KLM KT-34A BANDPASS TRIBANDER
(REVISED 10/24/83)

01759

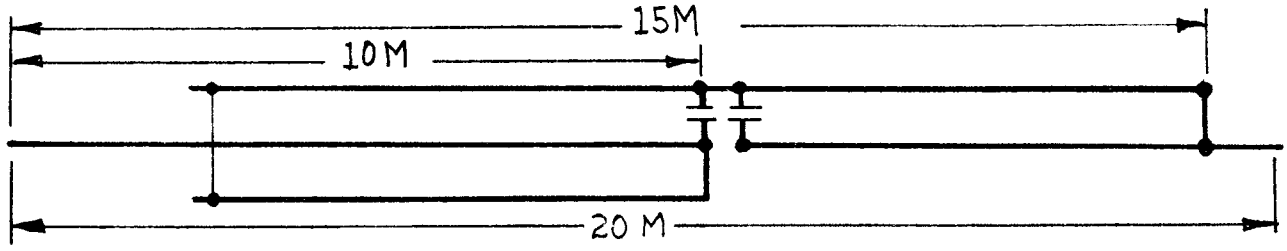
The KT-34 Tribander is innovative in concept, unique in its practical design, consistent in superior performance.

All four of the elements work on each band. Ten meters is a full-sized element using a trap formed with a small amount of linear loading (also used to shorten 20 meter section) and an air capacitor. Fifteen meters uses a tuned decoupling stub with another air capacitor and is also a full-size element. Twenty meters is approximately 75% of full size and defined by the element extending beyond the 15 meter decoupling jumper. Twenty and fifteen meters tune with total independence.

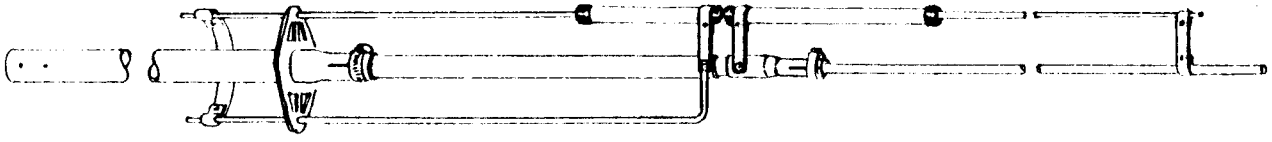
Two driven elements (log cell) with all three resonances are employed to achieve a broadband driven structure which allows almost constant flat VSWR and performance across each of the three bands. Basic feed impedance is 200 ohms balanced and is transformed to 50 ohms unbalanced with the 4KW PEP KLM balun (supplied).

Power handling capability is excellent with no lossy coils or capacitors. Consequently efficiency is high (a conventional tribander may be rated at 8db gain but if it's only 50% efficient, the effective gain is really 5db).

Normal operation (14.-14.350), (21.0-21.450), and (28.-29.50 MHz) requires no adjustments other than the original assembly dimensions given later in the text.



SKETCH AND SCHEMATIC OF TYPICAL ELEMENT HALF



KT-34A SPECIFICATIONS

Frequency of Operation:

20M = 14.0 - 14.35 MHz
15M = 21.0 - 21.45 MHz
10M = 28.0 - 29.75 MHz

Elements: 4 on each band
Max element length: 24 feet
Gain: 7dB over a dipole reference
F/B: 20M-25dB, 15M-22dB, 10M-20dB
F/S: 30dB or better

Feed Impedance: 200 ohms balanced/50 ohms with 4:1 balun supplied
Power Rating: 4KW P.E.P.
Wind Area: 6 sq. ft.
Wind Survival: 100 M.P.H.
Turning Radius: 15 ft.
Weight: 45 lbs.
Boom Length/Dia.: 16 ft./3" O.D.
Mounting: 2" mast

PARTS LIST

KT-34A BANDPASS TRIBANDER

HARDWARE PACKAGE #1

10-32 x 2-1/2" Screws	16
1/4-20 x 3-1/2" Bolts, s.s.	12

HARDWARE PACKAGE #2

8-32 x 1/2" Screws	56
8-32 x 1 3/4" Screws	16
#6 x 3/8" Sheetmetal Screws	7
10-32 x 3/8" Hexhead Screws	8

HARDWARE PACKAGE #3

#8 Flatwashers	2
#8 Lockwashers	94
8-32 Nuts	94

HARDWARE PACKAGE #4

#10 Flatwashers	2
#10 Lockwashers	26
10-32 Nuts	42

HARDWARE PACKAGE #5

1/4-20 Nuts & Lockwashers	12ea.
3/8-16 Nuts & Loxkwashers	4ea.
5/16-18 Nuts & Lockwashers	4ea.

HARDWARE PACKAGE #6

1/2" x 8-3/4" Jumper Strap	2
Standoffs, phasing straps	2
1/4 x 1" Linear Inserts(Peanuts)	8

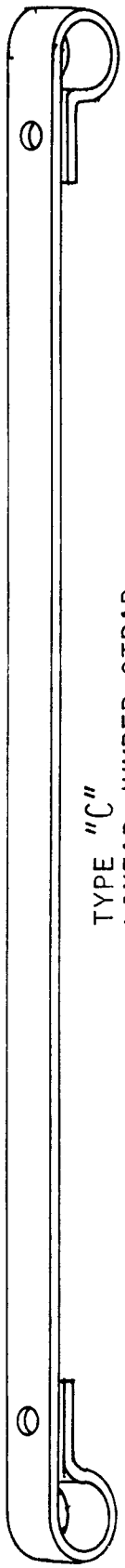
IN HARDWARE BOX

M-10 (or M-8) Band Clamps	8
5/8" Compression Clamps	8
Capacitor Caps	32
Capacitor Strap(Type A)	16
15M Strap (Type B)	8
Linear Jumper Strap (Type C)	8
Match Strap (Type D)	2
Linear Insulators 1"	8
Reducing Sections 1-1/2" to 1"	8
3/4" O.D. x 5" Swaged Section	8
4" Fiberglass Rod(5/8" O.D.)	8
HTM-350 Band Clamps	4
Anti-Sieze Paste	1
2" U-bolts & cradles	2ea.
3" U-bolts & Cradles	2ea.
Boom Caps(Factory Option)	2
Balun & Clip 3-60-4"1	1ea.

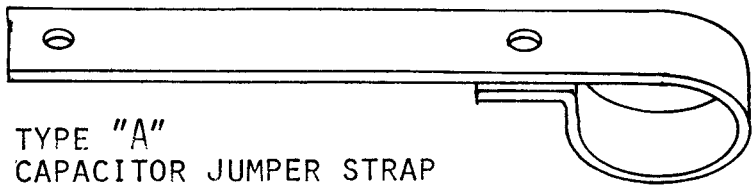
IN SHIPPING BOX

Boom: 3"O.D. x 5'5" straights	3
2.85"O.D. x 15" splice	2
-OR-	
3"O.D. x 5'8" Swaged	2
x 5'7" Straight	1
Elements:	
1"O.D. x 72" Swaged with 7/8" insert	8
3/4"O.D. Section x 23 3/4"	8
3/4"O.D. Capacitor Sections:	
x 8"	4
x 9"	2
x 10"	2
x 16"	8
1/2"O.D. x 48"	2
x 42-1/2"	2
x 53-1/2"	2
x 56-1/4"	2
3/8"O.D. x 72"	4
x 77"	4
x 30" with bend	8
Match Section (Factory Assembled):	
3/8"O.D. x 24"	2
1/4"O.D. x 4" Fiberglass Rod	1
8-32 x 1 1/2" Screws, Nuts, & Lockwashers	2 ea.
Boom-to-Mast Plate 8" x 9" or larger	1
Phasing Straps 1/2" x 55 1/2"	2
Boom Caps (Factory Option)	2
Balun & Clip 3-60-4:1	1ea.
Insulators 1-1/2" x 3"	4
Instructions	1

