

**INSTRUCTION
MANUAL**

**ORDER NO. 388S
TH3MK3-S THUNDERBIRD
3-Element, Ham Antenna**

PN 801819

General Description

The Hy-Gain TH3MK3-S is a three element tri-band beam antenna designed for operation on 10, 15 and 20 meters. Multi-banding is accomplished through the use of Hy-Gain's all Hy-Q traps. The antenna is designed to fit a 1 5/8" (41 mm) O.D. mast and can be rotated with a heavy duty TV rotator. All mounting and assembly hardware is high strength stainless steel except for 7 large bolts used in the boom to mast bracket.

Specifications

Electrical

Input impedance	50 ohms
Gain	8 dB minimum
Front-to-back ratio	25 dB
Maximum power input	1 kw AM
VSWR (at resonance)	less than 1.5:1
Lightning protection	DC ground

Mechanical

Boom Length	14 ft. (426.7 cm)
Boom diameter	2 in. (51 mm)
Longest element	27 ft. (823.7 cm)
Maximum wind survival	100 mph (160.93 kmph)
Net weight	36 lbs. (16.3 kg)
Accepts mast	1 1/4" to 2 1/2" O.D. (32 mm - 64 mm)
Wind surface area	5.10 sq. ft. (0.474 m ²)
Wind load at 80 mph	131 lbs. (59.42 kg)
Turning radius	15.7 ft. (4.8 m)

FOR OUR OVERSEAS CUSTOMERS: The United States uses English units of measurement. Please see the last page of this manual for assistance in identifying the hardware and components supplied with this product.

**Preparation
of Assembly**

The antenna site should be free of large buildings, metal objects or powerlines.

WARNING

When installing your system, take extreme care to avoid any contact with overhead powerlines. Failure to exercise this care could result in serious or fatal injury.

There are two methods of installing the TH3MK3-S at the top of your tower.

Method 1 — Completely assemble the antenna on the ground then hoist it into position using a block and tackle as shown in Figure 1.

Method 2 — Assemble the antenna on the ground in halves, then hoist each half up the tower and assemble in the boom-to-mast bracket on the tower as shown in Figure 2.

All tubing supplied with the TH3MK3-S telescopes together. Make all measurements as accurately as possible using the given dimensions to gain optimum results from your antenna.

WARNING
 When installing your system, take extreme care to avoid any contact with overhead powerlines. Failure to exercise this care could result in serious or fatal injury.

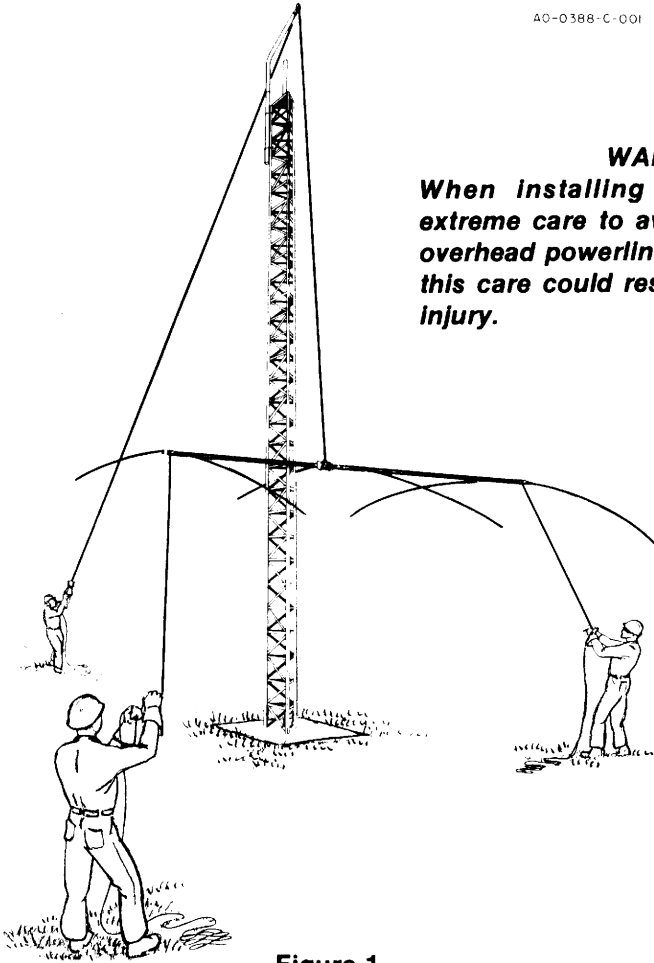


Figure 1

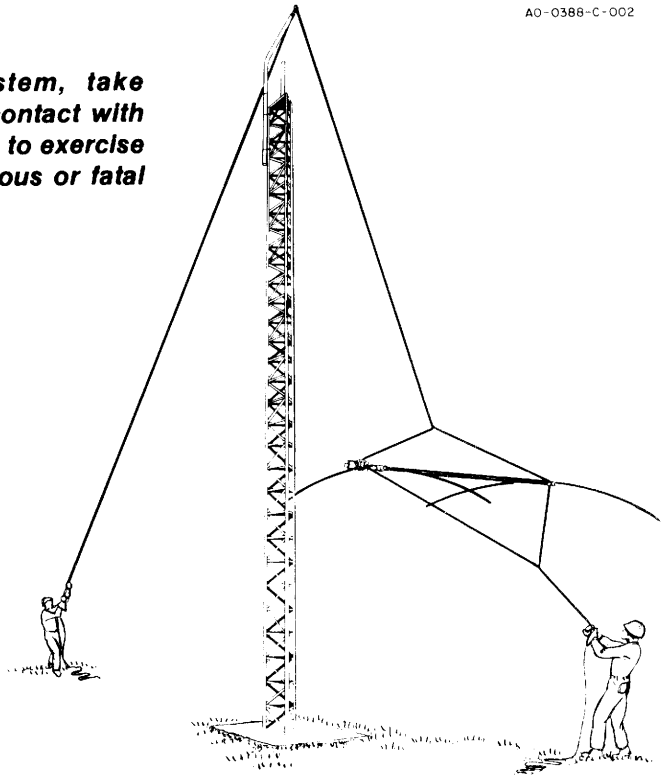


Figure 2

CAUTION

When unpacking your antenna, check the inside of all tubing for parts (clamps, insulators, smaller tubing, etc.). To conserve space, these smaller articles are sometimes put inside larger pieces.

Assembly of the Boom

Select the boom-to-bracket clamp parts (items 2 and 3). Loosely assemble them on the drilled ends of the two boom sections (item 8) using the $\frac{1}{4}$ "-20 x $\frac{3}{4}$ " bolts and the $\frac{1}{4}$ " nuts and internal lockwashers. Secure the boom to the bracket using the two $\frac{5}{16}$ "-18 x $2\frac{3}{4}$ " screws, nuts, and lockwashers provided. See Figure 3.

