

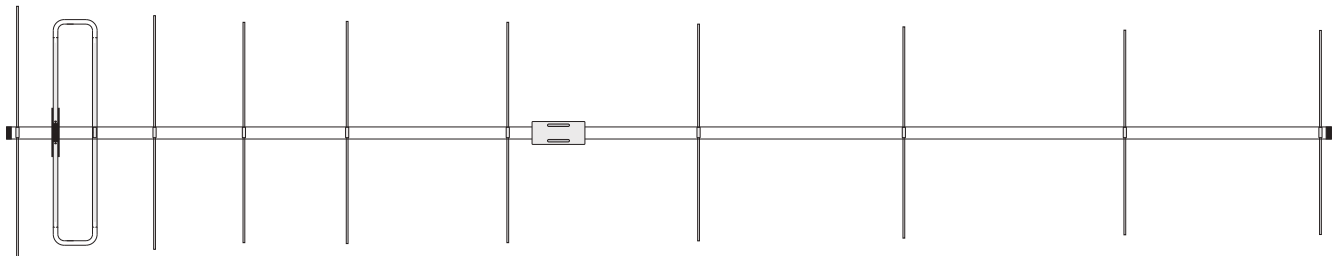
# Cushcraft

Amateur Radio Antennas

## LFA-220M10EL

10 Element Loop Feed Beam  
For 220 Mhz

### 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 check the parts against the Parts List and 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.

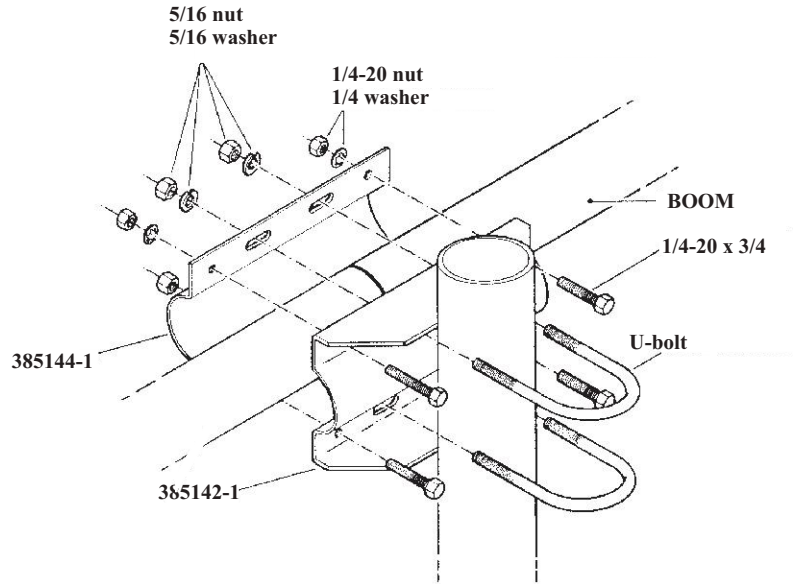
# **WARNING**

***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***

## Assembly of the Boom

Select the boom-to-mast clamp, (385142-1) the boom-to-mast bracket (385144-1) and four (4) 1/4" - 20 x 3/4" bolts (505266) four (4) internal lockwashers (562961) and four (4) 1/4" hex nuts (554099)

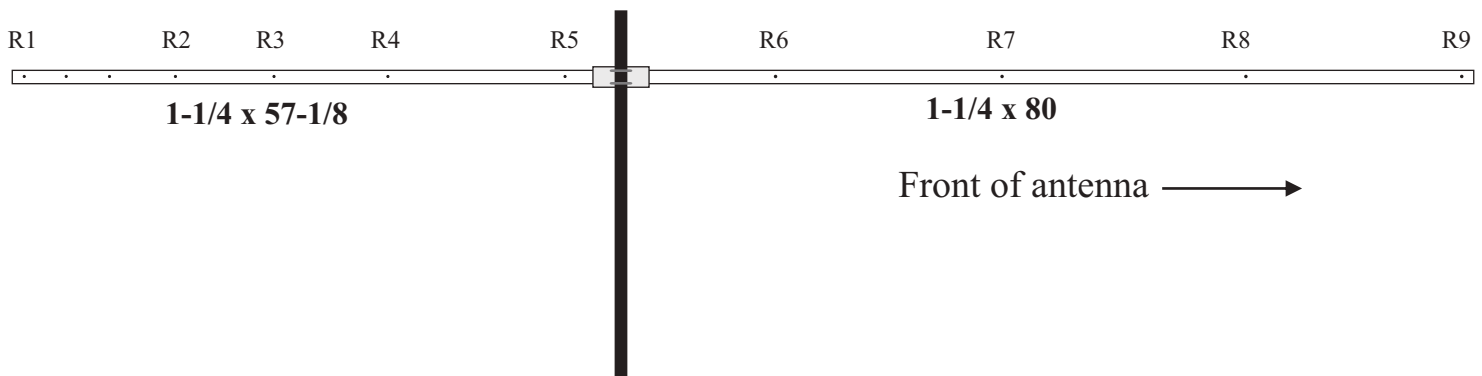
Place the boom-to-mast bracket (385144-1) on the boom-to-mast clamp (385142-1) align the holes and place the bolts in the four (4) outer holes as shown in Figure 1



