

FREDERICK TOOL & ENGINEERING CORP.
414 Pine Avenue
Frederick, Maryland
Electronics --- Machine Work

INSTRUCTIONS FOR INSTALLATION OF FT-100 BEAM

GENERAL

The beams are shipped in a single package with all hardware included. Small diameter tubing is "telescoped" inside larger tubing. Included with this instruction sheet is a drawing showing the method of assembly, selection of parts for each element, and the dimensions for each element.

PUTTING THE BEAM INTO OPERATION

The traps have been adjusted at the factory for "center-of-band" but this beam, like any other, will give best results if tuned in place. Power lines, other antennas, surrounding trees, or buildings can upset any beam. Therefore, you must decide how your talents, equipment, and time are to be used in putting this antenna into operation. If you don't want to check it, just put it up and it will do a reasonable job. If you like to concentrate on cw or fone, you will find it time well spent if you check all traps and adjust them to fit your particular requirements. For tuning instructions see sections on trap and element adjustments.

MOUNTING THE BOOM

Before commencing assembly, decide how you will mount the boom. A mounting plate (part #13) is supplied to permit mounting on a 2" O.D. pipe (1½" I.P.S.). It is recommended that the mounting plate and the mast be drilled through with a ½" clearance hole so that the plate can be bolted to the mast with a ½" round head bolt at least 4" long. A pilot hole is drilled in the plate as supplied and is located near the center of the plate. The purpose of this bolt is to provide ease of erection and to permit easy access to all parts of the beam from the tower. This is accomplished as follows:

Assuming that the antenna is in place and it is desired to make some adjustment, the procedure would be as follows:

1. Loosen the U-bolts (parts #20) holding the boom to the mounting plate.
2. Rotate the boom so that the elements are in a vertical position, then tighten the U-bolts to hold the elements in this position.
3. Next, remove the U-bolts (parts #21) holding the mounting plate to the mast.
4. Loosen the nut on the ½" bolt and run it out to almost the end of the bolt. (A second "Jam" nut or a cotter pin should be used at the end of the bolt to prevent the nut from falling off).
5. The whole beam can now be rotated like a windmill and any desired portion can be reached from a position on the tower.

ASSEMBLY PROCEDURE

Refer to drawing for parts noted below:

1. Remove all parts from the packing carton, handling assembled traps carefully to avoid bending the coils. (As noted in the introductory statement, a number of parts are packed inside the boom tubes).
2. Place the two boom tubes (Parts #1) end to end.
3. Spread the boom splice (part #10) slightly by inserting a screwdriver in the slot running the full length of the splice. Then insert one of the boom tubes 9" inside the splice.
4. Slide the 2 inch piece of 2½" diam. tubing (part #11) over the second boom tube, moving it at least 1 foot onto the tube. (This will be the reflector end of the boom).
5. Insert the second boom tube into the boom splice until the two butt against each other.

6. Assemble clamps (parts #19) as shown in the diagram.
7. Assemble the boom mounting plate (part #13) as shown in the diagram. (The need is now seen for part #11 noted in item 4).
8. Assemble one element saddle (part #8) for a $1\frac{1}{2}$ " element tube with the center of the saddle 3 inches from the end of the boom. Repeat operation on opposite end. (Do not tighten the U-bolts (parts #16) so as to distort the end of the boom more than $\frac{1}{4}$ ").
9. Assemble one element saddle (part #9) for a $7/8$ " diameter element tube (director No. 1) 6 ft. 9 inches from director No. 2 but leave bolts loose.
10. Assemble one element saddle (part #8) for $1\frac{1}{2}$ " diameter element (driven element) 10 feet forward from reflector No. 2 but leave bolts loose.
11. Assemble one element saddle (part #9) for a $7/8$ " diameter element tube (reflector No. 1) 5 feet from reflector No. 2 but leave bolts loose.
12. Check the spacing which should be, from center to center of saddles, Ref. No. 2 to Ref. No. 1 - 5 ft; Ref. No. 1 to Driven Element - 5 feet; Driven Element to Dir. No. 1 - 6ft. 9 in.; Dir. No. 1 to Dir. No. 2 - 6 ft. 9 in.
13. Insert all five of the 12 foot element tubes in the saddles, measuring carefully to get them exactly centered. NOTE - The driven element has insulator at center.
14. Set the boom up on two supports, such as boxes, and carefully check each end of the element tubes for dirt or burrs which might obstruct the entrance of the extensions.
15. Slip a hose clamp of proper size (see diagram) over each end of each element tube.
16. Insert the extensions into the element tubes in accordance with the drawing. If there is any tendency to bind, remove the extension and check for dirt. These parts fit very closely and any foreign matter can cause serious "jamming." A lubricant such as silicone DC-4 will help in assembly.
17. Set all dimensions for elements as shown in table on drawing.
18. Rotate (tilt) the three loose center elements relative to the end elements. Line up the two end elements by loosening the boom splice clamps and rotating the boom in the splice until the two elements are in line (in the same plane). Move some distance away from the assembly and directly in line with the boom to get an accurate perspective of the alignment.
19. Tighten the boom splice clamps and recheck the alignment of the end elements.
20. Align the driven element in the same plane as the end elements and tighten the U-bolts. Caution: Take up the nuts evenly to prevent rotating the element out of alignment. Recheck again to be certain the three elements are still parallel.
21. Align the $7/8$ " elements in the same manner. Then check over-all alignment and correct any misalignment. Check all nuts to be sure they are tight.
22. Assemble beam on the mast.
23. Connect an RG 8/U (52 ohm) coaxial feed line as follows:
 - a. Strip 12 inches of vinyl jacket from one end of the coax.
 - b. Compress the shield braid from the end of the coax back toward the end of the vinyl jacket.