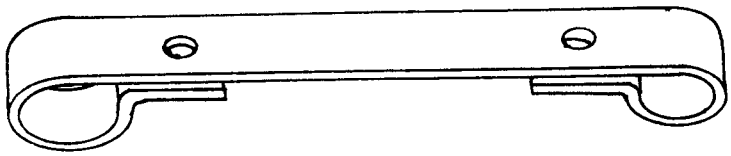
SMALL PARTS IDENTIFICATION PAGE



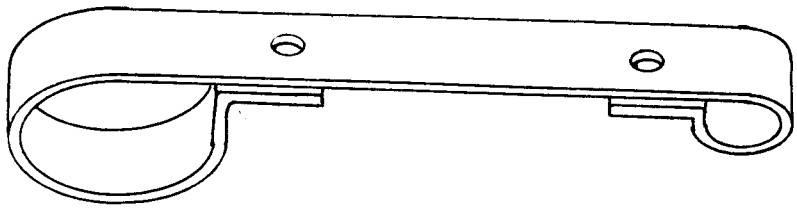
TYPE "C"
LINEAR JUMPER STRAP



TYPE "A"
CAPACITOR JUMPER STRAP

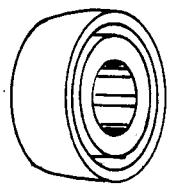


TYPE "B"
15 METER SHORTING STRAP

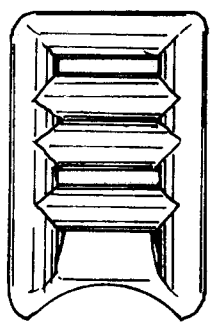


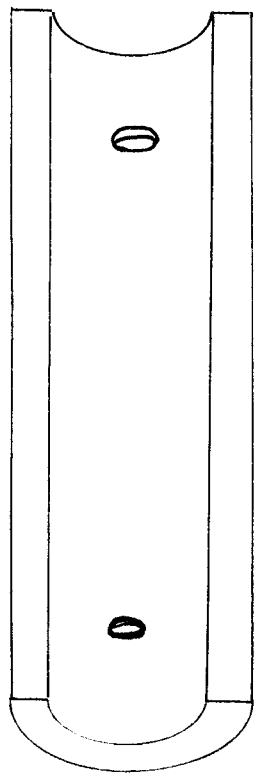
TYPE "D"
MATCH STRAP

CAPACITOR
CAPS



PHASING STRAP
STANDOFF

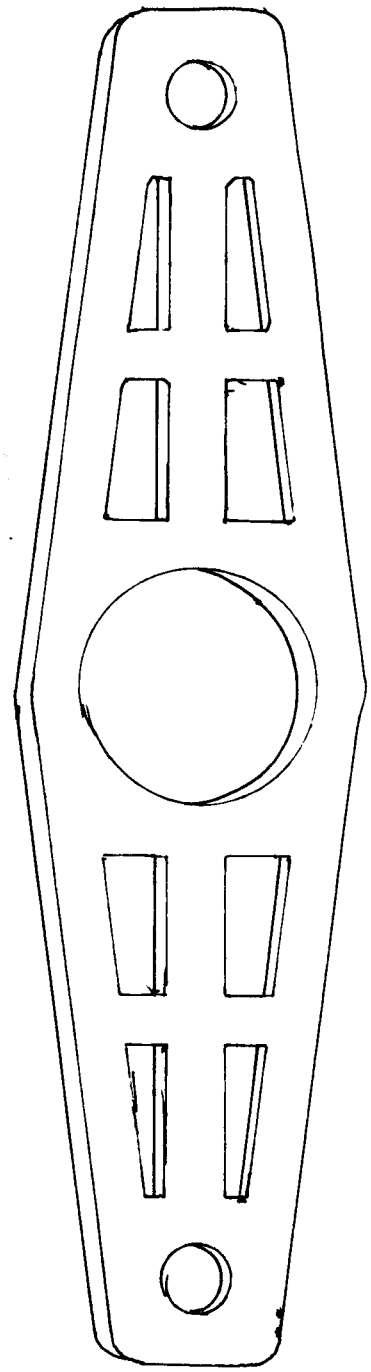




INSULATOR
REDUCTION
SECTION

LINEAR
REINFORCING
INSERT "PEANUT"

LINEAR
INSULATOR



I. BEFORE YOU BEGIN.....

1. Select an area large enough to accomodate boom and element lengths. A long workbench is helpful for assembling the element halves. Two sawhorses or large boxes are useful for holding the boom at a comfortable working height. A shallow box is handy for holding and sorting the small hardware. You will need a tape measure, screwdriver, spintites and socket or end wrenches. Common nut sizes used are:

11/32" ..... 8-32 hdwe	7/16" ..... ¼-20/28 hdwe
3/8" ..... 10-32" hdwe	1/2" ..... 5/16-18 hdwe

   Please remember, most small nuts and screws can be considered tightened securely when moderately hand tightened with screwdriver or spintites. When using tools with additional leverage on any hardware large or small, care must be taken not to overtightened and damage components.

2. A conductive zinc or copper paste is supplied with this antenna kit. Apply it lightly between all aluminum-to-aluminum and aluminum-to-copper joints. This includes element overlaps, straps, balun leads, etc. This paste should be used under each nut and lockwasher where they touch any part of the round aluminum elements. Use of this paste ensures long lasting electrical connections and ease in mechanical assembly.

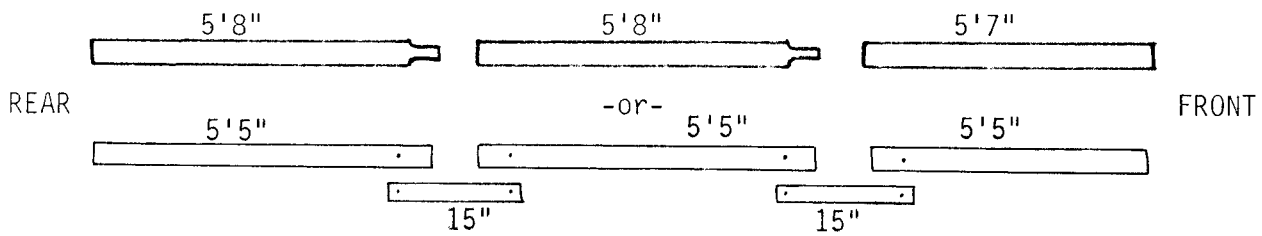
3. Thoroughly unpack the shipping box and check all hardware and components against the Parts List. In the event a difference is apparent, please check for a "Factory Update/Change" sheet accompanying these instructions prior to contacting your dealer or the KLM factory.

4. It is helpful to separate and group the larger components so that they are convenient to locate during the assembly process.

5. Correct assembly and dimensional adjustments are very important to successful operation of the KLM Tribander. A number of illustrations are provided to acquaint you with specific parts and assembly procedures. We suggest you read through the assembly instructions and familiarize yourself with the hardware BEFORE you actually begin construction.

II. BOOM ASSEMBLY

1. Assemble boom sections as shown in the sketch below. Align bolt holes and secure with ¼-20 x 3½" hardware:

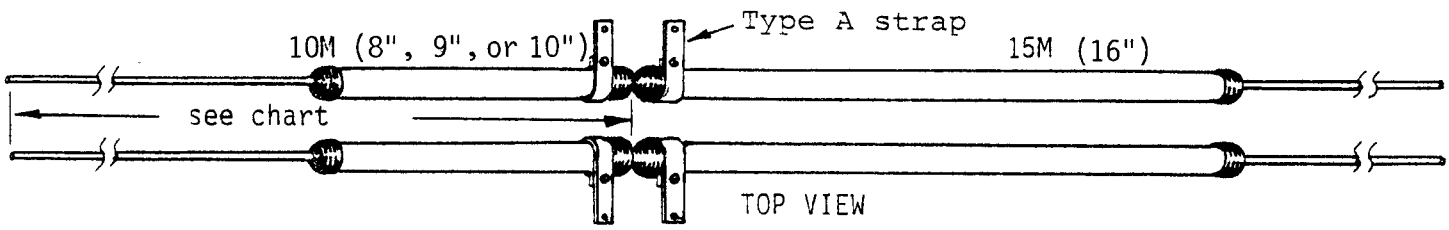


III. CAPACITY BANK ASSEMBLY

NOTE: A short block of wood with a 7/16 to 1/2" hole, clamped in a bench vice is handy for use during installation of the plastic (polyethylene) capacitor caps.