Select the two sections of boom (Front and Rear), and insert them into the boom-to-mast bracket until they meet at the center. Tighten the bolts. (See next Page)

Install the U-bolts using the 5/16 nuts (555747) and the 5/16 split washers (564792).

Boom shown in vertical position for illustration only.

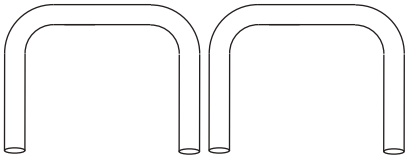


You may place the boom on a temporary mast or support it from each end. This will make assembly and measurements easier. Find a location that is suitable for an antenna this large. A concrete driveway is a good place to assemble antennas. Any hardware you drop in grass may be gone forever. Some of the smaller hardware has extra pieces just in case they are dropped.

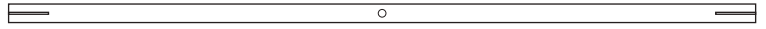
# Loop Assembly

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

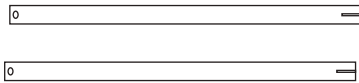
2 feed loop ends



1 long 7/16 tube



2 short 7/16 tube



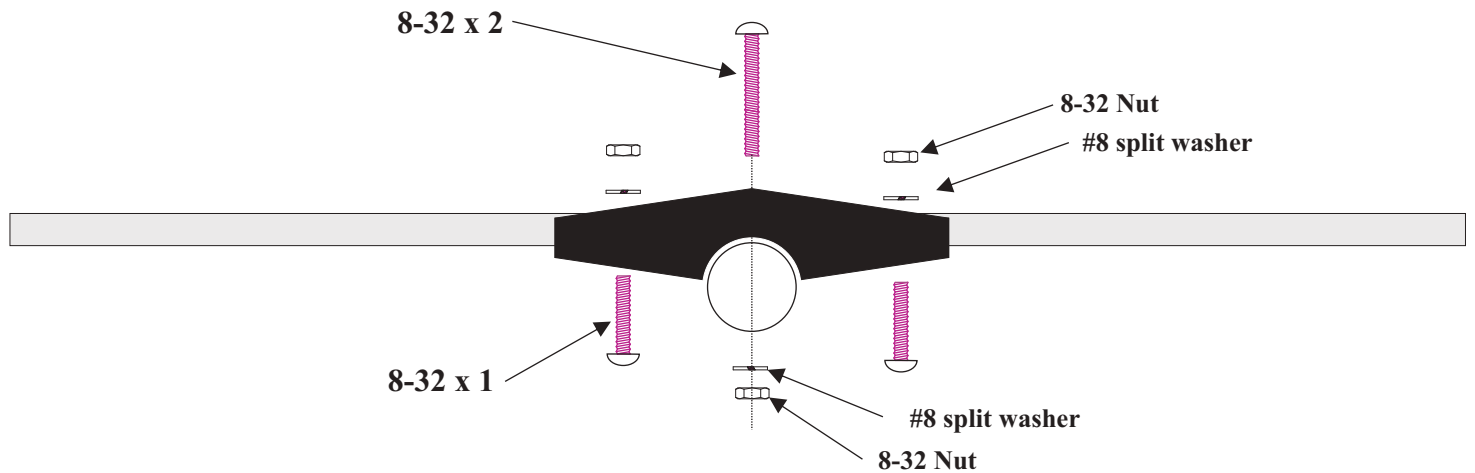
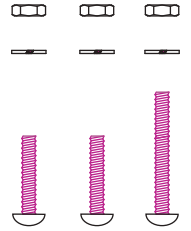
1 insulator