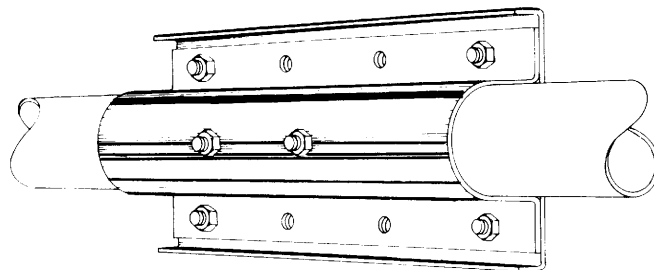


Figure 3

Select the cast aluminum boom-to-mast bracket (item 1). Align the holes in the boom-to-mast bracket with the holes in the boom-to-bracket clamp. Use the $\frac{5}{16}$ "-18 x 5" screws and the $\frac{5}{16}$ " nuts and split lockwashers to join the bracket and the clamp. See Figures 4 and 5. *Do not* tighten the screws at this time. The bracket must be loose to enable you to mount the antenna to the mast.

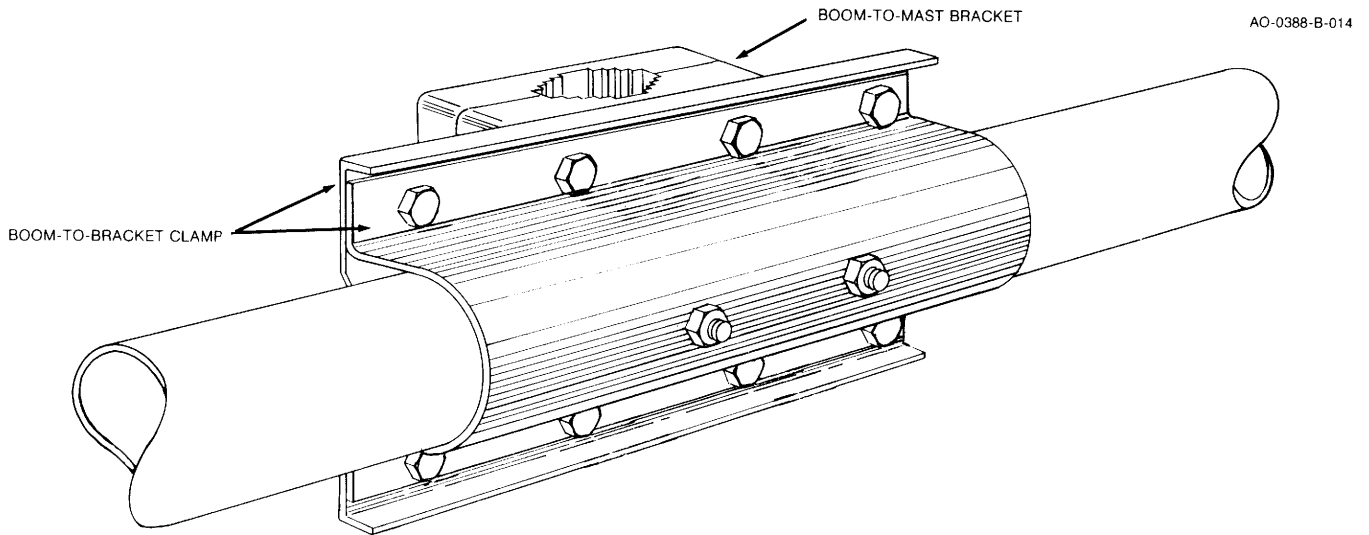


Figure 4

NOTE: The boom-to-mast brackets have a hole through their centers to allow securing to the mast with the $\frac{5}{16}$ "-18 x $3\frac{1}{2}$ " bolt. It is recommended that the mast be removed and an $11/32$ " 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.

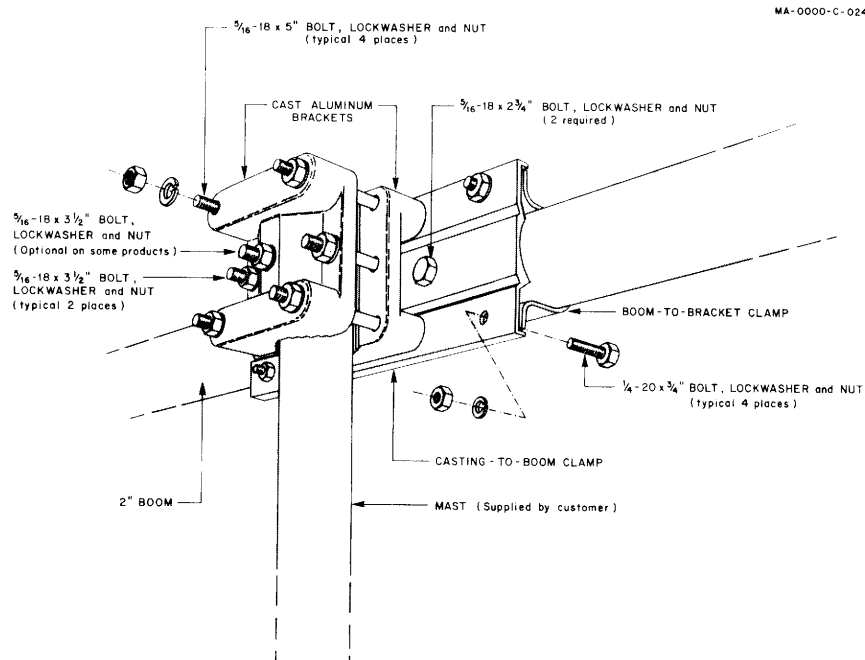


Figure 5

**Element-to-Boom
Brackets**

Select the element-to-boom brackets and insert the $\frac{1}{4}$ "-20 x $\frac{3}{8}$ " anchor screws and $\frac{1}{4}$ " nuts as shown in Figure 6.

