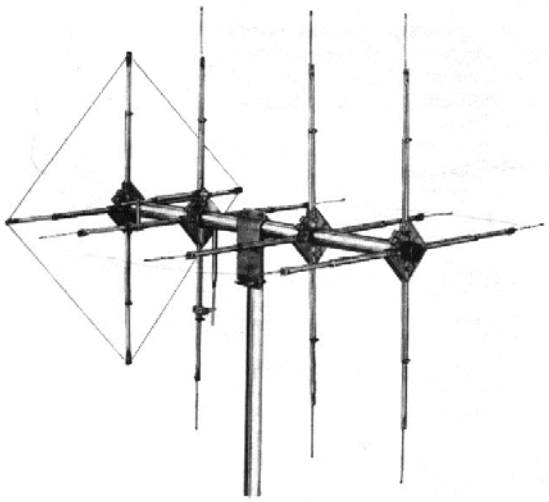
MODEL AV-140

MOONRAKER® 4 ANTENNA



YOU, YOUR ANTENNA AND SAFETY

WARNING

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

a CO-INDUCTIVE™ *antenna*

Each year hundreds of people are killed, mutilated or receive severe permanent injuries when attempting to install or remove 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 a proper installation, please READ and FOLLOW the safety precautions that follow – THEY MAY SAVE YOUR LIFE.

Save these instructions for future reference. The same precautions will apply when dismantling an antenna.

EMERGENCY AID FOR SHOCK

It is advisable to work with another person when installing or removing antennas. If your partner does receive a shock, don't touch him since his body could conduct the electricity to you; instead, try to pry or pull him away from the source of electricity with a length of dry wood, rope or blanket, or another non-metallic object.

If breathing has stopped, use mouth-to-mouth resuscitation until the doctor or ambulance arrives and relieves you. If the heart has stopped, closed-chest cardiac massage must be done simultaneously. The ambulance should be informed when called that an electric shock has occurred; it can bring proper equipment such as an intensive care or cardiac care mobile unit equipped with a heart defibrillator and carrying trained personnel.

® "Stripes of Quality"
the antenna specialists co.
a member of The Allen Group Inc.
30500 Bruce Industrial Parkway
Cleveland, Ohio 44139 - 3996 U.S.A.
TEL NO. 216 349-8400

Printed in U.S.A.

GENERAL SAFETY INSTRUCTIONS

If this is your first antenna installation or you are unsure of the safety of your intended mount and location GET PROFESSIONAL HELP. Look under CB sales and service in the Yellow Pages and consult your dealer. If necessary, consult your local power company. They can provide valuable assistance and MAY SAVE YOUR LIFE.

USE THE FOLLOWING GUIDELINES FOR A SAFE INSTALLATION.

1. Use a wood or fiberglass ladder — NOT METAL.
2. Do not install your antenna on a windy day.
3. Do not install your antenna during or after a rain or if moisture is present on the ground and surrounding objects.
4. Get assistance. Erecting even the smallest of antennas is not a one man job.
5. Dress properly — rubber soled shoes without heels (sneakers etc.), long sleeve shirt or jacket.
6. Carefully plan your installation. Each person should be given a specific task with one person designated as the boss.
7. If the assembly starts to fall, move away from it. If it should contact a power line it will become a DEADLY WEAPON. DON'T TOUCH IT. Call your local power company. They will safely remove the antenna.

Should an accident occur with the power lines DON'T touch the person or antenna still in contact with the power line. Use a dry board or rope to move the victim away from the antenna or downed power line. After the victim is clear of the hazard perform CPR (cardiopulminary resuscitation) if there is any doubt about the victim's condition. Have someone call an ambulance and the power company.

SELECTING A SITE.

Select a site for your antenna keeping the following in mind.

1. Ideally your antenna should be located as close to your operating position as possible.
2. Add the height of your antenna to the height of your mast, tripod or tower. Double this sum. This is the MINIMUM SAFE DISTANCE from the base of your installation to the nearest power line.

The effective height to be added to your mast or tower height for AVANTI AV-140 is 10 feet

Example: If your tower is 40 feet high and you are installing an AVANTI AV122 the effective height is 40 + 6.5 = 46.5 feet. Double this distance = 93 feet. This is the recommended MINIMUM SAFE distance from power lines for this example.
If your intended installation site does not meet this minimum distance — STOP — choose another location or seek professional help through your CB dealer.

HOW TO SUPPORT YOUR ANTENNA

Antenna mounts fall into three categories:
1. roof mounts
2. free standing mounts
3. side of structure mounts

Remember that the FCC limits the height of your CB antenna to 60 feet above the ground.

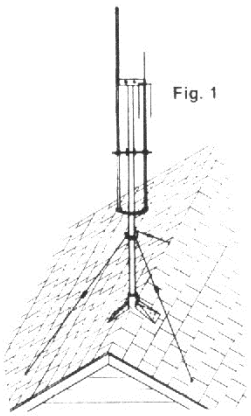


Fig. 1

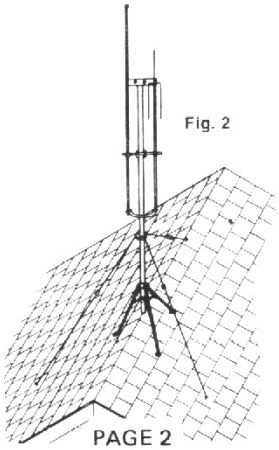


Fig. 2

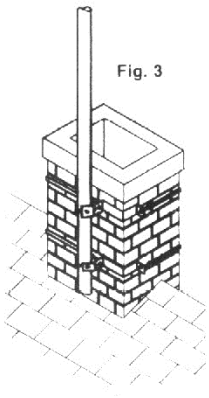


Fig. 3

PRINTED IN U.S.A.

Roof mounting usually employs a swivel mount (Fig 1), tripod (Fig 2), or chimney mount (Fig 3).
The swivel mount allows mounting the antenna on flat or sloped roofs. 5 to 10 feet of at least 1-1/4 inch metal pipe should be used. If possible, the swivel should be mounted directly over and screwed into a roof truss. Use a roof sealer to prevent leaks where the screws enter the roof. The mast should be guyed in three or four directions (Fig 4). Anchor the guys with screw eyes or other suitable guy line anchors. Remember that metal guy lines also present a shock hazard should they come in contact with power lines. Vinyl covered guys are available that LESSEN this risk but DO NOT eliminate it. DO NOT place guy lines over or near power lines.
Three and five foot tripods are also available for roof mounting. Do not use a mast longer than ten feet with tripods. Guy lines (Fig 4) should be attached as shown. Mast diameter should be 1-1/4 inch diameter minimum. Chimney mounts offer a convenient installation for small antennas. Before buying a chimney mount inspect your chimney for loose mortar or bricks. If either of these conditions exist do not use a chimney mount. Ratchet type chimney mounts are slightly more expensive than standard mounts but offer a more secure installation. Place the straps as far apart on the chimney as is possible. Use at least 1-1/4 inch metal pipe no longer than 10 feet. Guy as shown.