The instructions make a special effort to show how to keep the position and orientation of element components consistent and symmetrical (among elements and element halves) during assembly. It is also helpful to refer often to the pictorials and the "Overview". You should identify various element sections with a felt pen as they are completed. This will speed assembly later.

The sketch below shows a typical pair of 3/8"O.D. linear loading sections with 3/4"O.D. capacitor tubes in place. Note the type "A" straps are installed on one section to form a mirror image of the other. This assures proper orientation when the complete element is assembled.



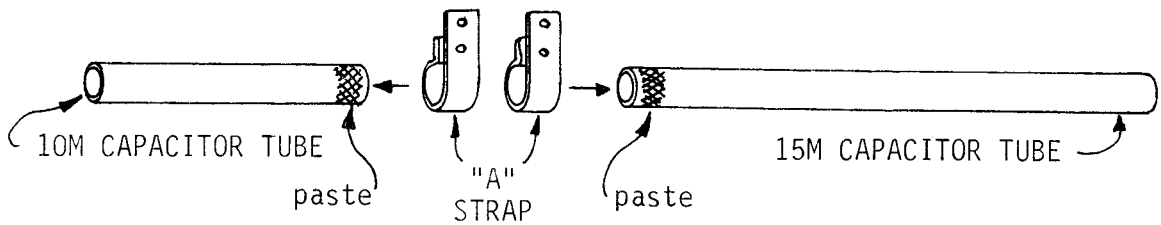
ELEMENT	3/8"O.D.	10M CAPACITOR	CENTER CAPS @	15M CAPACITOR
Director D1	2 ea. 72"	8"	27½"	16"
Front Driven	2 ea. 72"	8"	28"	16"
Rear Driven	2 ea. 77"	9"	28"	16"
Reflector	2 ea. 77"	10"	29"	16"

1. Note that each 3/8" x 72" and 77" tube has two vacuum breaker holes drilled @ 25" and 35" from one end. A few inches from this end, use a felt pen to mark the side of the tube with the holes. Later this will help orient the holes correctly when they are covered by the 3/4" capacitor tubes.

   From this same end, slide two capacitor caps, back to back, onto all 72" and 77" tubes. Center the caps according to the chart above. In all cases they will be between the two holes. Lightly rounding tubing ends with fine sandpaper may ease installation. For positioning the caps, pushing the 3/8" tubes through a 1/2" hole in a 2"x4" (securely clamped to a bench or cabinet) may help.

2. Prepare the 3/4" O.D. capacitor tubes for installation. Push a wad of cloth or foam through the inside of all 3/4" x 8", 9", 10", and 16" sections to remove aluminum chips, dust, moisture, etc.

3. Apply Penetrox paste to all the capacitor tubes in the areas shown in the sketch below. Then slide on the "A" jumper straps until they are 1/4" from the end. Maintain mirror image positioning of straps in capacitor tube pairs. Install the 8-32 x 1/2" screw, lockwashers, and nuts, but do not tighten at this time.



4. Slide a 3/4" x 16" capacitor tube onto the longer half of all pairs of 3/8" x 72" and 77" sections and work the tubes solidly into the capacitor caps. Maintain mirror image positioning of pairs. Push another capacitor cap solidly onto the open end of the 16" tubes.

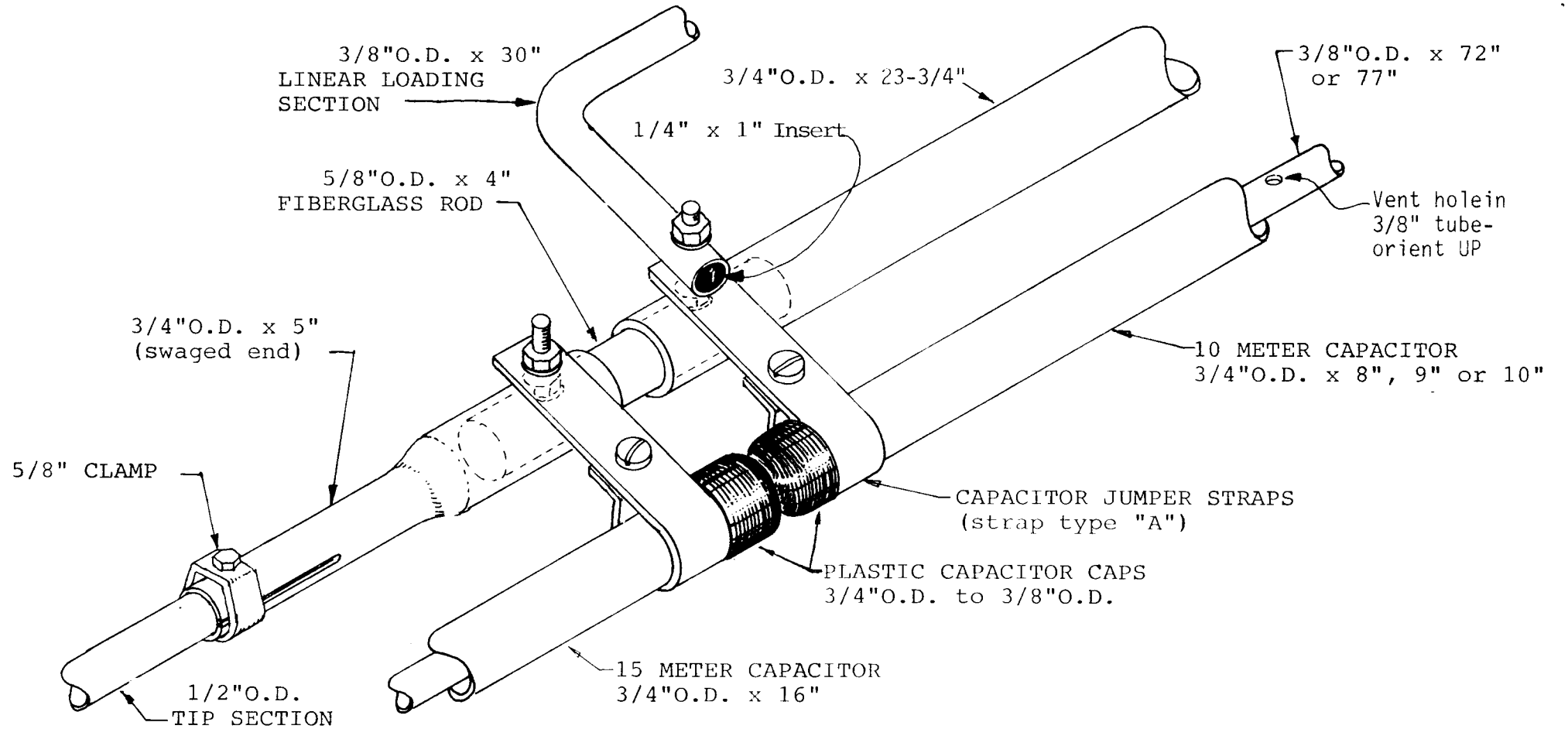
   The shorter half of both 72" pairs receive an 8" capacitor tube. The remaining pair of 77" sections receive 9" or 10" tubes (refer to the chart above).

