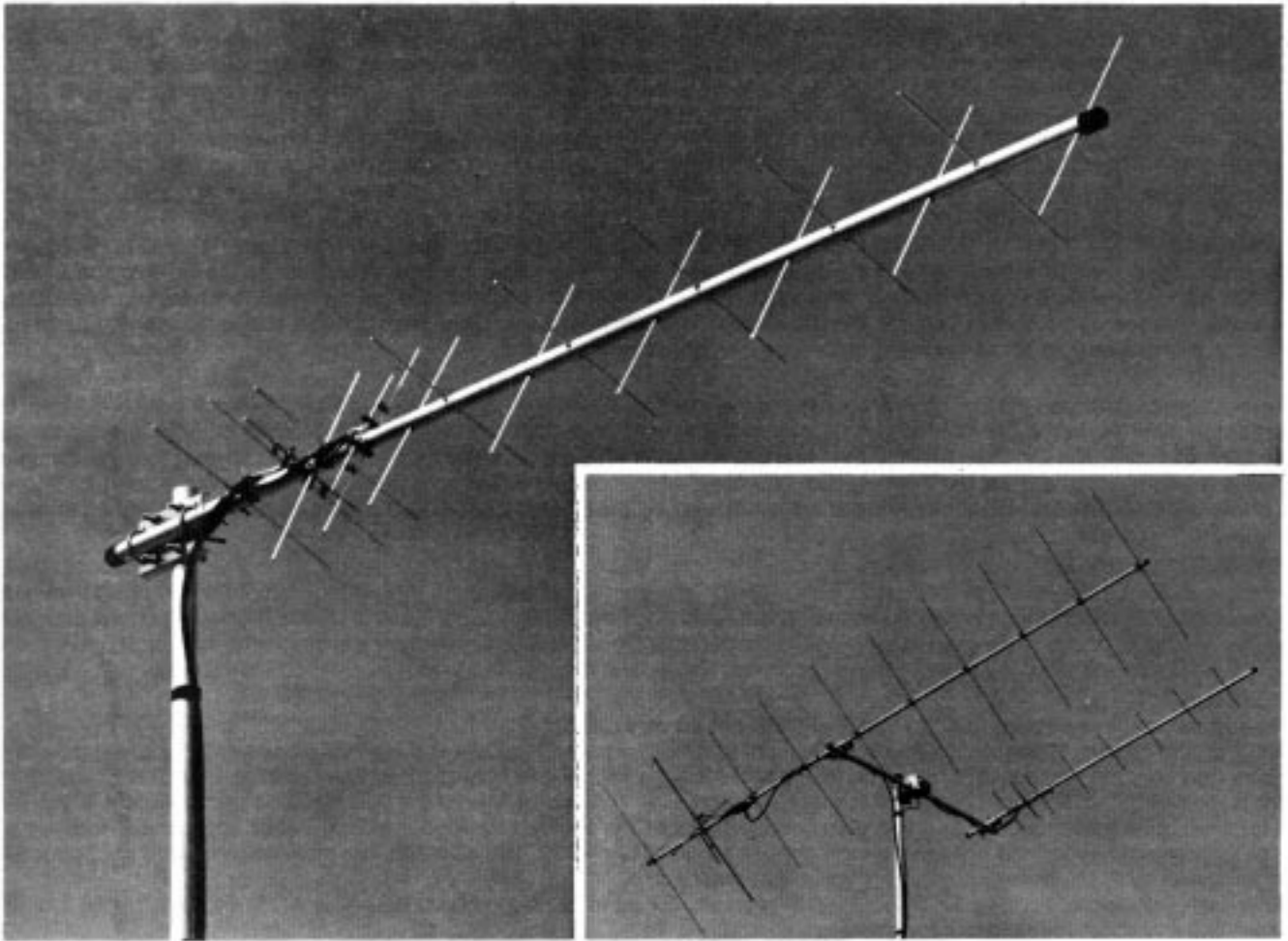


# **416-TB OSCAR Satellite Circular Polarization Boomer Antenna**





# **416-TB OSCAR Satellite Circular Polarization Boomer Antenna**



951298(3/84)

Your Cushcraft 416TB, Twist Boomer, is a high performance circular polarized Yagi for use with OSCAR and other Satellites. Figure 1 is an overall assembly guide for your 416TB. The twist is actually two identical antennas mounted 90 degrees to each other on the same boom. They are spaced  $\frac{1}{4}$  wavelength apart to produce circular polarization. This antenna is manufactured to give top performance and trouble free service. The antenna will perform as specified, if the instructions and suggestions are followed and if care is used in assembly and installation.