SIDE OF STRUCTURE MOUNTING

Light weight antennas may also be mounted alongside the structure with commercial wall mounts if the roof overhang is not excessive (typical wall mounts will allow for 6-8 inches of overhang). Two brackets should be used, spaced at least two to three feet apart. Follow the bracket manufacturer's weight and size limitations supplied with the brackets. (Fig 6).

GENERAL INSTALLATION INSTRUCTIONS FOR MAST MOUNTED ANTENNAS

1. Before beginning your installation collect all materials and tools needed for the installation
2. Assemble the antenna on the ground. Keep the assembly instructions for future disassembly.
3. If a rotor is used it should be installed to the mast and then install the antenna on the mast or rotor.
4. Connect coaxial cable(s) to the antenna and allow enough slack so that the cable will not hinder raising the antenna.
5. Install the type of mount you will use. Also install the guy anchors.
6. Estimate the length of guy line needed for each of the three or four lines. Cut the proper length and attach to the mast.
7. Methods for raising masts, towers, and proper guy line installation may be found in the American Radio Relay League *Amateur Radio Handbook* and *Antenna Handbook.* These publicatoins may be available at your dealer or public libraries.
8. Install the self adhering "DANGER" sticker supplied with the antenna on the antenna support in an obvious location.
9. All AVANTI antennas are lightning grounded. However do not depend on the base of the mast buried in the ground for lightning protection. Use a proper lightning ground rod (Fig 6). This information is also available in the previously mentioned publications.

You should never attempt to raise a mast longer than 30 feet (not including antenna) in a fully extended state. These tubular masts should be raised a section at a time and guyed off before raising the next section.

KEEP THIS BOOKLET. THE EXACT SAME PROCEDURES SHOULD BE FOLLOWED WHEN DISMANTLING THE ANTENNA — THE SAME DANGEROUS CONDITIONS WILL EXIST. IF IN DOUBT GET PROFESSIONAL ASSISTANCE.

FREE STANDING MOUNTS

A free standing mount may be a one-piece mast, telescopic mast, or tower. These mounting structures may be mounted away from structures or alongside for added support and strength.

Minimum mast diameters are listed in the antenna instruction manuals. Guy lines should be used at each ten foot section of unsupported mast or tower (Fig 5).

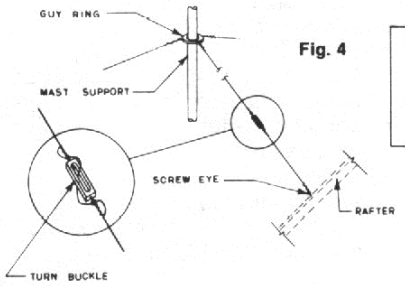
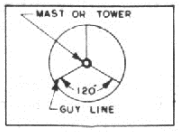


Fig. 4



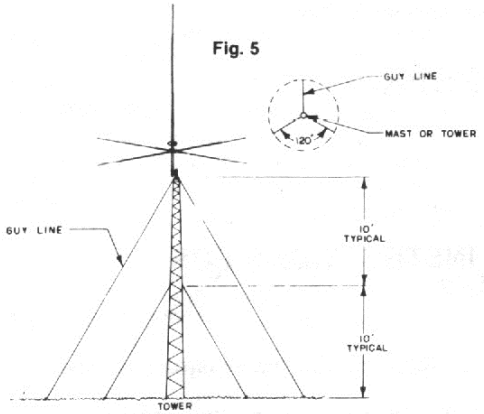


Fig. 5

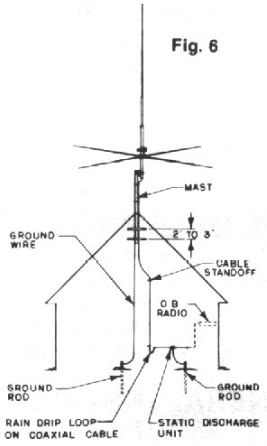


Fig. 6

MOONRAKER (MODEL AV-140) ASSEMBLY INSTRUCTIONS

PROPER CONSTRUCTION

If they could, manufacturers would ship all antennas fully assembled in order to eliminate mistakes in construction often found in antenna installations. Even the best instructions as sometimes mis-read and an antenna condemned only because of an error in assembly. If an antenna does not perform up to par, contact your local distributor or dealer, and if he can't help you, call the manufacturer.

These are by no means all of the possible variations to consider in antenna measurements; however, they are some of the most important and undertanding them will certainly be to the CBer's benefit and may save time in finding a trouble source.

MOUNTING RECOMMENDATION: Proper mounting requires a stable support. For proper support of the Moonraker 4 antenna we recommend the use of a tower, tripod, telescoping mast, or ground up mast. This structure must withstand the various weather conditions in your local area. For information regarding which of these supports would best suit your particular point of installation, consult a manufacturer of these products, a professional installer, or your local CB dealer for specific recommendations. Mention that the Moonraker 4 weighs 24 lbs. and has a wind load area of 5 sq. feet. For your assistance in determining a safe site selection as listed on page 2, the longest dimension of the Moonraker 4 is 19 feet. For best performance and maximum safety mount your antenna away from trees and electric lines of any type.

STEP 1:

Four hub assemblies are needed. Construct 3 of 4 hub assemblies as shown in Figure 1. Use 1/4 x 1-1/4″ bolts with flat washers under the heads of the bolts and a 1/4″ star washer under each nut. Tighten bolts.

The star washer should hold the nut from turning, so it will not be necessary to hold the nut while tightening.

The 4th hub assembly is identical except that the connector bracket is attached as shown in Figure 2. Two 1/4 x 1-1/2″ long bolts are used on the side which holds the bracket. Note the orientation of bracket on hub.

STEP 2:

Slide the hub assembly with the connector bracket 9″ onto one end of a 6 foot boom with the connectors facing out. (Figure 3). Slide another hub assembly 1″ onto the opposite end of the boom — see Figure 4. The slots in both hubs should be in line. (Figure 5). Construct another outer assembly identical to the one just completed. **NOTE:** Only one outer assembly has a connector bracket.