8-32 x 1 bolt

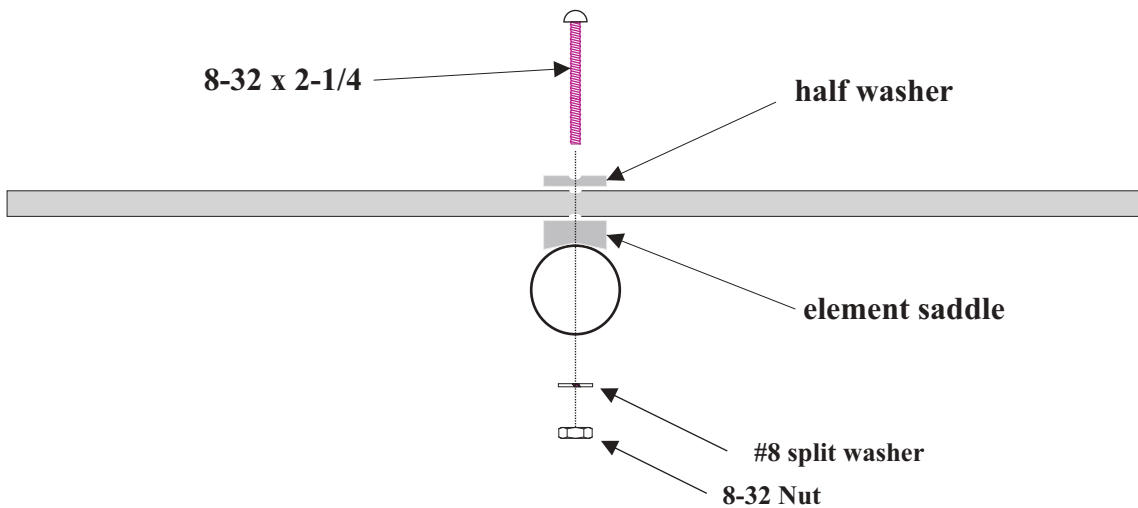
8-32 x 2 bolt

8-32 nuts and lock washers



Mount the insulator on the Boom at the second hole from the rear of the antenna using the 8-32 x 2 inch bolt. Attach the two short 7/16 tubes to the insulator using the 8-32 x 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 x 2-1/4 inch bolt, half washer and element saddle.



