

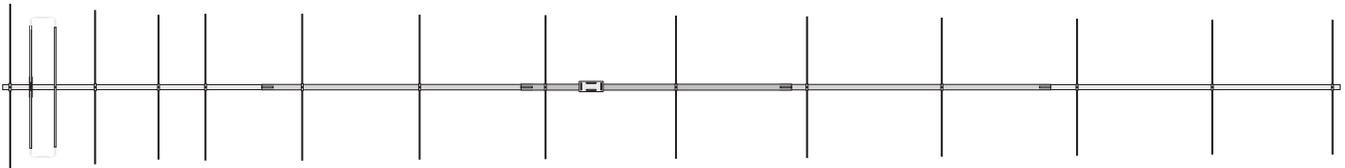
Cushcraft

Amateur Radio Antennas

LFA-2M14EL

14 Element Loop Feed Beam
For 2 Meters

INSTRUCTION MANUAL



CAUTION: Read All Instructions Before Operating Equipment

Cushcraft

Amateur Radio Antennas

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GENERAL DESCRIPTION

The LFA (Loop Fed Array) Low-Noise Yagi is very different from the traditional dipole fed Yagi in many ways with its primary benefit being unwanted noise rejection. The LFA has a rectangular shaped, full wave loop driven element that is laid flat on the boom between and in-line with the parasitic elements . Then there is the way in which the loop functions. The smaller end sections which run parallel to the boom, are engineered to be 180 degrees out-of-phase with each other. This provides the same effect as is seen within ladder-line feeder; each side cancels the other out and therefore, minimum radiation occurs. In practice this translates to highly suppressed side lobes and side-on signal rejection. This feature also plays a role in reducing F/B (Front to Back ratio), F/R (Front to Rear ratio) and broad-banding of the antenna too. It is these attributes which help give the LFA class-leading all-round performance at almost any boom length and for any given band.

UNPACKING

Unpack the antenna and separate the parts according to the drawings. This will simplify the antenna assembly. Parts have been separated when possible to aid in assembly. Make sure you have the necessary room to assemble the antenna before unpacking. This antenna will be very long when finished, don't try to assemble it inside your house and then move it outside. A car garage with a couple of saw horses or other means of support will make it easy to handle the antenna when putting it together. Assembly over grass is not recommended. There are lots of small things that can get lost forever in grass. Some parts may have extras included so don't worry if you have some left over when your done.

WARNING

WHEN INSTALLING YOUR SYSTEM, TAKE EXTREME CARE TO AVOID ANY ACCIDENTAL CONTACT WITH POWERLINES OR OVERHEAD OBSTRUCTIONS. FAILURE TO EXERCISE THIS CARE COULD RESULT IN SERIOUS OR FATAL INJURY

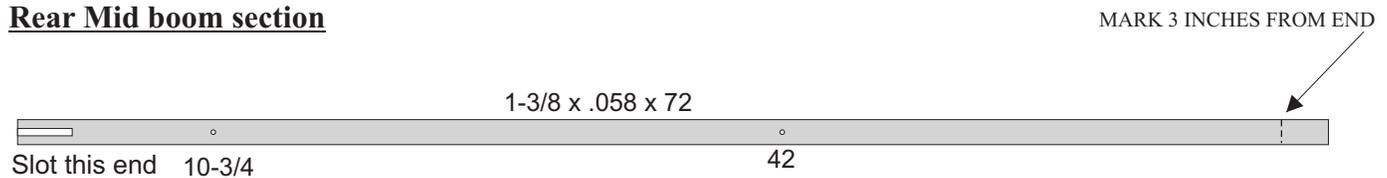
BOOM IDENTIFICATION

Here are the 5 boom sections with measurements displayed for the pre-drilled holes. You won't need these measurements, they are just there to identify the correct tube placement and orientation. Identify each tube by where the holes are. Once you have identified the tubes, determine which end of the tube will insert into the middle boom section. Mark this side of the tube 3 inches from the end. This mark will be used to set the insertion depth into the middle boom section. If the tubes are put together incorrectly, the elements will be out of place and the antenna will not work properly.