STEP 3:

Place the two outer assemblies on a flat surface such as a floor or sidewalk with the slots in the hubs facing up. The flat surface should keep the arms in alignment with each other. Refer to Figure 5.

STEP 4:

To secure hubs to the boom follow this procedure:

a. Start a 1/4″ nut onto a 1-1/2″ long bolt after a flat and star washer have been placed onto the bolt.

b. Place this bolt into the hub assembly as shown. The flat-washer should be under the head of the bolt, the starwasher under the nut. (Figure 6).

c. Tighten with a 7/16″ open end wrench. Place the wrench on the head of the bolt, (not the nut) the star washer will keep the nut from turning while tightening.

d. After hubs have been secured, place a black plastic boom plug onto each boom end. **NOTE:** Do not place a cap on the 9″ boom ends.

STEP 5:

Connect both gamma tubes to connectors as shown. **Do not tighten. NOTE:** Put a #10 starwasher on each gamma, between the gamma tube end and the flat lug. See Figure 7.

STEP 6:

A. Slip 2 gamma fasteners over the proper 5/8″ arm and secure lightly. Use 10-32 x 1/2″ screws and 10-32 square nuts. See Figure 2 and Figure 8.

B. Refer to Figure 8 and Figure 10. Slide the gamma stud onto the gamma rod as shown. Put the gamma sleeve onto the gamma stud. Place the threaded end of the gamma stud through the 3/8″ hole in the gamma fastener and attach the aluminum nut. Leave "finger tight."

C. Position the center of the vertical gamma fastener 22-1/2″ from the corner of the hub, lock into position by tightening the 10-32 screw and also the aluminum nut.

D. In a similar manner, position the center of the **horizontal** gamma fastener 24-5/8″ from the corner of the hub. Lock into position by tightening its 10-32 screw and also its aluminum nut.

STEP 7:

Tighten screw illustrated in Figure 7.

STEP 8:

Put tubing clamps over all slotted ends of the 5/8″ arms. Do not tighten. There are 16 arms and clamps.

STEP 9:

Select a flat surface and stand the outer section with the gamma tubes on end; gamma tubes up.

STEP 10:

Identify the proper elements: There are four fiberglass reflector elements with flattened aluminum tips. Take the fiberglass elements and measure 2-7/16" from non-flattened end; using a marker make a mark at that point. Slide the four fiberglass elements into the 5/8" arms nearest the floor. The fiberglass rods are inserted up to the mark on the fiberglass (Figure 12). Tighten tubing clamps. The screw heads on the tip of the fiberglass elements should face up. (Figure 11). **NOTE:** Keep the tubing clamps near the edge of the slotted tubes. If this is not observed, the fiberglass elements will not be secure.

STEP 11:

Install hardware on the tips of 3 fiberglass elements as shown in Figure 14, the fourth fiberglass element has two flatwashers (Figure 15). Leave all screws loose.

STEP 12:

IMPORTANT: Extreme care must be exercised in stretching and marking the reflector wire. The dimension of 9'6" is critical and should be held within 1/16". Proper operation of the antenna depends largely on the care taken in making this measurement. The wire length cannot be measured correctly when it is installed on the fiberglass arms. The wire MUST be measured and marked, stretched out STRAIGHT. It is suggested that a flat surface be used for making this measurement, such as a sidewalk or floor. It is necessary to have a 50 foot tape measure to mark the wire.

Follow this procedure and refer to Figure 13.

a. Fasten one end of a wire to a nail, or clamp the end in a vise.

b. At the opposite end, wrap the wire around a pair of pliers or a stick so that the wire won't slip loose when pulling.

c. Pull on stick so wire stretches a few inches. If done correctly, wire will be perfectly straight.

d. Lay the tape measure next to the wire on the floor and mark the wire with a black magic marker or paint spot as shown.

NOTE: Put all five marks on the wire without moving the tape measure or wire. SEE FIGURE 13. The total length of the wire from the first mark to the fifth should measure exactly 38 feet.

e. "String" the wire around the fiberglass elements, FIGURE 11. Make sure the mark on the wire is in the center of the screw before tightening, FIGURE 16. The fiberglass arm which has two flatwashers in its tip, is the tip which will terminate the two free ends of the wire. Wrap both ends around the screw. One end should be under one flatwasher, the other end should be under the other flatwasher. SEE FIGURE 17.

NOTE: The marks on both ends of the wire should be positioned in the center of the screw. SEE FIGURE 17 and FIGURE 11.

STEP 13:

After you have completed the reflector assembly, check to see if the wire is too tight. This will cause bowing as shown in FIGURE 23. The check this, have someone hold the assembly up vertically off the ground. By sight, line up the wires. The wire closest to you and the one on the far side should cross the hub. See FIGURE 23.

If the wire is too tight or loose, adjust by loosening the 5/8 tube clamps and sliding the fiberglass elements in or out. Move the elements 1/8" and re-tighten. Adjust all four elements equally. Repeat this procedure until the wire is as tight as possible without bowing the arms. Refer to FIGURE 23.

IMPORTANT NOTE: Don't change the wire length as an adjustment. Always adjust the wire tension by changing the fiberglass element lengths.

STEP 14:

On the flattened end of all 1/2″ tubes, attach stainless steel rods. See Figure 18. use a large sharp screwdriver. Fasten securely.
NOTE: It is important to use both starwashers in each tube.
Put plastic tips on stainless steel rods.

STEP 15:

Sight down the tube and if the rod is not protruding straight off the end of the tube, bend to correct. See Figure 19.

STEP 16:

Identifying the proper elements: There are twelve 1/2″ arms (with stainless steel rods attached in Step 15). Take four of the arms and measure 3-1/16″ from the non-flattened end; using a marker, mark a point which is 3-1/16″ from the end and label all four arms "Set #1." (Figure 20).

Take four more arms and measure 5-1/16″ from the non-flattened end, mark a point, and label all four arms "Set #2." Take the last four arms and measure 6-9/16″ from the non-flattened end, mark the point, and label all four arms "Set #3." **NOTE:** The marks you make indicate the distance the 1/2″ arms will be inserted into the 5/8″ arms in Step 17.

STEP 17:

The four marked #1 are slipped into the four 5/8″ arms on the driven element (the elements with the gamma matches). The four marked #2 should be installed on the other outer assembly on the end with the 9″ boom protrusion. The remaining four marked #3 are installed in the four 5/8″ arms with the 1″ boom protrusion. See Figure 20.