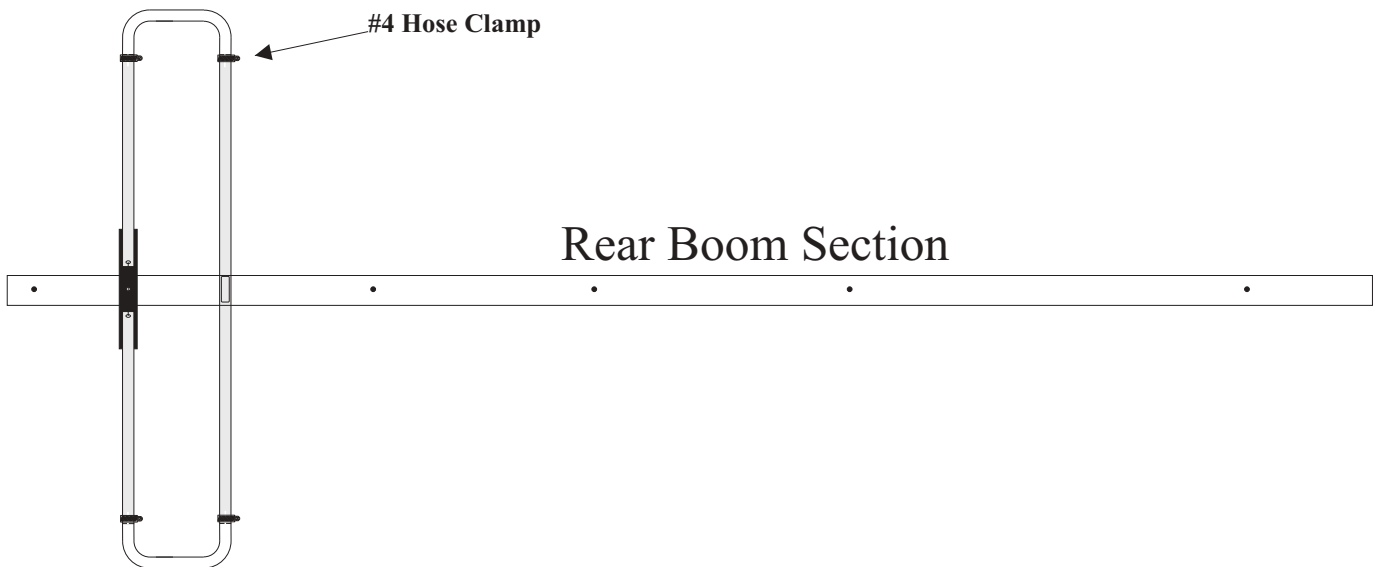
**long tube with saddle**



## Rear Boom Section

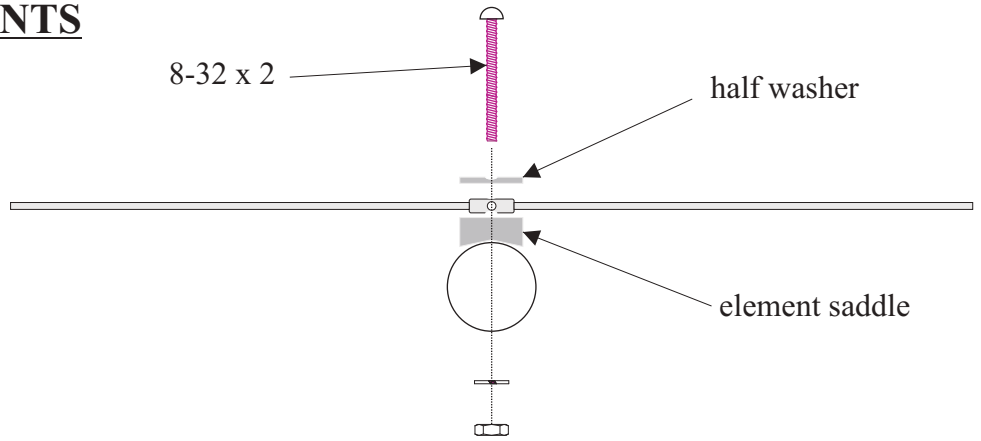
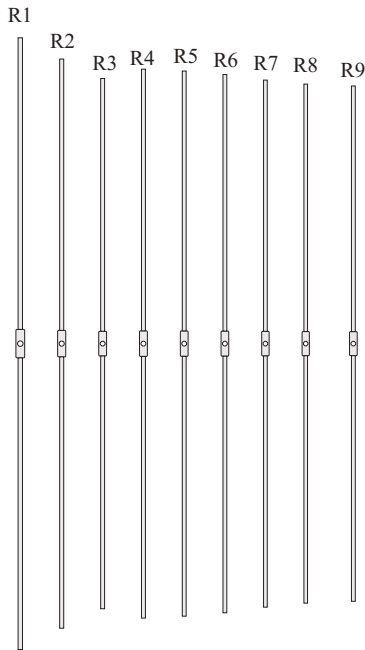
**short tubes with insulator**

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.