MA-0000-B-042

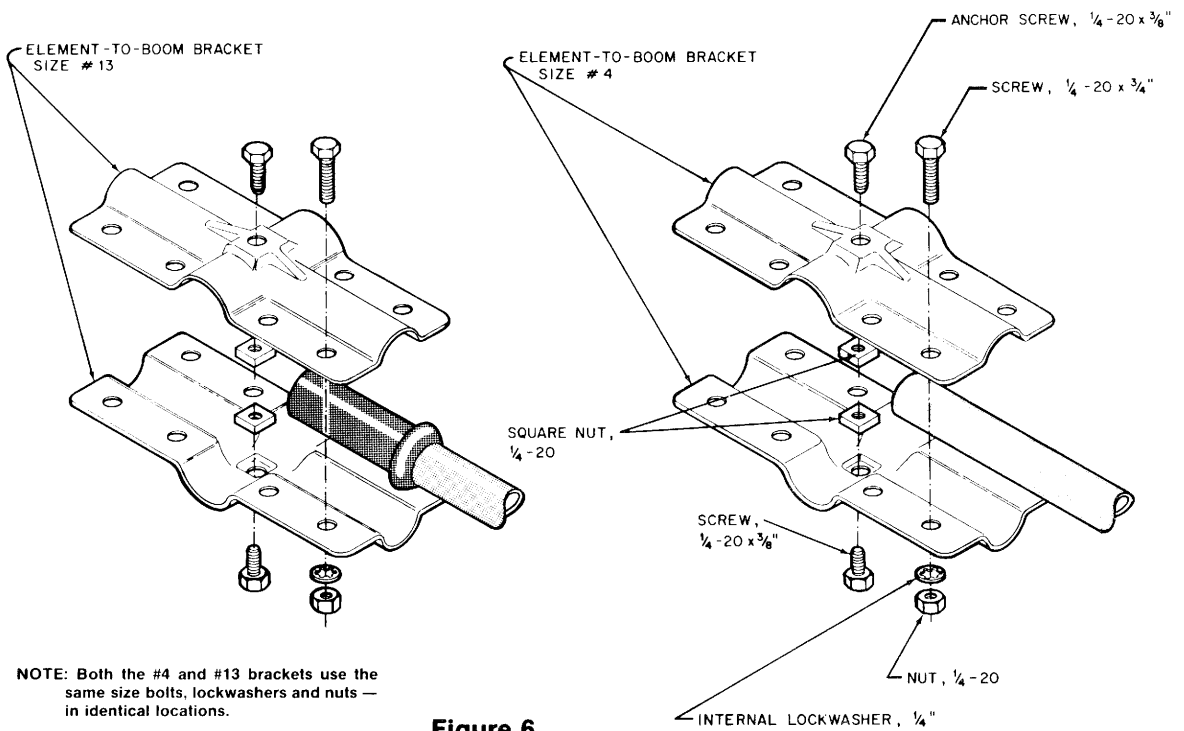


Figure 6

Loosely assemble the larger element-to-boom brackets and place them over one end of the boom. Slide them toward the boom-to-mast bracket. This will be the bracket for the Driven Element (DE).

Loosely assemble the smaller element-to-boom brackets and slip them over the same end of the boom. This will be for the Reflector element. See Figure 7.

Loosely assemble the remaining pair of element-to-boom brackets and slip them over the opposite end of the boom. This will be for the Director Element.

