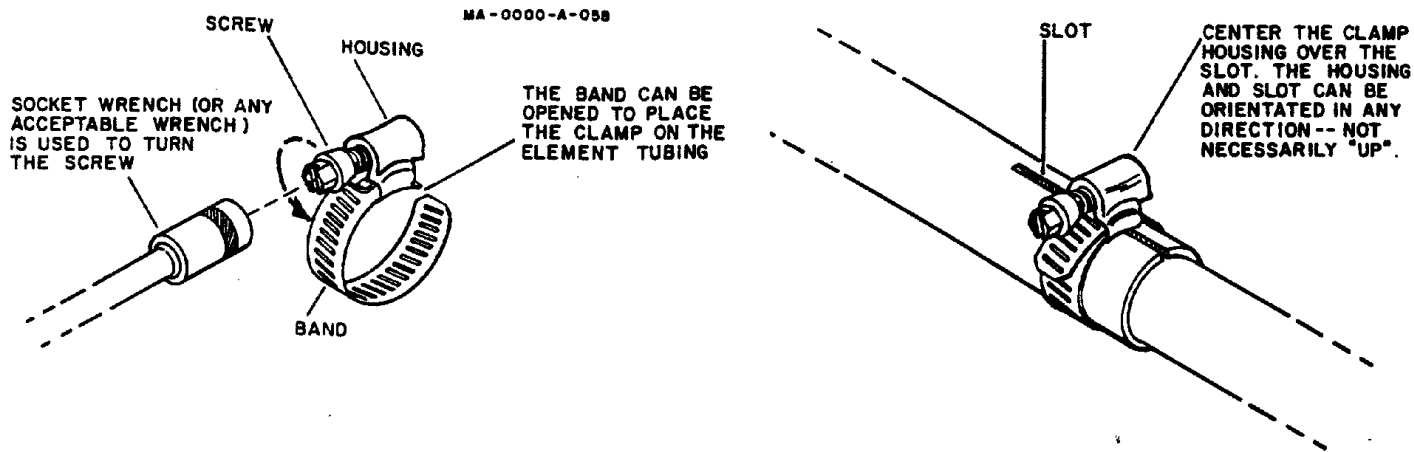
Do Not tighten these bolts at this time, the feed-line will attach to this point in a later step. See Figure 7.

Check the Driven Element to see if it will lie in a plane parallel to the earth, then tighten the anchor bolts in the bracket securely.

## Installation of Tubing Clamps

Select the proper size tubing clamp as shown in the chart. When installing the clamps, place the clamp near the tube end with the top of the clamp over the slot in the tube as shown in Figure 5.

After adjustment of the tubing lengths, tighten the clamp with a 5/16 inch nut driver, socket, or open end wrench until the tubing will not twist or telescope.



Part No.	Description	Fits Tubing Sizes
358756	Clamp, size #6 all stainless steel 5/16" hex head screw	1/2 and 3/4