## Rear Boom Section

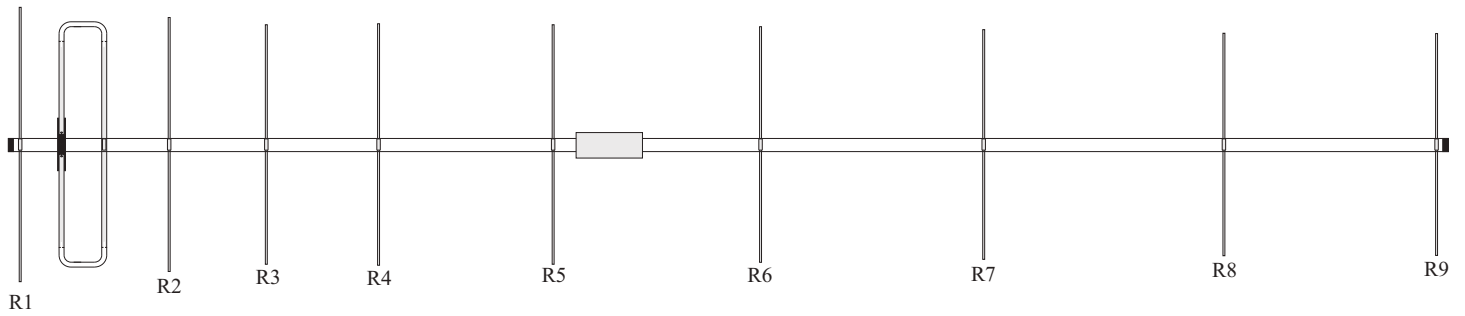
## INSTALL THE ELEMENTS



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 R9. 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.

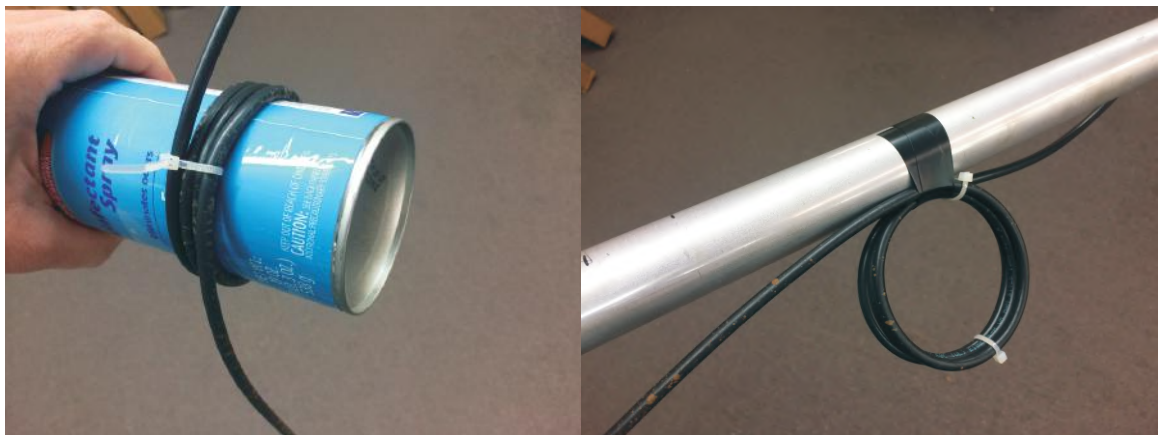
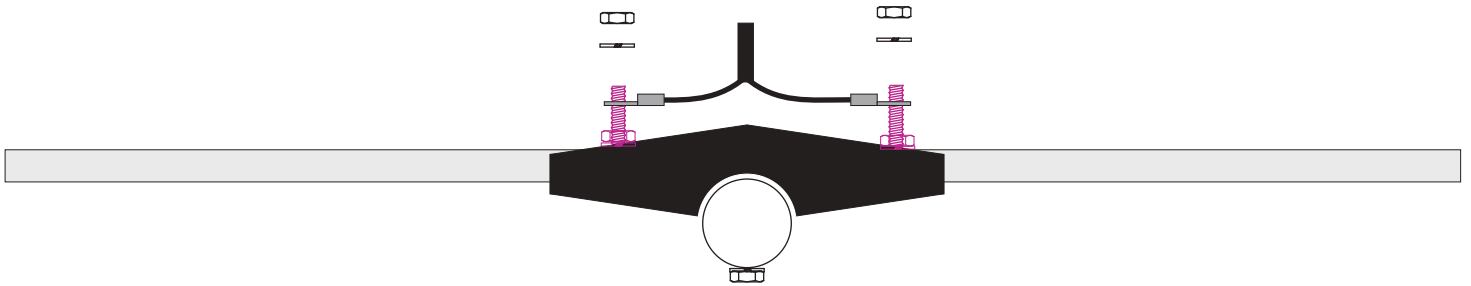
### 3/16 ELEMENT ROD LENGTHS