AO-0388-C-015

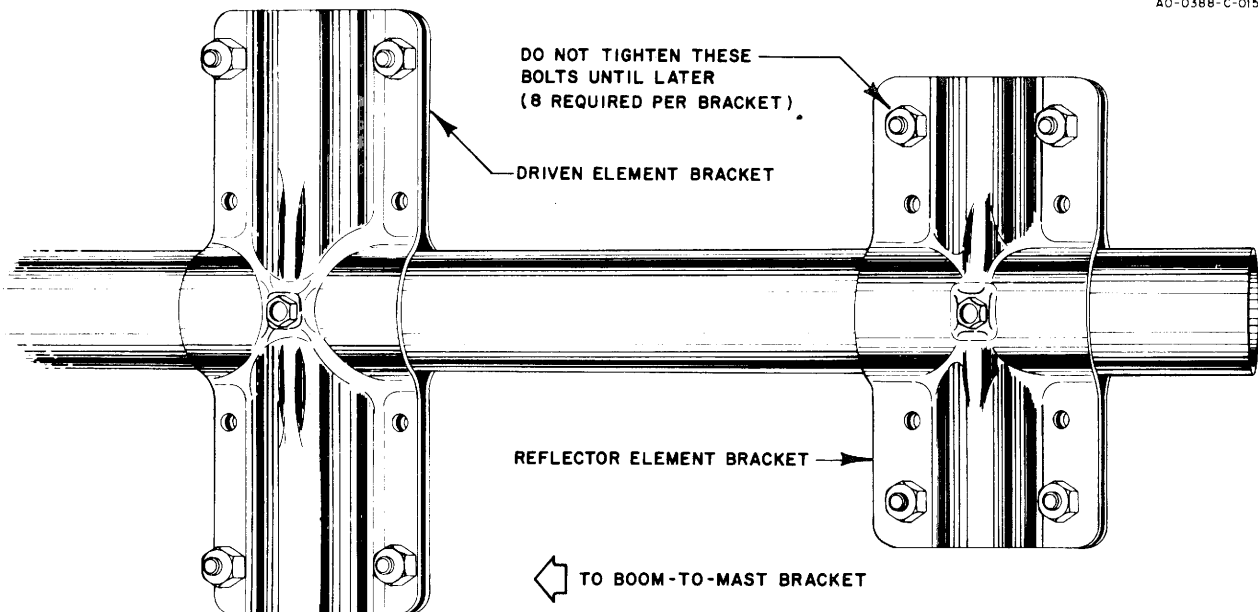


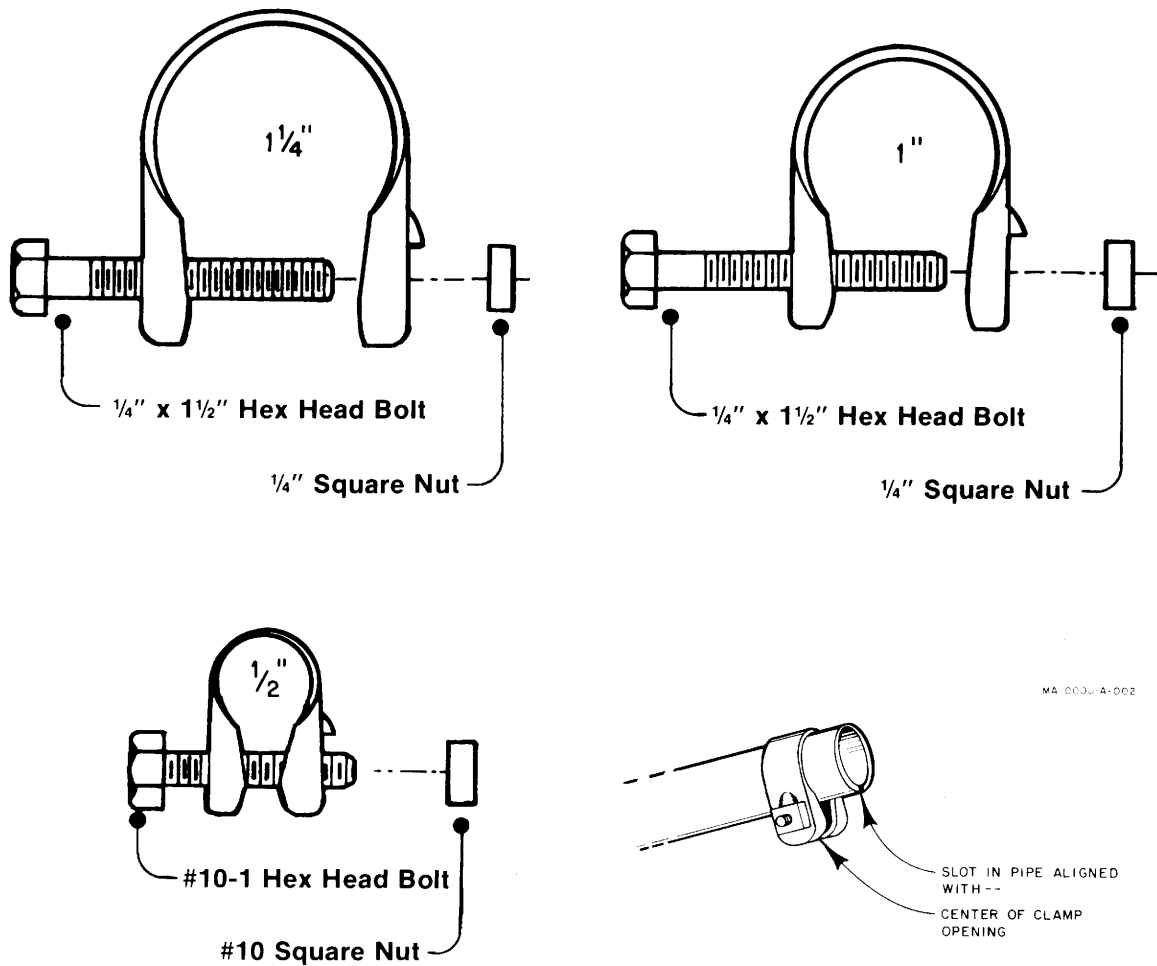
Figure 7

Compression Clamps

Use the compression clamps in the following manner: Take care when measuring the tubing lengths for your mode of transmission. Place the clamp near the end of the tube with the joint even with the slot. Tighten the clamp until the inner tube cannot be turned in the outer tube. **DO NOT OVERTIGHTEN!** If you notice an obvious bowing of the #10 screw, you have tightened it too far.

NOTE: To save time, loosely assemble all of the compression clamps and their appropriate hardware before beginning further installation of the antenna.

MA-0000-A-001

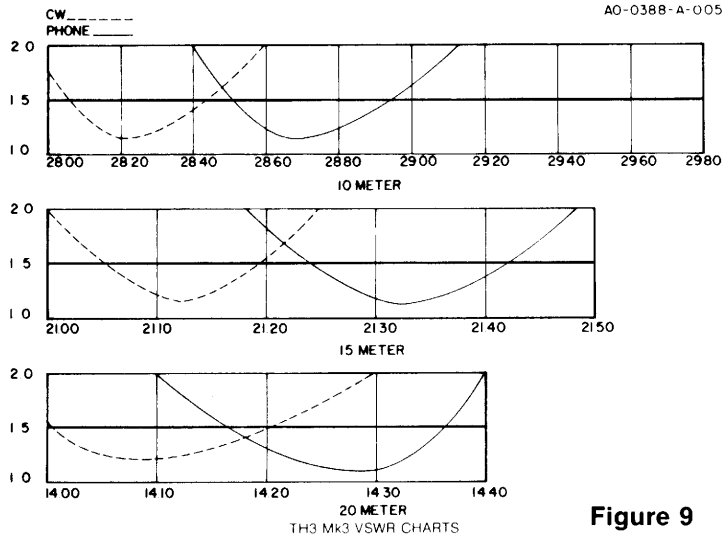


COMPRESSION CLAMPS

Figure 8

Transmission Modes

Determine which mode of transmission you will use—either phone or continuous wave (CW). Dimensions for both are shown, but only one mode must be used throughout the assembly of the antenna. Trying to use phone dimensions on one band and CW dimensions on another band will give less than optimum results on both. The typical VSWR charts shown in Figure 9 will help you to decide which mode is best for your use.



VSWR CURVES

These VSWR curves are typical for this antenna mounted 70 feet above the ground, horizontally polarized. Similar curves can be expected for this antenna mounted between 30 and 100 feet above the ground. **DO NOT TRY TO TUNE THIS ANTENNA FOR LOW VSWR AT GROUND LEVEL.**

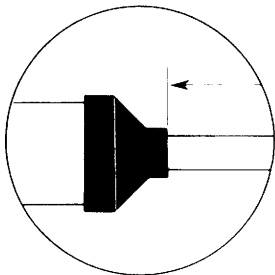
Figure 9

NOTE: The following steps cover assembly of only one side of the antenna. They will have to be done first for one side and then repeated for the other side.

Assembly of the Reflector

Check to see that all the element-to-boom brackets will lie horizontal when the antenna is mounted on your mast. Do this by observing the position of the element with respect to the boom-to-mast bracket. Make any adjustments necessary, keeping the center of the bracket $2\frac{5}{8}$ " from the tip of the boom then tighten the anchor screws securely.

AO-0388-A-016



Select the R1 section of tubing ($1\frac{1}{4}$ " x 48", 121.9 cm long, item 4). Slip a $\frac{1}{4}$ " compression clamp onto the R1 section. Refer to Figure 8. Select the R2 section ($1\frac{1}{8}$ " x 48", 121.7 cm long, item 7). Slip the unswaged (untapered) end of the R2 section into the R1 section and measure dimensions B for your mode of transmission (phone or CW) as shown in Figure 10 then tighten the compression clamp slightly.

CAUTION

There are two kinds of 15-meter traps. Part No. 878694 is a parasitic trap that is used in the Reflector and Director. Part No. 878637 is for use on the Driven Element.

