CUBEX
Quad Antennas

MK IV – PT3
MK IV – PT5
(also as p/o of MANTIS II 40M series)

Safety warning

Please read through these instructions completely before starting your installation.
Antenna work is dangerous. Always wear an OSHA approved safety harness with the appropriate nylon or wire rope safety lanyards to protect yourself and your helpers from falls. Also all helpers on the ground should be wearing hard hats to protect them from falling objects such as tools etc.

Cubex Quads has no control over the conditions at the antenna site and therefore can not be held responsible for any damage or injury to persons or property.

If for any reason you do not understand any part of these instructions, or your installation is different and these instructions do not pertain to your situation. Do not hesitate to call Cubex Quads. for assistance at 616.868.9907

Note: Take precautions when handling and further processing fiberglass material. It is recommended that gloves be used when working with this material.

Price: $ 4.95 US

SAFETY FIRST!
LOOK UP AND LIVE.

POWER LINE CONTACTS CAN KILL!

LIMITED WARRANTY

CUBEX QUADS warrants on the terms hereof, to the original purchaser of this product, for a period of one year from the date of purchase, that the product was not defective, but this warranty is void if the product has been subjected to improper or abnormal installation or usage.

If a customer believes that a product is defective, the customer may, within such one-year period, return the entire product to CUBEX QUADS at CUBEX QUADS' factory, all shipping charges pre-paid by the customer. If the product was defective, CUBEX QUADS will at its option and expense repair or replace the product and will at its expense return the repaired or replaced product to the customer, in a manner selected by CUBEX QUADS, at the address from which the customer sent the product to CUBEX QUADS.

The above warranty and remedy are exclusive and are in lieu of all other warranties, express or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose.

No seller will be liable for any loss, inconvenience or damage, including direct, special, incidental or consequential damages resulting from the use of or inability to use a product, whether the liability would result from breach of warranty or under any other legal theory.

This warranty does not cover damage to or caused by an antenna (a) by reason of the antenna acting as a lightning rod, (b) by reason of corrosion or strain from exposure of an antenna to wind or weather, (c) from improper assembly, installation or use of an antenna, (d) from failure periodically to inspect and maintain an antenna and its installation, or (e) the antenna coming into contact with a source of electrical power. The customer is responsible to insure that the installation and use of an antenna complies with applicable laws (such as zoning laws) and regulations (such as condominium regulations).

The laws of some states do not allow the exclusion of implied warranties, and if these laws apply, then all express and implied warranties are limited in duration to such one year period. No warranties of any kind apply after that period.

Such repair or replacement is the customer's sole and exclusive remedy for a defective product. Specifically, CUBEX QUADS is not liable (to the customer or otherwise) for (a) any loss or damage arising in any way from a product or from actual or anticipated sale, lease, license or use of a product, or involving in any matter such as interruption of service, loss or business or anticipated profits, or delay in receiving, repairing, replacing or returning a product, or (b) any incidental, indirect, special or consequential damages.

No other person (such as an employee, agent or dealer) is authorized to change this warranty in any way, or to give any other warranties of any kind on behalf of CUBEX QUADS. This warranty gives a customer specific legal rights, and a customer may also have other rights, which vary from state to state.

As used herein, ***customer*** is the initial end-use purchaser of a product from seller, a ***product*** is an antenna therefore manufactured by CUBEX QUADS, a product is ***defective*** if and only if the product was not free of defects of material and workmanship when manufactured, and a ***seller*** is CUBEX QUADS and any authorized CUBEX QUADS dealer.

CUBEX QUADS

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ASSEMBLY INSTRUCTIONS: MK IV 4 ELEMENT QUAD ANTENNA

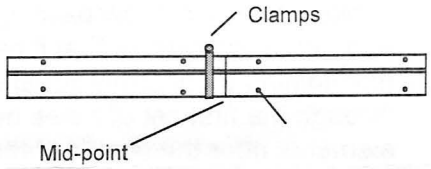
FOREWORD: The CUBEX MK IV is a pre-tuned Quad Antenna. All elements are factory measured and under normal conditions should not require adjustment. Elements are designed for operation in the center of each band. Should one wish to favor the low or high end of one or more bands, limited "tuning", is provided for at Note 2 at the end of the Instructions. It is recommended that the assembly Instructions be read completely prior to starting Installation.