STEP 18:

Slide the mast mount over the 1-3/4″ center boom section. Rivet on boom should point down.

STEP 19:

With 1/4 x 1″ long bolts and square nuts, tighten the mast mount to center boom section. The nuts should be on the side with the lip. The mast mount is attached to the boom section, off center. See dimensions. Refer to Figure 21 and Figure 22.

STEP 20:

Place two band clamps over boom section (Figure 21), leave loose. Install two "U bolts" with saddles, split 5/16″ Hex nuts. Leave loose. (Figure 22).

STEP 21:

The final assembly — refer to Figure 20. The 9″ end of the outer assembly which contains the gamma rods and the fiberglass arms should be inserted into the **23″ end** of the center boom section. (Figure 21). The 9″ end of the outer assembly goes into the opposite end of the center boom section. After sighting through all the elements and the mast for alignment, tighten both band clamps with a proper tool which is in good condition. This will prevent misalignment in wind storms. A 5/16″ spintight (nut driver) is recommended.
(Figure 20, Figure 10)

NOTE: Check to see that the slots in all the hubs are in alignment (when facing the front of the antenna the slots should be toward your upper left). Also make sure the two gamma rods are oriented properly. See Figure 20 and Figure 10.

STEP 22:

Connecting the antenna — foam insulated, 50-52 ohm, coaxial cable is recommended such as RG8U. Label the coax connected to the **horizontal** arm and connect it to the "H" terminal on the switch box. Label the coax connected to the **vertical** arm and connect it to the "V" terminal on the switch box. After connecting the cables, use vinyl tape to tape the coax to the boom and the mast. **NOTE:** Tighten the coax connectors with pliers. Wind and vibration will cause them to become loose.

Connect a length of coax between the "XMTR" terminal on the switch box and your transceiver antenna terminal.

Coax And Connectors — The quality of a coax and connectors and especially the soldering of the coax to the connector can affect S W R and gain. An unsuspecting CBer may buy a lower grade coax and lose 2 or 3 dB after paying good money for an expensive transceiver and antennas. A quick check for good coax and connectors can be run by substituting a dummy load on the antenna end of the coax. If all is right, the S W R with the dummy load should be 1 to 1 match. S W R can also be affected by the length and conductivity characteristics of the coaxial cable. If using solid dielectric coax, cut to multiples of 12 feet. If coax is foam, cut to 14 foot multiples.

Frequency Variations — Mr A and Mr B are neighbors and they are comparing the performance of their antennas by their ability to transmit to Mr C about 20 to 30 miles away. If Mr A's frequency is slightly higher, he might show a weaker signal to Mr C even though his operation has more power. This would make A's antenna seem inferior to B's. This problem can be eliminated by Mr C's having a tunable receiver on his transceiver to match A's variation.

Antenna Height — Whenever antennas are being compared, they should be installed at the proper distance above the ground and preferably in an open field. Ideally antennas should be one wave length (36′ at CB frequency) or more above the ground. For comparison testing always install test antennas at the same height.

Time Variation — Any test of antennas should be performed with a time variation of about 15 minutes or less or variations due to tropospheric shifts and other changes will affect performance.

Guy Wires And Supporting Structures — Guy wires should be of the non-metallic type using ski tow rope or other plastic lines. If metallic, they should be broken up at uneven intervals along their length to avoid interference and possible high S W R. In many cases, the mast or tower is used as a radiating element.

Proper Construction — If they could, manufacturers would ship all antennas fully assembled in order to eliminate mistakes in construction often found in antenna installations. Even the best instructions are sometimes mis-read and an antenna condemned only because of an error in assembly. If an antenna does not perform up to par, contact your local distributor or dealer, and if he can't help you, call the manufacturer.

FACTS YOU SHOULD KNOW ABOUT CB ANTENNAS

Occasionally CBer's are heard to remark that a particular antenna is not living up to the advertised performance figures such as gain, S W R , or front-to-back ratio. The statements are usually founded on their personal field tests; often based on comparisons between one antenna and another. The disparity between the tests of the CBer and the factory usually stems from the conditions under which the tests are run. Here are a few conditions that can affect performance.

Effect Of Other Antennas — When two antennas are mounted near each other (even if used for different frequencies), a coupling usually results which in some way alters their operation. This coupling is even more pronounced when the antennas are mounted less than one wavelength (36 ft) apart and may change your antenna's performance in some way.

The Effect Of Metal Structures — Not only antennas, but water towers, power lines, buildings, or any material of a conductive nature has the ability to mis-direct transmission. Sometimes these obstacles may act as directors or as reflectors — causing the signal to increase or decrease in the intended direction. Complaints of poor front-to-back ratio or lower than expected gain can usually be traced to this above circumstance — especially in beam-type operation.

Signal Intensity — The signal strength of a transmiting station can never be assumed to be of the same strength as in previous transmissions. Signals of incoming stations should be recalibrated to the antennas being compared. For this reason, you cannot take down one antenna, put up another one week later, and expect to make accurate measurements. If the stations being used are using beam type antennas, a slight change in the beams' direction can also be critical. Contacts with mobiles are even less valid. A movement of five feet sometimes makes measurable differences in mobile communications.

S Meter Calibration — Depending upon the CB set, an S meter is calibrated so that one S unit is equal to 6 dB. Therefore, an antenna responsible for 1 S unit gain over another has also about 6 dB over that other antenna. Some S meters, however, are calibrated at only 3 dB per S unit and others at 3 or 4 at low end, and 6 or 7 at the top of the scale.

Another problem encountered with S meters is the inability to measure high strength inputs. Some bounce back at a powerful signal and appear erratic in operation even reading lower on the scale with an increased signal.