Dimensions Measured as Shown

Detail

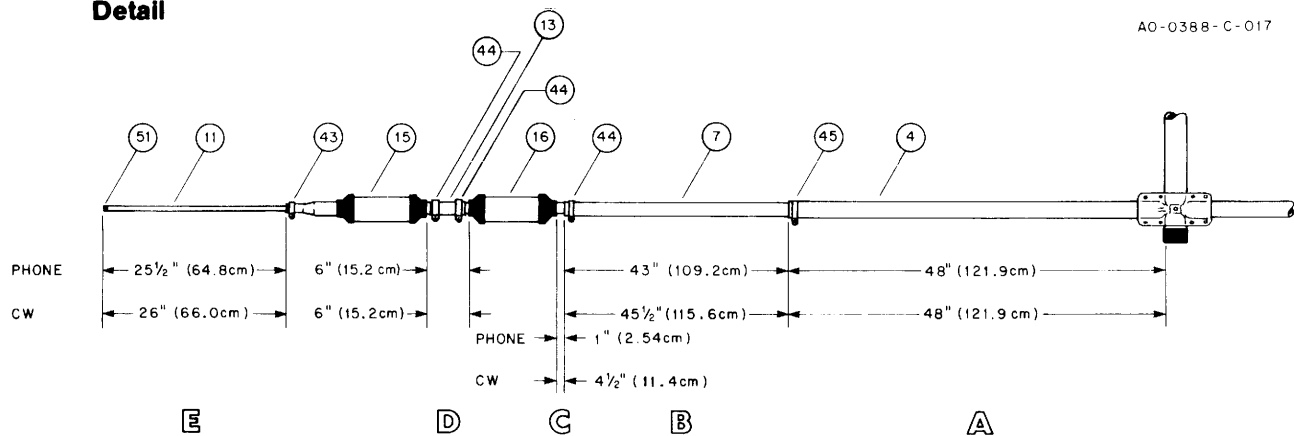


Figure 10
Reflector

NOTE: Install all the traps with drain holes on bottom and make sure the part number end is toward the boom.

Slip a 1" compression clamp onto the swaged end of the R2 section. Select the 10-meter trap (item 16), and slip the shorted end into the R2 section. The shorted end can be identified by the part number marking near the plastic insulator. Measure dimension C for your mode of transmission as shown in Figure 10. Make certain the drain holes in the traps are facing downward.

CAUTION

Be sure you install the traps correctly. They will not operate properly unless the shorted end is facing towards the boom.

Slip two 1" compression clamps onto the R3 section (1" x 5", 12.7 cm long, item 13). Now slip the R3 section over the 10-meter trap and slip the shorted end of the 15-meter parasitic trap (item 15), into the R3 section. Make certain the shorted end of the trap (identified by the part number) is inserted into the R3 section. Measure dimension D for your mode of transmission as shown in Figure 10, keeping R3 section approximately equidistant from the two traps. Make certain the drain holes in the trap are facing downward. Now tighten all compression clamps slightly.

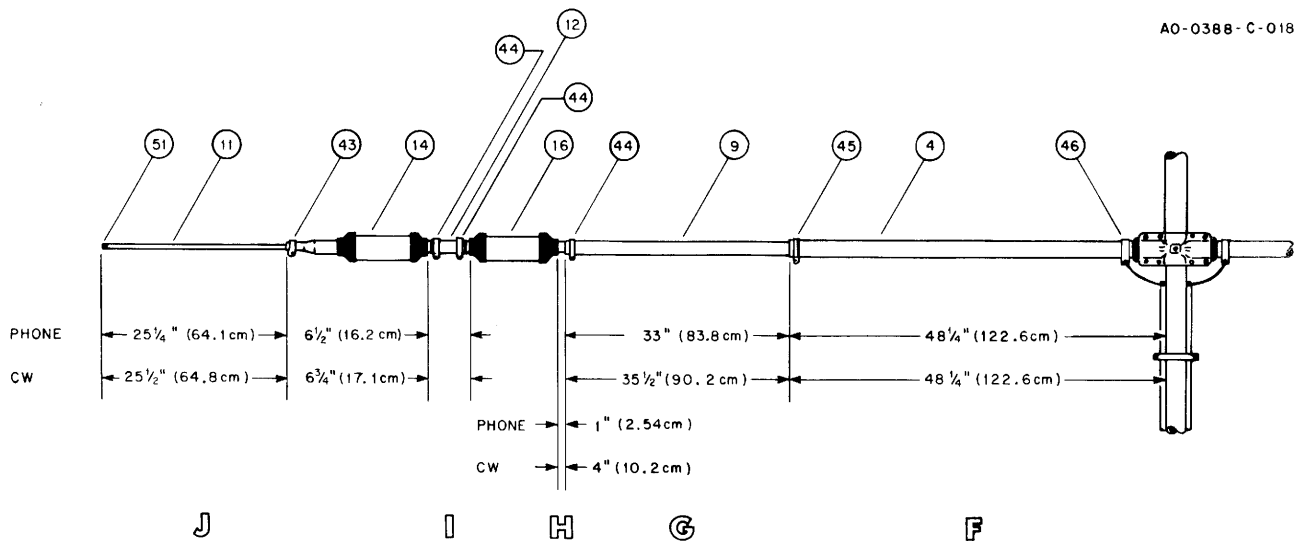
Slip a 1/2" compression clamp over the swaged end of the 15-meter trap. Select the R4 section (7/16" x 28", item 11) and slip it into the 15-meter trap. Measure dimension E for your mode of transmission as shown in Figure 10, then tighten compression clamp slightly.

Carefully recheck all measurements and make certain the shorted end of all traps are pointed towards the boom. Now tighten all compression clamps as explained earlier. Remember not to overtighten them. Make sure all drain holes are facing down.

Slip the Reflector element into the bracket assembled in the boom. Tighten the screws to hold the R1 section securely but *do not* tighten the anchor screw (item 25) at this time.

Assembly of the Driven Element

Select the DE1 section of tubing (1 1/4" x 48", 121.9 cm long, item 4). Slip a 1 1/4" compression clamp and a 1 1/4" tubing clamp over the DE1 section. Select the DE2 section (1 1/8" x 38", 96.5 cm long, item 9). Slip the unswaged end of the DE2 section into the DE1 section and measure dimension G for your mode of transmission as shown in Figure 11. Now tighten the compression clamp slightly.



**Figure 11
Driven Element**

Slip a 1" compression clamp over the swaged end of the DE2 section. Select the 10-meter trap (878749, item 16) and slip the shorted end (identified by the part number) into the DE2 section. Measure dimension H for your mode of transmission as shown in Figure 11. Make certain the drain holes in the trap are facing downward. Now tighten the compression clamp slightly.

Slip two 1" compression clamps over the DE3 section (1" x 6", 15.2 cm long, item 12). Now slip the DE3 section over the 10-meter trap then slip the shorted end of the 15-meter Driven Element trap (878637, item 14) into the DE3 section. Make certain the shorted end of the trap (identified by part number) slipped into the DE3 section. Measure dimension 1 for your mode of transmission as shown in Figure 11, keeping the DE3 section approximately equidistant from the two traps. Now tighten the compression clamps slightly.

Slip a 1/2" compression clamp over the swaged end of the 15-meter DE trap. Select the DE4 section (7/16" x 28", item 11) and slip it into the swaged end of the 15-meter DE trap. Measure dimension J for your mode of transmission as shown in Figure 11 then tighten the compression clamp slightly.