STARTING THE ASSEMBLY:

In this latest version of the Cubex Mark IV antenna we are now shipping a very much heavier wall boom. The joining of the two boom halves requires a little patience, but the results are a much superior boom structure. This new boom consists of two 12-ft or 15-ft lengths of 3" O.D. x 0.083" wall aluminum tubing. They are coupled together with a 36" length of nominal 2.875" dia. tubing that has been split to permit reducing its diameter so that it may be inserted in the middle ends of the two boom sections. It uses two pair of #28 worm gear (or a larger #44) clamp(s) to keep it compressed for insertion. **(Retain the #28 worm gear clamps as they are used later).**

Before attempting to insert the coupler it is suggested that some form of lubricant be liberally applied (such as WD-40) to the insert or sprayed inside the boom.

Now lets get started on this task--
For the next step it is suggested that you set up three or more saw horses to support the full length of the boom. Place the boom ends so that the "A" section end and the "B" section end face each other. Insert the split coupler halfway into the appropriate boom half and align the marks (and the holes). (Remember to lubricate first).



The next step is important. Check the alignment of the coupler – the split should be aligned with the top of the boom (reference line at top).

IMPORTANT – Using the supplied 11/64" drill bit, and using the pre-drilled holes in the boom as a guide, drill through the coupler. Initially only put two (2) screws in ONLY ONE SIDE of the split until both halves of the boom have been assembled. This allows the split section to be compressed for ease of insertion. **See diagrams at end of Instructions**

With this first half (take precautions to keep the section clean, and free of dirt or grit), you can proceed to couple the other ("A" or "B") half of the boom. Using the same technique as above, and repositioning the two sets of worm gear clamps to compress the insert, push, slide the half over the coupler/insert (a second pair of hands is very helpful at this time).
In some cases it may be necessary to gently "tap" the end of the boom, using a wooden block to protect the end from any damage, to fully engage the two halves).
When fully engaged (very important) recheck alignment of the "B" half with the "A" half (alignment marks) and making sure that the "eyebolt holes" are aligned and "vertical" - Then insert two of #12 SS sheet metal screws supplied. Now drill through the incomplete holes with a 11/64" bit and insert the remaining #12 screws to secure the section. The boom should be set aside and the ends protected from any damage.

ELEMENT ASSEMBLY: <u>Go to the page titled: SPREADER ARM ASSEMBLY. When completed come back to this section.</u>

1. Begin antenna assembly by laying one of the "spider" castings on the ground with the "trough" facing upward. Place the butt ends of four spreader arms in the spider troughs. BE SURE the arms are all similar (Driven Element, Reflector or Director). Each arm is marked. Fasten each spreader arm to its respective casting arm using two "gear" driven clamps on each arm (be sure to orienting the wire holes parallel the ground for proper element dressing). One clamp is located near the butt of the arm and is positioned between the two guides on the outer face of the casting. The other clamp is positioned near the end of the casting arm in the depression provided for It. The gear driven clamps are assembled and tightened by hand using a screwdriver. With the screw head facing upward, loop the strap around the arm, positioning the adjustment screw next to the arm and tighten slightly.

   Final permanent tightening should be done at the very end of the wire element assembly after everything has been positioned properly. The same procedure is followed for the remaining assemblies.

2. Partially uncoil a roll of wire marked 10 METER DRIVEN ELEMENT. This will permit the element wire bundle to be laid out straight in preparation for stringing through the spreader arms. The stringing procedure is illustrated by Figure 3 and there will be less of a tendency to tangle if this procedure is followed closely. As the wire element is unfolded, straighten the "kinks enough to allow passage through the holes drilled in the spreader arms but try and retain enough of the kink so that it can later be centered in each respective arm for the purpose of maintaining a uniformly square structure configuration. The 10 meter elements are strung through the first set of holes nearest the butt end of the arms; 12 meter next (optional) 15 meter elements near the center of the arms; then 17 meter (optional) and finally the 20 meter elements near the tips of the arms.

   BE SURE that Driven Element wires are used with Driven Element ARMS, Reflector wires with Reflector ARMS and Director wires with Director ARMS. The wire ends of all DRIVEN ELEMENTS are terminated at a special DRIVEN ELEMENT TERMINAL as shown In Figure I (Separate terminal for each band) or at the CUBEX MATCHING TRANSFORMER.

   If one wishes to assemble the antenna for operation with a SINGLE FEED LINE system such as the CUBEX MATCHING Transformer, the 15 meter DRIVEN ELEMENT should be strung first and the 1O and 20 meter wires then brought to the corresponding transformer terminals as marked. If used, the 12 and 17 meter wires can then be added (Note these elements connect to the 10m and 20m terminals respectively. The wire element ends of the 20 meter and 10 meter (also 12m and 17m) DRIVEN ELEMENTS have extra long "fold backs". These provide the slight added length needed to reach the Matching Transformer. When all DRIVEN ELEMENTS are terminated properly, this excess fold back is simply trimmed off and discarded.

