

# ASSEMBLY AND INSTALLATION INSTRUCTIONS



# A3S

20 / 15 / 10 Meter Beam

# Cushcraft

Amateur Radio Antennas

### **WARNING**

THIS ANTENNA IS AN ELECTRICAL CONDUCTOR. CONTACT WITH POWER LINES CAN RESULT IN DEATH, OR SERIOUS INJURY. DO NOT INSTALL THIS ANTENNA WHERE THERE IS ANY POSSIBILITY OF CONTACT WITH OR HIGH VOLTAGE ARC-OVER FROM POWER CABLES OR SERVICE DROPS TO BUILDINGS. THE ANTENNA, SUPPORTING MAST AND/OR TOWER MUST NOT BE CLOSE TO ANY POWER LINES DURING INSTALLATION, REMOVAL OR IN THE EVENT PART OF THE SYSTEM SHOULD ACCIDENTALLY FALL. FOLLOW THE GUIDELINES FOR ANTENNA INSTALLATIONS RECOMMENDED BY THE U.S. CONSUMER PRODUCT SAFETY COMMISSION AND LISTED IN THE ENCLOSED PAMPHLET.

Your Cushcraft A3S Yagi is designed and manufactured to give trouble free service. This antenna will perform as specified if the instructions and suggestions in this manual are followed and care is used in the assembly and installation. When checking the components received in your antenna package use the parts listed beside each diagram. There is a master parts list on page 2. If you are unable to locate any tube or component, check the inside of all tubing. **IMPORTANT:** Save the weight label from the outside of the carton. Each antenna is weighed at the factory to verify the parts count. If you claim a missing part, you will be asked for the weight verification label.

### **PLANNING**

Plan your installation carefully. If you use volunteer helpers be sure that they are qualified to assist you. Make certain that everyone involved understands that you are the boss and that they must follow your instructions. If you have any doubts at all, employ a professional antenna installation company to install your antenna.

### **LOCATION**

Location of the antenna is very important. Surrounding objects such as trees, power lines, other antennas, etc. will seriously reduce efficiency. To minimize the effects of surrounding objects, mount the antenna as high and in the clear as possible. If metal guy wires are used, they should be broken with strain insulators. **EXTREME CARE MUST BE USED FOR YOUR SAFETY. YOU MUST INSURE THAT WHILE THE A3S IS IN OPERATION NEITHER PEOPLE OR PETS CAN COME IN CONTACT WITH ANY PORTION OF YOUR ANTENNA. DEADLY VOLTAGES AND CURRENTS MAY EXIST. ALSO, SINCE THE EFFECTS OF EXPOSURE TO RF FIELDS ARE NOT FULLY UNDERSTOOD, LONG TERM EXPOSURE TO INTENSE RF FIELDS IS NOT RECOMMENDED. THERE IS A WARNING STICKER WHICH MUST BE ATTACHED TO THE BOOM AS SHOWN IN FIGURE I.**

### **MOUNTING**

The mast mount bracket will accommodate up to a 2" (5.1 cm) mast. A 1-1/2" OD (3.8 cm) or larger heavy wall tubing mast should be used. A good heavy duty antenna rotator will provide the best service and longest life. Often it is desirable to mount several antennas on one mast. To keep possible interaction to a minimum, place your antennas as far apart as you can.

### **SYSTEM GROUNDING**

Direct grounding of the antenna, mast and tower is very important. This serves as protection from lightning strikes and static buildup, and from high voltage which is present in the radio equipment connected to the antenna. A good electrical connection should be made to one or more ground rods (or other extensive ground system) directly at the base of the tower or mast, using at least #10AWG ground wire and noncorrosive hardware. For details and safety standards, consult the National Electrical Code. You should also use a coaxial lightning arrester. Cushcraft offers several different models, such as LAC-1, LAC-2 and the LAC-4 series.

### **ASSEMBLY**

Assemble your antenna by following the directions and illustrations in steps 1 through 5. After the antenna is completely assembled, verify dimensions and element spacings for accuracy. Then, return to the section below for final tuning.

### **TUNING PROCEDURE**

Set the element lengths for the portion of the band you want to operate on using Chart 1 and Figure B. Your A3S is now ready for use.