PARTS LIST

Part No.	Quantity	Description
519-117	1	1¾" x 55" Center Boom
519-118	2	Gamma Match —
519-119	4	Fiberglass Reflector Element
519-120	1	Connector Bracket
503-1001	12	½" x 48" Outer Element
507-1007	8	Aluminum Hub Section
502-1309	12	⅛" x 24" Stainless Steel Rod
518-1311	1	Roll of 14 Gauge Copper Wire
519-292	1	Mast Mount
503-1741	2	1⅜" x 76" End Boom
503-1766	16	⅝" x 36" Inner Element
519-115	1	Hardware Kit AV-140 Complete
509-1004-2	2	Black Plastic Boom Plug
20-33-21	2	1¾" Boom Band Clamp
20-33-16	16	⅝" Element Clamp
506-1071-1	2	5/16-18 U-Bolt
24-8-27	2	1/4-20x1 Hex Socket Cap Screws
12-3-46	20	¼-20 Hex Nut
512-1091	16	10-32 Hex Nut
520-1765	2	Gamma Fastener
512-1098	2	¼-20 Square Nut
512-1099	4	10-32 Square Nut
11-3-29	30	#10 Star Washer
528-1152	20	¼" Flat Washer
11-3-12	20	¼" Star Washer
11-1-8	4	5/16 Split lockwasher
528-1165	19	#10 Flat Washer
24-3-2	14	¼-20 x 1¼" Screw
524-1189	6	¼-20 x 1½" Screw
24-3-87	20	10-32 x ½" Screw
509-1303	12	Plastic Tip for Stainless Steel Rod
26-866-1	2	U-Bolt Saddle
512-1469	2	Aluminum Gamma Stud Nut
506-3031	2	Gamma Stud
525-3032	2	Gamma Sleeve
12-3-49	4	5/16-18 Hex Nut
23-1-8	1	3/16 Hex Key

FIGURE 1

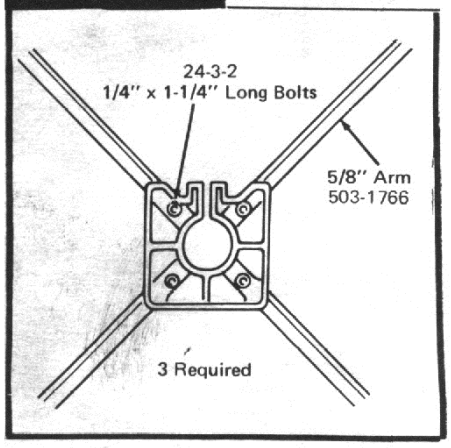


FIGURE 2

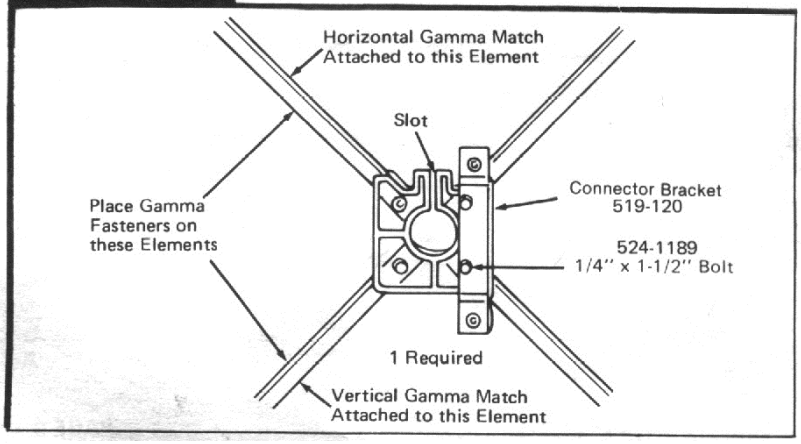


FIGURE 3

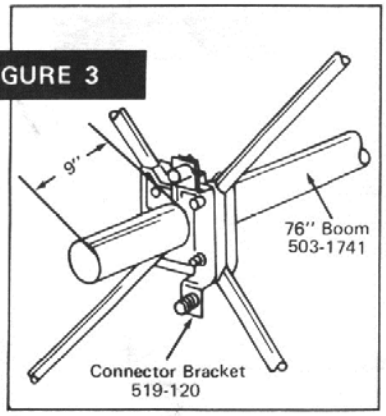


FIGURE 4

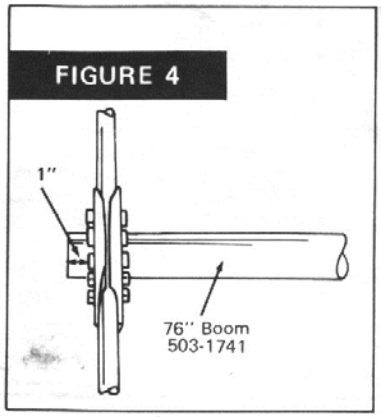


FIGURE 5

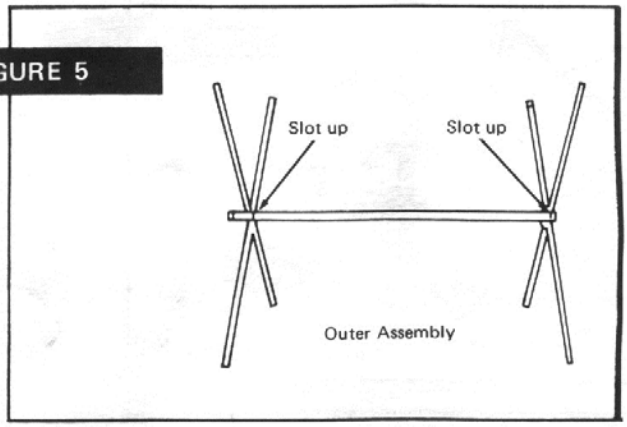
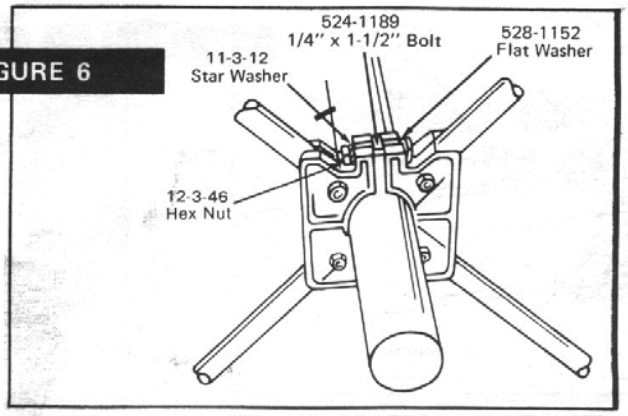