3. For REFLECTOR and DIRECTORS 1 & 2 assembly, the procedure is the same as step 2 except that the wire element ends are simply brought together at the "end kinks", spliced and soldered (See Detail Fig 3 Addendum page). Both sets of DIRECTOR element wires are cut to the same physical dimension. Either set of wires may be used with either set of Director spreaders arms.

4. After the 4 element assemblies (Driven, Reflector and Directors 1 & 2) have been completed, the assemble boom should be temporarily supported on a 10 to 12 foot step ladder or lashed to the side of a tower at a height which will permit the bottom element wires to clear the ground.

PUTTING IT ALL TOGETHER-

WARNING - THE CUBEX SPIDERS HAVE BEEN PRE-SPREAD USING A MICROMETER FOR PRECISE MEASUREMENT. TO FORCE THE UNITS OPEN PAST THE ALREADY PRE-DEFINED LIMITS WILL RESULT IN BREAKAGE OF THE CAST UNITS.

1. Attach the Boom to Mast plate in the center of the boom. Be sure all four 3" U-bolts are secured using, nuts and lock washers. Do not over tighten - final adjustment may be necessary when positioned in the final place.
2. NEXT Mark one end of the boom as a starting point for measurements and begin.

   The REFLECTOR Assembly, is placed at the end of the boom, as shown in Figure 4. (On the starting mark) DIRECTOR 1 is placed at the 20 ft. mark for the 30 ft. boom, 16 ft. for the 24 ft. boom. DIRECTOR 2, is placed on the other end of the boom. Again, DIRECTORS 1 & 2 are the same physical dimensions so they may be interchanged. After the assemblies are in place on the boom they should be rotated and aligned so that all bottom element wires are parallel to the ground.

BOOM LENGTH	Reflector	Driven El	Director 1	Director 2
24 ft Boom	End (start)	+ 8 ft	16 ft	24 ft (other end)
30 ft Boom	End	+ 10 ft	20 ft	30 ft (other end)

3. With the help of some friends and a tall ladder, scaffold or scissors lift. Begin with the two inner 10 –20m elements (Director 1 and/or Driven Element) if applicable. Carefully raise the spreader assembly up to the boom and slide onto the boom. Align the spiders with the marks previously made then you can remove the ¼ " nut used to hold the spreader arms apart at this point. Tighten the bolt in the spider once you are satisfied with element alignment. Continue as above until all inner elements have been mounted. **The spreader arm alignment is the critical task at this time. The mast/boom plate alignment may be accomplished during the final placement on the mast.** It is desirable however, to make an effort to align the boom to mounting plate before it is loaded with the weight of the elements.
4. It is now a good idea to attach the bridge truss hardware to the boom. Locate the 2-5/16"x 4" Eyebolts and insert into the appropriate boom mounting holes. Use the flat washer on top (near eyehole) and lock washer and nut below. Secure snuggly, but do not over-tighten and damage the boom.
5. The antenna array is then lifted into place on the tower and the boom/mast coupler plate is secured to the mast using the supplied hardware. The antenna & boom assembly is bolted to the mast using the supplied 2", U-bolts REMINDER: DON'T TAKE CHANCES. USE A CLIMBING BELT OR SAFETY HARNESS WHILE ON A TOWER. THE LIFE YOU SAVE COULD BE YOURS!
6. CAUTION; While every effort has been made in designing and fabricating both the spreader arms and the spiders for maximum strength, it is possible to suffer breakage if the assembly is dropped or impacted against buildings, trees, etc., Use care in handling.

FEEDING THE, 4 ELEMENT QUAD.

The feed-point impedance of this antenna will vary with each band. Twenty meters is about 50 ohms, Fifteen meters about 80 ohms and Ten meters is about 110 ohms. The CUBEX matching transformer is a combination unbalanced to balanced, and impedance transformation device. It will allow for single feed line with acceptable SWR while using 3 or 5 bands of operation.

An alternative method of feeding the multi band quad utilizes a remote antenna switch such as the AMERITRON RCS-8V. When using the remote antenna switch or separate feed lines for each band it will be necessary to fabricate Co-Ax matching sections from 75 ohm RG11U cable. **See TABLE I *(3/4 wave length recommended)*** These cable sets are available from Cubex.

Where a REMOTE SWITCHING SYSTEM is used, one would position the remote unit at a point on the mast or boom where both 10 (, 12) and 15 meter matching sections could terminate in the box. This would eliminate splicing of cables.

Baluns are generally not needed and have proven effective in only a small percentage of unusually rough situations. Fortunately, the great majority of quad installations perform very satisfactorily without the need to resort to complicated matching systems, but in an occasional "rare" case of difficulty, the Gamma Match (either individual or Tri-Gamma) has proven to be a good solution. For Gamma Match information refer to Bill Orr's Quad Book or see "Old Notes" addendum at end of instructions.