Carefully recheck all measurements as shown in Figure 11 and make certain that the shorted ends of the traps are pointed towards the boom and trap drain holes are facing downward. Now tighten all compression clamps securely.

Slip the insulated end of the driven element into the bracket assembled on the boom. Tighten the screws to hold the element securely but *do not* tighten the anchor screw (item 25) at this time. Refer to Figure 6.

Check to see that the Driven Element will lie in the same plane as the Reflector and make certain it is still 72 3/4" (184.8 cm) from the center of one bracket to the center of the other. Now tighten the anchor screw securely.

Assembly of the Director

Select the D1 section of tubing (1 1/4" x 48", 121.9 cm long, item 4). Slip a 1 1/4" compression clamp over the D1 section. Select the D2 section (1 1/8" x 38", 96.5 cm long, item 9). Slip the unswaged end of D2 into the D1 section and measure dimension L for your mode of transmission as shown in Figure 12. Now tighten the compression clamp slightly.

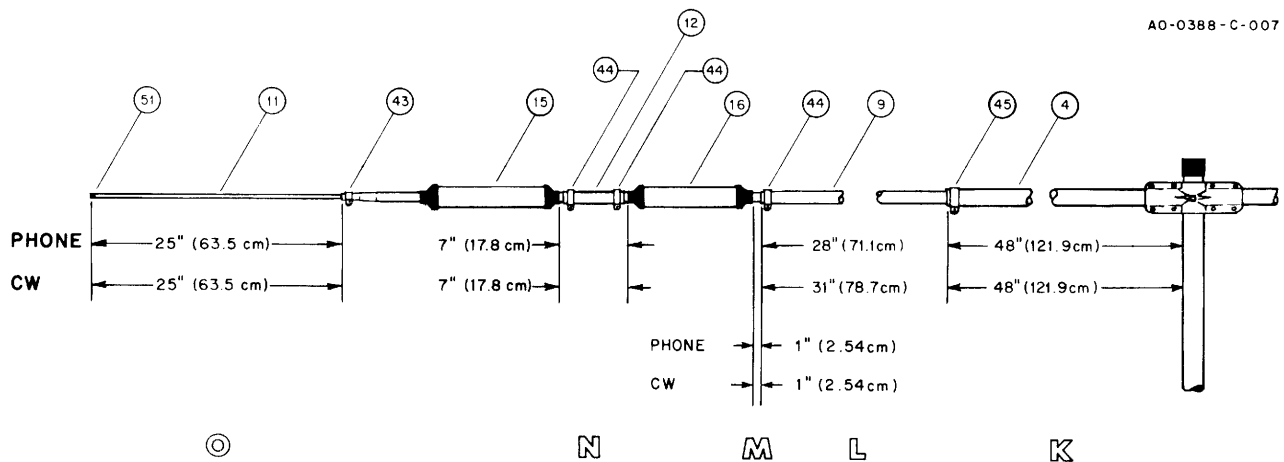


Figure 12
Director

Slip a 1" compression clamp over the swaged end of D2. Select the 10-meter trap (878749, item 16) and slip the shorted end (identified by the part number) into the D2 section. Measure dimension M for your mode of transmission as shown in Figure 12. Make certain the trap drain holes are facing downward, then tighten the compression clamp slightly.

Slip two 1" compression clamps over the D3 section (1" x 6", 15.2 cm long, item 12). Slip the D3 section over the 10-meter trap, then slip the shorted end of the 15-meter parasitic trap (878694, item 15), into the D3 section. Make certain the shorted end of the trap (identified by the part number) is inserted into the D3 section. Measure dimension N for your mode of transmission as shown in Figure 12, keeping D3 approximately equidistant from the two traps. Now tighten the compression clamps slightly.

Slip a $\frac{1}{2}$ " compression clamp over the swaged end of the 15-meter trap.

Select the D4 section ($\frac{7}{16}$ " x 28", 71.1 cm long, item 11) and slip it into the swaged end of the 15-meter trap. Measure dimension O for your mode of transmission as shown in Figure 12 and then tighten the compression clamp lightly.

Insert the Director Element into the bracket assembled on the boom. Tighten the screws to hold the element securely but *do not tighten the anchor screws* (item 25) at this time.