Figure 5  
Tubing Clamp Installation

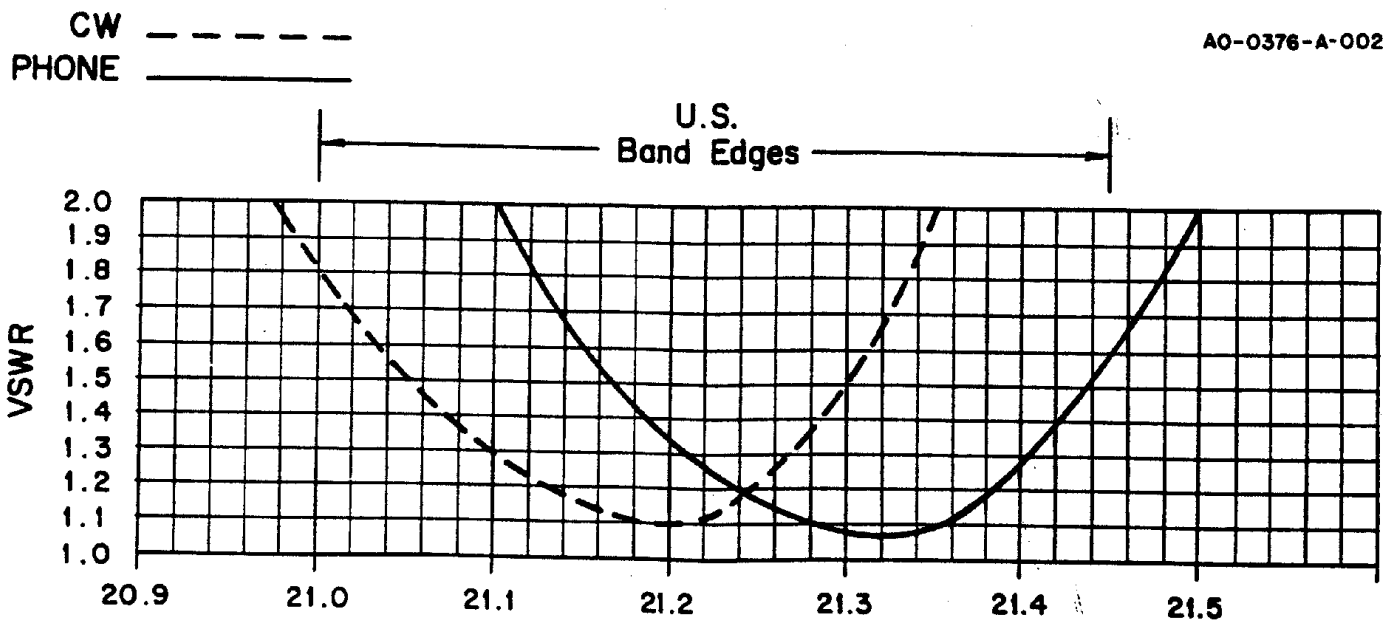
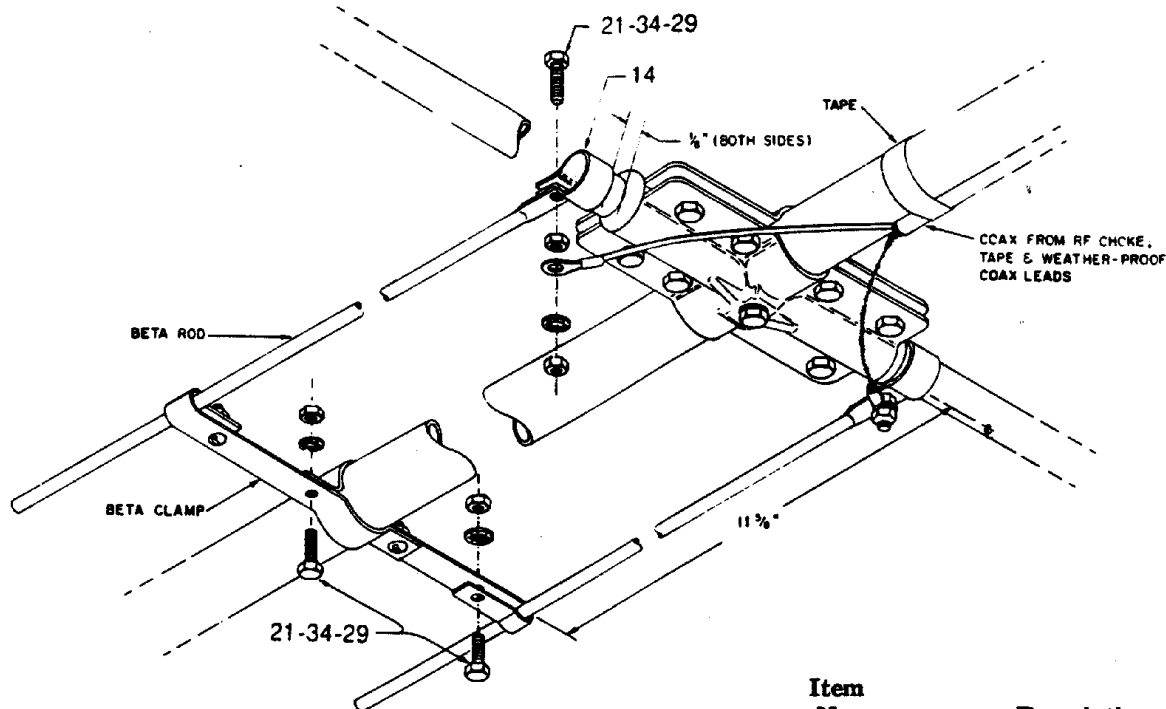