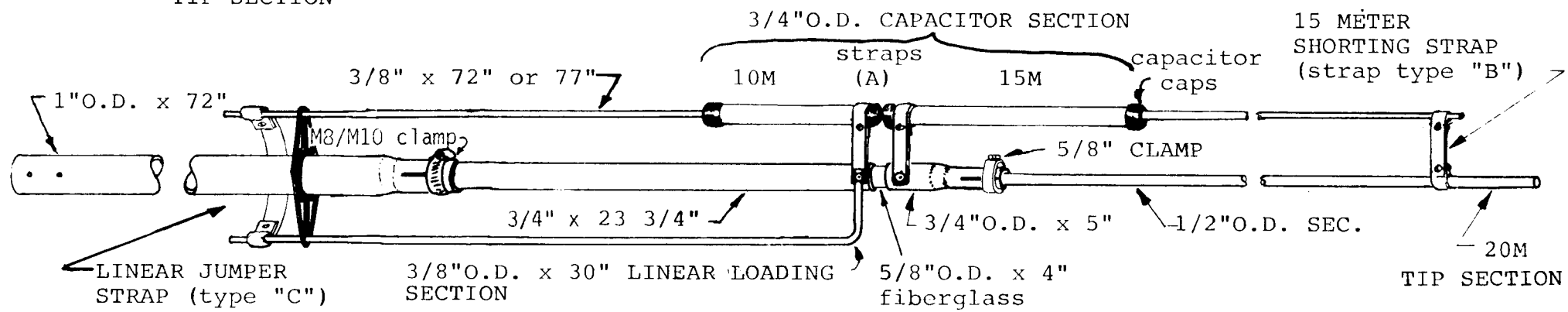
   As each capacitor tube is installed, push a capacitor cap onto the open end and work solidly onto the tube. Maintain mirror image positioning of straps, but do not tighten at this time.

This completes the initial Capacity Bank Assembly. Orientation of 3/8" tubing holes (see step 1 above) is done later.

ASSEMBLY PICTORIAL

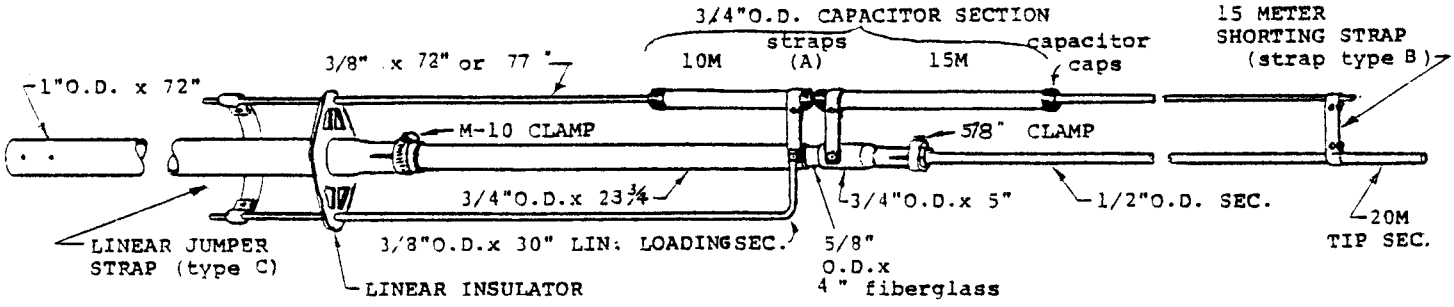
TYPICAL ELEMENT-HALF & DETAIL





IV. ELEMENT TIP ASSEMBLY (Reflector, Rear Driven, Front Driven, D1)

Study the sketch below before beginning.

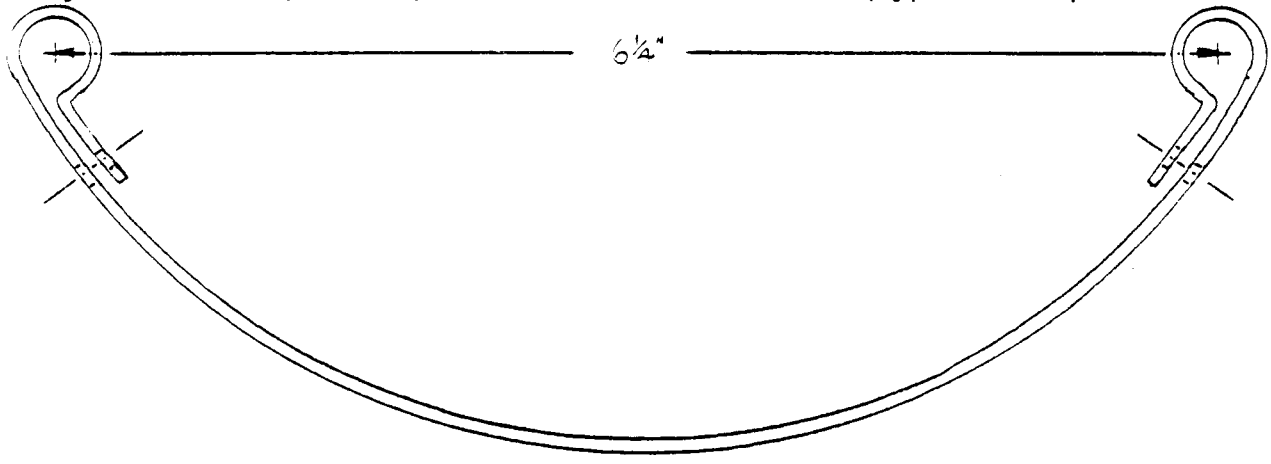


NOTE: A bench vice is handy for holding the 3/4" x 23 3/4" main part during this assembly.

1. Assemble the 3/4"O.D. x 23-3/4" and 5" (swaged) sections to opposite ends of the 5/8" x 4" fiberglass rods. Align holes and secure with 8-32 x 1 3/4" screws, nuts, and lockwashers. Tighten until the tubing flattens onto the rod and the assembly becomes rigid.

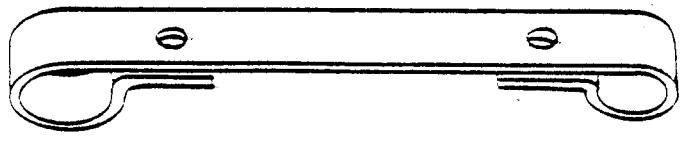
   Repeat for all eight sections.

2. Bend all eight linear jumper straps to the arc drawn below. (Type "C" Jumper Strap).

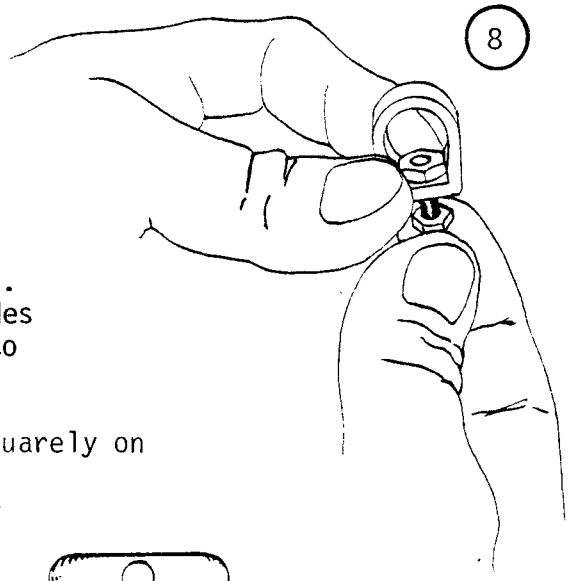


   Add the 8-32 x ½" screws, nuts, and lockwashers. Finger tighten only at this time.

3. Prepare the type "B" shorting strap by adding the 8-32 x ½" screws, nuts, and lockwashers. Finger tighten only at this time.



TYPE "B"
15 METER SHORTING STRAP



4. Prepare eight 5/8" compression clamps as shown. Dab a bit of paste on the end and threads of the 10-32 x 3/8" hexhead screw. Position the 10-32 nut in the clamp and thread together.

5. Beginning with Director D1 capacitor bank (3/8"O.D. x 72"), spread a small amount of paste on both sides of each type "A" strap fingers where they attach to the studs. Next place fingers onto the studs. Separate two 10 and 15M capacitor tubes 1/16" to 1/8" as required for the "A" strap holes to fit squarely on stud. The 15M strap attaches to the screw stud on the 3/4"O.D. x 5" section and the 10M strap to the stud on the 20" length.

6. Insert a peanut into the drilled end of the 3/8" linear loading section ("L" shaped part).

LINEAR
REINFORCING
INSERT (PEANUT)

7. Place the drilled end onto the screw stud OVER the 10M capacitor strap. Secure both studs with 8-32 lockwashers and nuts.