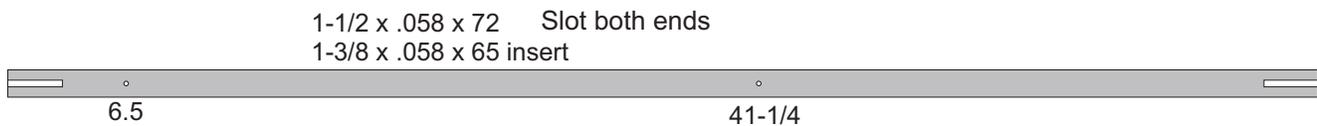
Rear Boom Section



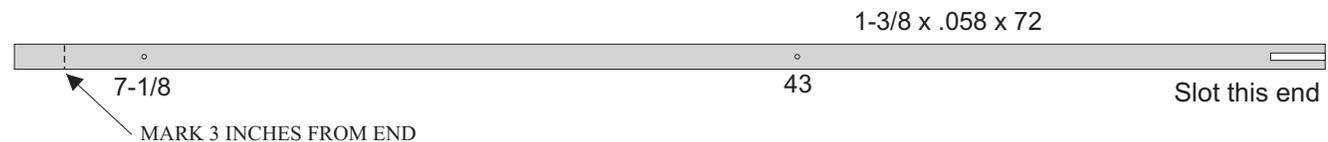
Rear Mid boom section



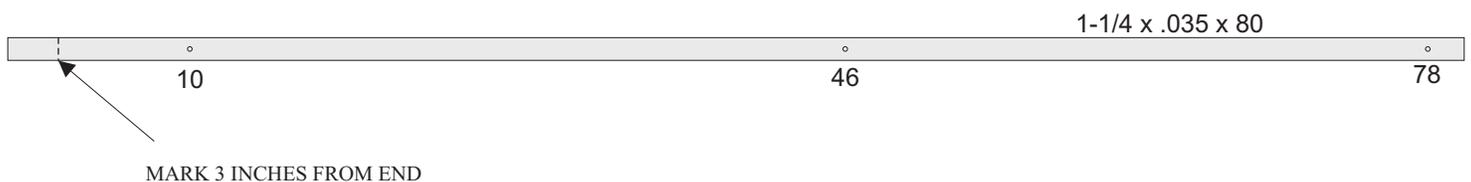
Middle Boom Section



Front Mid Section

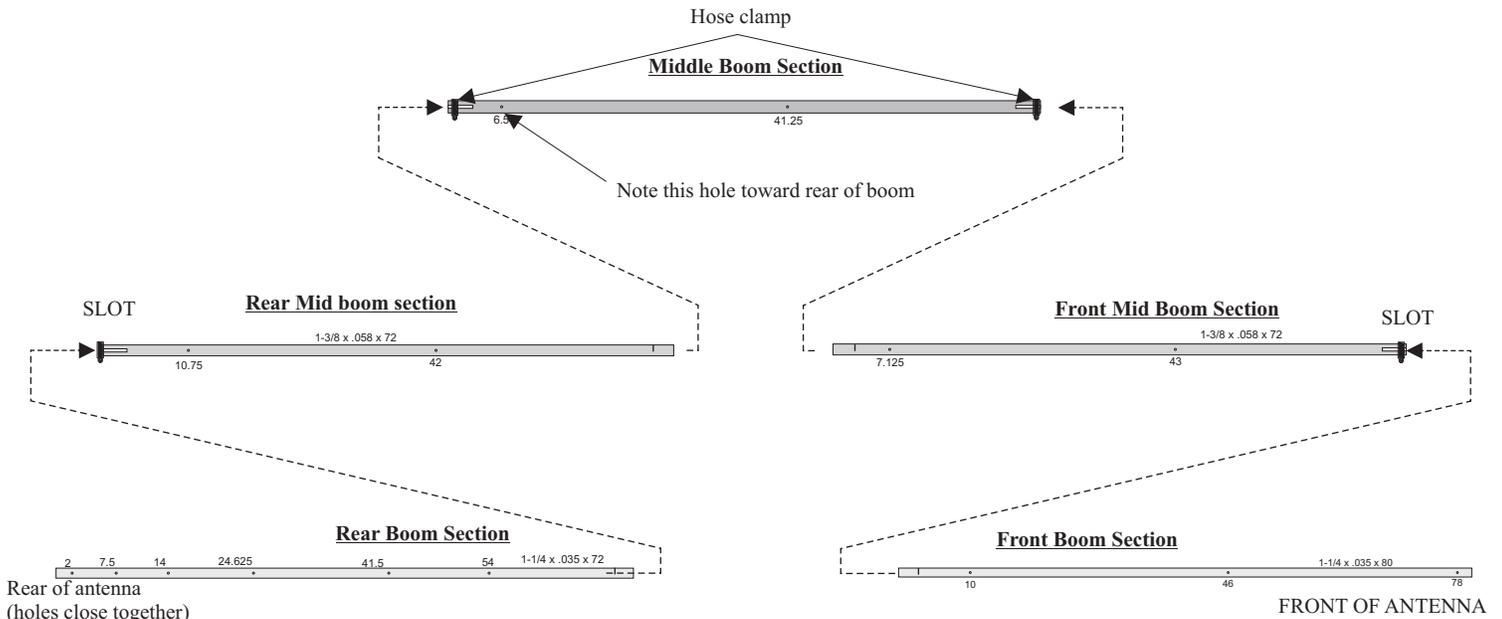


Front Boom Section



BOOM ASSEMBLY

Place a #16 hose clamp over the tube before inserting next section

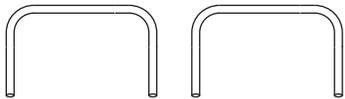


Insert each tube 3 inches into the next using the marks you made. Try your best to align the holes in each tube. Tighten the hose clamps just enough so that the tubes do not move. Final alignment of the tubes will likely be needed later. Now would be a good time to support the boom on a couple of saw horses or something similar.

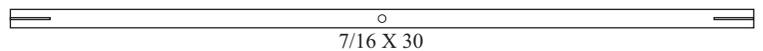
Loop Assembly

To assemble the feed loop onto the boom you will need the following parts.

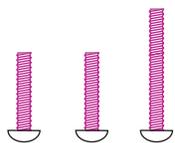
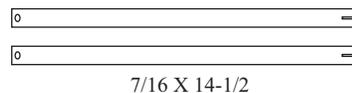
2 feed loop ends