You may check the VSWR in order to confirm assembly was done properly. The easiest place to check the antenna is likely to be in its final mounting configuration. Orient the antenna such that it is pointing straight up. The back of the antenna should be at least 2 feet (.6 m) off the ground.

Run the coax cable from your transmitter to the area in which the antenna is to be tested. The length of this cable or your feedline is not critical. Connect a good quality VSWR bridge to the end of this cable. Connect a short length of cable [10 ft. (305 cm) or less] from the VSWR bridge to the antenna under test. Set the transmitter to your center operating frequency and measure the VSWR while taking care not to effect the measurement with your body. A VSWR of 2:1 or less is satisfactory and will not degrade the performance. If the VSWR is greater than 2:1, check all dimensions and connectors.

### **ADD-ON KIT**

Adding 30 or 40 meters to your A3S is easy with the A743 add-on kit. You'll be on the air quickly operating on your new band because the A743 easily clamps to your A3S. You can operate on 40 meters or with simple adjustment, 30 meters. The kit comes complete with a reinforced center insulator, teflon® protected high power traps, all stainless steel hardware and non-stretch lamcord® support line. Cushcraft makes it easy to add more excitement to your hobby.

# MASTER PARTS LIST

KEY	PART#	QTY	KEY	PART#	QTY	
BA	Aluminum tubing 1-5/8" x 12" (4.1 x 30.5 cm) drilled and slotted both ends	1	46	050046	1-1/2" (3.8 cm) black plastic cap	2
BB	Aluminum tubing 1-1/2" x 84" (3.8 x 213.4 cm) drilled one end	2	53	050053	1/2" (1.3 cm) black plastic cap	6
EA	Aluminum tubing 1-1/8" x 72" (2.9 x 182.9 cm) drilled for U-bolt, slotted both ends.	2	58	173658	3-1/2" (8.9 cm) V-block	2
EB	Aluminum tubing 1-1/8" x 36" (2.9 x 91.4 cm) drilled one end, slotted both ends	2	63	170063	2" (5.1 cm) V-block	2
EC	Aluminum tubing 1" x 67" (2.5 x 170.2 cm) slotted one end	2	84	010084	1/4" (.6 cm) lock washer	6
ED	Aluminum tubing 1" x 65" (2.5 x 165.1 cm) slotted one end	2	85	010085	1/4" (.6 cm) hex nut	6
EE	Aluminum tubing 1" x 46-1/2" (2.5 x 188.1 cm) slotted one end	2	96	122096	10" (25.4 cm) fiberglass insulator	1
EF	Aluminum tubing 1" x 5-1/4" (2.5 x 13.3 cm) slotted both ends	6	118	010118	5/16" (.8 cm) hex nut	8
EG	Aluminum tubing 1/2" x 35-7/8" (1.3 x 91.1 cm)	6	119	010119	5/16" (.8 cm) lock washer	8
TA	10 meter trap	6	120	010120	#8-32 x 2" (5.1 cm) machine screw	2
TB	15 meter director trap	2	123	010123	#8-32 x 1-1/2" (3.8 cm) machine screw	2
TC	15 meter driv. & refl. trap	4	143	190143	1-1/8" (2.9 cm) aluminum bracket	3
11	010011 #8-32 hex nut	6	326	290326	Danger label	1
33	190033 Backing plate	2	402	010402	1-1/2" x 3-3/4" (3.8 x 9.6 cm) U-bolt	3
41	011941 #8 split lock washer	6	403	010403	1-5/8" (4.1 cm) U-bolt	2
			404	010404	2-1/8" x 3" (5.4 x 7.6 cm)	2
			409	030409	11/16" (1.7 cm) worm clamp	6
			410	030410	1" (2.5 cm) worm clamp	18
			411	030411	1-1/8" (2.9 cm) worm clamp	8
			413	030413	1-5/8" (4.1 cm) worm clamp	2
			453	100453	Terminal	2
			919	190919	6" x 6" (15.2 x 15.2cm) mounting plate	1

## #1 - BOOM ASSEMBLY

Place worm clamps (413) over the slotted ends of tube BA. Slide both BB sections into BA (Figure A). Rotate them as required to align the holes for the 2" screws (120). Place the lock washer (41) and the hex nut (11) on the screws and tighten them. Tighten the worm clamps. Place the plastic caps (46) on the ends of the boom assembly.