#### **MASTING**

The mast mount bracket will accommodate up to a 2 inch (5.1 cm) mast. 1½ inch (3.8 cm) or larger tubing should be used for your mast.

#### **ROTATOR**

Choose a good quality rotator designed for use with amateur radio antenna installations.

#### **LOCATION**

Location of the antenna is very important. Surrounding objects such as trees, powerlines, 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 guywires are used, they should be broken with strain insulators. **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 GUIDE LINES FOR ANTENNA INSTALLATIONS RECOMMENDED BY THE U.S. CONSUMER PRODUCT SAFETY COMMISSION AND LISTED IN THE ENCLOSED PAMPHLET.** You should also choose an installation site away from regular activity areas, to prevent the possibility of injury from falling ice or parts that may be damaged during installation or severe weather. Plan your installation carefully. If you use volunteer helpers be sure that they are qualified to assist you. Make certain that every one 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.

#### **MOUNTING**

Several different antennas may be mounted on the same mast. VHF and UHF beams should be mounted at least 5 ft. (1.5m) from other antennas if possible. Do not install antennas of the same frequency in close proximity to each other or serious detuning will result. Typically the 416TB is mounted parallel to your other OSCAR antenna (ie, A144-20T etc.) so that they are constantly aimed in the same direction. Mount the 416TB so that the angle between the elements is bisected by the crossboom as shown in the photo on the cover. The exact mounting angle is not critical. The Cushcraft A14T-MB mounting boom is designed for this application.

#### **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 10 AWG ground wire and non-corrosive hardware. For details and safety standards, consult the National Electrical Code.

#### **ASSEMBLY**

Follow these steps in sequence and your assembly will go very quickly:

1. Snap the plastic insulators (809) into the element holes in boom. Identify the elements according to Chart 1 — their lengths may vary plus or minus 1/16" (.16 cm). Place a mark on each element at the position listed as LENGTH B. Use the element fastening tool (208) to position the stainless steel fastener (195) at the line which you made on each element. If you insert too far, then push it off the other end and start over. Now insert the element through the boom at the appropriate hole and slide the other fastener against the insulator on the opposite side of the boom. The elements are now assembled to the boom. Make sure to attach both the horizontal and vertical elements.

2. Attach the rear boom (BB) 1-1/8" x 12" (2.86 cm x 30.48 cm) to the main boom (BA) 1" x 72" (2.54 cm x 182.88 cm) using #8-1½" (3.8 cm) long stainless steel hardware.

3. Assemble the driven elements to the E2 elements. Note that they are identical. Attach the ground brackets to the boom using #8-1½" (3.8 cm) long stainless steel hardware. Attach the black T-match spacers (196) to the T-match rods (198), secure them with a stainless steel fastener (195). Attach each T-match rod to the E-2 element with two T-match clamps (197) and #8-32 x 3/8" (.95 cm) stainless steel hardware. All dimensions are from boom center. Attach the balun (DB) and phasing harness (PS) to each driven element as shown in Diagrams 3 and 5.

4. Attach the boom to the mast according to the Diagram.

5. Set up Polarity (see POLARITY) and attach the coax-feed and vinylboot (115). Insert your coax through the small end of your connector boot. Attach the PL259, cut off the top of the silicon package (116) and apply a liberal amount to the threads (DO NOT APPLY TO THE CONNECTOR CENTER PIN) of the phasing harness connector. Screw the PL259, of the feed, onto this connector finger tight. Now apply the remaining silicon to the outside of the connector. Slip the boot over the connector as far forward as possible.