1 long 7/16 tube



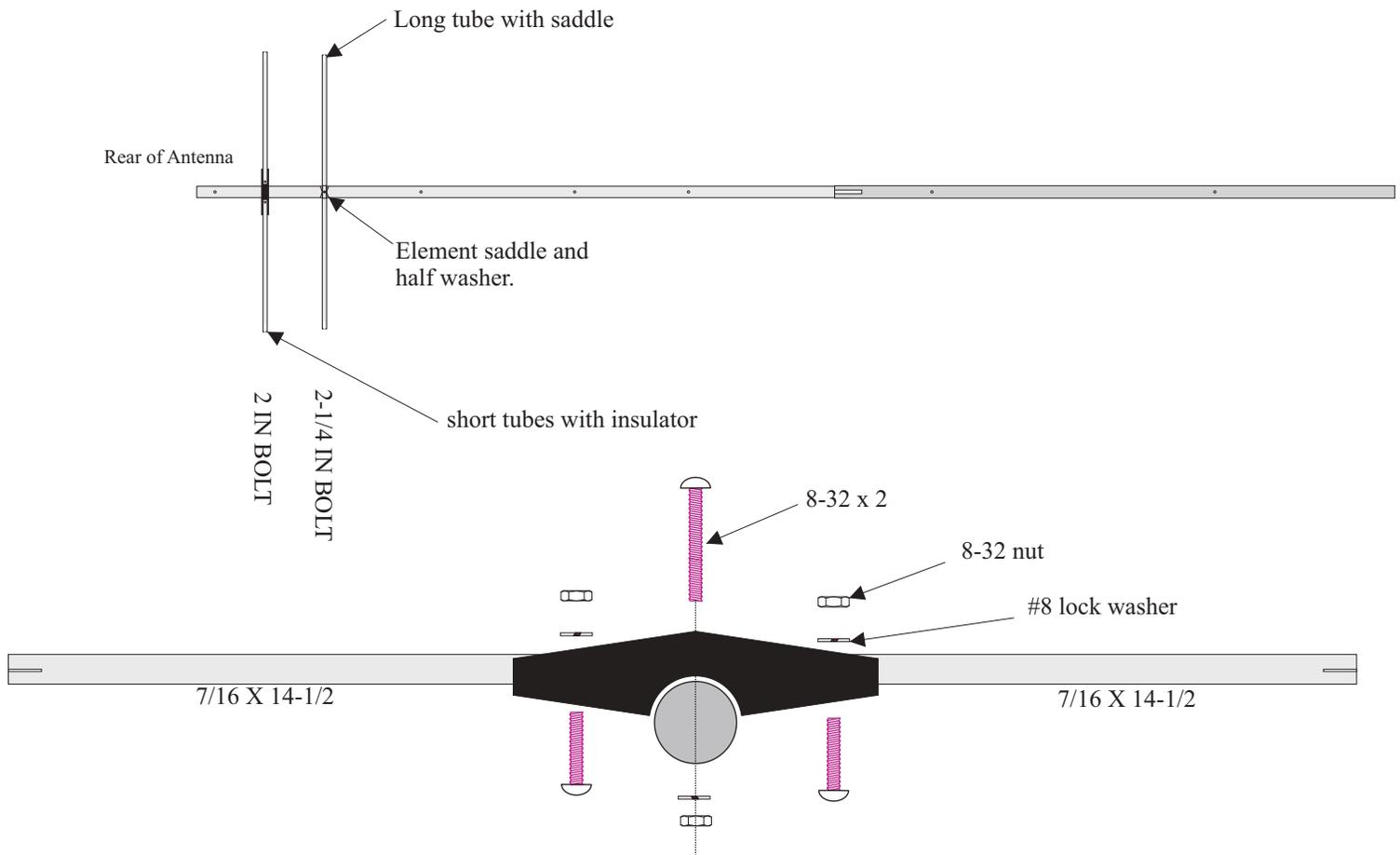
2 short 7/16 tube



8-32 x 1 bolt
8-32 x 2 bolt
8-32 nuts and lock washers

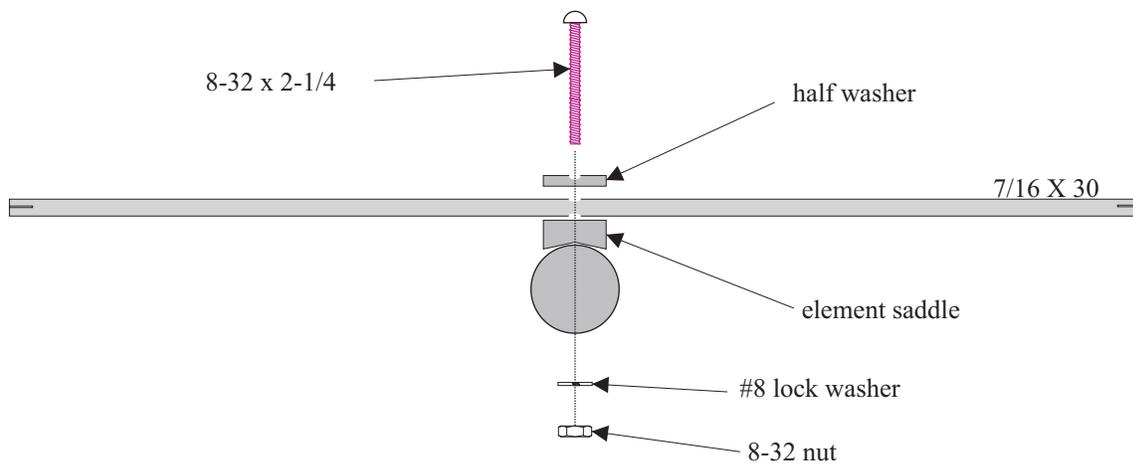
1 insulator



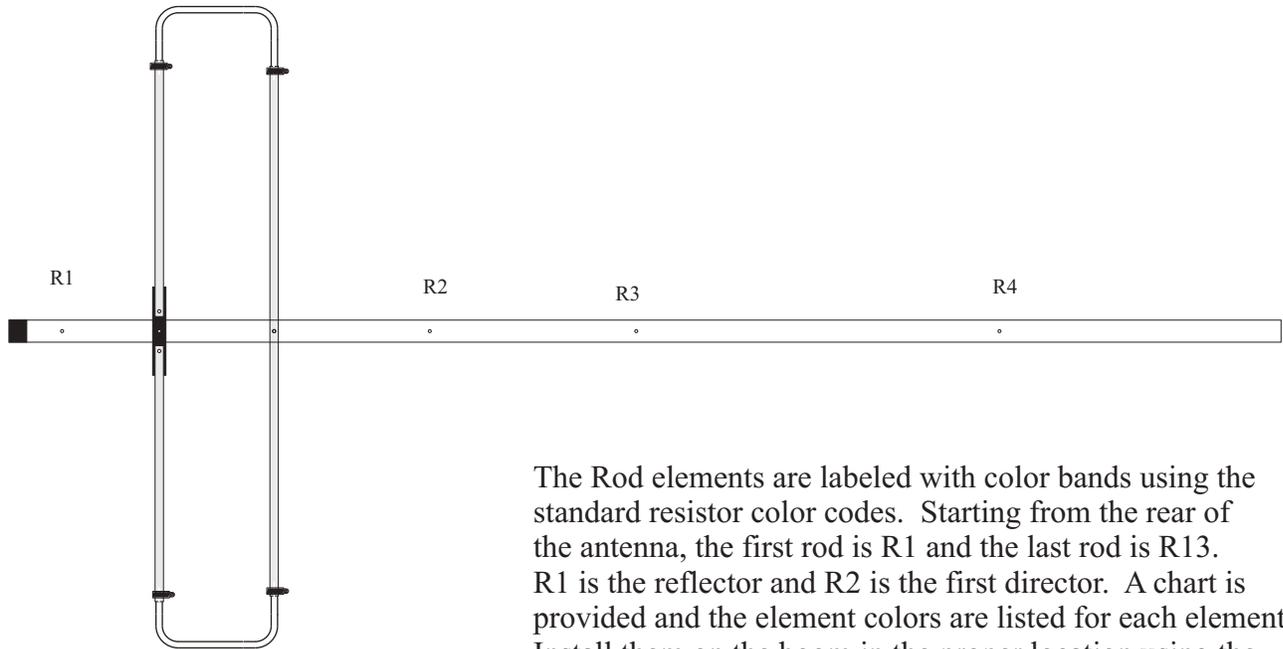


Mount the insulator on the Boom at the second hole from the rear of the antenna using the $8-32 \times 2$ inch bolt. Attach the two short $7/16$ tubes to the insulator using the $8-32 \times 1$ inch bolt thru the holes in the ends of the tubes. Go ahead and tighten the nuts but do not crush the tubes.