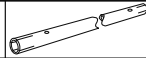
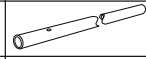





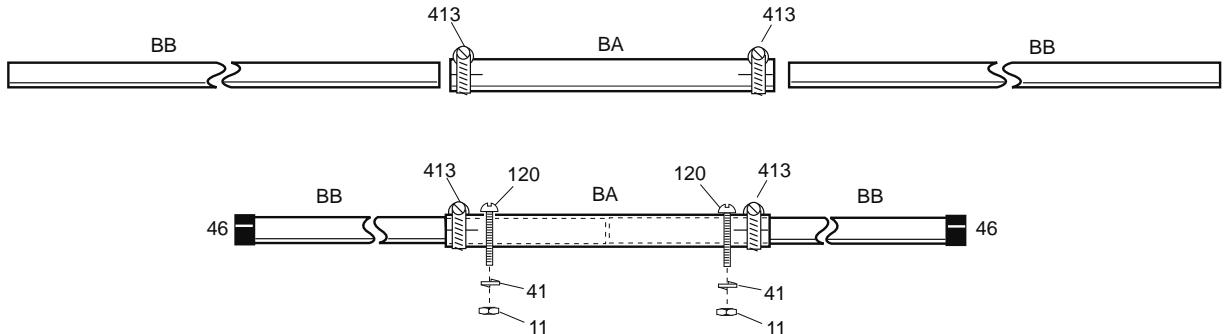
KEY	P/N	DISPLAY	DESC	SIZE	QTY
BA			ALUM TUBE	1-5/8" x 12" (4.1 x 30.5 cm)	1
BB			ALUM TUBE	1-1/2" x 84" (3.8 x 213.4 cm)	2
46	050046		PLASTIC CAP	1-1/2" (3.8 cm)	2
11	010011		HEX NUT	8-32	2
41	011941		SPLIT LOCK WASHER	#8	2
120	010120		MACHINE SCREW	8-32 x 2" (5.1 cm)	2
413	030413		WORM CLAMP	1-5/8" (4.1 cm)	2

FIGURE A



# #2 Element Assembly

Assemble the elements per Figure B. First place a worm clamp (410) over the slotted ends of all EC, ED, and EE tubes. Insert the traps (TA) into the slotted ends of the tubing. Make sure the arrow on the trap faces the slotted tubing.

Place the worm clamps (411) on both slotted ends of the EB tubes (element 2). Slide the end with the screw hole of the EB tube onto the center insulator (96) as shown in Figure C. Align the screw holes in the tubing with those in the insulator. Place an 8-32 screw (123) through the tubing and insulator hole and fasten it in place with nuts (11) and washers (41). Tighten all nuts. Insert the ED tubes into the EB tubes and tighten the worm clamps.

Place worm clamps (410) at both slotted ends of the EF tubing. Slide one end onto the TA traps. Attach the TC traps to the other end of tube EF on elements 1 and 2. Attach the TB traps on element 3. Slide tube EG into the ends of all elements and secure with worm clamps (409). Place end caps (53) onto ends. Set dimensions according to the desired band using Chart 1 and Chart 2 for reference. Tighten all clamps.

KEY	P/N	DISPLAY	DESC	SIZE	QTY
EA			ALUMINUM TUBING	1-1/8" x 72" (2.9 x 182.9cm)	2
EB			ALUMINUM TUBING	1-1/8" x 36" (2.9 x 91.4cm)	2
EC			ALUMINUM TUBING	1" x 67" (2.5 x 170.2cm)	2
ED			ALUMINUM TUBING	1" x 65" (2.5 x 165.1cm)	2
EE			ALUMINUM TUBING	1" x 46-1/2" (2.5 x 188.1cm)	2
EF			ALUMINUM TUBING	1" x 5-1/4" (2.5 x 13.3cm)	6
EG			ALUMINUM TUBING	1/2" x 35-7/8" (1.3 x 91.1cm)	6
TA			TRAP	10 METER	6
TB			DIRECTOR TRAP	15 METER	2
TC			DRIV & REFL TRAP	15 METER	4
11	010011		HEX NUT	#8-32	2
41	011941		SPLIT LOCK WASHER	#8	2
53	050053		BLK PLASTIC CAP	1/2" (1.3cm)	6
96	122096		FIBERGLASS INSULATOR	10" (25.4cm)	1
123	010123		MACHINE SCREW	#8-32 x 1-1/2" (3.8 cm)	2
409	030409		SS WORM CLAMP	11/16" (1.7cm)	6
410	030410		SS WORM CLAMP	1" (2.5cm)	18
411	030411		SS WORM CLAMP	1-3/8" (3.5cm)	8