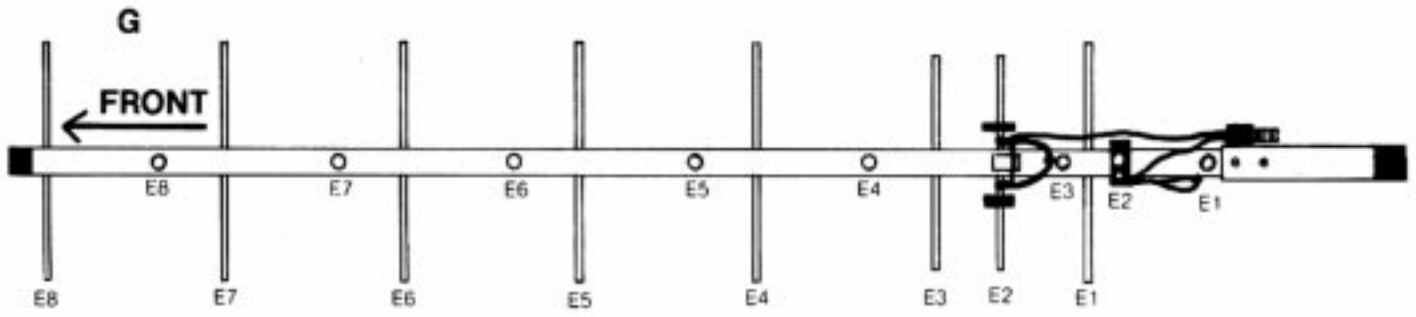
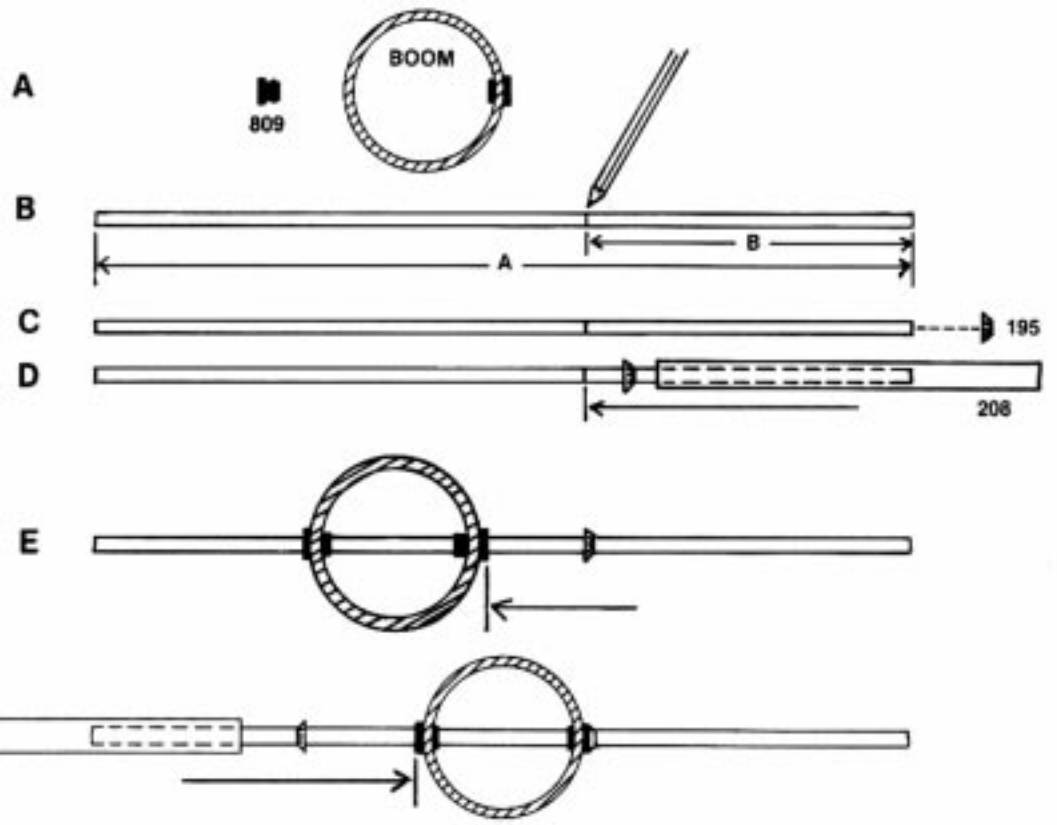
#### **POLARITY**

See Diagram 5 when the phasing harness is connected exactly the same to both feeds, the polarity will be circular left. For circular right polarity, connect the phasing harness center conductors to alternate sides of the feedpoint, i.e. one left and one right. Follow Diagram 5 for proper polarization.

