

INSTRUCTIONS FOR HY-GAIN TRI-BANDER MODEL TH-2

A. DESCRIPTION

The HY-GAIN Thunderbird tri-banders are three band antennas designed for 10, 15 and 20 meters. Multi-banding is accomplished through the use of the HY-GAIN "SOLID STATE" Slim Line Traps which isolate various sections of the antenna.

B. MOUNTING

All HY-GAIN communications antennas are designed to fit a 1 5/8" outside diameter mast. The 1 1/4" inside diameter steel galvanized plumbers pipe (which is 1 5/8" outside diameter) is highly recommended for mast use. It is very strong and also relatively low in cost. Adaptation for larger outside diameter masts can easily be made through the use of standard couplings and nipples.

IT IS EXTREMELY IMPORTANT that the antenna be mounted in the clear. The detrimental effect of surrounding objects is often underestimated in the average antenna installation. Extensive experimentation at our antenna range has pointed up the fact that these effects can be very serious and the problem of getting the antenna in the clear of surrounding objects is a very important one. It should be pointed out in particular that power lines and other metal objects of considerable mass or length will deteriorate the performance of any antenna. It is therefore highly recommended that one of the first considerations in any antenna installation be the positioning of the array as far away as possible from surrounding objects. In this respect, a little additional transmission line, with the accompanying transmission losses, is much to be preferred over the close proximity of surrounding objects.

C. HEIGHT

In general, any antenna system operating above 14MC should be at least 40 feet above ground. If mounted on a house or building, the antenna should be at least 20 feet above the roof.

D. LIGHTNING PROTECTION

Your antenna installation may be adequately protected from lightning if you properly ground the base of the tower or mast which supports your antenna. A proper ground consists of #8 or larger copper or aluminum wire running directly and by the shortest path to a 1/2" x 8' copper clad steel ground rod driven into the earth. All other grounds, for example, water pipes, vent pipes, etc. should be avoided. The chassis of your transmitter should also be grounded with a similar grounding system.

E. STACKING

It is not recommended that any antennas which are resonant below 30mc be stacked or mounted near the Tri-Bander. This includes doublets and verticals as well as beams. VHF beams (on 50MC or higher) when mounted at least 8 feet away from the Tri-Bander, will not seriously affect its operation. However, the Hy-Gain Model 402B, 40 meter beam may be installed either 10' above or below the TH-2 without any adverse detuning effect.

The HY-GAIN TH-2 may be rotated by heavy duty TV rotators in winds up to approximately 40 MPH. In higher wind areas, the HY-GAIN Roto-Brake is recommended.

G. MECHANICAL SPECIFICATIONS

| | TH-2 |
|--------------------------|----------------|
| Boom Length | 6' |
| Boom Material | Aluminum |
| Boom Outside Diameter | 2" |
| Longest Element | 26' 11" |
| Element Diameters | 1 1/8" to 3/4" |
| Element Material (Alum.) | 6063T832 Alloy |
| Net Weight (Lbs) | 19 |
| Wind Surface (Sq. Ft.) | 2.86 |
| Wind Load at 100 MPH | 85.9 |

H. ELECTRICAL SPECIFICATIONS

| | TH-2 | | |
|---------------------------------|-------------|-----|-----|
| | 10M | 15M | 20M |
| Gain in DB over 1/2 wave dipole | 5.5 | 5.1 | 5.0 |
| Front to Back ratio in DB | *(12 to 20) | | |
| Typical SWR at resonance | 1.5 | 1.3 | 1.5 |
| Maximum Power Input (P.E.P.) | 2 KW | | |
| Maximum Power Input (AM) | 1 KW | | |

*Front to back ratio will vary considerably with height above ground and the proximity of surrounding objects. Front to back ratio is also dependent upon the arrival angle of the radio frequency wave front. Maximum front to back ratio is maintained over only a very narrow band of frequencies. Approximately equivalent to plus or minus 1/2 of 1% of the operating frequency.