The CUBEX matching transformer is an excellent choice for matching the antenna system to the transceiver. It allows for a single FEED LINE and matches the CUBEX antenna without the hassle of complicated matching networks.

Good luck and DX –

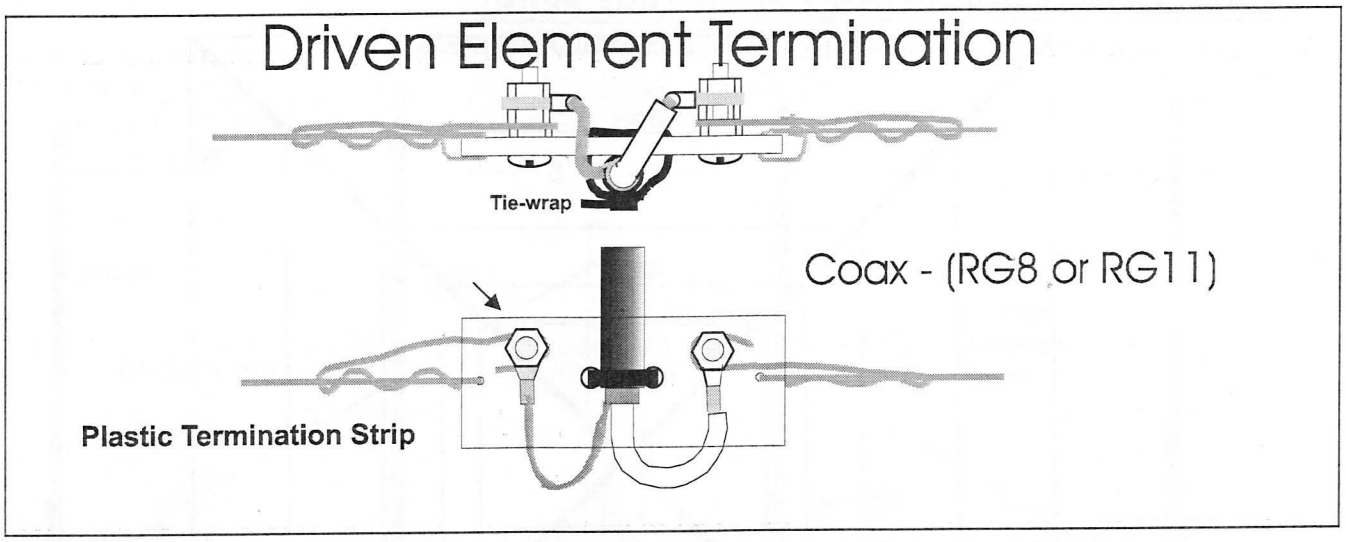


Figure I

Note: *These terminals are not supplied when Cubex Matching Transformer is ordered with Antenna.*

Matching Stub dimensions: Table I

Electrical Quarter wave 75 ohm coax ; **velocity factor = 0.67**

BAND	CABLE TYPE	LENGTH (IN.)	LENGTH (CM)
10 Meters	RG11/U 75 ohm	69 in (3/4 w-17'-3")	175.25 cm (5.2575m)
12 Meters	RG11/U	79-9 ½" in (3/4w=19'-11")	202.74 cm (6.082m)
15 Meters	RG11/U	92 in. (3/4w=23'-0")	233.68 cm (7.01m)
17 Meters	RG 8/U 50 ohm	1/2w 18.5 ft	563.9 cm
20 Meters	RG 8/U 50 ohm	1/2w 24 ft	731.5 cm
40 Meters	RG11/U	23.35 ft (420 in)	7.1171 m

Note 1- that any length 50 ohm coax maybe connected to the end of these matching stubs.
Note 2- Some experimentation may be required in adjusting each matching stub to optimize the impedance transformation.
Note 3- When using 3/4 wave cables (or 1/2w 50 ohm), the excess cable should be rolled into a 6" dia. Coiled and securely taped. (locate at the remote switch).