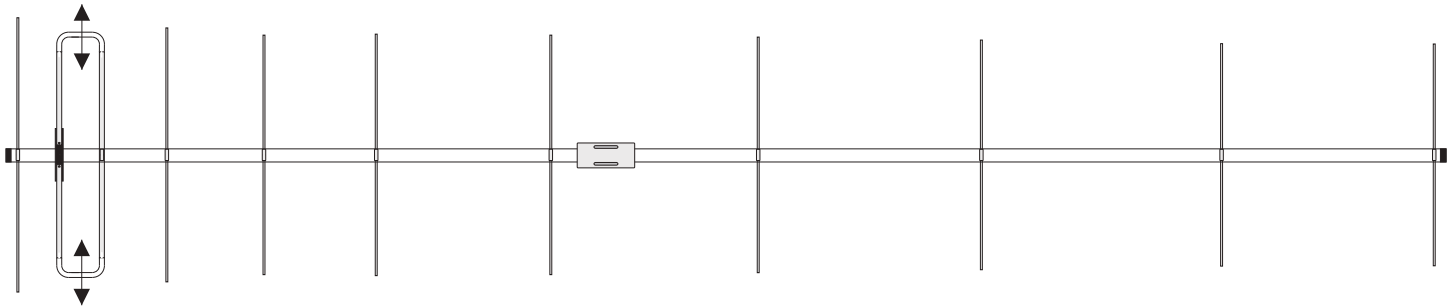
R1	26-1/8	INCH	BROWN	BLACK	0
R2	24-3/4	INCH	RED	BROWN	1
R3	22-13/16	INCH	ORANGE	RED	2
R4	23	INCH	YELLOW	ORANGE	3
R5	22-13/16	INCH	GREEN	YELLOW	4
R6	22-7/16	INCH	BLUE	GREEN	5
R7	21-7/8	INCH	VIOLET	BLUE	6
R8	21-3/16	INCH	GREY	VIOLET	7
R9	21-1/8	INCH	WHITE	GREY	8
				WHITE	9



Once you have all the elements on in the correct location, check the alignment of the elements on the boom sections. Place the Boom caps on the ends of the antenna

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.

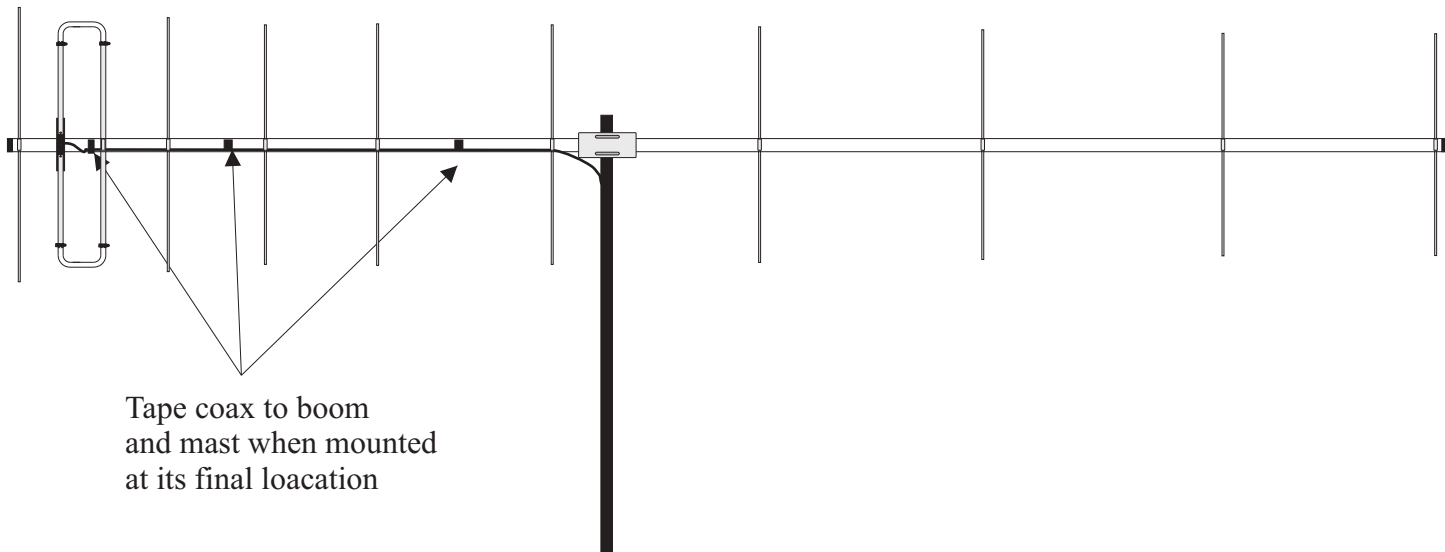




Move out to shift frequency down

## **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 220.000 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.