I. LENGTH AND SPACINGS

The element length and spacings were very carefully experimentally derived at our antenna test range. They are shown for either phone or CW operation in a sketch of the antenna in another part of this manual. It is recommended that these figures be used and that no attempt be made to further adjust the parasitic reflectors and/or directors. The antenna will perform within 10% of its electrical specifications if it is mounted at least 40 feet high and relatively in the clear of surrounding objects.

J. THE BETA MATCHING SYSTEM

The exclusive HY-GAIN Beta matching system is completely factory pretuned and requires no further adjustment. The Beta matching line is mounted and the 52 ohm coaxial feed line cable is attached as shown in Figure 2. Simply strip the center conductor and shield of the coaxial cable back about 7 1/2" and attach soldering lugs. (See Figure 2). The soldering lugs are then connected to the driven element input terminals as shown. (BE SURE TO SEAL THE EXPOSED END OF THE COAXIAL CABLE TO PREVENT MOISTURE FROM GETTING INSIDE THE PLASTIC COVERING.)

K. TRANSMISSION LINES

The HY-GAIN TH-2 is designed for use with 52 ohm coaxial transmission lines. RG-58/U may be used when line runs are short and power levels do not exceed 100 watts. RG-8/U has relatively lower loss and will handle 1 KW of RF power.

Special "Polyfoam" type RG-58/U and RG-8/U coaxial cables are highly recommended because of their lower relative losses and constant impedance characteristics.

When originally laid out, the feed line should be a little longer than necessary, to facilitate pruning (for proper transmitter loading on all bands, if necessary). Pruning of the feed line is sometimes necessary if transmitter loading is either too heavy or too light. If your antenna is at least 40 feet high and relatively in the clear of surrounding objects, an SWR of 2:1 or less at resonance will result. An SWR of 2:1 or less at resonance is considered very good, and results in negligible transmission line losses. As is well known, height above true electrical ground, the proximity of surrounding objects and many other factors will affect SWR readings at any given installation site.

ASSEMBLY INSTRUCTION FOR MODEL TH-2

Before assembly begins, all parts should be checked against the parts sheet. When assembling, keep all telescoping sections free from dirt and grit. Supplied with the antenna is a jar of ELECTROSEAL. This is a specially compounded material which is an oxidation inhibitor and increases electrical conductivity. It should be applied to mating surfaces at all telescoping sections and other parts where an electrical connection is made.

The element lengths for PHONE and CW operation may be found on Page 6. This figure gives the element section dimensions for all elements.

The two element Thunderbird Tri-Bander should be assembled in the following steps:

1. Driven Element Assembly
2. Reflector Assembly
3. Boom Assembly

1. DRIVEN ELEMENT ASSEMBLY

All parts relating to the driven element are bundled together and marked with printed tape. Refer to Page 6, Figure 6. If it is possible completely assemble the entire antenna on the ground and then hoist it into position on a tower or pole, it is, of course, the most desirable. If, however, it is impossible to completely assemble the antenna on the ground, (because of obstructing wires or trees,) the boom to driven element bracket with sections DE1A should be assembled on the ground and the outer end sections inserted when the boom is on the tower.

Refer to Figure 5 which shows the boom to driven element bracket assembly. The point of attachment is marked with printed tape. The two 1/4" formed bolts are assembled through the two brackets and ride over the boom and are secured with nuts on each end. The 1/4" bolts also pass directly through the boom. Part DE2 is inserted into part DE1A and secured with 1 1/8" aluminum tubing clamps. Part 3 is the 10 meter slim trap, and is inserted into part DE2 and secured with a 1" tubing clamp. BE SURE TO INSERT THE SHORTEST LENGTH OF TUBING EXTENDING FROM THE SLIM TRAP INTO PART DE-2. Part DE4 is then mounted on the outer tubing extending from the slim trap. Do not secure until Part 5 (the 15 meter slim trap) is inserted into Part DE4, and the proper dimensions are attained, then secure with 1" tubing clamps. The 15 METER SLIM TRAP IS INSTALLED IN THE SAME MANNER AS THE 10 METER SLIM TRAP. Into the outer end of Part 5, insert Part DE6 and secure with 7/8" tubing clamps.