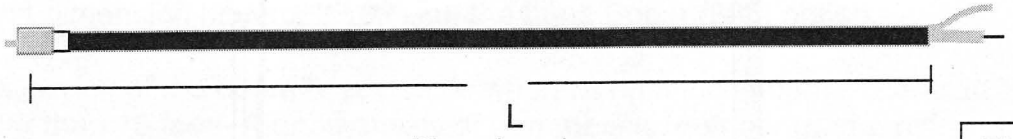


Fig. 2

Note - Cables supplied by Cubex may vary in length (longer) from above as we use a special RG-11 coaxial cable with a VF of 0.72

QUAD LOOP DIMENSIONS:

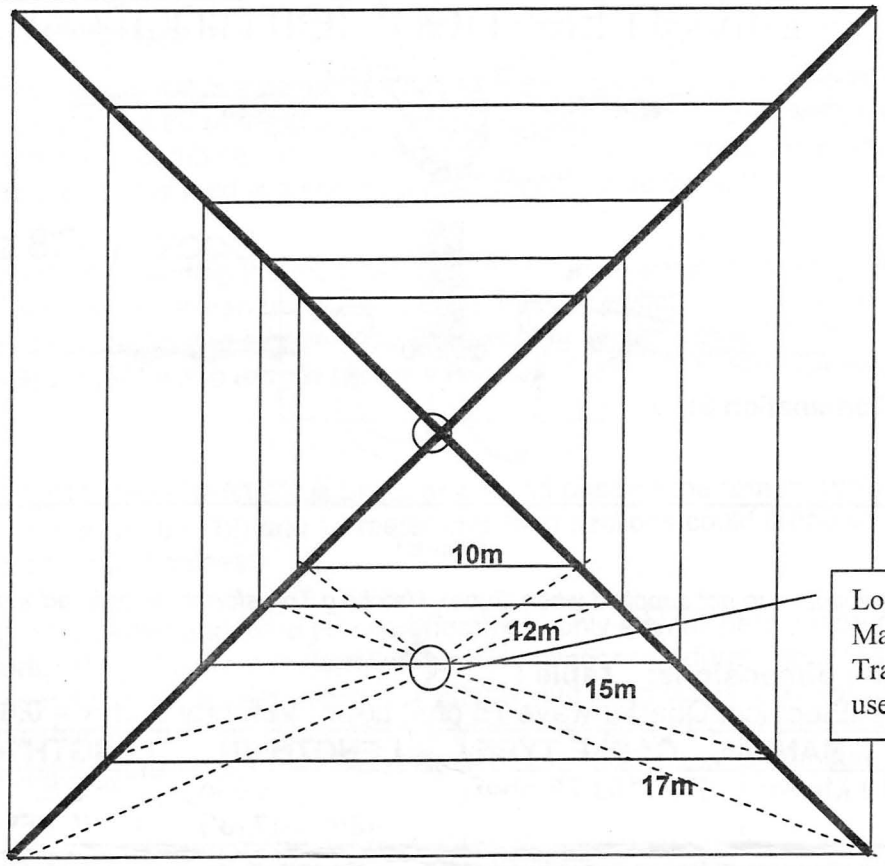
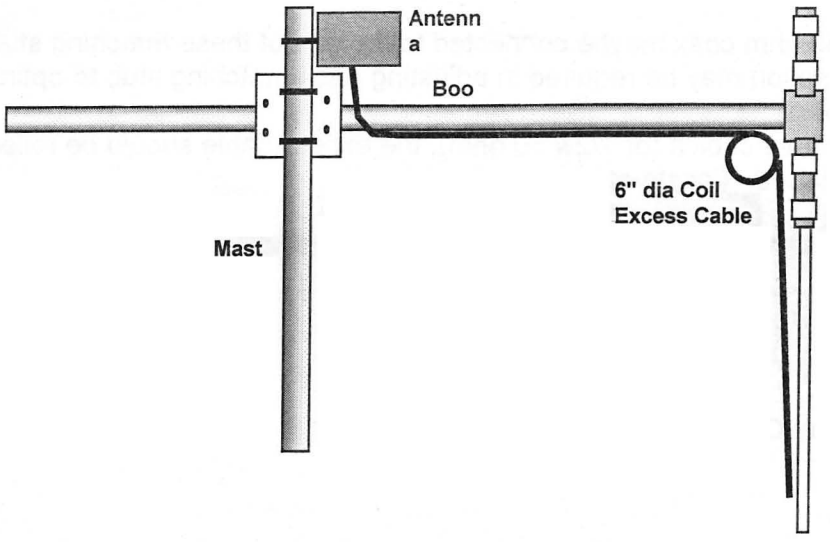


Fig. 2a

BAND	10M	12M	15M	17M	20M
Reflector					
Driven					
Director 1					
Director 2					

Purposely record assembled.