FIGURE B

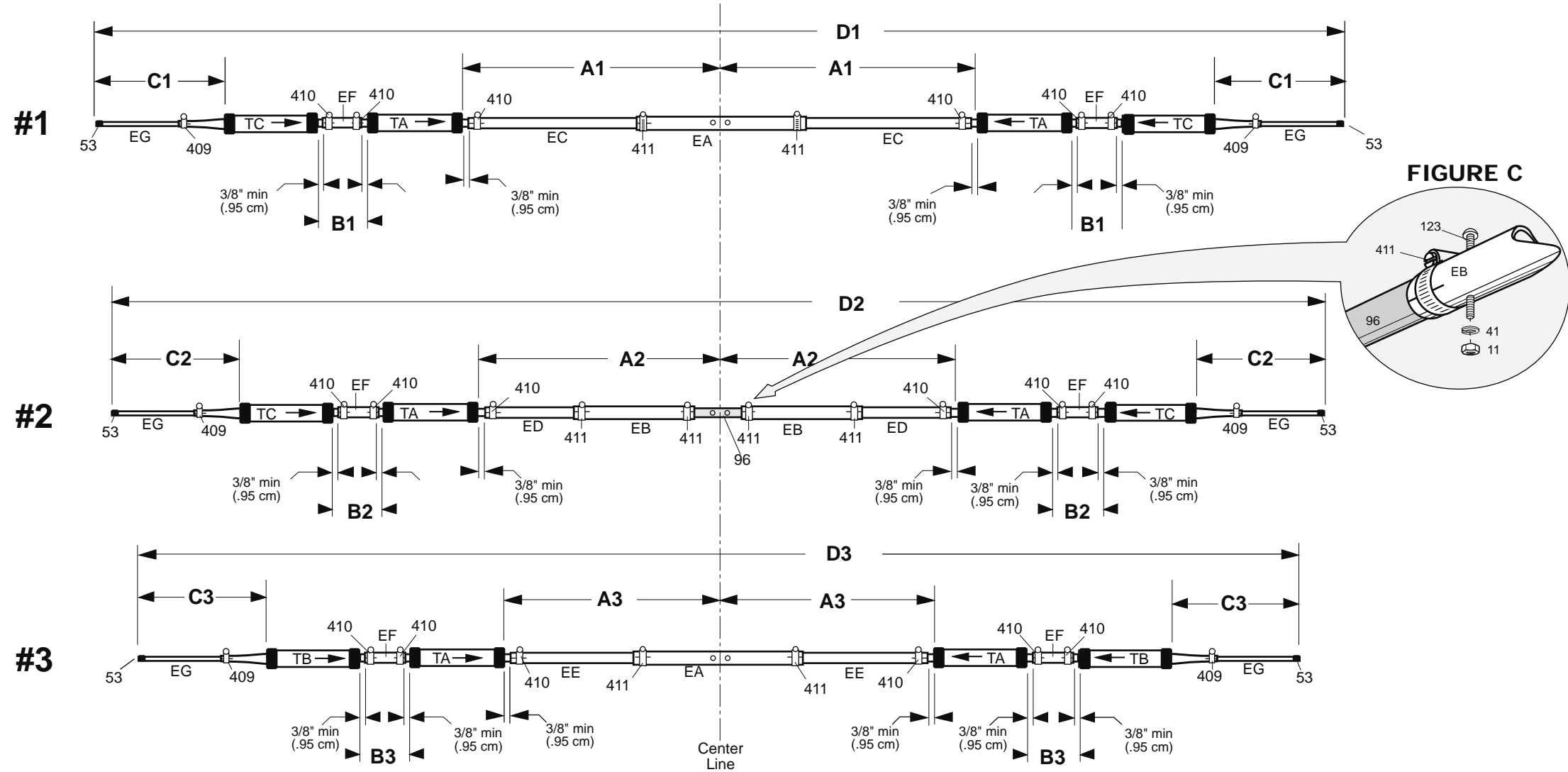







Chart 1

#1 Reflector				#2 Driven Element				#3 Director			
A1	B1	C1	D1	A2	B2	C2	D2	A3	B3	C3	D3
7' 10" 238.8 cm	6-1/4" 15.9 cm	3' 1" 94.0 cm	26' 8-1/2" 814 cm	6' 9-1/4" 206.4 m	5-3/4" 14.6 cm	3' 1-1/2" 95.3 cm	24' 7" 749 cm	6' 2-3/4" 190.0 cm	5-3/4" 14.6 cm	2' 11" 88.9cm	23' 1" 704 cm
8' 1/2" 245.1 cm	6-1/2" 16.5 cm	3' 1" 94.0 cm	27' 2" 828 cm	6' 11-1/2" 212.1 cm	6" 15.2 cm	3' 1-1/2" 95.3 cm	25' 762 cm	6' 5" 195.6 cm	6" 15.2 cm	2' 11" 88.9 cm	23' 6" 716 cm