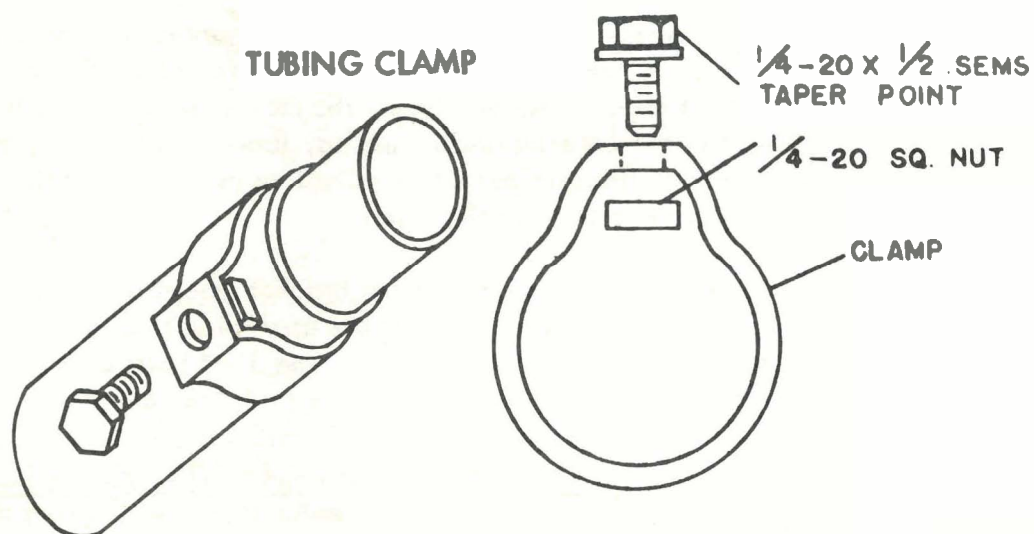
Refer to Figure 2. Place the Beta Match on the bottom side of the boom. Secure the end of the hairpin (nearest the reflector) to the boom with the shorting clip, and sheet metal screw. Secure the insulator to the boom, at the point drilled, with a sheet metal screw. The open ends of the hairpins are attached to the driven element with self-tapping screws, and flat washers as shown in Figure 2.

2. REFLECTOR

Both of these elements are assembled in the same manner. REFLECTOR. Select the center section (Part R1) and attach the element to boom bracket as shown in Figure 3. Insert Part R2 into Part R1, adjust to dimension given on Page 6 for phone or CW and secure with 1 1/8" tubing clamps. Part 3 is then inserted into Part R2, adjusted for proper length and secured with 1" tubing clamps. BE SURE TO INSERT THE SHORTEST LENGTH OF TUBING EXTENDING FROM THE SLIM TRAP INTO PART R2. Part R4 is then mounted on the outer tubing extending from the slim trap. Do not secure until Part 5 (the 15 meter slim trap) is inserted into Part R4, and the proper dimensions are attained, secure with 1" tubing clamps. Into the outer end of Part 5, insert Part R6 and secure with 7/8" tubing clamps. Care should be taken to be sure that both sides of these elements are the same length and symmetrical.

3. BOOM ASSEMBLY

As mentioned previously, if the site will allow the complete assembly of the antenna on the ground, it is the most desirable. If this is not possible, we suggest the boom be raised to the top of the supporting structure and held in the vertical position (parallel) with the tower or pole and the reflector and driven element mounted. The position for mounting the reflector is marked with printed tape. The antenna may then be mounted on the mast as shown in Figure 4.