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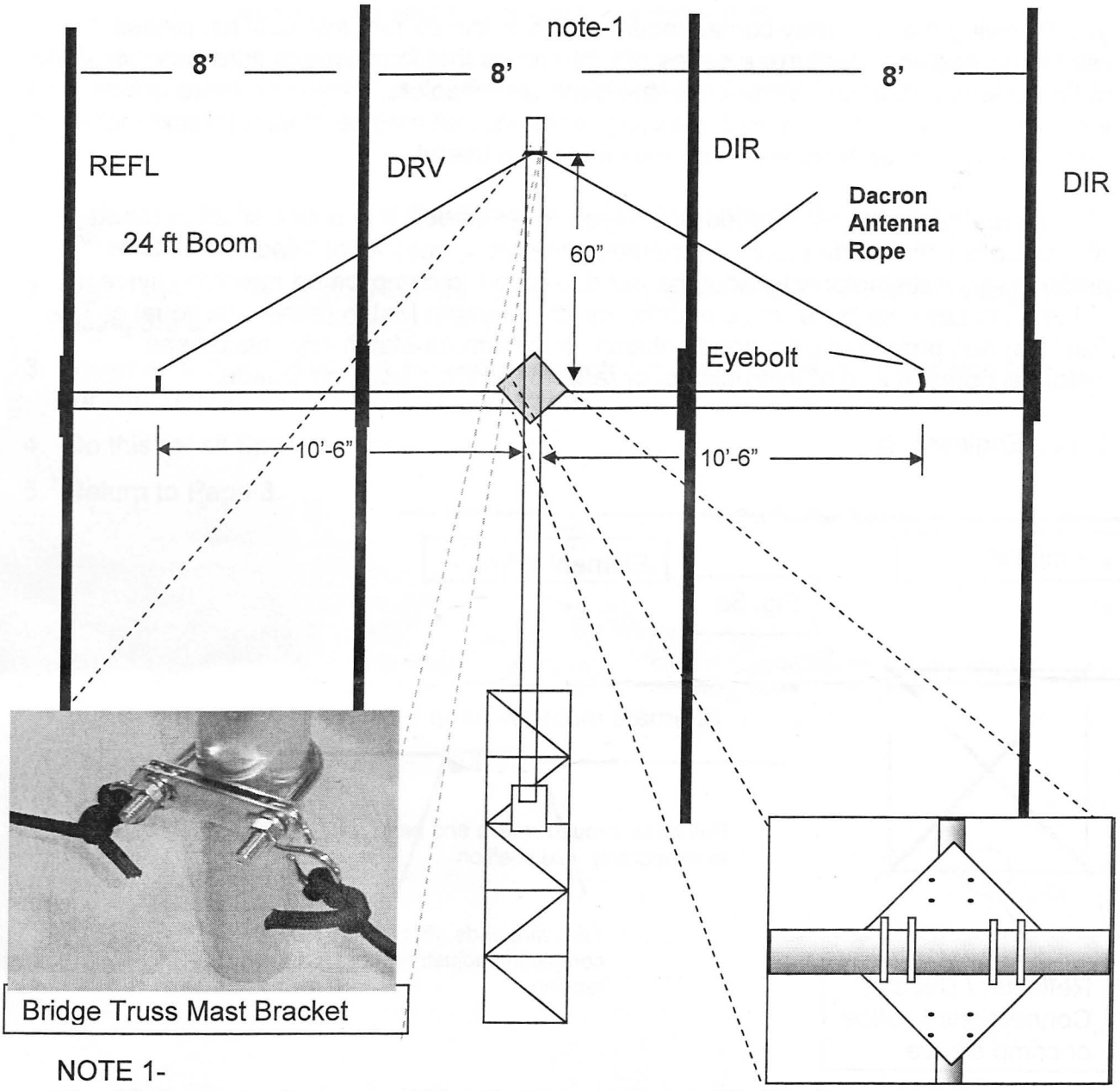
TRUSS ARRANGEMENT
4 element Quad ELEMENT Spacing



Bridge Truss Mast Bracket

NOTE 1-
The 8ft dimension becomes 10ft with the Long Boom (30ft) option.

Truss guying of the boom is advisable when using 3 inch boom material in lengths greater than 15 feet. A good quality of non-metalic, outdoor grade, nylon or Dacron line may be used. (Cubex Dacron Antenna Support Rope supplied)

ADDENDUMS and OLD NOTES-

The following material may contain addendum's to the current instructions, please review. In addition there are a series of "old " notes that from time to time was included in Cubex antenna assembly but now are generally obsolete. However, there is some information on adjustments and matching (gamma) that may be of interest and therefore have been included. You may find them useful.

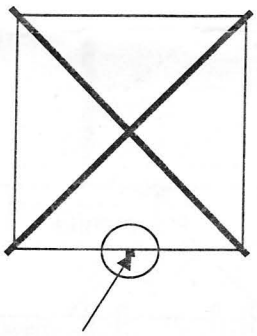
Baluns are generally not needed and have proven effective in only a small percentage of unusually difficult situations. Fortunately, the great majority of quad installations perform very satisfactorily without the need to resort to complicated matching systems, but in an occasional "rare" case of difficulty, the Gamma Match (either individual or Tri-Gamma) has proven to be a good solution. For Gamma Match information see historical notes at end of instructions, or refer to Bill Orr's book on Quads.