Mount the long $7/16$ tube to the third hole from the rear of the boom using a longer $8-32 \times 2-1/4$ bolt, half washer and element saddle.

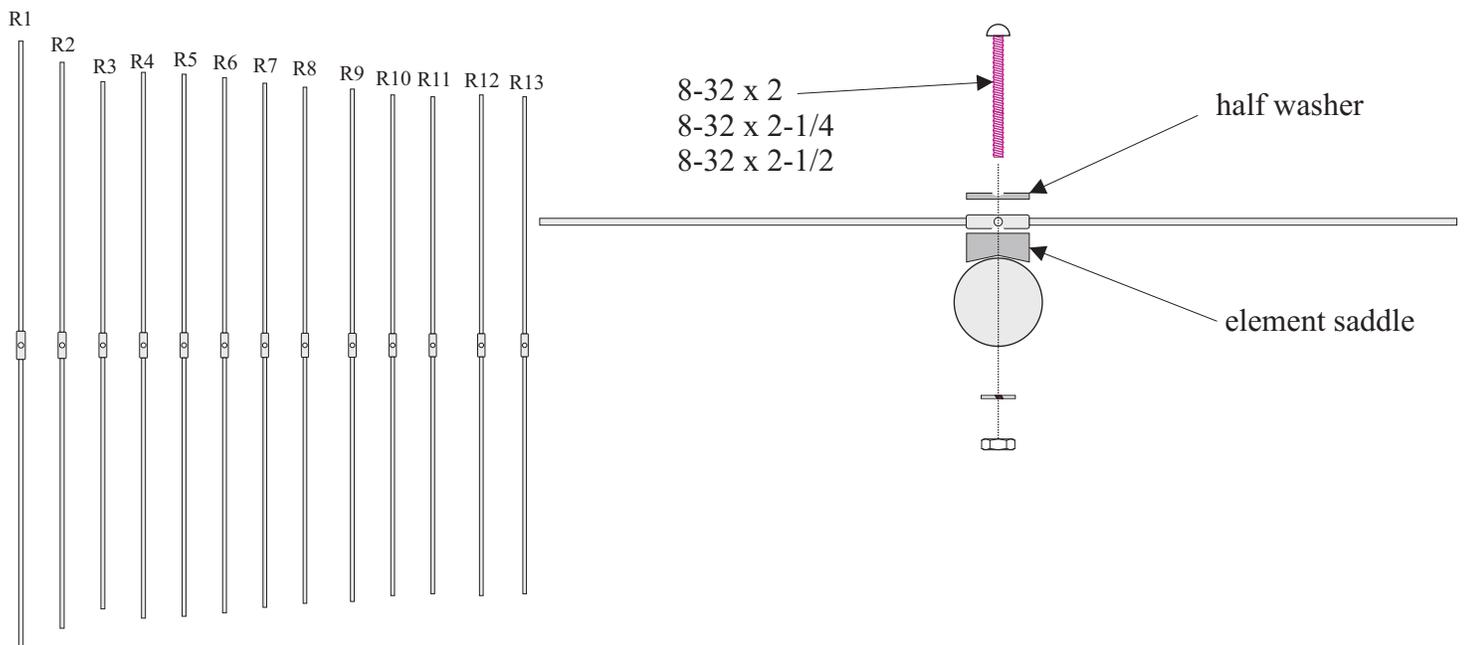


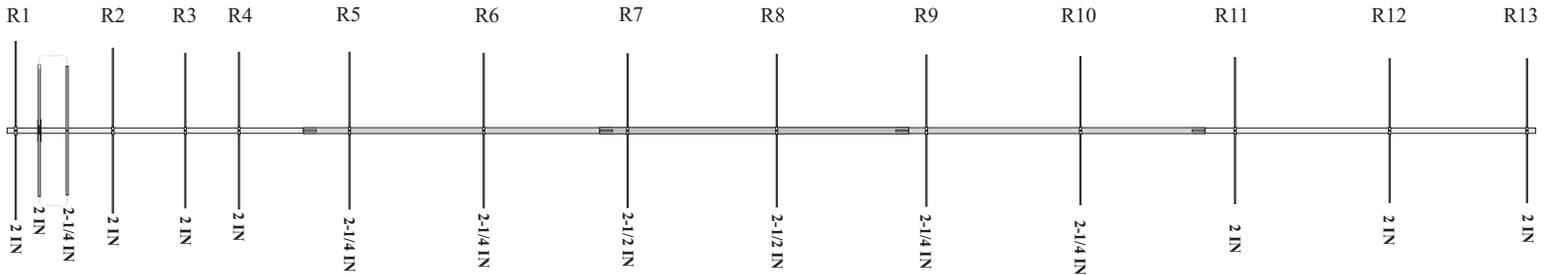
Put one hose clamp over each end of each tube. Insert the loop ends into the 7/16 tubes. Don't force them. Keep them straight as they go in. Leave them loose for tuning the SWR later. The tubes will have enough friction to stay without the hose clamps being tightened.