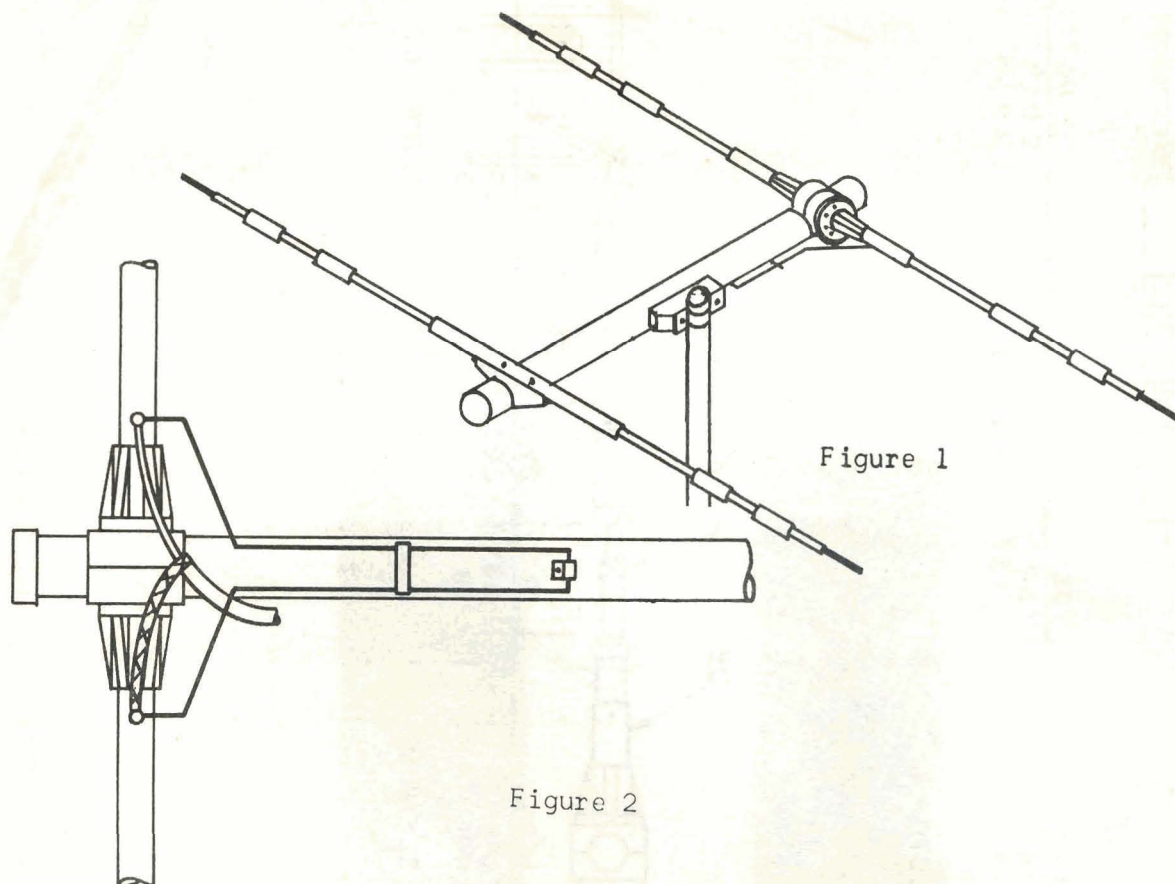


Figure 1

Figure 2

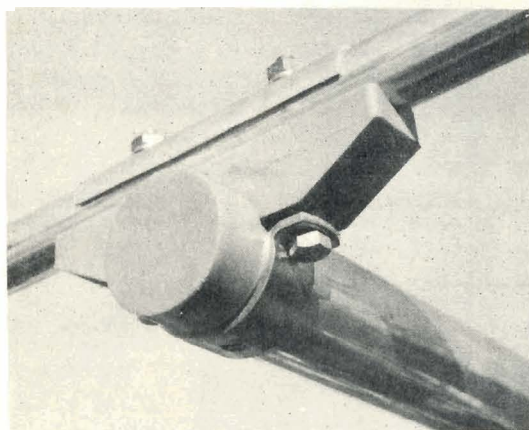


Figure 3

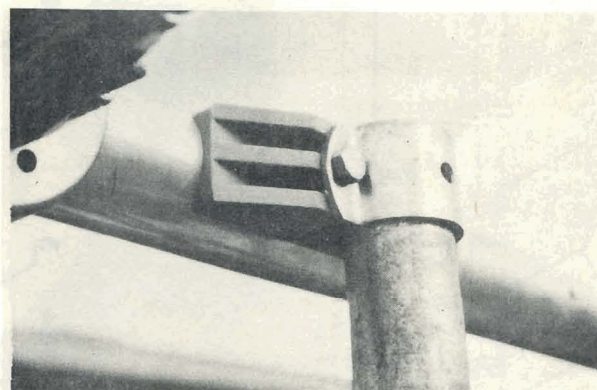


Figure 4