Figure 6  
VSWR Chart

**NOTE:** The VSWR Chart is typical of the 155BA-S when mounted at least 30 feet above ground and at least 10 feet from another HF antenna. The antenna should also be mounted in the clear - at least 30 feet from any large metallic object such as a metal roof, anchor tower structure or parallel guy wires.



Item No.	Description
14	Clamp, Tubing, 7/8"
21	Bolt, hex head, #10-24 x 1"
29	Nut, hex, #10-24
34	Lockwasher, internal, #10

**Figure 7**  
**Beta Match Assembly**

### Assembly of the Reflector

Select the R1 section of tubing and slip the unswaged end into the bracket assembled on the boom. Tighten the bolts to hold the element securely, but do not tighten the anchor bolts in the center of the bracket at this time.

Check the Reflector Element to see if it will lie in the same plane as the Driven Element. Carefully recheck the distance from the Driven Element, then tighten the anchor bolts securely.

Assemble the remainder of the Reflector Element in the same manner as the Driven Element. Refer to Figure 1 for tubing descriptions and dimensions and to Figure 5 for tubing clamp installation.

### Assembly of Director 1

Select the D1-1 section of tubing and slip the unswaged end into the bracket assembled on the boom. Tighten the screws to hold the element securely, but do not tighten the anchor bolts at this time.

Check the Director to see if it will lie in the same plane as the other elements and carefully recheck the distance from the Driven Element. Tighten the anchor bolts securely.

Assemble the remainder of the Director Element in the same manner as the previous elements. Refer to Figure 1 for tubing descriptions and dimensions and to Figure 5 for tubing clamp installation.

Tighten all tubing clamps securely. Be careful not to overtighten.

Refer to "Rope Dampening Installation" and Figure 8.

### Assembly of Directors 2 and 3

Assemble the two remaining directors in the same manner as the previous elements. Refer to Figures 1 and 5.

Refer to "Rope Dampening Installation" and Figure 8.

### Rope Dampening Installation

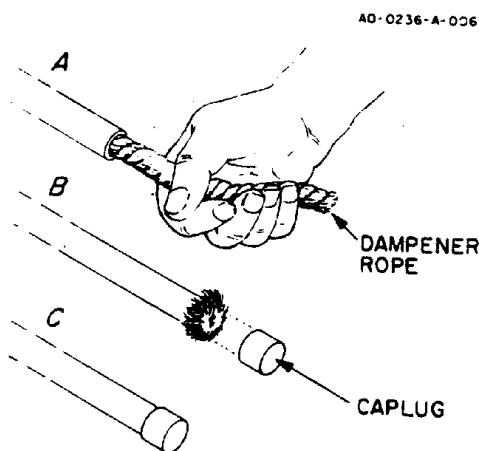


Figure 8  
Rope Dampening

Select the rope and cut it into ten (10) equal lengths of six feet. Slip a length of rope into the end of each element. With about a half inch of rope extending from the element end separate the fibers and fold them back over the element and rope. The rope inside the element will prevent vibrations caused by low wind velocities.

### Feedpoint Configurations

A balun is required for normal operation of this antenna. However, there are three recommended feedpoint configurations, one of which utilizes the Hy-Gain Model BN-86 balun for increased performance and convenience.

The first feedpoint configuration involves connection of the coaxial feedline directly to the driven element. The recommended feedline is RG-213/U (such as Belden 8267). Other types of coaxial cable may be used if proper selection and careful assembly are utilized. The feedline should be stripped as shown in Figure 10. Attach solder lugs (not supplied) to the center conductor and shield for easy connection to the driven element. Weatherproof this connection.