#### **PS-4 MOUNTING**

Do not use phasing harness supplied with 416TB. Mount PS-4 (see Diagram 6) on rear of antenna, behind the last element. PS-4 mounting bolts, brackets, and vent plug should be facing down. Attach the two cables from PS-4 to the driven elements, for circular right polarization (Diagram 5). The relay in the PS-4 requires + 12 volts DC at 50 Ma (to center pin of phono plug) to energize. In the configuration shown in Diagram 6, your 416TB will be circular LEFT polarized when the PS4 is NOT ENERGIZED and circular RIGHT polarized when it is ENERGIZED. **CAUTION: DO NOT ENERGIZE RELAY WHILE TRANSMITTING.**

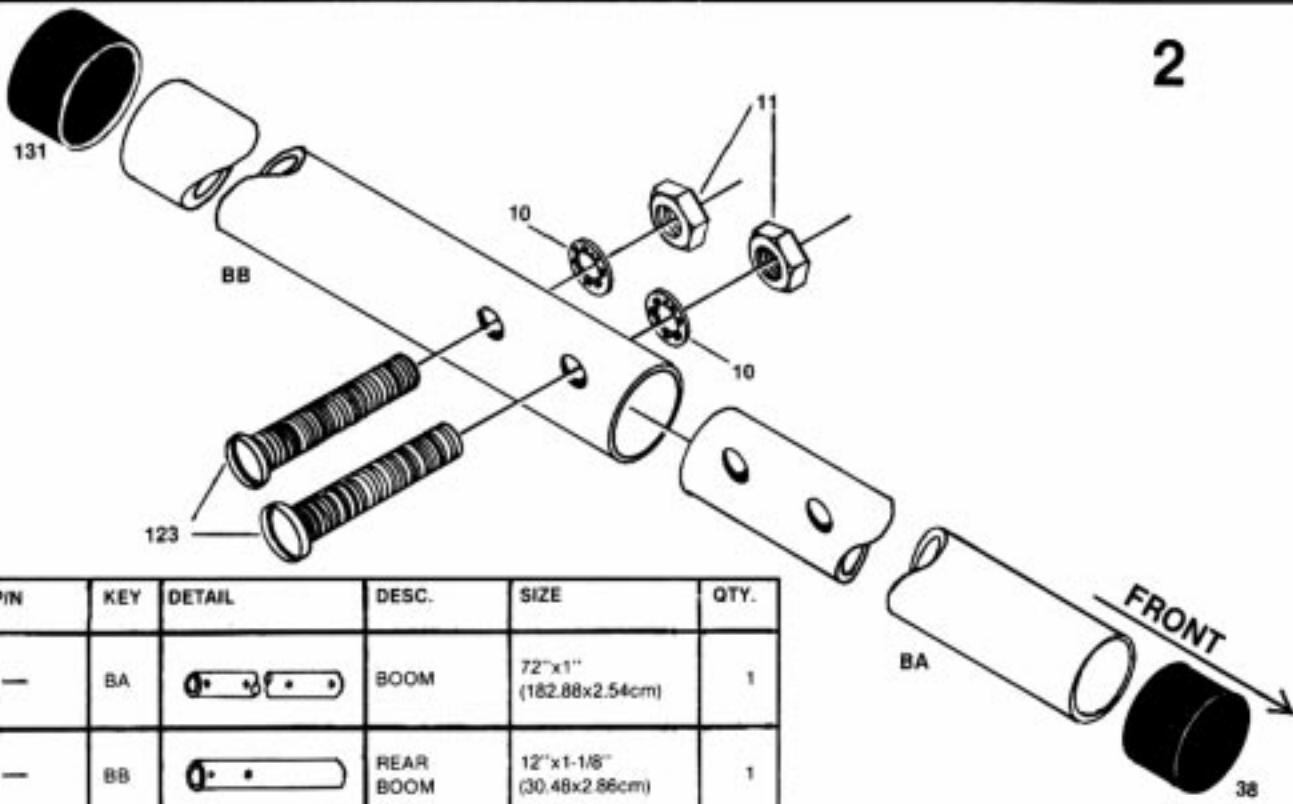
# 1



P/N	KEY		DESCRIPTION	SIZE	QTY
150809	809		ELEMENT INSULATOR	3/16" (.48 cm)	32
010195	195		ELEMENT FASTENER	3/16" (.48 cm)	36
	E		ELEMENTS	SEE CHART 1	16
190746	208		ASSEMBLY TOOL	3/8" x 4-1/2" (.95 x 11.4 cm)	1