Cubex Engineering

"Line men's"

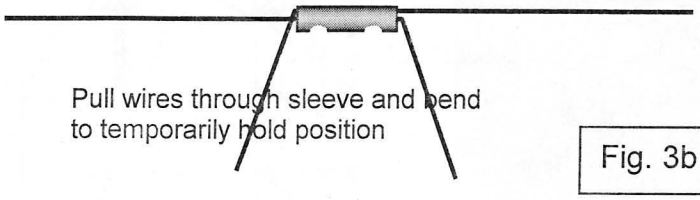
Element Wires -

Fig. 3a



Reflector / Director Connections - splice or crimp sleeve

Alternate method-Crimp sleeve



Pull wires through sleeve and bend to temporarily hold position

Trim wire ends after completing adjustment of tension

Fig. 3b

Locate the small bag of <u>crimp sleeves (5 +1spare).</u>
After completing the wiring of the Reflector and Director elements the ends must be connected to complete the Quad loop. Slide both ends through the sleeve as shown in fig 3b. Pull wire through to eliminate the slack in the wire. Temporarily fold each wire end as above to hold the wire position. Check the tension in all of the sides of this element, making sure that the arms are "square" and in line. Make an adjustment at the sleeve and if satisfied Crimp, or solder the element wire into the sleeve. This technique allows you to get the element wire tension correct without committing to a wire wrap or crimped connection.

Spreader Arm Assembly:

We have pre-assembled two sections of each Spreader Arm.

At the base of each Spreader Arm you will find words that identify as to which Spreader Arm this is. For example: REFL for Reflector; DRVN for Driven; DIR1 for Director 1 and DIR2 for Director 2.

1. Gather each Spreader Arm types together. For example: all Reflector parts together; all Driven parts together, etc.
2. Insert the smaller section into the larger section for each color. Be sure to align them by using the alignment marks on the tube.
3. Insert a 10-32 x 1-1/4" bolt through and tighten a nyloc nut on the other side of the tubing. Tighten snug but do not over tighten.
4. Do this for all Spreader Arms.
5. Return to Page 3.