> The studs and straps are on the "top" side of the element. The vaccuum breaker holes in the 3/8" tubes (see page 5 step 1) must also be oriented to the top. Rotate the 3/8" tubes until the felt pen marks are on "top", then tighten the 8-32 x 1/2" screws on the "A" straps.

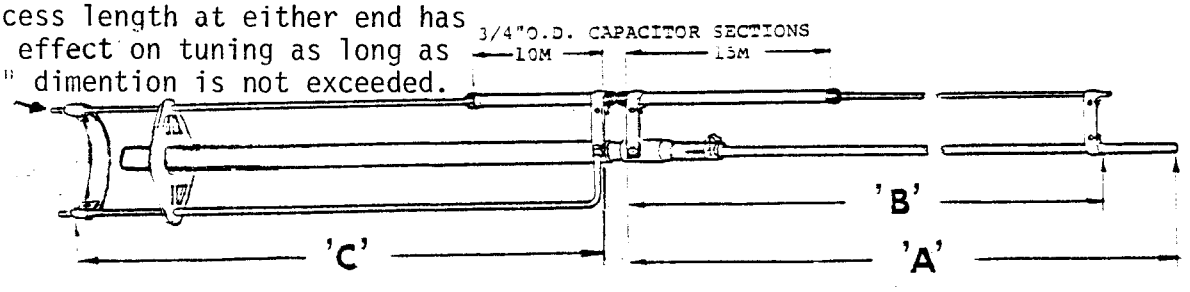
8. Slide a diamond-shaped linear insulator about 6" onto the shorter half (10M side) of the 3/8"O.D. tubes.

9. Using a small swab, apply paste inside the loops of the type "B" and "C" jumpers and to about 2" of the ½"O.D. x 51" tip. Install the ½" tip, "B" and "C" jumpers, and adjust to the dimensions below by hooking a tape measure on the type "A" capacitor straps and pulling toward "A" and "B" or "C". Measure to the outer edge of the "B" and "C" straps. Tighten all hardware on this assembly. Mark it appropriately (D1), wipe of excessive paste, and repeat for the other half.

10. Repeat Step 9 for the Front Driven, Rear Driven, and Reflector element parts marking them accordingly.

	½"O.D. TUBE REQUIRED	A	B	C
DIRECTOR D1	48"	51"	43"	23-3/4"
FRONT DRIVEN	42-1/2"	45-1/2"	43"	25-1/4"
REAR DRIVEN	53-1/2"	56-1/2"	47	27"
REFLECTOR	56-1/4"	59-1/4"	47-1/4"	28"

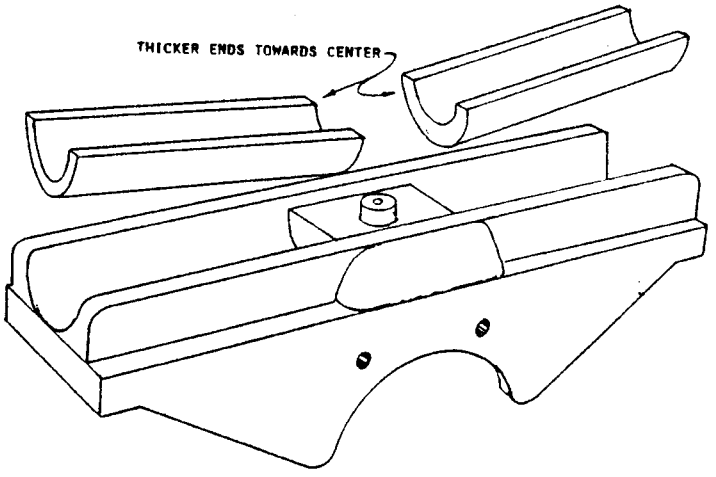
Excess length at either end has no effect on tuning as long as "A" dimention is not exceeded.



Element tip caps are not supplied or recommended due to potential moisture build-up inside the tips when caps are used.

V. MOUNTING ELEMENT SECTIONS TO INSULATORS

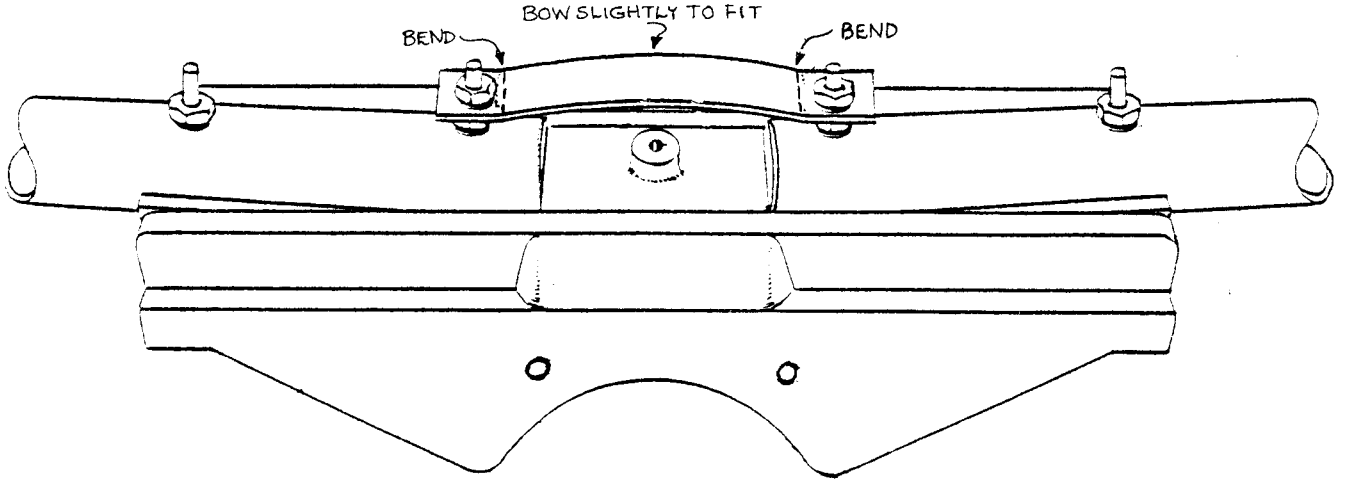
1. The KLM Lexan insulator has been designed to accomodate up to 1½"O.D. elements. Antennas using smaller O.D. elements are supplied with half-round reduction sections These are placed in the two element channels on top of the insulator with the. thicker ends toward center as shown in the drawing below. Prepare all insulators.



2. Mount the 1"O.D. x72" element half pairs to the insulators (check that the 7/8"O.D. butt reinforcing inserts are in place with holes aligned).

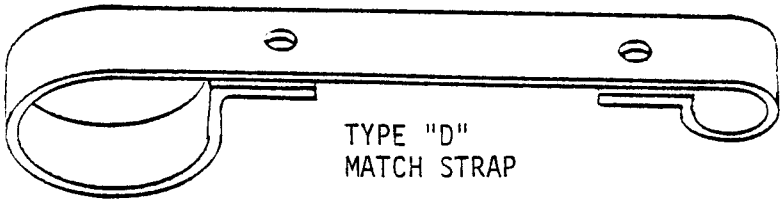
   NOTE: The element butt holes are drilled at a slight angle to compensate for the upward camber of the insulator cradle. Element should be rotated 180 degrees until the mounting screws pass easily through the insulator and element. The 10-32 x 2½" screws are inserted from the bottom of the insulator. Apply paste to the element around the screw hole and secure with lockwashers and nuts above the element butt (the studs formed by the two inside screws are used later for strap connections). Tighten the nuts securely to be sure the element sections are well seated in the insulator. Note that upon installation, the sections tilt up slightly to compensate for element droop.

3. Apply paste and place a ½" x 3 3/4" jumper strap across the inner element studs for the Reflector and D1. Secure with additional 10-32 nuts and lockwashers. For convenience, DO NOT install the completed element tip assemblies yet.