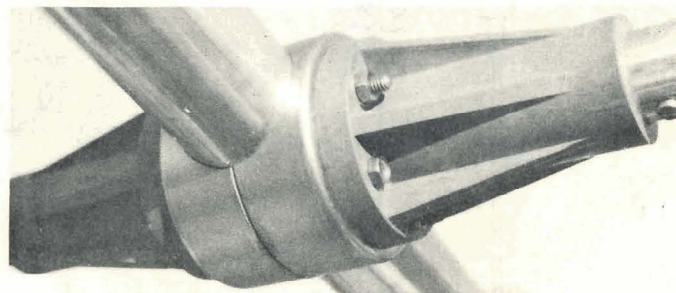
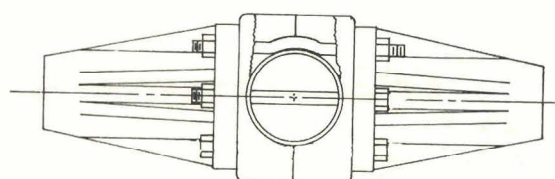


Figure 5

TH-2

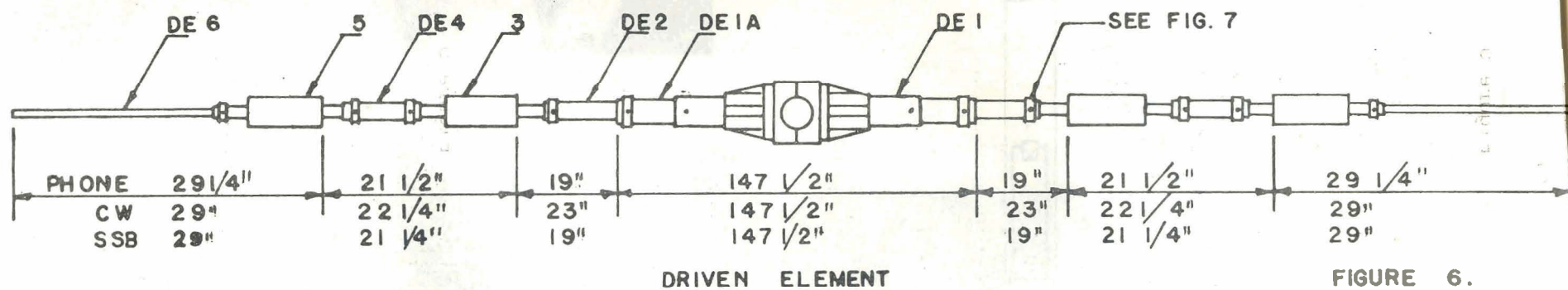
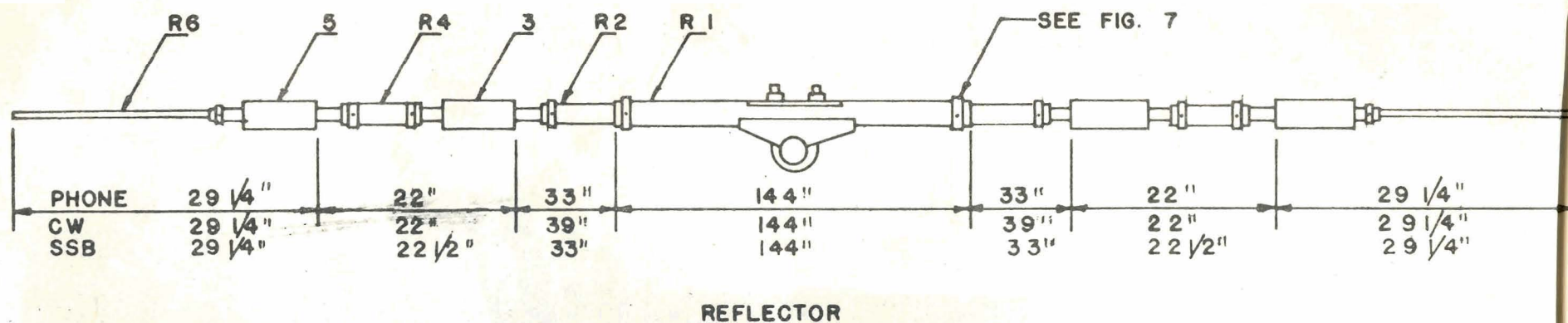