**ALWAYS** have a friend over to help you install the antenna. The antenna is very lightweight but it is awkward to handle.

**NEVER** try to install this antenna near power lines or place it anywhere that it can contact power lines if it were to fall.



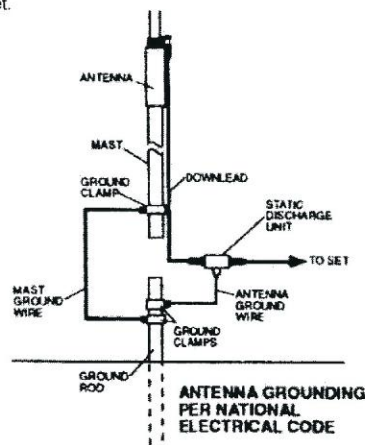
## GENERAL INSTALLATION INSTRUCTIONS FOR MAST MOUNTED ANTENNAS

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.

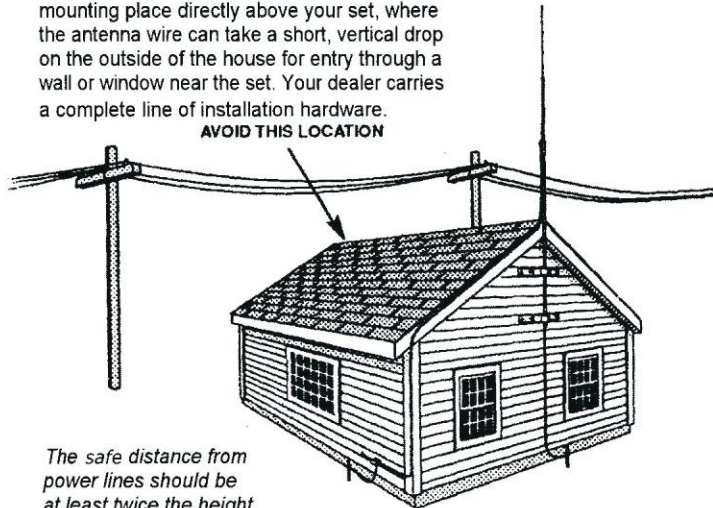
## SITE SELECTION

Before attempting to install your antenna, think where you can best place your antenna for **safety** and performance.

To determine a safe distance from wires, power lines and trees:

1. Measure the height of your antenna.
2. Add this length to the length of your tower or mast, and then
3. Double this total for the minimum recommended safe distance.

If you are unable to maintain this safe distance, **STOP! GET PROFESSIONAL HELP.** Many antennas are supported by pipe masts attached to the chimney, roof or side of the house. Generally, the higher the antenna is above the ground, the better it performs. Good practice is to install your antenna about 5 to 10 feet above the roof line and away from power lines and obstructions. Remember that FCC limits your antenna height to 60 feet. If possible, find a mounting place directly above your set, where the antenna wire can take a short, vertical drop on the outside of the house for entry through a wall or window near the set. Your dealer carries a complete line of installation hardware.

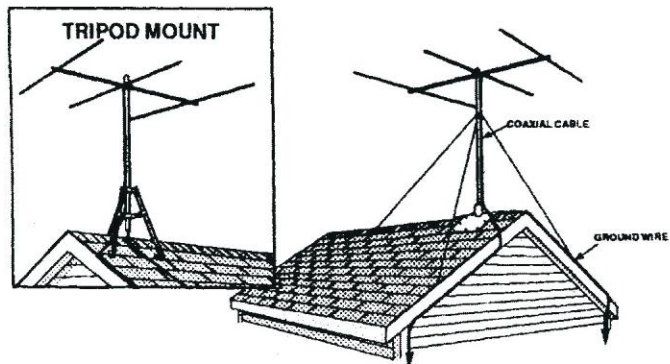


*The safe distance from power lines should be at least twice the height of the antenna and mast combined.*

## CHOOSE A PROPER SUPPORT AND MOUNTING METHOD

However you decide to mount and support your antenna always make sure that safety is your first concern. Some of the more common installation methods are illustrated below.