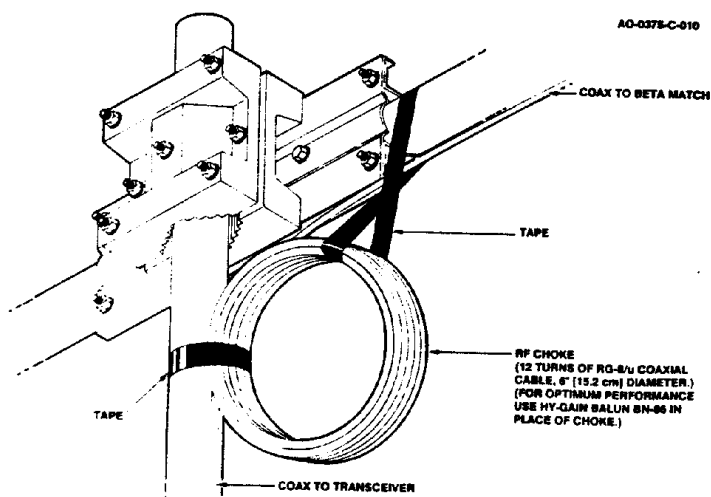
The second feedpoint configuration involves construction and installation of a homemade RF choke. The RF choke will prevent RF from flowing on the outside of the coaxial shield. This will block radiation from the coaxial feedline, thereby reducing the risk of TVI and preventing radiation pattern degradation.

Wind the RF choke from RG-213/U (or equivalent) coaxial cable. The choke should consist of 12 turns with an inside coil diameter of 6 inches. Allow enough cable at the end to reach from the mast to the driven element. Strip the coaxial cable as shown in Figure 10. Attach solder lugs (not supplied) to the center conductor and shield for easy connection to the driven element. Weatherproof this connection.

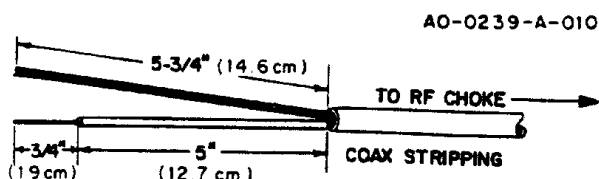


The third feedpoint configuration using a 50 ohm 1:1 balun to connect the feedline to the driven element. (Hy-Gain Model BN-86 is recommended.) a balun will act as an RF choke and will balance the flow of current on the driven element, resulting in a symmetrical radiation pattern. A balun will also have a coaxial connector, providing more convenience than a coax splice. Follow the instructions supplied with the balun for connection to the antenna.

**NOTE:** Use caution when selecting a balun to use with this antenna. Some baluns are designed for 50-75 ohm impedance and may result in a higher SWR when used with this antenna. For best results, use the Hy-Gain BN-86, 50 ohm balun. The Model BN-86 is available at your local Hy-Gain dealer.



**Figure 9**  
RF Choke Installation



**Figure 10**  
Coax Stripping Dimensions

## Installing The Antenna

There are two recommended methods for getting the antenna to the top of the tower.