The Rod elements are labeled with color bands using the standard resistor color codes. Starting from the rear of the antenna, the first rod is R1 and the last rod is R13. R1 is the reflector and R2 is the first director. A chart is provided and the element colors are listed for each element. Install them on the boom in the proper location using the half washer, saddle and 8-32 x 2 inch bolts nuts and lock washers. Because of different size boom sections, some bolts need to be longer to mount the element. These bolt lengths are listed on the next page.

INSTALL THE ELEMENTS





Color code chart

BLACK	0
BROWN	1
RED	2
ORANGE	3
YELLOW	4
GREEN	5
BLUE	6
VIOLET	7
GREY	8
WHITE	9

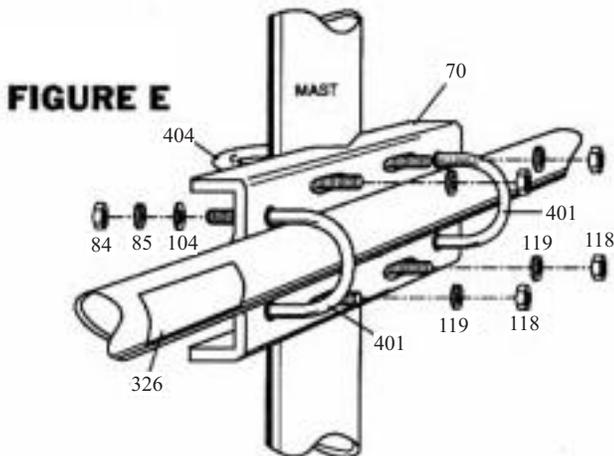
R1	41.5	INCH	BROWN
R2	38.4	INCH	RED
R3	36	INCH	ORANGE
R4	36.5	INCH	YELLOW
R5	36.54	INCH	GREEN
R6	36.04	INCH	BLUE
R7	35.83	INCH	VIOLET
R8	35.58	INCH	GREY
R9	35.23	INCH	WHITE
R10	34.54	INCH	BROWN BLACK
R11	34.04	INCH	BROWN BROWN
R12	33.50	INCH	BROWN RED
R13	33.50	INCH	BROWN ORANGE

Once you have all the elements on in the correct location, check the alignment of the elements on the boom sections.

Rotate the sections to align the elements if needed and retighten the clamps.

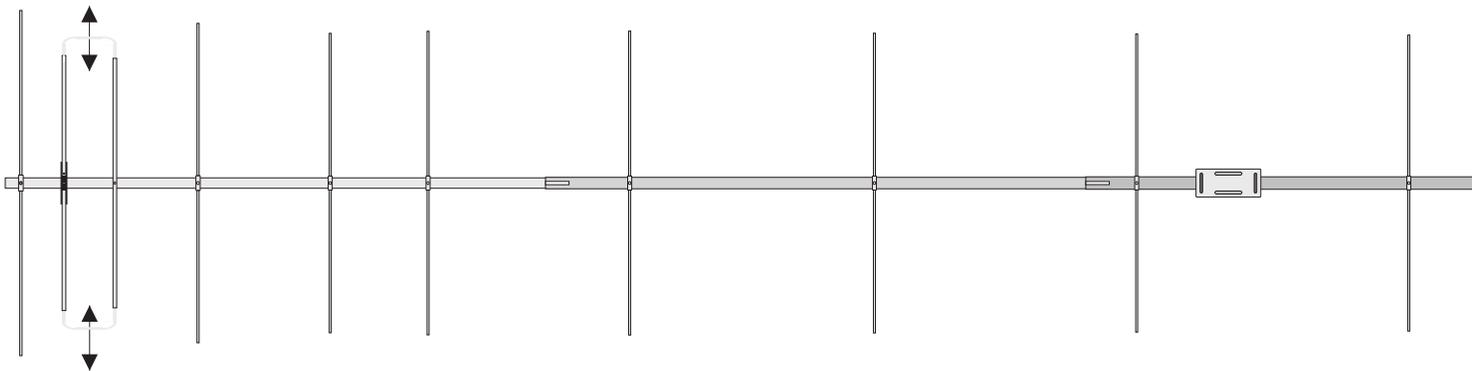
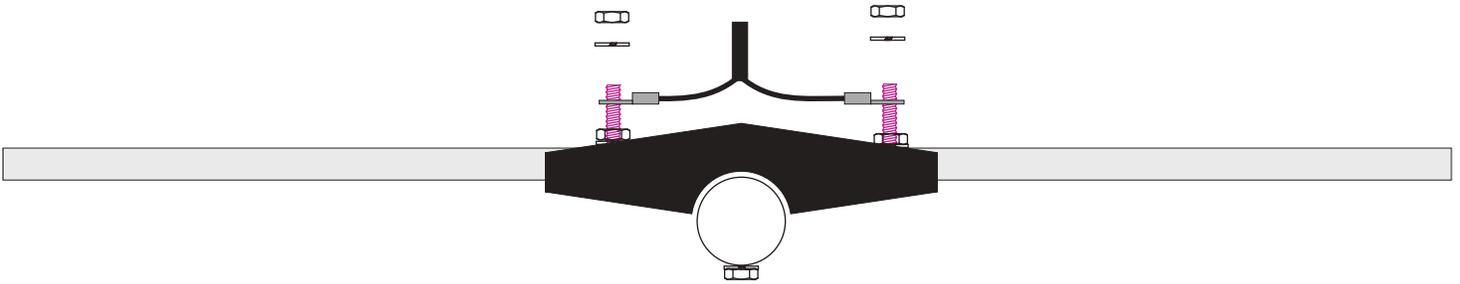
Boom to Mast