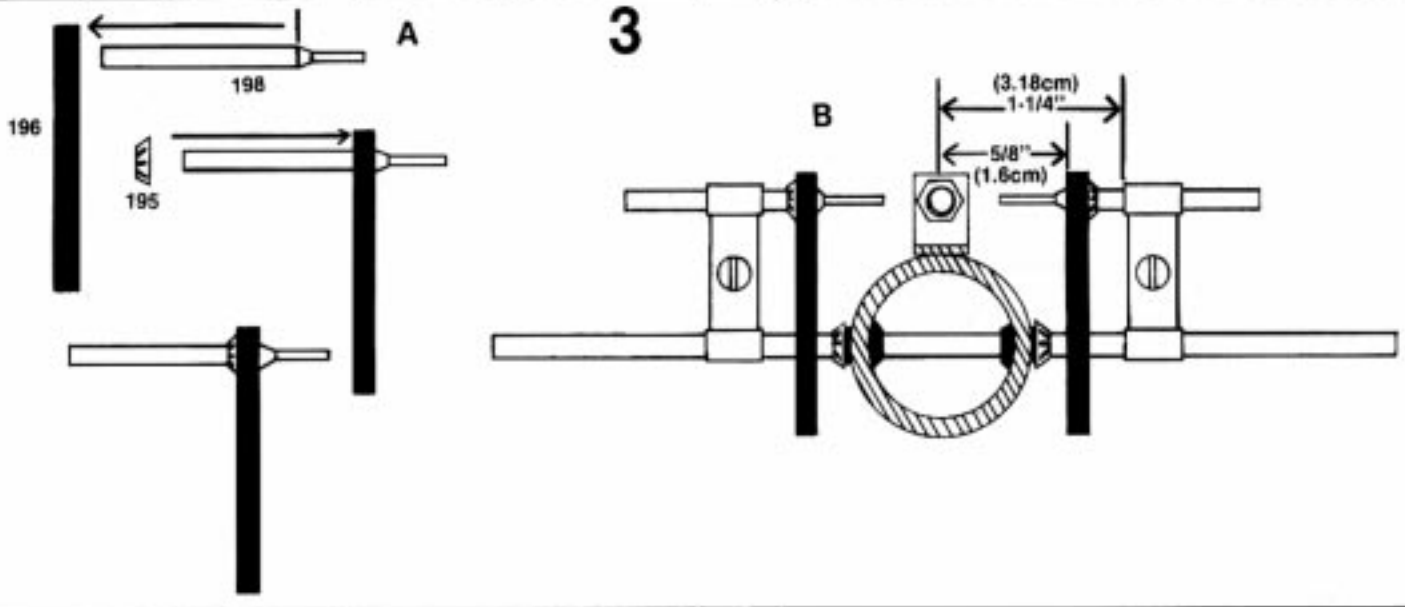
CHART 1 ELEMENT CHART				
Element	Dimension A		Dimension B	
	Inches	CM	Inches	CM
E1 x 2	12-11/16	(32.2)	5-3/4	(14.6)
E2 x 2	13	(33)	5-15/16	(13.5)
E3 x 2	11-5/8	(29.5)	5-1/4	(13.3)
E4 x 2	11-5/16	(28.7)	5-1/16	(12.9)
E5 x 2	11-1/16	(28.1)	5	(12.7)
E6 x 2	11-1/8	(28.3)	5	(12.7)
E7 x 2	10-13/16	(27.5)	4-7/8	(12.4)
E8 x 2	11-1/4	(28.6)	5-1/16	(12.9)