### ROOF MOUNTED



### ROOF MOUNTING

The swivel feature of "universal" type mounting brackets makes a convenient antenna mount for flat or peaked roofs. One clamp type bracket is used with 3 or 4 guy wires equally spaced around the mast and anchored to the roof or eaves by eyebolts. Apply roofing compound around the base of the bracket, screws and eyebolts for moisture sealing.

## TELESCOPING MAST

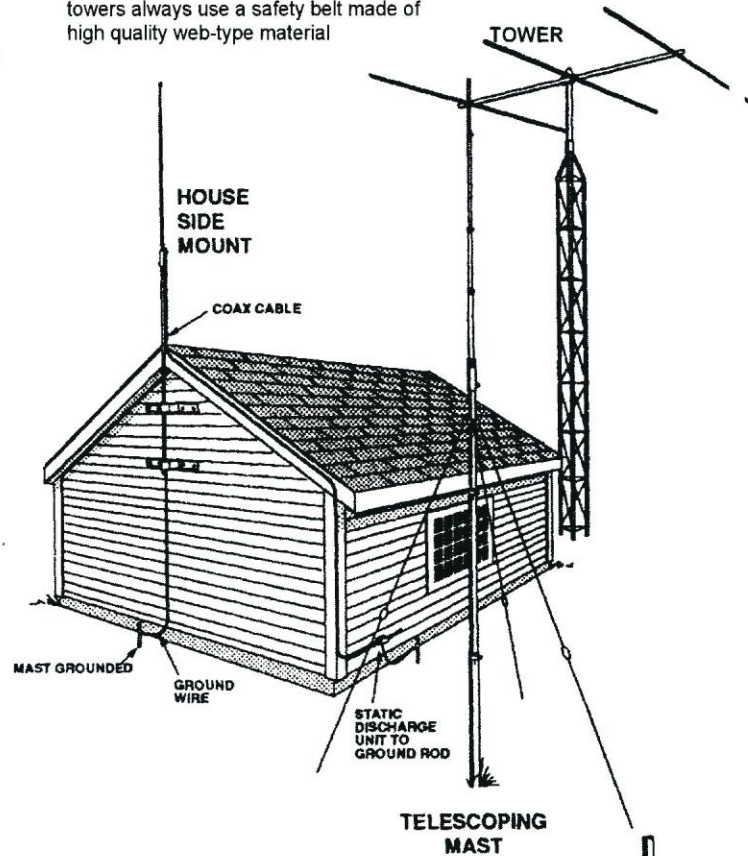
Guy wires should be equally spaced in at least three directions. Use at least three guy wires for each 10 foot section of mast.

## SIDE OF HOUSE MOUNTING

The safe distance from power lines is at least twice the height of antenna and mast combined. Where roof overhang is not excessive, the side of the house provides a convenient mounting. Position the brackets over a stud if possible, one above the other, and space two or three feet apart. For metal siding, first mark mounting holes, then drill pilot holes through the siding to accept mounting screws.

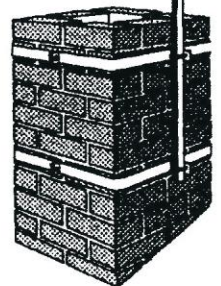
## TOWER

Tower safety is paramount to a good installation and requires that you take location, tree growth, soil depth and proximity to buildings into consideration. Tower foundations must be securely based on a solid concrete/ tower mounting plate. An alternative is to sink a 4-6 foot section of tower into a concrete base for an extremely rugged mount. Proper guying is essential to a safe weather-resistant installation that must handle severe wind loading and is best accomplished with preformed guy grips, torque brackets and turnbuckles. When working on towers always use a safety belt made of high quality web-type material



## CHIMNEY MOUNTING

The chimney is often an easy and convenient mounting place. But the chimney must be strong enough to support the antenna in high winds. Do not use a chimney that has loose bricks or mortar. A good chimney mount makes use of a 5 or 10 foot, 1-1 1/4" diameter steel mast, and a heavy duty two strap clamp-type bracket. Install the upper bracket just below the top course of bricks, and the lower bracket two or three feet below the upper bracket. For maximum strength, space the brackets as far apart as possible.



# Notes

## **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.