8' 2-3/8" 250 cm	7-3/4" 19.7 cm	3' 1-1/2" 95.3 cm	27' 9-1/4" 883 cm	7' 7/8" 215.6 cm	7" 17.8 cm	3' 1-1/2" 95.3 cm	25' 4-3/4" 774 cm	6' 6-1/8" 198.4 cm	7" 17.8 cm	2' 11-1/2" 90.2 cm	23' 11-1/4" 730 cm

Chart 2

BAND	20M	15M	10M
Phone	14.25	21.35	28.60
Center	14.20	21.275	28.350
CW	14.10	21.125	28.150
Center Frequency (MHz)			

Phone  
Center  
CW

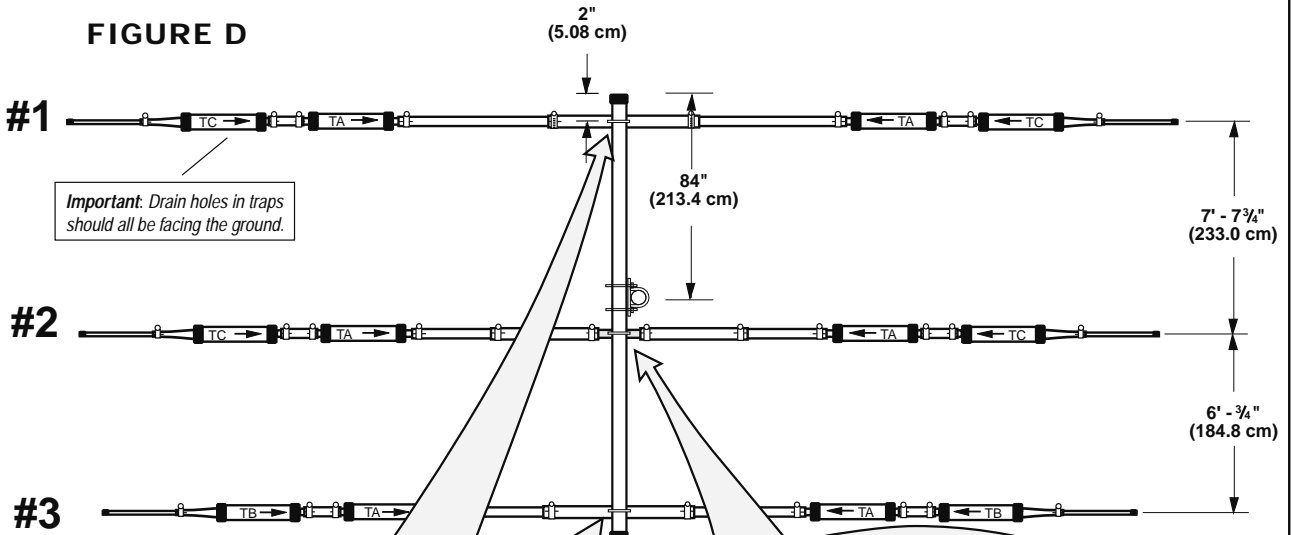
KEY	P/N	DISPLAY	DESC	SIZE	QTY
33	190033		BACKING PLATE		2
84	010084		LOCK WASHER	1/4" (.6 cm)	6
85	010085		HEX NUT	1/4" (.6 cm)	6
143	190143		ALUMINUM BRACKET	1-1/2" (3.81 cm)	3
402	010402		U-BOLT	1-1/2" x 3-3/4" (3.8 x 9.6 cm)	3