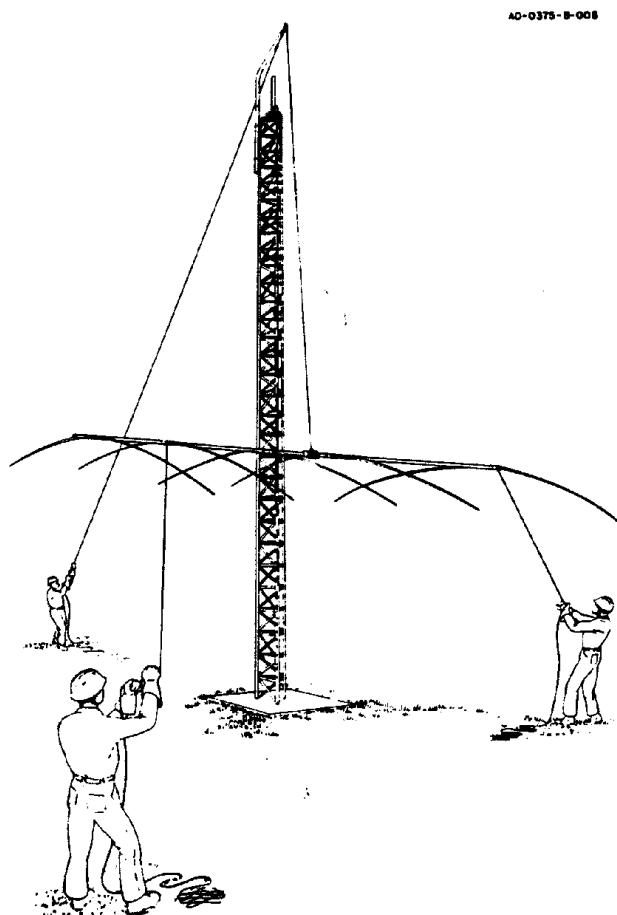
### WARNING

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**Method One** - Completely assemble the antenna on the ground, then hoist it into position using the set-up shown in Figure 11.

**Method Two** - Assemble the antenna on the ground in halves, then hoist each half up the tower and assemble on the boom-to-mast bracket on the tower as shown in Figure 12.

Mount the antenna on your mast using one of the two methods given. Tighten all bolts in the boom-to-mast bracket securely.

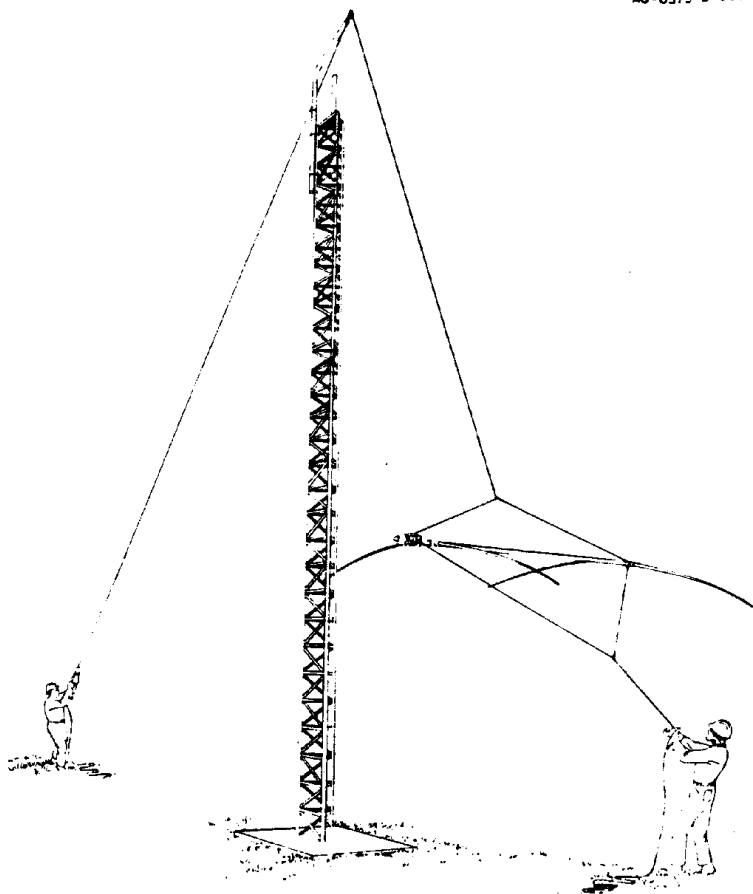


**Figure 11**  
Raising Entire Antenna To Top Of Mast

## Lightning Protection

You must ground your antenna supporting structure. This will also insure noise-free operation. A proper ground consists of a 1/2"-8' copper clad, steel ground rod driven into the ground as close as possible to the base of your tower or mast. Connect the rod to the tower or mast using #8 copper wire and non-corrosive clamps.

For total protection of your equipment it is recommended that you use a Hy-Gain Model LA-1 Lightning Arrestor, which is available from your Hy-Gain dealer.



**Figure 12**

### Raising Antenna In Sections To Top Of Mast

**NOTE:** The boom-to-mast brackets have a hole through their centers to allow securing to the mast with the 5/16"-18 x 3 1/2" bolt. It is recommended that the mast be removed and a 11/32" hole be drilled at the desired mast clamp position, then reinstall the mast. If this is not possible, the clamp will hold its position on the mast in all but the most severe weather conditions.