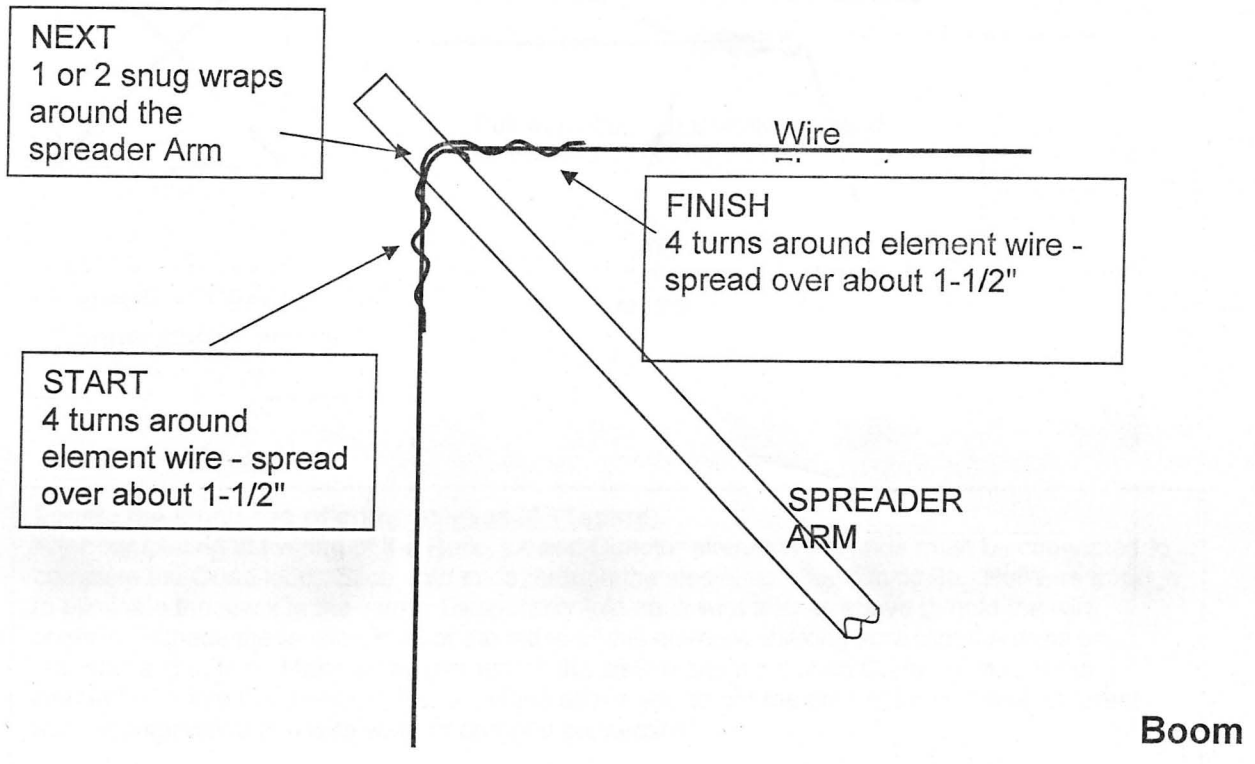
Stranded Wire Element Preparation

CAUTION: Working with stranded antenna wire certain precautions are required. First to prevent wire strands from unraveling when cutting to proper lengths it is important to flow solder about ½" either side of the cut point. Be careful as the wires may be very hot after soldering.

The second caution comes when un-spooling the wire to the necessary lengths. It is recommended that the wire be "unrolled" from the roll and not "stripped", as this will accentuate the spiral wrap tendency leading to wire kinks. Always be on the watch for wire kinks forming and take appropriate action to prevent them. If one should occur, it may be recoverable by carefully straightening it while smoothing.

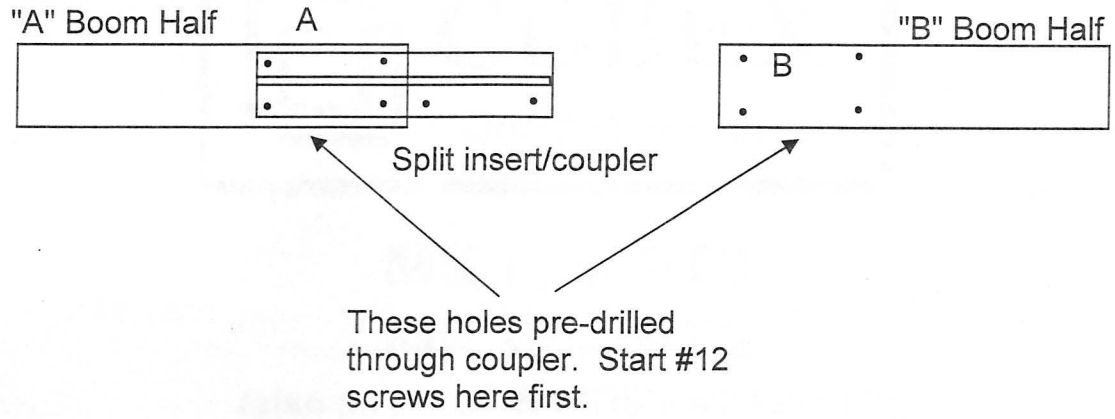
Wire Element Support - "Wire Wrap"

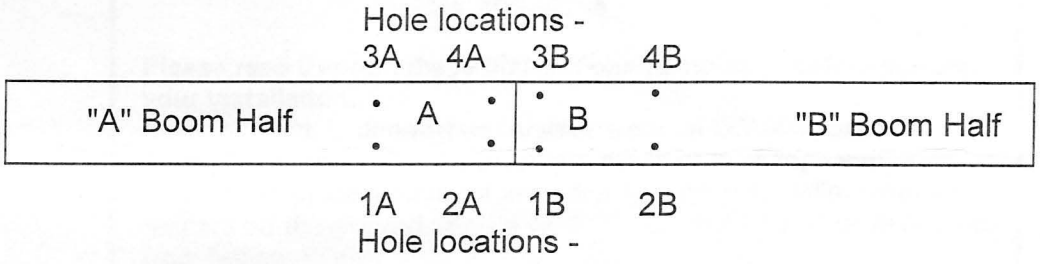
After feeding the element wire through the spreader arm holes, and checking for arm alignment, the "wire wrap" should be applied. This following procedure will assure minimum flexing of the element wire at the arm attachment point and to maintain element/spreader arm alignment we recommend securing all 20 meter and 17 meter element arm attachment points in the following manner. Generally speaking 15, 12 or 10 meter elements will not need this treatment. Sufficient "Wire Wrap" wire has been provided for this procedure - follow the diagram below.



Assembly -

Tools - 11/64" drill bit - supplied
5/16" nut driver (preferred for #12 screws)





With the two screws fully engaged in both "A" & "B" halves, drill the upper pairs of holes (3A. 4A, 3B, & 4B) through the insert. Secure with remaining #12 stainless sheet metal screws.

Overhead view of High Wind Kit