### #3 - ELEMENT MOUNTING

Attach elements #1 and #3 on the boom assembly using the U-bolts (402), aluminum brackets (143), backing plates (33), washers (84) and nuts (85) as shown in figure E. Attach the driven element (#2) in the boom assembly using the U-bolt (402), aluminum bracket (143), washers (84) and nuts (85) as shown in Figure F. Note that there is no backing plate on the fiberglass insulator.

Check all dimensions for proper placement of elements on the boom. Level the elements and tighten all the nuts on the U-bolts that hold the elements on the boom per Figure G. Check all traps to make sure that the arrows are pointed towards the boom and the drain holes are facing the ground so that moisture will not build up in the traps.

FIGURE D



Important: Drain holes in traps should all be facing the ground.

FIGURE E

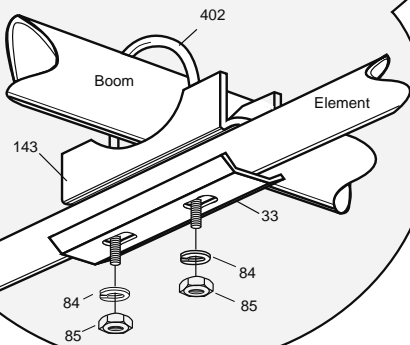


FIGURE F

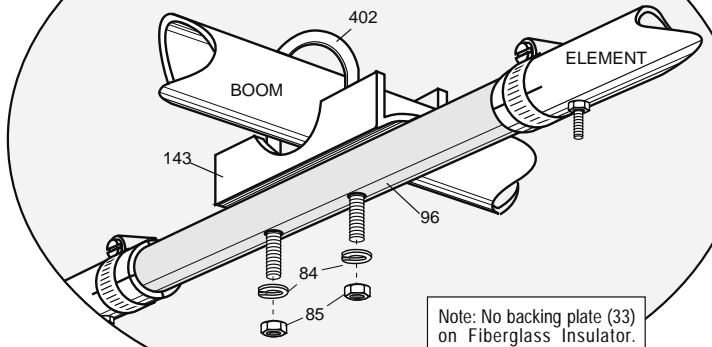
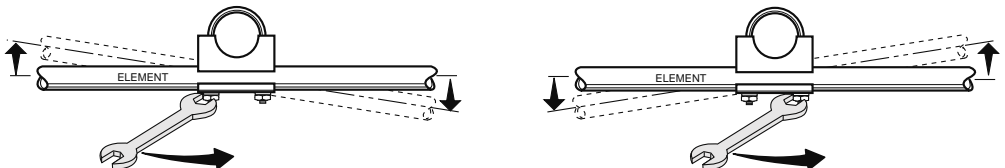


FIGURE G



# #4 - RF CHOKE

A feedline should be prepared as shown in Figure H using the solder terminals (453) provided. A 1:1 balun may be installed at the feedpoint but it is not required. We recommend using an RF choke made from 8 turns of RG8/U coaxial cable with 6 inch (15.3 cm) diameter as shown here. **Important- Do not use foam dielectric coax for your RF Choke because when the coax is wound in a coil the center conductor may migrate away from the center and detune your choke.** Attach the RF choke to the driven element using washers (41) and nuts (11). Be sure to tape and seal the feedline against water at the point where the center dielectric and braid separate. Tape the feedline, between the feedpoint and the RF choke, to the boom. Tape the RF choke to the mast. If you plan to install the antenna in a salty or corrosive environment, you may want to consider coating all elements with a clear marine varnish or its equivalent after it is assembled.