Select the parts shown and install the mast plate onto the boom. You may balance the boom by installing the plate at the center of gravity of the antenna. You can determine this point by simply holding the antenna and balancing it in your hand. The other option is to put the plate in the physical middle of the boom. This will balance the wind load on the antenna. Make sure the elements are in correct orientation before tightening the U-bolts.



KEY	P/N	DISPLAY	DESC	SIZE	QTY
84	010084		SS LOCK WASHER	1/4" (.64 cm)	4
85	010085		SS HEX NUT	1/4" (.64 cm)	4
104	010104		SS FLAT WASHER	1/4" (.64 cm)	4
118	010118		SS HEX NUT	5/16" (.79 cm)	4
119	010119		SS LOCK WASHER	5/16" (.79 cm)	4
401	010401		SS U-BOLT	1 1/2" x 3" (3.8 x 7.6 cm)	2
404	010404		SS U-BOLT	2 1/2" x 3" (5.5 x 7.6 cm)	2
70	190070		MOUNTING PLATE	4" x 6" (10.2 x 15.2 cm)	1
326	290326		DANGER LABEL		1

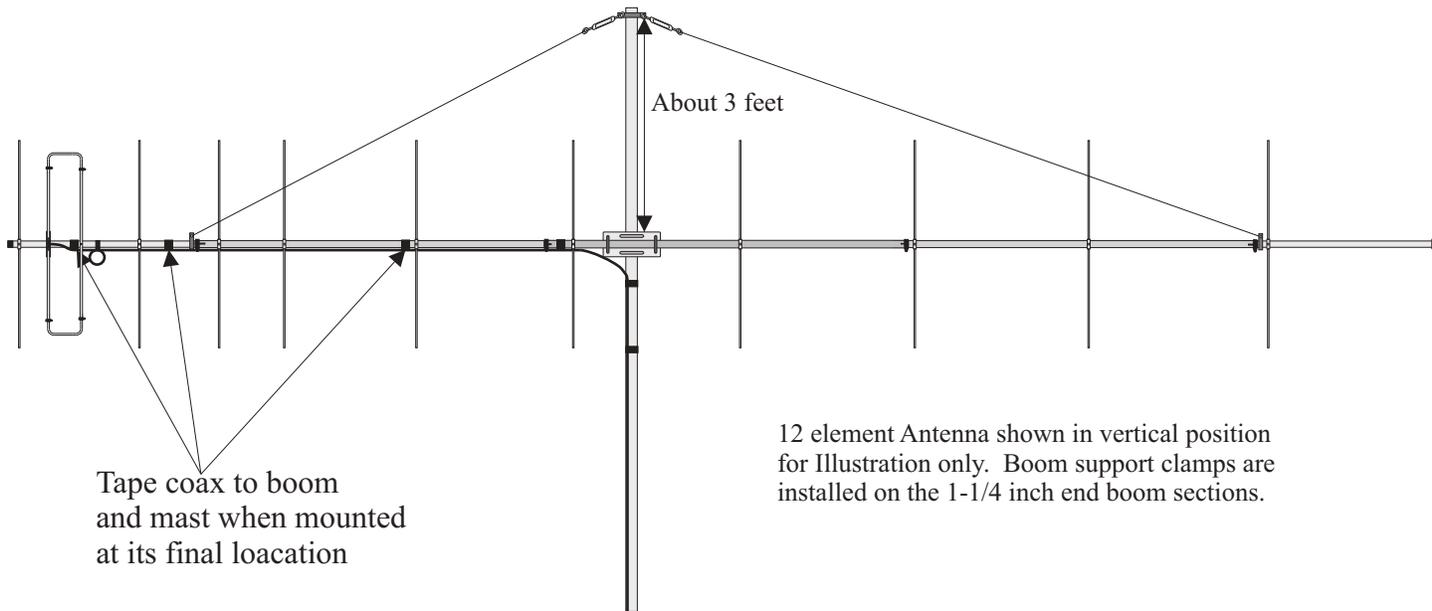
Attach your coax to the feed loop using the remaining 8-32 nuts and lock washers. Make the distance of the exposed conductors as short as possible. Seal this connection using an appropriate sealant to prevent water from entering the coax. Wind a choke balun into the coax using a household cleaner or spray paint can. Put 3 turns around the can and secure the coax together using cable ties. Attach the balun to the boom with tape and route the coax along the boom to the mast and go down from there.



Move out to shift frequency down

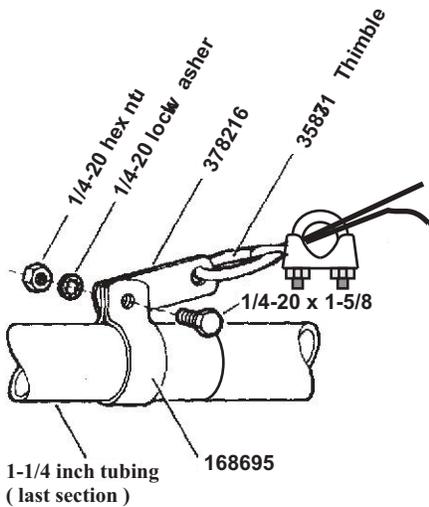
Tuning

Your antenna is now ready for tuning. Remove it from your assembly area and mount it on a temporary mast at least 8 feet off the ground. Using a SWR analyzer or radio and SWR meter, check for a dip in swr at or about 144.300 MHZ. You should see a dip in the SWR. If not, Check all connections and retest. If the dip is too low in frequency, move the loop ends in toward the boom. Move each side the same and keep them both the same distance from the boom. If the dip is too high in frequency, move the loop ends out away from the boom. It is not necessary to tighten the clamps each time for tuning. Once the dip is centered where you want it, tighten the clamps on the tubes. Do not use a wrench or powered device to tighten the clamps. A nut driver or screwdriver is plenty to do the job.