- c. Separate the shield braid, that is, make a small opening about an inch from the end of the vinyl jacket.
- d. Pull the center coax conductor with insulation intact through this opening.
- e. Solder a $\frac{1}{4}$ " lug to each conductor allowing ample length to reach between the two feed points of the driven element.
- f. Starting with the end previously lugged, form the coax feedline into a "bundle" approximately 5 inches in diameter and consisting of 12 turns. (This will require a feedline about 20 feet longer than would otherwise be required so be sure you have ample length to start with) Tape the turns together securely and then tape the assembly to the boom just forward of the driven element.
- g. Connect the end lugs to the driven-element feed-point bolts.

10 METER TRAP ADJUSTMENT

The 10 meter traps (parts #4) are removed from the assembly as follows: Loosen the $1\frac{1}{2}$ " clamp and slide the element extension off the $1\frac{3}{8}$ " diam. tubing (part #3). Next loosen the $\frac{7}{8}$ " clamp and slide the trap off the conversion assembly (part #5). This leaves the trap assembly, which is about 14" long, free from other parts and ready for checking. The assembly should be set up on a workbench or table, a foot or more away from any metallic objects, and checked by holding the coil of a grid-dip meter as far away from the trap coil as possible but still permitting a good meter indication. The 10 meter coils should be adjusted to resonate at a frequency 300 kc. lower than the center of the frequency range in which you normally operate. For cw operation this would be about 28.0 mc., and for fone operation 28.5 mc. to 29.0 mc. depending on your operating habits. Adjustment of the traps is accomplished by loosening the socket head cap screw in the clamp fitting which holds the coil to the $\frac{7}{8}$ " diam. tube, and sliding the fitting in or out to obtain the desired resonant frequency. (The necessity for adjustment of traps to a frequency lower than that at which you prefer to operate is caused by the length of the trap itself. If the trap could be made to have no length it could be tuned to the operating frequency).

15 METER TRAP ADJUSTMENT

To check the 15 meter traps, first remove the 20 meter end extension tube ($\frac{3}{4}$ " diameter tube extending out of the 7 turn trap) by loosening the $\frac{7}{8}$ " clamp located at the junction point of the $\frac{3}{4}$ " tubing and the 7 turn trap (part #6). Next, loosen the $1\frac{1}{2}$ " clamp at the end of the conversion unit. The 15 meter trap can now be removed. This trap is about 14" long free from other parts and ready for checking. These traps should be adjusted to resonate 1200 kc. below the center of the frequency range in which you normally operate. Adjustment to 19.9 mc. for cw or 20.15 mc. for fone will be found to be satisfactory frequencies. (Observe the precautions noted in preceding paragraph on 10 meter traps relative to keeping traps away from metal objects during adjustment).

ELEMENT ADJUSTMENT

In setting the element lengths be sure to make all measurements to the point where the tubing meets the polystyrene as indicated on the drawing. From Table IV, it will be noted that the 20 meter director element is longer for the high frequency adjustment than for the low frequency adjustment. THIS IS NOT AN ERROR. If it is desired to change the frequency at which minimum SWR is obtained on any one band, it is permissible to change the length of the driven-element slightly. Note that this will change the frequency of minimum SWR on all lower frequency bands. For example if the 15 meter length is changed by increasing length "B" the operation on 10 meters will be unaffected but the operation on 20 meters will be affected and length "C" might require a correction. Adjustments on the driven-element will not affect the gain or the front-to-back ratio of the beam. Any such changes made to the parasitic elements will have a marked effect on both the gain and front-to-back ratio and should be made only if one is prepared to make necessary field measurements to determine the operating efficiency.