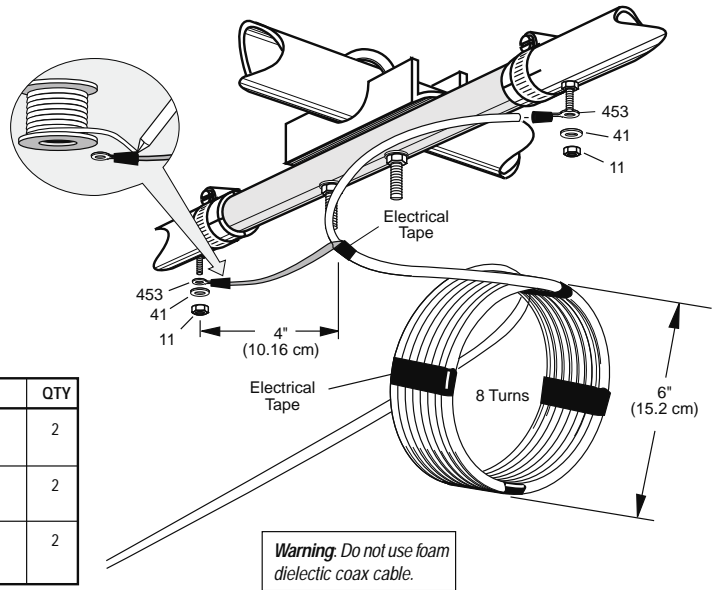






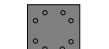

KEY	P/N	DISPLAY	DESC	SIZE	QTY
11	010011		HEX NUT	#8-32	2
41	011941		LOCK WASHER	#8	2
453			TERMINAL		2

FIGURE H

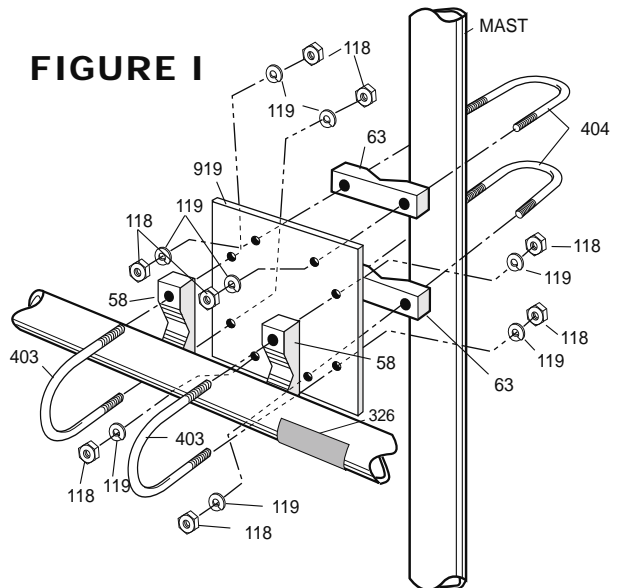


# #5 - BOOM TO MAST ASSEMBLY

KEY	P/N	DISPLAY	DESC	SIZE	QTY
58	173658		V-BLOCK (fits 403 U-Bolt)	3-1/2" (8.9 cm)	2
63	170063		V-BLOCK (fits 404 U-Bolt)	2" (5.1 cm)	2
118	010118		HEX NUT	5/16" (.8 cm)	8
119	010119		LOCK WASHER	5/16" (.8 cm)	8
403	010404		U-BOLT	1-5/8" (4.1 cm)	2
404	010404		U-BOLT	2-1/8 x 3" (5.4 x 7.6 cm)	2
919	090919		MOUNTING PLATE	6" x 6" (15.2 x 15.2 cm)	1
326	290326		DANGER LABEL		1

Attach the boom to your mast as shown in Figure I. First attach the mounting plate (919) to the BA section of the boom using U-bolts (403), washers (119), nuts (118), and V-blocks (58). Attach the mounting plate to the mast using the U-bolts (404), V-block (63), washers (119) and nuts (118). Affix the danger label (326).

FIGURE I



## SPECIFICATIONS

Model	A3S
Frequency Ranges	28, 21, 14
Forward Gain, dBd	8
Front to Back Ratio, dB	25
2:1 Bandwidth KHz	>500
Power Rating, Watts PEP	2000
3 dB Beam Width, Deg. E Plane	60
Boom Length	14 (4.27)
Boom Diameter, In (cm)	1.5 (3.81)
Longest Element, ft (m)	27.75 (8.45)
Element Center Dia, In (cm)	1.25 (3.18)
Turning Radius, ft (m)	15.5 (4.72)
Mast Size Range, In (cm)	1.25-2 (3.18-5.08)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	4.36 (0.47)
Weight, lb (kg)	27 (12.9)

## 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.

# Cushcraft

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