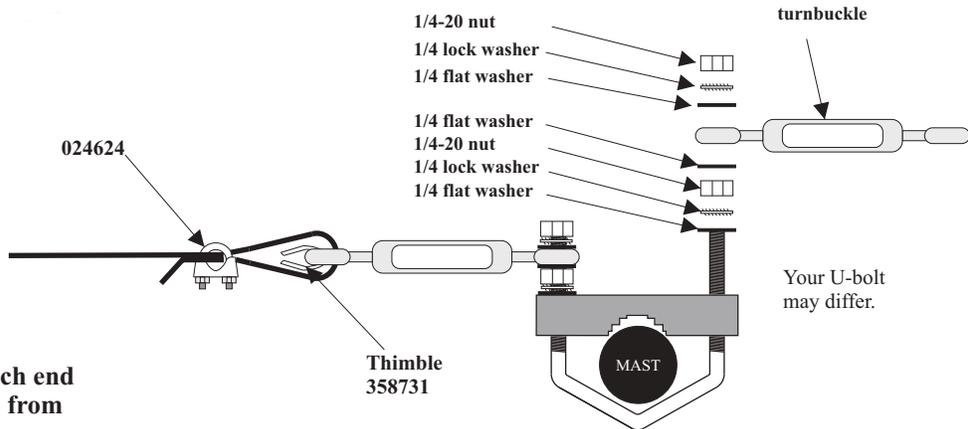


The antenna is now ready for mounting on your pole or tower. Route the coax along the boom and mast. Secure it using cable ties or electrical tape. Check the antenna over one last time to make sure everything is in place and secure. If you haven't already, place the plastic end caps over the end of the booms. When installing the boom support, pull the rope tight. It may stretch over time so you may compensate by adding about an inch of height to the ends of the antenna over the mast mount. Un-screw the turnbuckles all the way and move the clamp up and down to adjust the tension at first. Use the turnbuckles to make fine adjustments to the tension. Don't forget the thimbles on each end of the rope, they prevent the metal from cutting through when the antenna moves.

BOOM SUPPORT



Install the tube clamp at the last joint on each end of the antenna. This will prevent the clamp from slipping.



Tighten the U-bolt first and then tighten the nuts holding the turnbuckle.

Place support clamp about 3 feet above the boom clamp. Use left over rope to prevent turnbuckle from rotating after installation by routing it through the eyelets. Pull the rope tight and tie it off. You may use cable ties or other means of securing the turnbuckle if you wish.

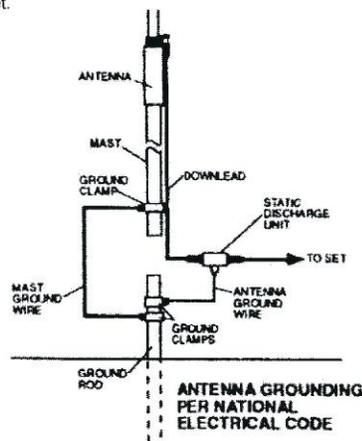
GENERAL INSTALLATION INSTRUCTIONS FOR MAST MOUNTED ANTENNAS

1. Assemble your new antenna on the ground at the installation site. Keep separate assembly instructions that come with it. Large CB and Amateur beams may have to be finally assembled on the tower or mast.
2. On the ground, clamp the antenna to mast and connect the coaxial cable to the antenna.
3. To insure that the mast does not fall the "wrong way" it should get away during the installation or takedown, durable non-conductive rope should be secured at each two foot level as the mast is raised. The boss stands in a position where he can yank or pull the ropes if the need arise to deflect the falling mast away from hazards (such as power lines) into a "safe fall" (such as a yard or driveway). The ropes are tied taut at the base of the mast after installation and in place at the various levels.
4. Install selected mounting bracket.
5. If you are going to use guy wire installation instead of a mounting bracket:
 - install guy anchor bolts
 - estimate length of guy wire and cut
 - attach a mast using guy ring
6. Carefully take antenna and mast assembly to mounting bracket and insert. Tighten camp bolts. In case of guyed installation, it will be necessary to have at least a second person hold the mast upright while the guy wires are attached and tightened to the anchor bolts.
7. Install self-adhering "DANGER" label packaged in antenna hardware kit at eye level on your mast.
8. Install ground rod to drain off static electricity build-up and connect ground wire to mast and ground rod. Use special ground rods, not a spare piece of pipe.

EXAMPLE OF ANTENNA GROUNDING AS PER NATIONAL ELECTRICAL CODE INSTRUCTIONS

1. Use No. 10 AWG copper or No. 8 AWG or larger copper-clad steel or bronze wire, as ground wires for both mast and lead-in. Securely clamp the wire to the bottom of the mast.
2. Secure lead-in wire from antenna to antenna discharge unit and mast ground wire to house with stand-off insulators spaced from 4 feet (1.2 meters) to 6 feet (1.8 meters) apart.
3. Mount antenna discharge unit as close as possible to where the lead-in wire enters the house.
4. Drill a hole in wall (CAREFUL! There are wires in that wall.) near your set just large enough to permit entry of cable.
5. Push cable through hole and form a rain drip loop close to where it enters the house.
6. Put small amount of caulking around cable where it enters house to keep out drafts.
7. Install static electricity discharge unit.
8. Connect antenna cable to the set.