FIGURE 6



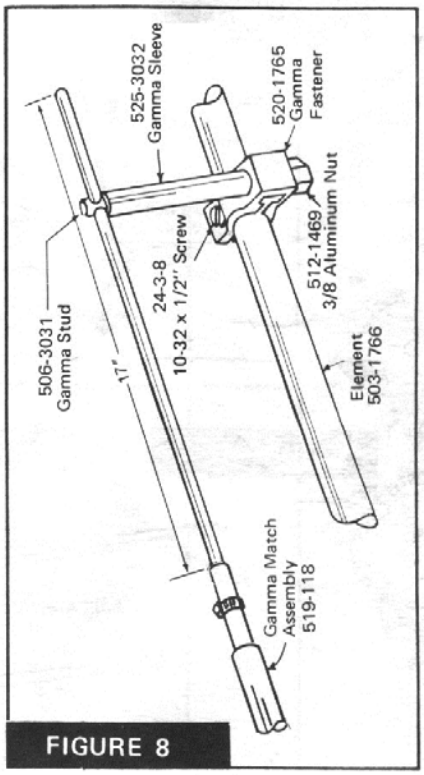


FIGURE 8

FIGURE 7

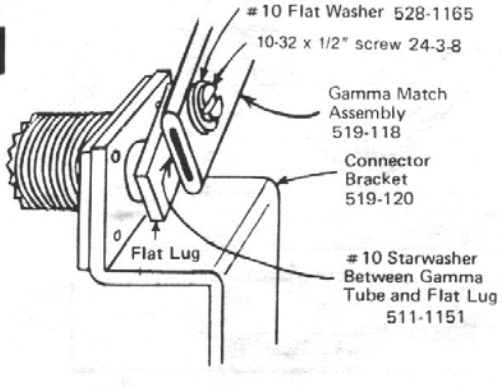


FIGURE 10

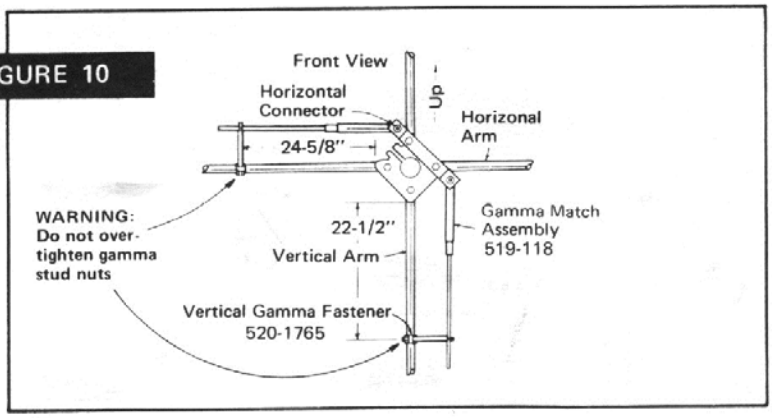


FIGURE 11

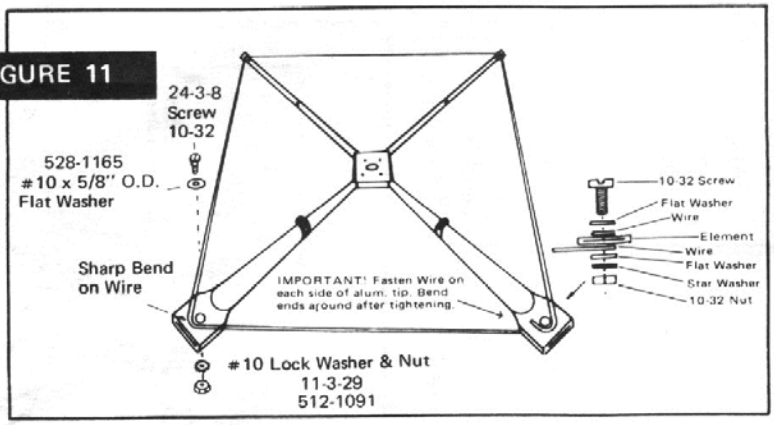


FIGURE 12

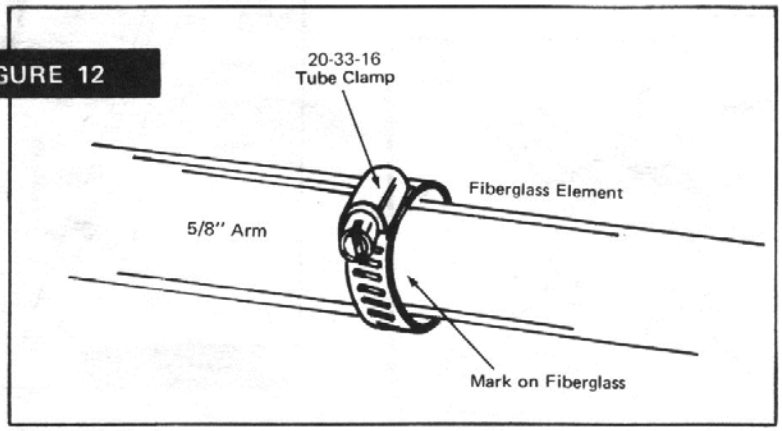


FIGURE 13

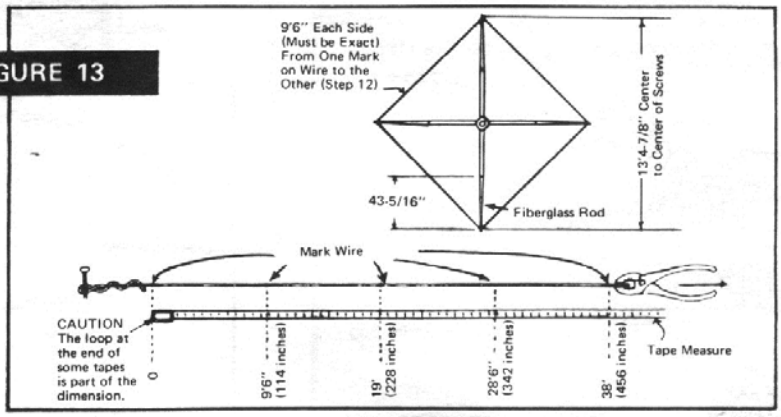
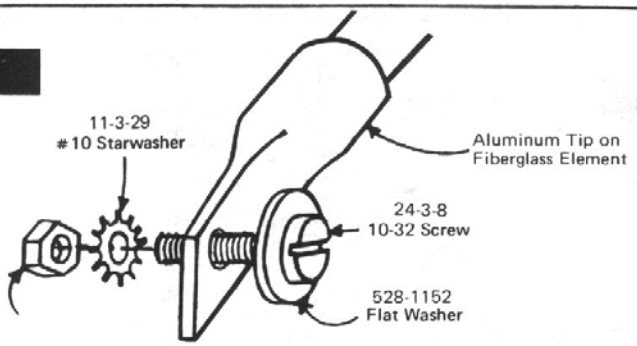
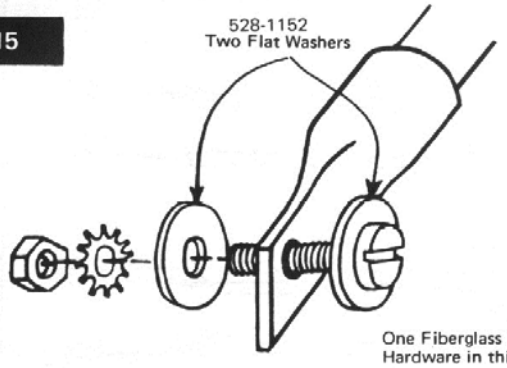