FIGURE 6.

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M-TH2-1

PARTS LIST FOR MODEL TH-2

| <u>PART NO.</u> | <u>DESCRIPTION</u> | <u>QUANTITY</u> |
|-----------------|---|-----------------|
| R1 | 1 1/8 x .058 x 144" Aluminum Tubing | 1 |
| R2 | 1 x .058 x 40 1/2" Aluminum Tubing | 2 |
| R4 | 1 x .058 x 14 1/2" Aluminum Tubing | 2 |
| R6 | 3/4 x .035 x 20 1/4" Aluminum Tubing | 2 |
| DE1 | 1 1/4" Tubing with insulator and cup assembly | 2 |
| DE1A | 1 1/8 x .058 x 72" Aluminum Tubing | 2 |
| DE2 | 1 x .058 x 24 1/2" Aluminum Tubing | 2 |
| DE4 | 1 x .058 x 14 1/2" Aluminum Tubing | 2 |
| DE6 | 3/4 x .035 x 20 1/4" Aluminum Tubing | 2 |
| Boom | 2 x .049 x 72" | 1 |
| 3 | 10 Meter Mini Slim Traps | 4 |
| 5 | 15 Meter Mini Slim Traps | 4 |
| H1 | 1/8" Aluminum Rod Hairpin with Insulators | 1 |
| | Boom to Mast Bracket (Plastic) | 1 |
| | Element to Boom Bracket (Plastic) | 1 |
| | Electroshield (Container) | 1 |

PARTS PACKAGE

MATERIAL

| | | |
|----------|---------------------------------|----|
| | Flat Washers | 2 |
| Aluminum | Back Plates | 1 |
| Steel | Sheet Metal Screw | 4 |
| Steel | 5/16" x 4" Bolts | 2 |
| Steel | 5/16" x 3" Bolts | 2 |
| Steel | 1/4 - 20 x 4" Formed Stud Bolts | 2 |
| Steel | 1/4 - 20 x 4" Bolts | 2 |
| Steel | #10 Thread-cutting Bolts | 2 |
| Steel | 5/16" Nuts | 2 |
| Steel | 5/16" Lockwashers | 2 |
| Steel | 1/4" Nuts | 6 |
| Steel | 1/4" Lockwashers | 6 |
| Steel | 5/16" Nuts | 2 |
| Steel | 5/16" Lockwashers | 2 |
| HS1 | Hairpin Shorting Strap Assembly | 1 |
| | Element to boom strap | 1 |
| Steel | Boom to Mast Strap | 1 |
| Aluminum | 1 1/8" Compression Clamp | 4 |
| Aluminum | 1" Compression Clamp | 12 |
| Aluminum | 7/8" Compression Clamp | 4 |
| | 1/4" - 20 x 1/2" Screw | 20 |
| | 1/4" - 20 Square Nut | 20 |

HY-GAIN ANTENNA PRODUCTS
1135 NORTH 22nd STREET
LINCOLN, NEBRASKA