You should not attempt to raise a mast in excess of 30 feet in height/length (not including the antenna proper) in a fully-extended condition. Thirty to fifty foot tubular masts must be elevated, a section at a time, with the base or outer section secured in place with guy wires. GET PROFESSIONAL HELP.



WARNING

INSTALLATION OF THIS PRODUCT NEAR POWER LINES IS DANGEROUS. FOR YOUR SAFETY, FOLLOW THE ENCLOSED INSTALLATION DIRECTIONS.

HOW TO INSTALL YOUR OUTDOOR ANTENNA SAFELY IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE U.S. CONSUMER PRODUCT SAFETY COMMISSION

YOU, YOUR ANTENNA, AND SAFETY

Each year hundreds of people are killed, mutilated or receive severe permanent injuries when attempting to install an antenna. In many of these cases, the victim was aware of the danger of electrocution, but did not take adequate steps to avoid the hazard.

For your safety, and to help you achieve a good installation, please **READ** and **FOLLOW** the safety precautions below. **THEY MAY SAVE YOUR LIFE!**

1. If you are installing an antenna for the first time, please, for your own safety as well as others, seek **PROFESSIONAL ASSISTANCE**. Consult your dealer. He can explain which mounting method to use for the size and type antenna you are about to install.
2. Select your installation site with safety, as well as performance, in mind. (Detailed information on Site Selection appears in a separate section of this booklet.) **REMEMBER: ELECTRIC POWER LINES AND PHONE LINES LOOK ALIKE. FOR YOUR SAFETY, ASSUME THAT ANY OVERHEAD LINES CAN KILL YOU.**
3. Call your electric power company. Tell them your plans and ask them to come look at your proposed installation. This is a small inconvenience considering **YOUR LIFE IS AT STAKE**.
4. Plan your installation procedure carefully and completely **before** you begin. Successful raising of a mast or tower is largely a matter of coordination. Each person should be assigned to a specific task, and should know what to do **and** when to do it. One person should be designated as the "boss" of the operation to call out instructions and watch for signs of trouble.
5. When installing your antenna, **REMEMBER: DO NOT** use a metal ladder. **DO NOT** work on a wet or windy day. **DO** dress properly -shoes with rubber soles and heels, rubber gloves, long sleeve shirt or jacket.
6. If the assembly starts to drop, get away from it and let it fall. Remember, the antenna, mast, cable and metal guy wires are all excellent conductors of electrical current. Even the slightest touch of any of these parts to a power line complete an electrical path through the antenna and the **installer-THAT'S YOU!**
7. If any part of the antenna system should come in contact with a power line-**DON'T TOUCH IT OR TRY TO REMOVE IT YOUR SELF. CALL YOUR LOCAL POWER COMPANY.** They will remove it safely.

If an accident should occur with the power lines call for qualified emergency help immediately.

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PARTS LIST

part #	Description	Qty
190070	boom to mast	1
010401	u-bolt	2
564792	5/16 split washer	4
555747	5/16 hex nut	4
561177	1/4 lock washer	4
554099	1/4-20 hex nut	10
566344	FLAT WASHER 1/4	10
010404	UBOLT	2
745-3116S	#16 hose clamp	4
745-3104S	#4 hose clamp	4
455630	1-1/4 caplug	2
465420	driven insulator	1
010229	8-32 x 1	2
010120	8-32 x 2	8
010232	8-32 X 2-1/2	2
014764	8-32 X 2-1/4	5
190028	Half washer	14
190026	element saddle	14
011941	lock washer #8	19
556990	8-32 hex nut	19
164150	ELEMENT R1	1
163840	ELEMENT R2	1
163600	ELEMENT R3	1
163650	ELEMENT R4	1
163654	ELEMENT R5	1
163604	ELEMENT R6	1
163583	ELEMENT R7	1
163558	ELEMENT R8	1
163523	ELEMENT R9	1
163454	ELEMENT R10	1
163404	ELEMENT R11	1
163550	ELEMENT R12	1
163550	ELEMENT R13	1
178145	DRIVER ELEMENT A 14-1/2	2
178630	DRIVER ELEMENT B 30 "	1
174022	2MTR LOOP END	2
631570	ROPE	25FT
	REAR boom 1-1/4 X .035 x72	1
	REAR MIDboom 1-3/8 X .058 x72	1
	FRONT MIDboom 1-3/8 X .058 x 72	1
	MID boom 1-1/2 X .058 x 72 with insert	1
	front boom 1-1/4 x 0.035 x 80	1
5035200	U-BOLT	1
024624	ROPE CLAMP	4
358731	THIMBLE	4
351243	TURNBUCKLE	2
378216	SS STRIP	2
500098	1/4-20 X 1-1/2 BOLT	2
562961	LOCK WASHER	8
168695	1-1/4 TUBE CLAMP	2
195726	SADDLE BRACKET	1

LIMITED WARRANTY

Cushcraft Amateur Radio Antennas, 308 Industrial Park Rd., Starkville, MS 39759, warrants to the original consumer purchaser for one year from date of purchase that each Cushcraft antenna is free of defects in materials or workmanship. If, in the judgment of Cushcraft, any such antenna is defective, then Cushcraft Amateur Radio Antennas will, at its option, repair or replace the antenna at its expense within thirty days of the date the antenna is returned (at purchasers expense) to Cushcraft or one of its authorized representatives. This warranty is in lieu of all other expressed warranties, any implied warranty is limited in duration to one year. Cushcraft Amateur Radio Antennas shall not be liable for any incidental or consequential damages that may result from a defect. Some states do not allow limitations on how long an implied warranty lasts or exclusions or limitations of incidental or consequential damages, so the above limitation and exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights that vary from state to state. This warranty does not extend to any products that have been subject to misuse, neglect, accident or improper installation. Any repairs or alterations outside of the Cushcraft factory will nullify this warranty.