FIGURE 14



Three Fiberglass Tips Contain
Hardware in this Order

FIGURE 15



One Fiberglass Element Contains
Hardware in this Order

FIGURE 16

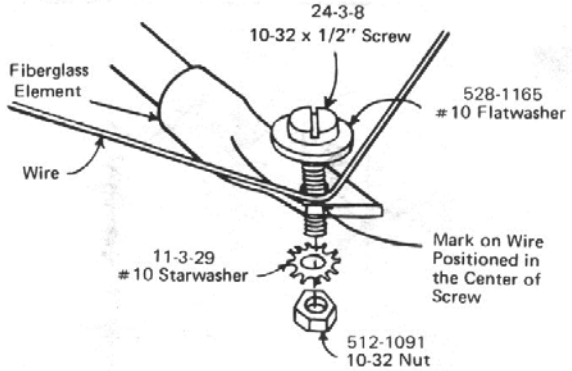


FIGURE 17

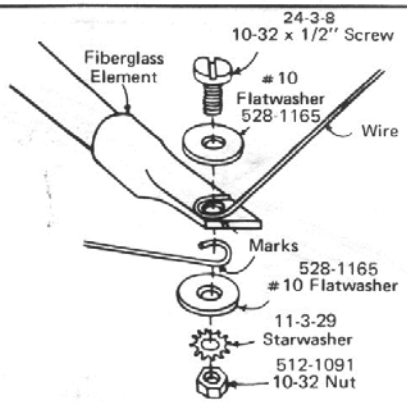
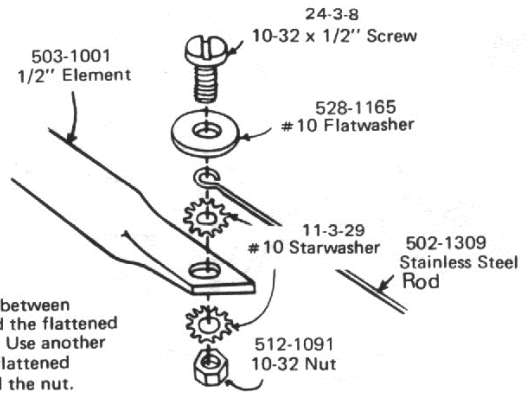


FIGURE 18



NOTE: Use a starwasher between the stainless steel rod and the flattened surface of the 1/2" tube. Use another starwasher between the flattened end of the 1/2" tube and the nut.