Securely tape the feedline to the mast and your antenna is ready to use.

## Weatherproofing

To ensure optimum performance, weatherproof all coaxial connections with Coax-Seal® or another similar substance.

Coax-Seal® is a registered trademark of Universal Electronics, Inc.

## Stacking The 205BA-S With The 155BA-S And The 105BA-S

If you choose to stack the 205BA-S and the 155BA-S in a Christmas tree fashion, you must use a very heavy mast. Recommended mast material is 1027 cold drawn carbon steel tubing, 20 feet long, two inch O.D. minimum, 1/2" wall thickness minimum. The 1027 cold drawn tubing has a yield strength of approximately 70,000 p.s.i.. If this is not available, you could also use 1018, 1020, 1025, or 1026 cold drawn tubing. These have yield strengths ranging from 55,000 to 65,000 p.s.i.. Whatever you choose, you should check the yield strength specified by the manufacturer. If you cannot obtain high strength tubing, you should increase the O.D. or the wall thickness.

Recommended spacings for the 205BA-S, 155BA-S and 105BA-S are listed below.

205BA-S - 6 inches above the tower  
 155BA-S - 9 feet above the 205BA-S  
 105BA-S - 7 feet above the 155BA-S

Using the spacings and the recommended mast with dimensions of two inch O.D. and 1/2" wall, you will have a moment of 3415 foot-pounds at the top of the tower in an 80 mph wind and a flexural strength of approximately 55,684 p.s.i.. Using 1027 cold drawn steel tubing, this will give you a safety factor of about 1.26:1.

The spacings listed above will minimize the wind load on the mast and tower and minimize interactions between the antennas.

NOTE: When stacking the 155BA-S with HF antennas, the CW setting should be used.

## PARTS LIST

Item No.	Part No.	Description	Qty
1	102734	Bracket, cast aluminum .....	2
2	163371	Clamp, beta .....	2
3	163764	Bracket, element-to-boom, #4.....	8
4	165919	Bracket, element-to-boom, #13.....	2
5	175943	Rod, beta, 1/4" x 11 7/8" .....	2
6	174868	Tube, 7/16" x 68" .....	10
7	172732	Clamp, boom-to-bracket .....	1
8	172735	Clamp, casting-to-boom .....	1
9	171029	Tube, boom section, 2" x 79" .....	2
10	871048	Tube, inner boom, 2" x 81" .....	2
11	174862	Tube, swaged, 7/8" x 84" .....	2
12	190100	Tube, swaged, 7/8" x 72" .....	8
13	871842	Parts Pack 376S, stainless steel.....	1
14	163312	Clamp, tubing, 7/8" .....	2
15	358756	Clamp, #6 tubing .....	10
16	455625	Caplug, 2".....	2
17	455644	Caplug, 7/16" .....	10
18	463767	Insulator, 7/8" ID x 1 1/4" OD.....	2
19	500154	Bolt, hex head, 5/16"-18 x 3 1/2" .....	3
20	500153	Bolt, hex head, 5/16"-18 x 5" .....	4
21	504069	Bolt, hex head, #10-24 x 1" .....	7
22	500156	Bolt, hex head, 1/4"-20 x 3/8".....	11
23	505734	Bolt, hex head, 1/4"-20 x 2 1/2" .....	2
24	505266	Bolt, hex head, 1/4"-20 x 3/4".....	46
25	506968	Bolt, hex, cap, 5/16"-18 x 2 3/4" .....	2
26	555693	Nut, square, #10-24 .....	1
27	555747	Nut, hex, 5/16"-18 .....	9
28	554099	Nut, hex, 1/4"-20 5 .....	2
29	554071	Nut, hex, #10-24.....	7
30	551367	Nut, square, 1/4"-20.....	11
31	564792	Lockwasher, split, 5/16" .....	9
32	560024	Flatwasher, 5/16" .....	7
33	562961	Lockwasher, internal, 1/4".....	50
34	565697	Lockwasher, internal #10 .....	8
35	690190	Rope, black poly, 5/32" x 60' .....	1

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