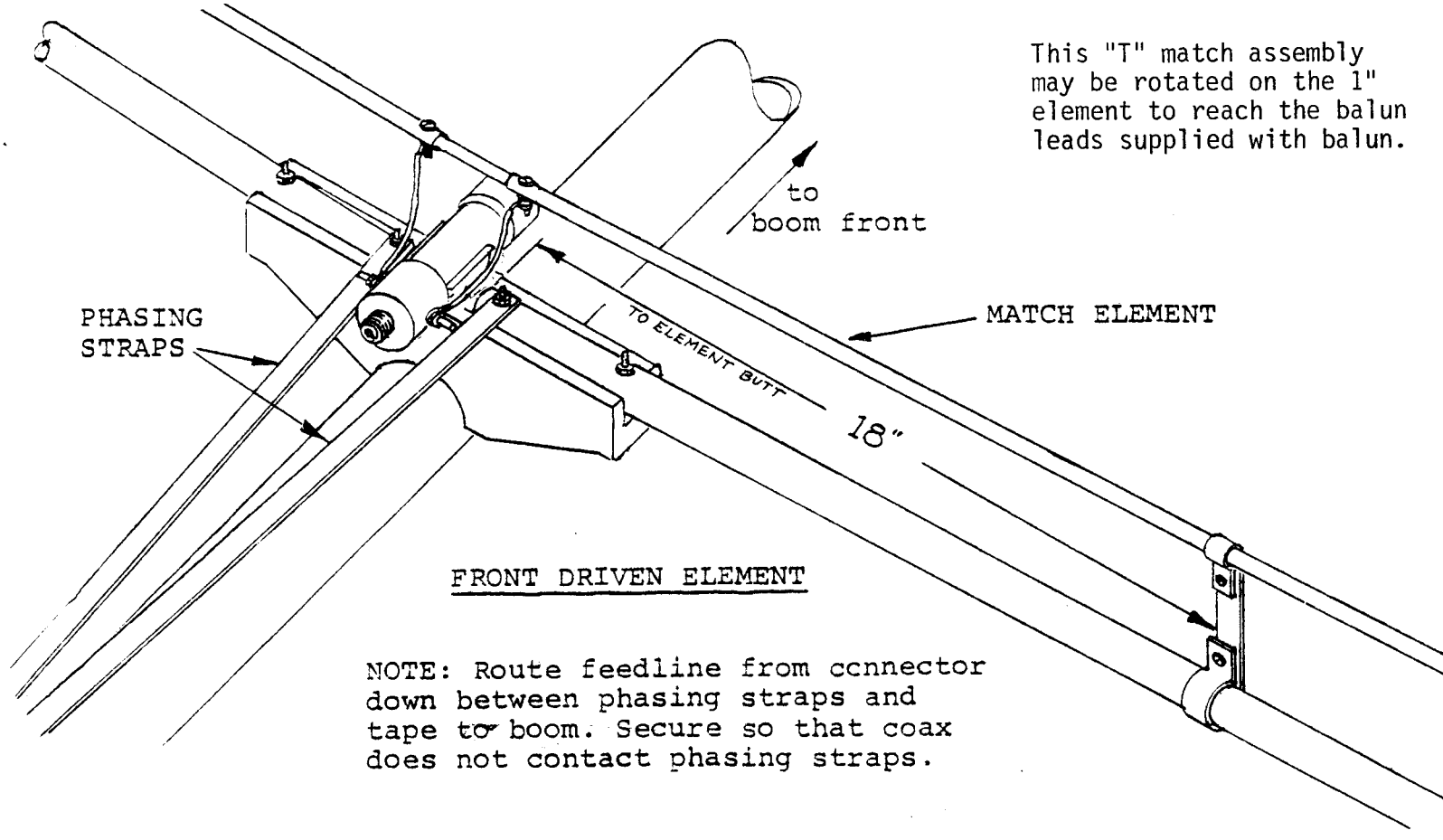
VI. FRONT DRIVEN ELEMENT "T" MATCH ASSEMBLY

1. Locate the two type "D" match straps and install the ½" x 8-32 screws, lockwashers, and nuts loosely.



2. Select one of two remaining element insulator assemblies without center jumpers and slide a type "D" on each side locating them 18" each side of the element butts (apply paste under the straps and tighten in place per sketch below).

MATCH ASSEMBLY - FRONT DRIVEN ELEMENT

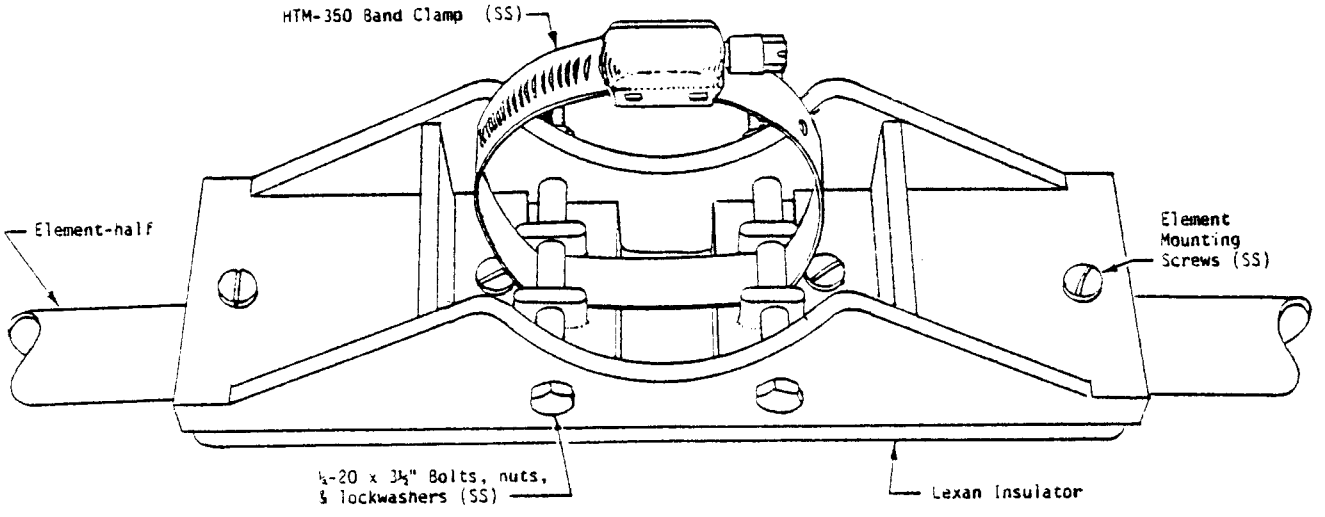


3. Now slide the preassembled 3/8"O.D. match assembly tubing first into one side; Then into the other. Apply paste to the appropriate areas under the strap. Center the assembly over the element insulator and tighten the type "D" screws around the 3/8" tubes.
4. Insert a #6 sheet metal screw through the end hole in the balun clip and mount the balun clip to the circular boss in the center of the element insulator.
5. Snap the 3-60-4:1 4KW PEP balun into place. Apply paste and attach the #12 AWG copper leads between the balun and the "T" match using #8 flatwashers, lockwashers, and nuts on the "T" match studs. Rotate the "T" match assembly off of vertical to make lead connections. DO NOT SUBSTITUTE LONGER LEADS.