FIGURE 19

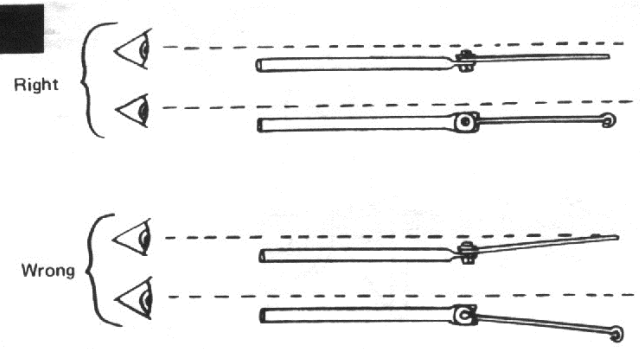


FIGURE 20

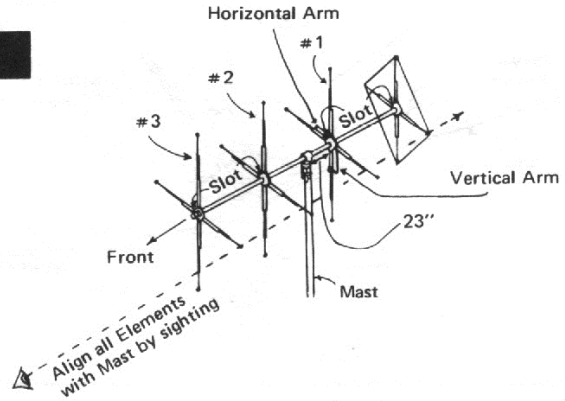


FIGURE 21

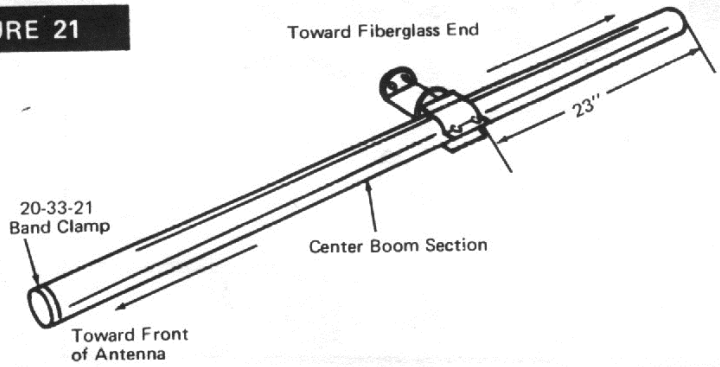


FIGURE 22

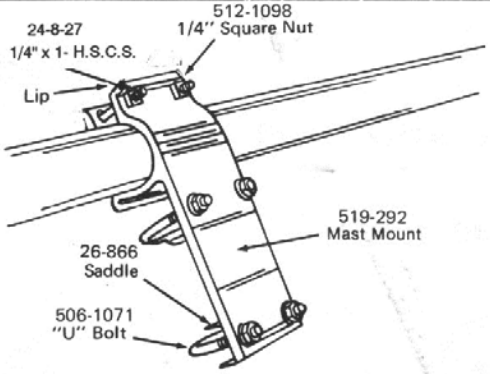


FIGURE 23

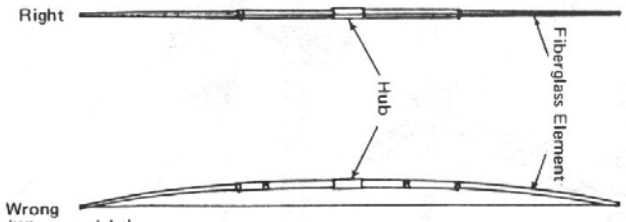
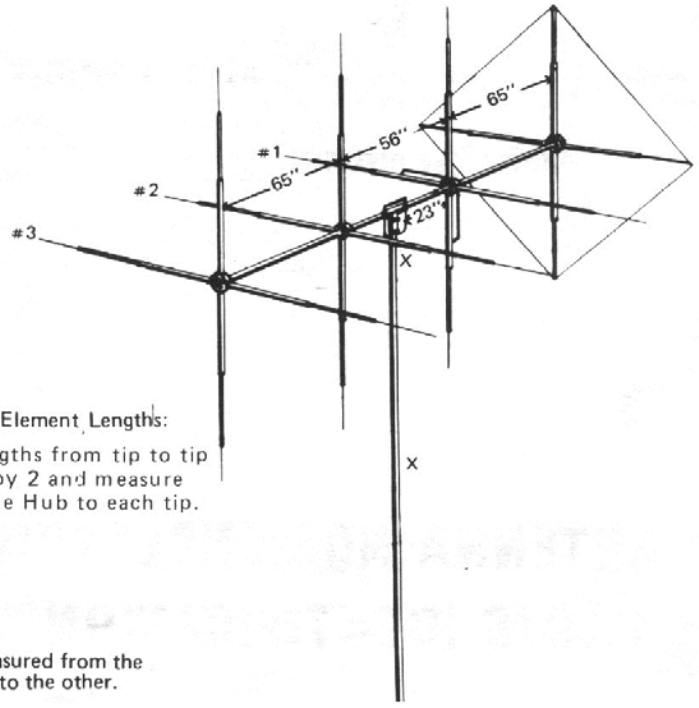


FIGURE 24

MOONRAKER 4 TROUBLE SHOOTING TIPS



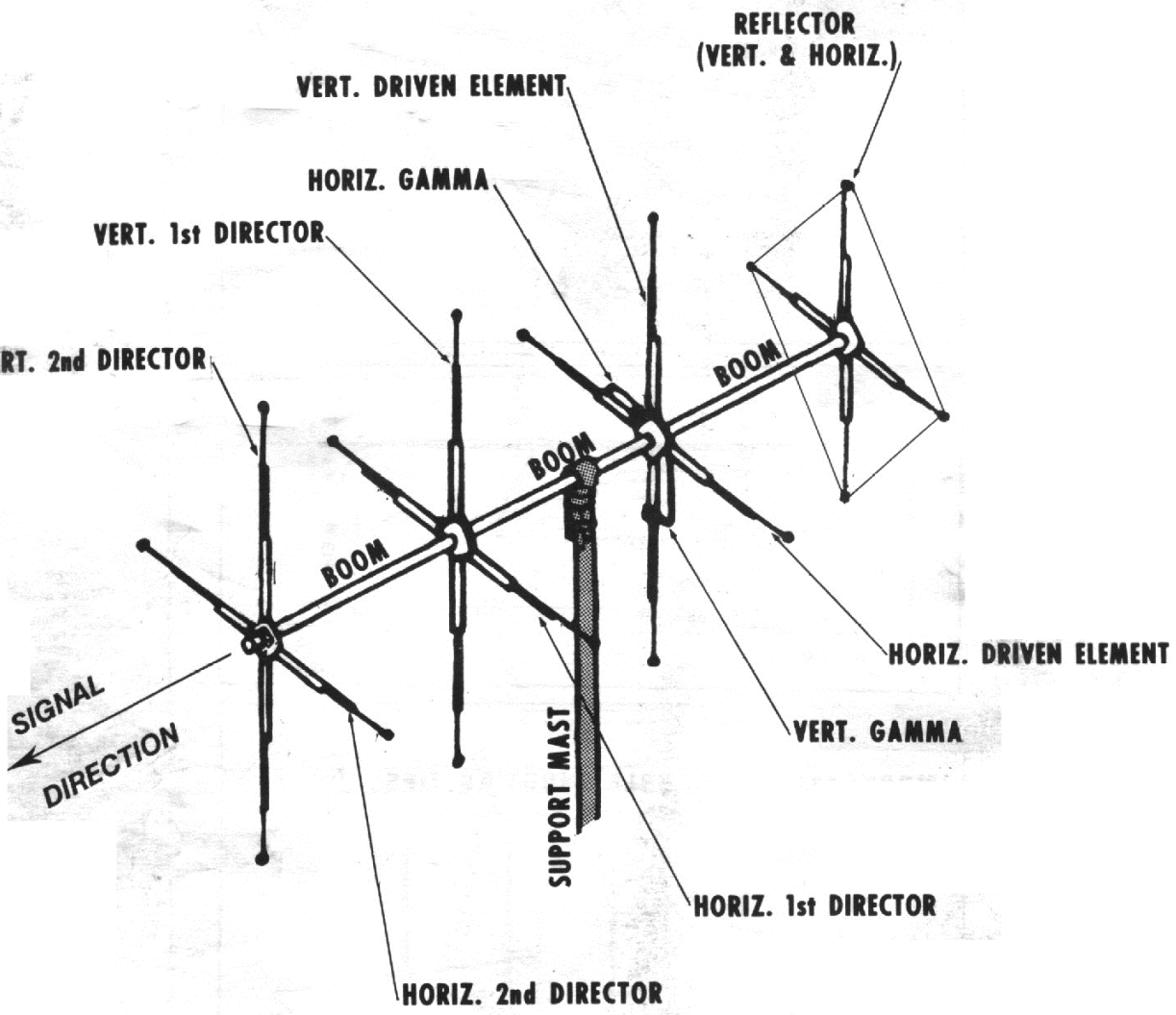
Vertical and Horizontal Element Lengths:

Measure Element lengths from tip to tip or divide the length by 2 and measure from the center of the Hub to each tip.

- #1 – 17'6-1/2"
- #2 – 17'2-1/4"
- #3 – 16'11-1/4"

Element spacing is measured from the center of one element to the other.

The X's indicate the recommended positions for the rotor. The lower one, being positioned below the Vertical elements is preferred.



BASIC ANTENNA NOMENCLATURE FOR PARTS IDENTIFICATION

27P7316-1 3/91