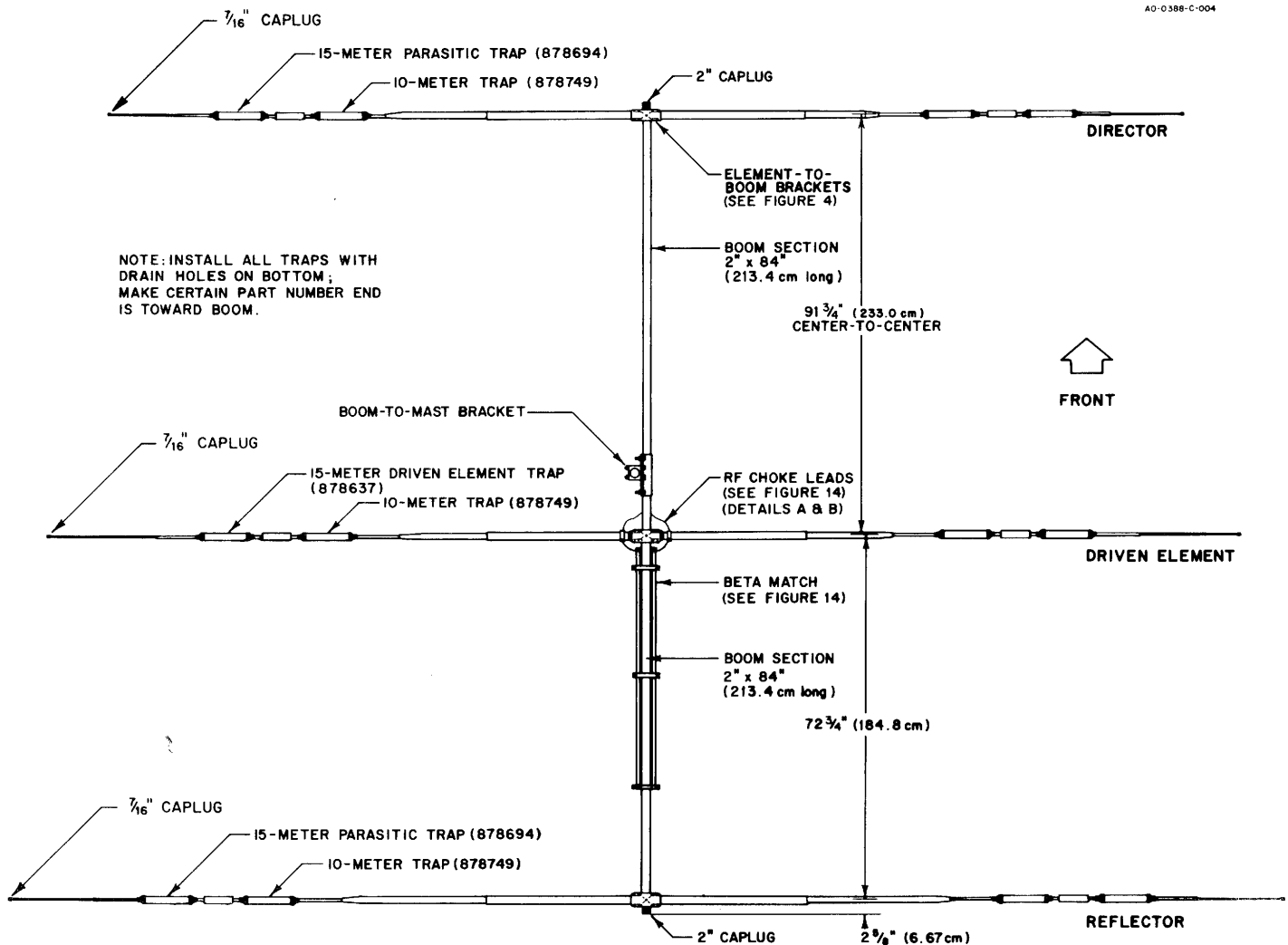


Figure 13. Overall View

Carefully recheck all measurements as shown in Figure 13. The driven element should measure $72\frac{3}{4}$ " (184.8 cm) from the center of the reflector element-to-boom bracket to the center of the driven element-to-boom bracket as shown in Figure 13. The director should measure $91\frac{3}{4}$ " (233.0 cm) from the center of the driven element-to-boom bracket to the center of the director-to-boom bracket. Make certain that the shorted ends of the trap are pointed towards the boom and the trap drain holes are facing downward. Now tighten all compression clamps and anchor screws securely.

Installation of the Beta Match

Select the beta match tubes ($\frac{3}{4}$ " x 46", 116.8 cm long, item 10) and the beta support insulators and clamps as shown in Figure 14 and Detail C & D. Assemble the beta match tubes in the boom as shown in Figure 14 and Detail C & D.

Select the beta match shorting clamps and the shorting strap and assemble as shown in Figure 14 and Detail D. Notice that the #10-24 x $1\frac{1}{2}$ " screw attaching the shorting clamps to the strap has a sleeve slipped over it. This allows you to install the shorting clamps without putting undue strain on the beta match tubes.

Install the pigtail assemblies (item 55) on the beta match tubes using the two #10 screws (item 32) and lockwashers (item 42). Slip the $1\frac{1}{4}$ " tubing clamps on the Driven Element near the insulator. Loosely attach the pigtails to the tubing clamps using the $\frac{1}{4}$ "-20 x $1\frac{1}{2}$ " screws as shown in Figure 14. **Do not** tighten the connection at this time. The coaxial feedline will connect to this point in a later step.

Final Assembly

Place a $\frac{7}{16}$ " caplug on each element tip and a 2" caplug on each end of the boom.

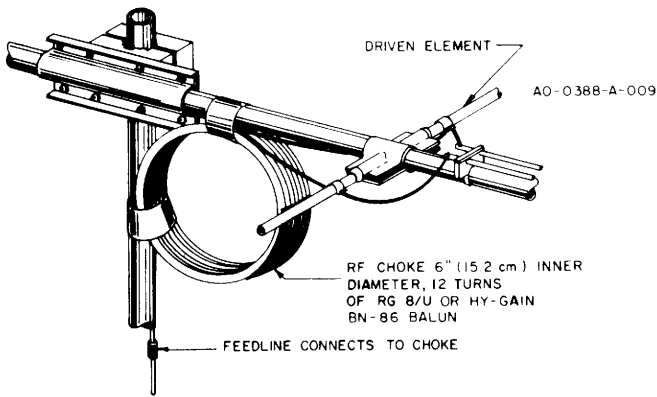
A balun is not required for normal operation of this antenna. However, there are three recommended feedpoint configurations, one of which utilizes the Hy-Gain Model BN-86 balun for increased performance and convenience.

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 14, Detail B. Attach solder lugs (not supplied) to the center conductor and shield for easy connection to the driven element. Make sure to weather proof all connections.

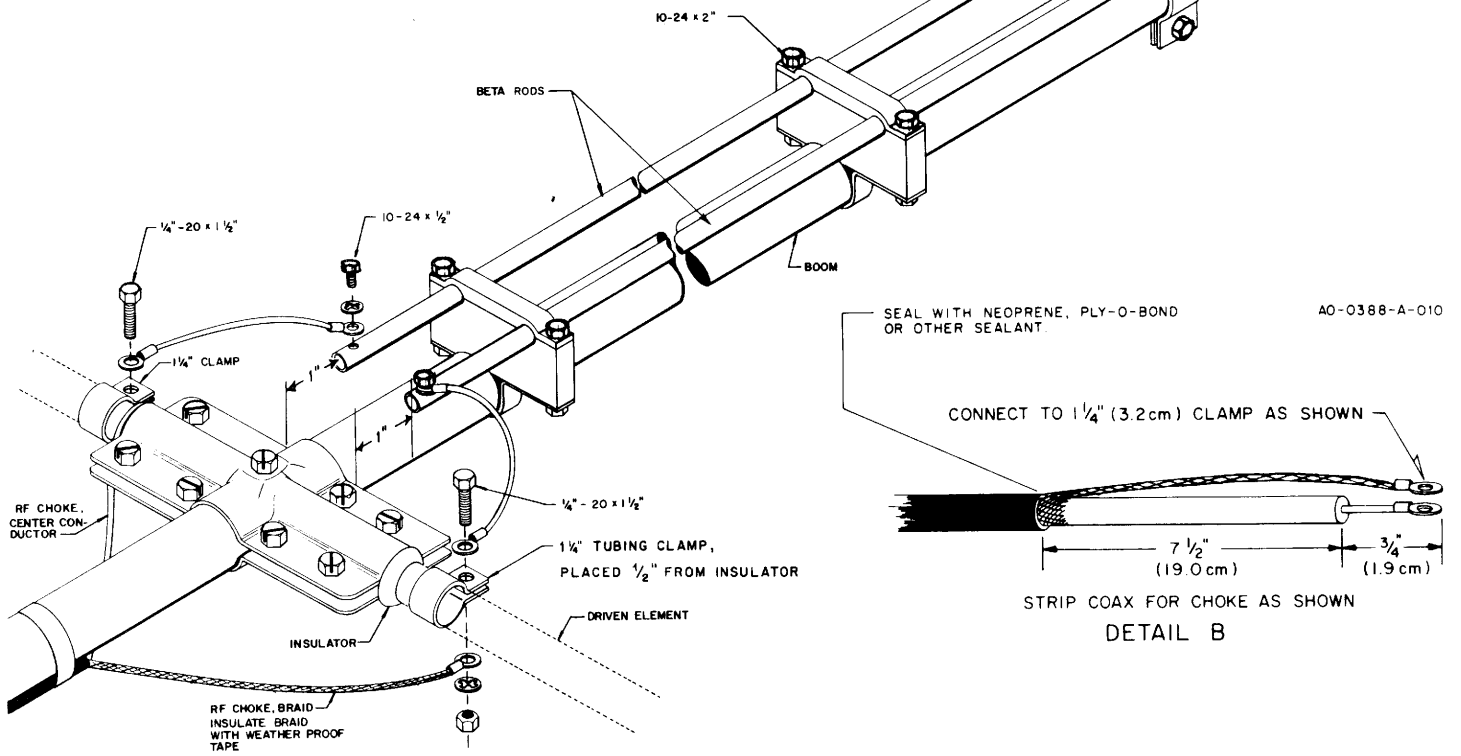
The second feedpoint configuration involves construction and installation of a homemade RF choke. The RF choke will prevent RF from flowing on the outside of the coaxial shield. This will block radiation from the coaxial feedline, thereby reducing the risk of TVI and preventing radiation pattern degradation. 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 14, Detail B. Attach solder lugs (not supplied) to the center conductor and shield for easy connection to the driven element. Weather proof all connections.