# 2

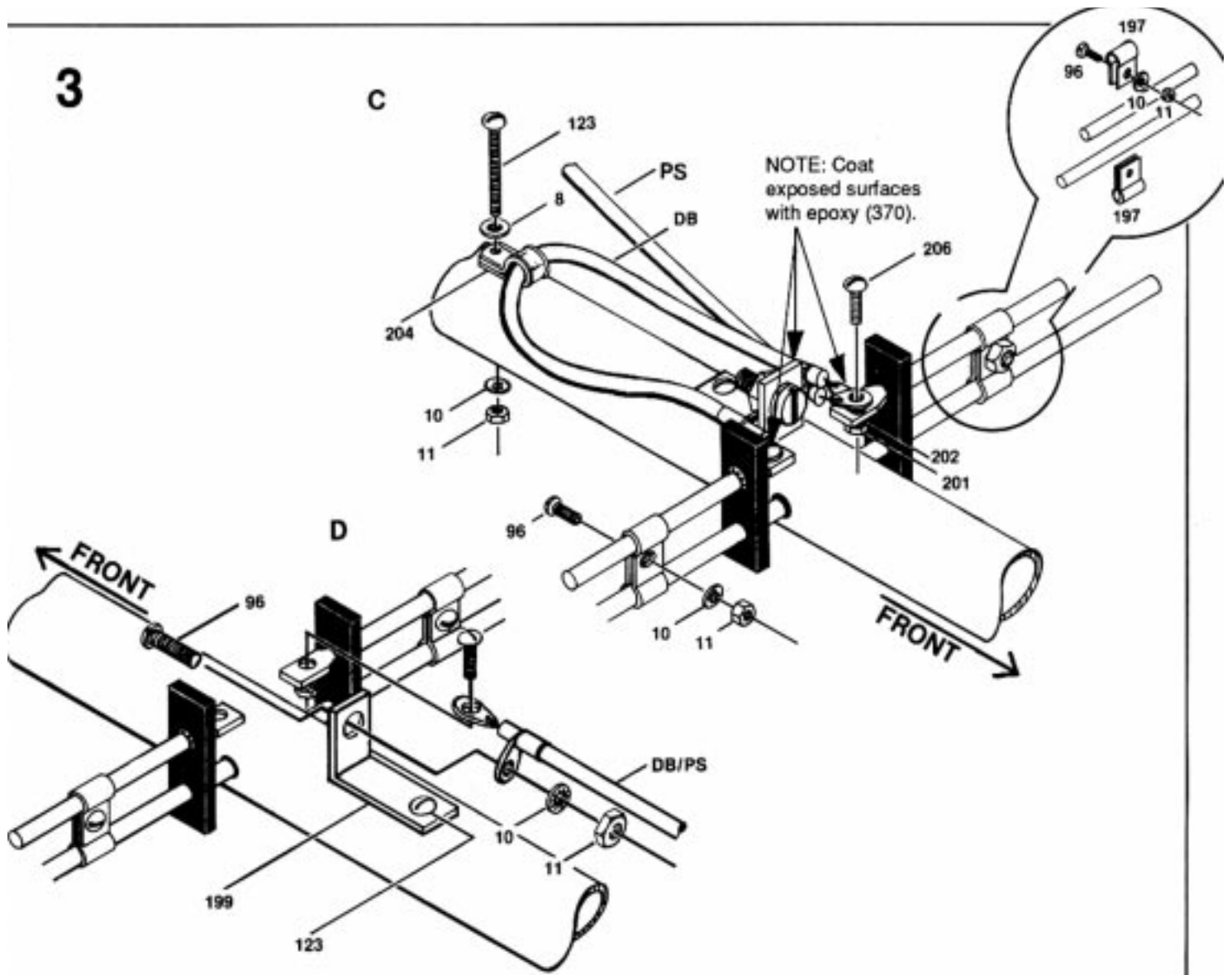


PIN	KEY	DETAIL	DESC.	SIZE	QTY.
—	BA		BOOM	72"x1" (182.88x2.54cm)	1
—	BB		REAR BOOM	12"x1-1/8" (30.48x2.86cm)	1
010123	123		MACHINE SCREW	8-32x1-1/2" (3.81cm)	2
010011	11		HEXNUT	8-32	2
010010	10		INTERNAL TOOTHLOCK WASHER	#8	2
050038	38		END CAP	1" (2.54cm)	1
050131	131		END CAP	1-1/8" (3.86cm)	1