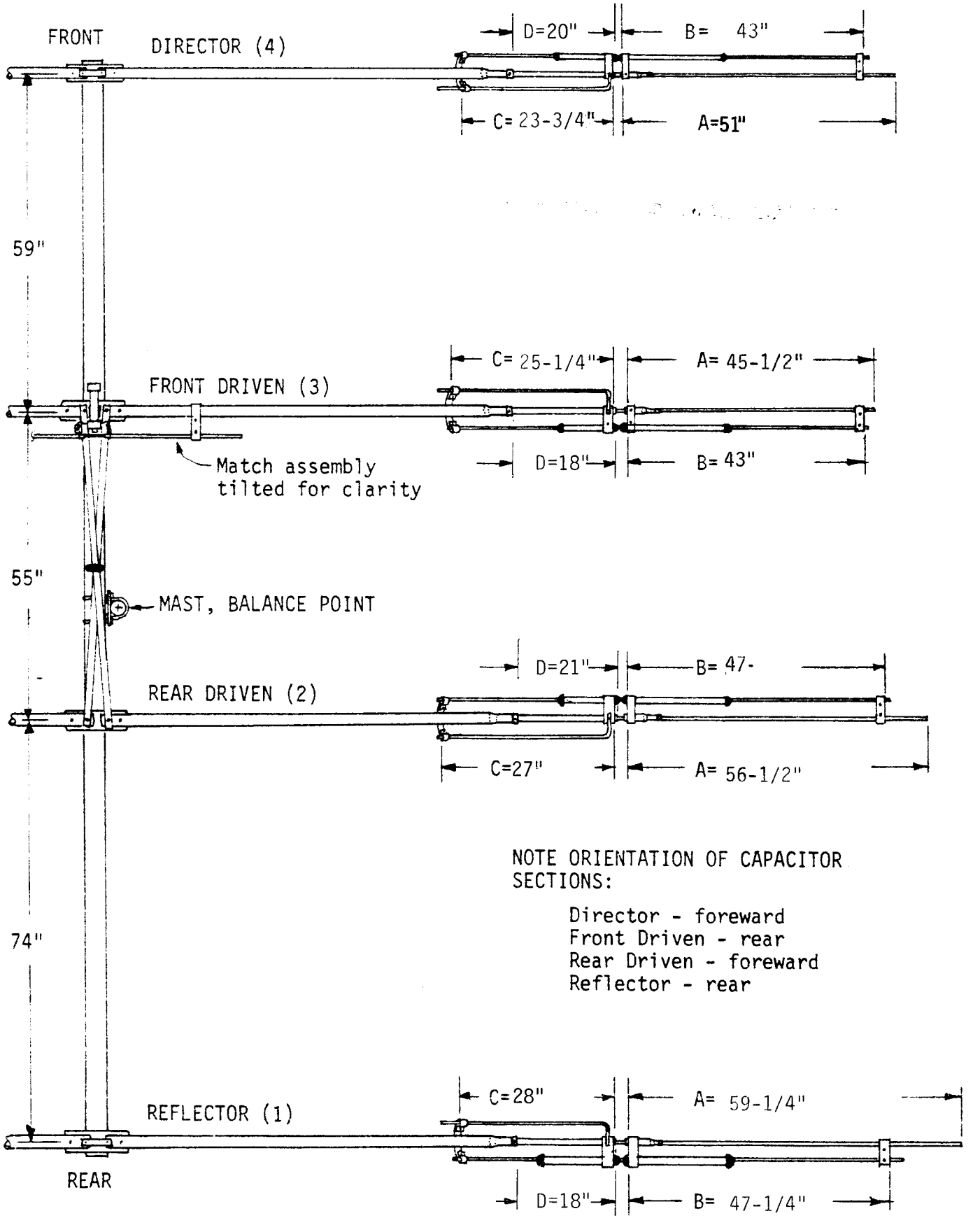
   NOTE: The only thing critical about this assembly is that paste is applied to all joints as this assembly carries the full power of your transmitter.

VII. INSTALLATION OF ELEMENT MOUNTING CLAMPS

1. The large HTM-350 band clamps are bolted into the underside of the Lexan insulators with ¼-20 x 3½" bolts, lockwashers, and nuts (stainless steel) as shown in the drawing below. Install in all the insulators. DO NOT over-tighten the ¼-20 bolts (100 in lbs. maximum torque).



KLM KT-34A
DIMENSION SHEET & OVERVIEW



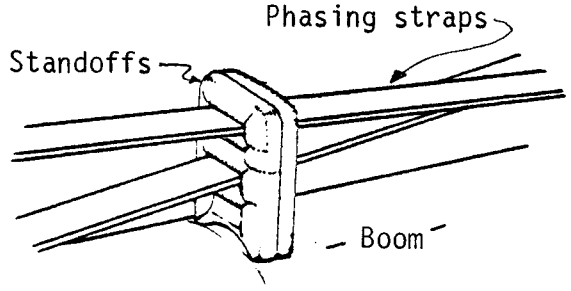
NOTE ORIENTATION OF CAPACITOR SECTIONS:

Director - foreward
Front Driven - rear
Rear Driven - foreward
Reflector - rear

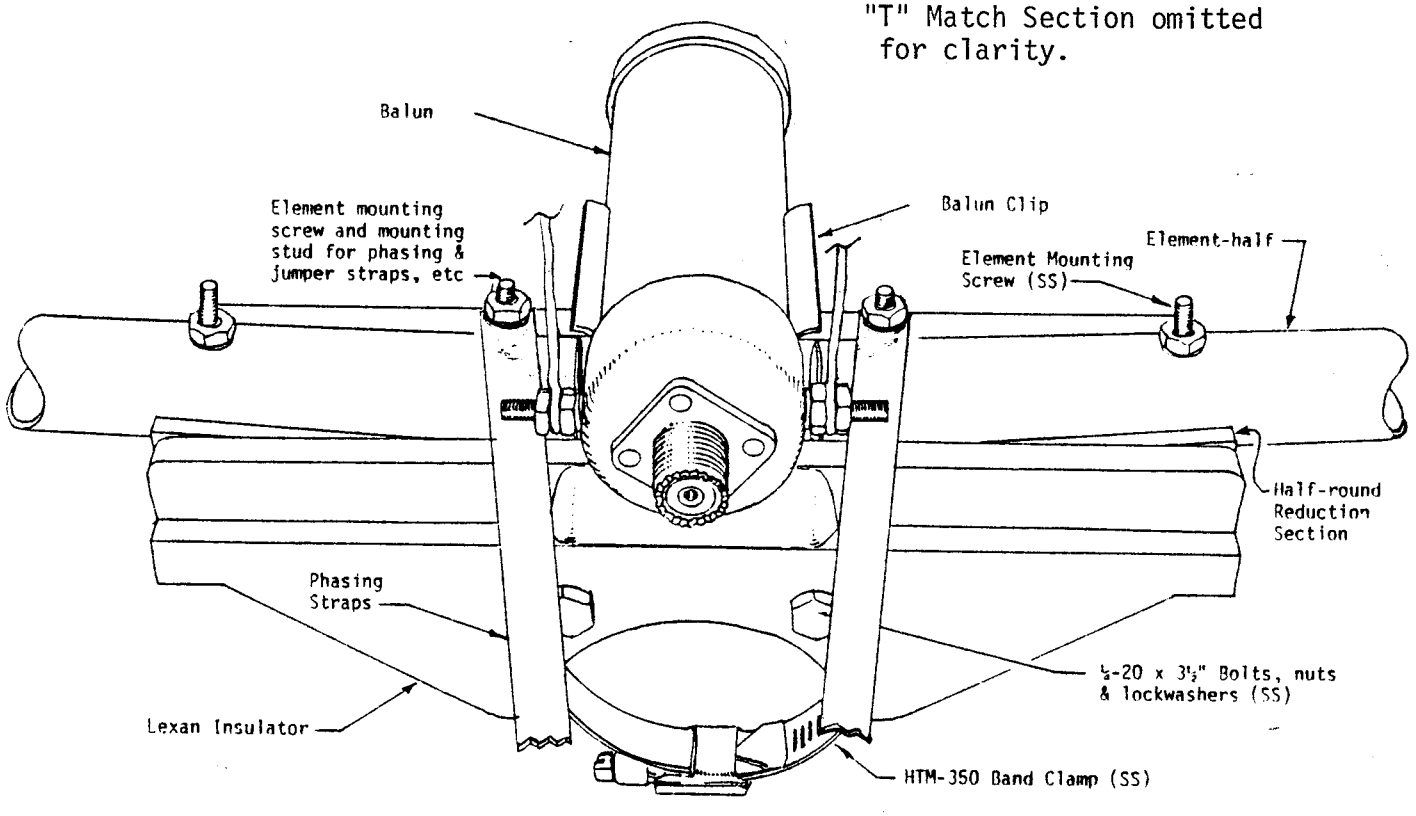
VIII. MOUNTING ELEMENTS TO BOOM (See complete half antenna sketch)

NOTE: The completed element tips are NOT installed as yet.