The third feed point configuration involves 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.

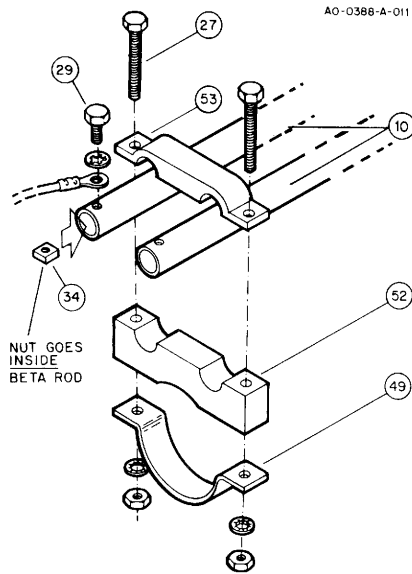
NOTE: Use caution when selecting a balun to use with this antenna. Some baluns are designed for 50-75 ohm impedance and may result in a higher SWR when used with this antenna. For best results, use the Hy-Gain BN-86, 50 ohm balun. The model BN-86 is available at your local Hy-Gain dealer.



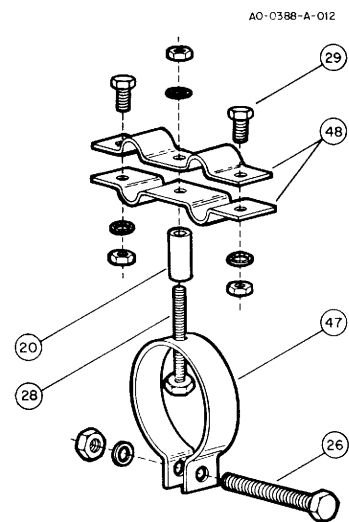
DETAIL A



DETAIL B



DETAIL C



DETAIL D

Figure 14

Parts List

Item	Part No.	Description	Qty	Item	Part No.	Description	Qty
1	102734	bracket, cast aluminum	2	24	505266	bolt, 1/4"-20 x 3/4", hex head	28
2	172732	clamp, boom-to-bracket	1	30	506968	bolt, 5/16"-18 x 2 3/4", hex head	2
3	172735	bracket, casting-to-boom	1	38	551367	nut, 1/4"-20, square	30
4	190900	R1, DE1, D1, 1 1/4" x 48"	6	37	554071	nut, #10-24, hex	9
5	165919	bracket, element-to-boom, #13	4	36	554099	nut, 1/4"-20, hex	34
6	165920	bracket, driven element-to-boom, #14	2	34	555693	nut, #10-24, square	9
7	190300	R2, 1 1/8" x 48" swg 7/8"	2	35	555747	nut, 5/16"-18, hex	9
8	178411	boom section, 2" x 84"	2	39	564792	lockwasher, 5/16", split	9
9	190307	DE2, D2, 1 1/8" x 38" swg 7/8"	4	41	562961	lockwasher, 1/4", internal	58
10	170443	beta rod, 3/4" x 46"	2	42	565697	lockwasher, #10, internal	11
11	178558	D4, DE4, R4, 7/16" x 28"	6	40	560024	flatwasher, 5/16"	7
12	190606	D3, DE3, 1" x 6"	4				
13	190607	R3, 1" x 5"	2		872089	Parts Pack C contains the following	
14	878637	trap, 15 meter driven element	2	50	455625	caplug, 2"	2
15	878694	trap, 15 meter parasitic	4	51	455644	caplug, 7/16"	6
16	878749	trap, 10 meter	6	52	465595	insulator, beta tube, bottom	2
17	872089	Parts Pack C	1	53	465600	insulator, beta tube, top	2
18	871867	Parts Pack D	1	54	465833	insulator, DE-to-boom	2
19	871787	Stainless Steel Hardware Pack, 388S	1	55	878561	pigtail assembly	2
		Contains the Following:					
23	500153	bolt, 5/16"-18 x 5", hex head	4		871867	Parts Pack D contains the following	
22	500154	bolt, 5/16"-18 x 3 1/2", hex head	3	20	171131	beta sleeve	1
25	500156	bolt, 1/4"-20 x 3/8", hex head	6	46	168695	tubing clamp, 1 1/4"	2
27	500157	bolt, #10-24 x 2", hex head	4	47	171077	beta shorting strap, 2" ID	1
29	500158	bolt, #10-24 x 1 1/2", hex head	5	48	171162	beta shorting strap, 3/4"	2
28	500159	bolt, #10-24 x 1 1/2", hex head	1	49	177888	beta support clamp	2
21	504069	bolt, #10-24 x 1", hex head	6	43	380413	compression clamp, 1/2"	6
26	504098	bolt, 1/4"-20 x 1 1/2", hex head	27	44	380421	compression clamp, 1"	18
				45	380422	compression clamp, 1 1/4"	6

471-337-37.26
 33.77
 7-2-61-117-9585

13m
 2.100
 1.111
 1.111

Converting English Measurements to Metric

Use this scale to identify lengths of bolts, diameters of tubes, etc.
 The English inch (") and foot (') can be converted to centimeters in this way.

$$1 \text{ inch (1")} = 2.54 \text{ cm}$$

$$1 \text{ foot (1')} = 30.48 \text{ cm}$$

Example: $42" \times 2.54 = 106.7 \text{ cm}$