1. Rotate boom until splice bolts are diagonal, heads up. Center element #1 (Reflector) insulator 3" from the boom end and tighten the band clamp.
2. Mount element #2 (Rear Driven) 74" from #1 (center-to-center). Align element with reflector and tighten clamp.
3. Loosely mount element #3 (Front Driven) 55" forward of #2 (Rear Driven).
4. Slide 55½" phasing straps through two standoffs until they are centered. Apply paste around the strap holes and install straps between elements #2 and #3. Place ends onto inner set of element mounting screw studs (over existing nuts). Slide element #3 forward to fit straps. Be sure straps cross at center and connect to element halves on opposite side of the boom. Secure with #10 lockwashers & nuts.



5. Tension the phasing straps by tapping element #3 away from #2 until straps are taut. (Hold boom straight for this operation.) Align #3 element sections with the others and tighten clamp.

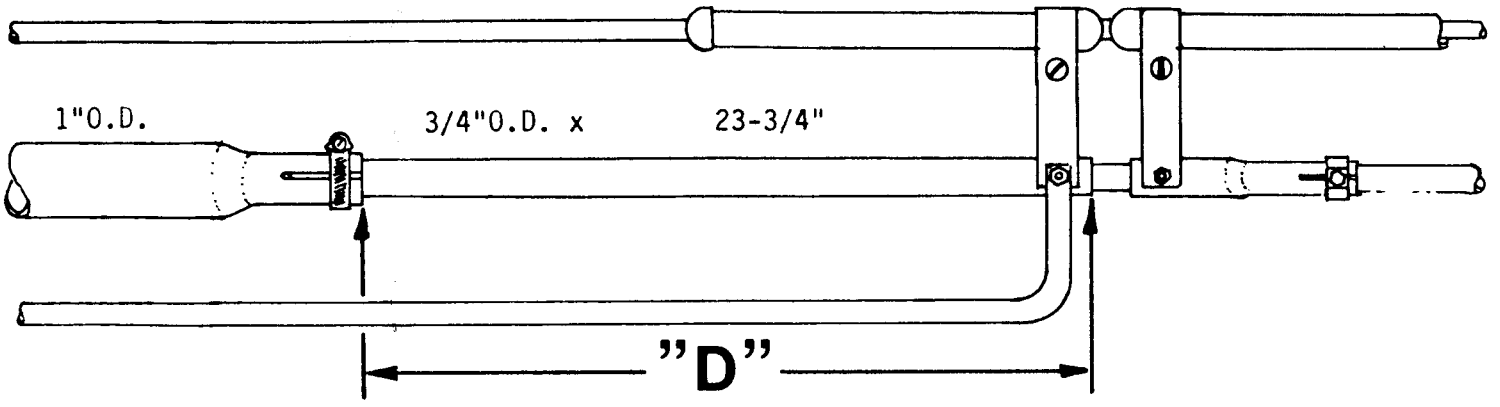


6. Place Director D1 59" forward of the Front Driven Element. Align and secure.
7. Once elements are all correctly aligned, the HTM-350 clamps may be additionally secured. Drill a small hole into boom (#38 drill) through existing hole in HTM-350 band clamp. Tighten a #6 x 3/8" sheetmetal screw into hole.

   This operation is recommended especially if you live in an area with extreme weather conditions or if it is likely that the elements will snag on guy wires, trees, or other obstacles during installation of the antenna.

IX. ELEMENT TIP MOUNTING

At this point, the size of your assembly area may dictate whether the element tips can be mounted now or the remainder of the assembly should be completed first. With some installations, the boom and partial elements may even be mounted to the tower before installing the element tip assemblies.



	"D" DIMENSION
DIRECTOR D1	20"
FRONT DRIVEN	18"
REAR DRIVEN	21"
REFLECTOR	18"

1. Select the D1 tip assemblies. Refer to the "Antenna Overview" page for correct orientation of the capacitor sections. Also note that the capacitor straps/studs are "up" and the vacuum breaker holes in the 3/8" tubing are "up".

   Apply paste to about 3" of the butt of the 3/4" x 23-3/4" tubing. Place an M-8/M-10 clamp onto the swaged end of the 1"O.D. tube. Insert the 3/4" tube into the swage until the correct "D" dimension is achieved (D1=20"). Tighten band clamp. Repeat for other tip assembly

X. ATTACHING THE BOOM TO MAST PLATE

1. Raise the antenna off it's supports and determine the balance point on the boom. This will be in the area of the central boom joint.
2. Center the 9" x 9" boom-to-mast plate at the balance point and secure with two 3" U-bolts. Plate may be mounted on either side of the boom.
3. Two 2" U-bolts are supplied for securing antenna to a mast.

XI. INSPECTION

1. Upon completion of assembly, have another person recheck antenna against critical dimensions given on Overview,page 12.
2. If possible, allow antenna to temperature-cycle overnight. Then check and retighten all connections. This will ensure long-lasting mechanical and electrical integrity.
3. Check that all capacitor caps are pressed firmly onto the 3/4" capacitor tubes and that the vent/vacuum breaker holes in the 3/8" tubing are "up".

XII. PRE-INSTALLATION CHECK-OUT

1. Since the permanent installation of any antenna requires a great deal of time and effort, we would like to suggest the following tests be made on the KT-34A prior to final installation.

2. Attach your good quality 50 ohm feedline to the balun and place the KT-34A on a temporary support 10 to 25 feet above ground. Use a non-metal roof, tall ladder, short tower, etc.

3. Using your exciter and a good quality SWR bridge, take SWR readings every 100 KHz on each band. Start and end at or beyond the band edges. Naturally, some SWR will be present and the general shift, because of the low height, will indicate the antenna is resonant slightly low in frequency. For the most accurate SWR readings, keep the system simple, i.e., exciter - SWR bridge - antenna. Eliminate scopes, antenna switches, filters, etc., for your initial readings. This simple system should be used for your post-installation SWR check also.

   Gross problems such as 50-100% power reflected on all portions of each band indicate a problem in the feedline or balun. Disconnect the feedline at both ends and check for center pin-to-pin continuity and connector shell-to-shell continuity. There should be no continuity between center pin and shell. The balun should show continuity from center pin-to-shell and to each of the balanced terminals.

4. Another rough check of general performance even with the antenna at the low temporary height is to listen to the signals on 10, 15, and 20. If possible, compare it with another antenna on those bands. Signals on 10 and 15 meters particularly should sound lively. Twenty meters may be subdued somewhat by the temporary test height conditions. Again, you're looking for anything grossly different than what you would expect.

   If any gross problem appears to be present, a continuity check of each element should be made. Check for continuity across each joint. This continuity check will almost invariably expose the problem and we consider it a most valuable time spent to ensure long trouble-free operation.

XIII. INSTALLATION HINTS AND KINKS

1. Good quality coax feedline of the proper impedance is a major factor in achieving good VSWR across each ham band. KLM recommends the following cables.

   1. RG-213 AU
   2. Times FM-8 Foam Coax
   3. Belden 8214 Foam Coax

   Other brands of foam "RG-8 type" coax are typically not 50 ohm (more like 60-70 ohm) and should be avoided.

2. Large objects and other antennas, 40 or 80 meter dipoles for instance, can also affect the VSWR of a tribander. To check for detrimental effects, temporarily lower or remove the dipole or at least rotate it 90° out of line with the tribander elements. If the VSWR is reduced, one of the antennas should be relocated to avoid adversely affecting the performance of the Tribander.

   The KLM 40 meter dipole (7.2-1) can be used with the Tribander and will work well. But, the dipole must be mounted above or below the Tribander and in line with its boom (90° out from elements).

3. Mounting height: Generally, the comment "the higher - the better" is true. Excellent performance can be realized, however, from 30 feet on up. Ten (10) meters will be affected least by increased heights over 30 feet and 20 meters will be improved the most.

   Overall, antenna efficiency is reduced at low heights because surrounding objects (buildings, trees, metal fences, etc.) absorb RF from the antenna before that energy can become a sky-wave. Whenever possible, mount the antenna high and in the clear.

4. See Page 17 for typical SWR curves for each band. Your curves may vary somewhat due to instrument accuracy, height above ground, surrounding objects, etc. But, you should be able to recognize key corner points and ripple.

KT-34A TYPICAL VSWR CURVES