# 3











# 3



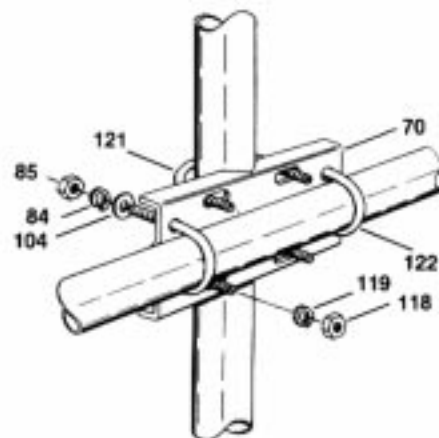
P/N	KEY		DESCRIPTION	SIZE	QTY
010010	10		INTERNAL TOOTH LOCK WASHER	#6	10
010206	206		MACHINE SCREW	4-40 x 3/8" (.95 cm)	4
010201	201		HEX NUT	4-40	4
010202	202		SPLIT LOCK WASHER	#4	4
000435	204		PLASTIC CABLE CLAMP		2
350747	DB		BALUN		2
360940	8		FLAT WASHER	1/4" (.63 cm)	2
250370	370		EPOXY		3

P/N	KEY		DESCRIPTION	SIZE	QTY
010011	11		HEX NUT	8-32	12
010195	195		ELEMENT FASTENER	3/16" (.48 cm)	4
320196	196		T-MATCH SPACER		4
200197	197		T-MATCH CLAMP		8
080907	198		T-MATCH ROD	4" x 3/16" (10.16 x .48 cm)	4
190748	199		GROUND BRACKET	3/8" x 1-1/2" (.95 x 3.8 cm)	2
010096	96		MACHINE SCREW	8-32 x 3/8" (.95 cm)	6
010123	123		MACHINE SCREW	8-32 x 1/2" (3.8 cm)	4



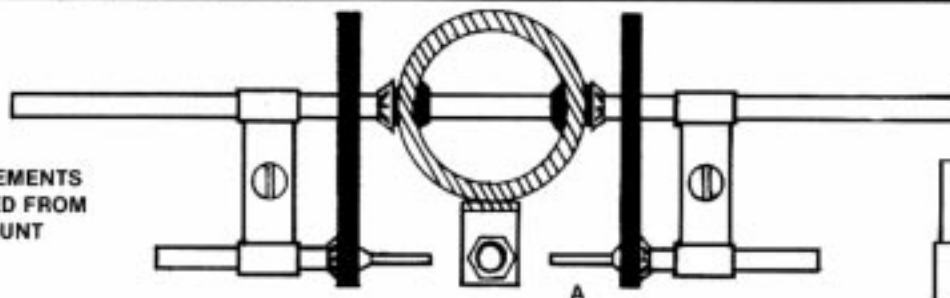
PIN	KEY	DETAIL	DESC.	SIZE	QTY.
010404	121		U-BOLT	2-1/8"x3" (5.4x7.6cm)	2
010401	122		U-BOLT	1-1/2"x3" (3.8x7.6cm)	2
010118	118		HEXNUT	5/16" (.80cm)	4
010119	119		SPLITLOCK WASHER	5/16" (.83cm)	4
010084	84		SPLITLOCK WASHER	1/4" (.63cm)	4
010085	85		HEXNUT	1/4" (.63cm)	4
010104	104		FLAT WASHER	1/4" (.63cm)	4
190070	70		MOUNTING PLATE	4"x6" (10.16x15.24cm)	1

4



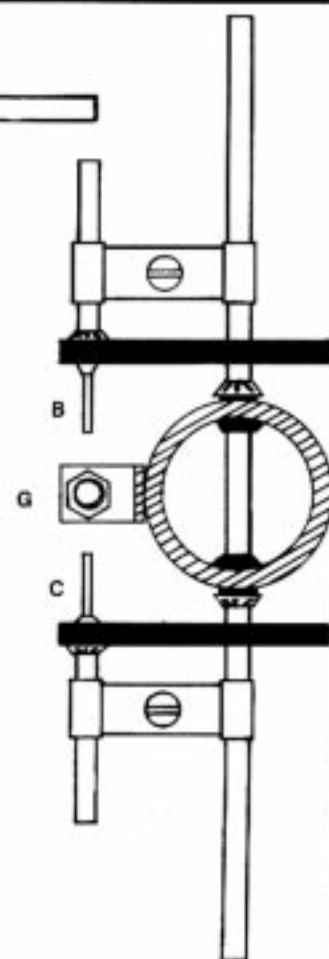
5 A





BOTH DRIVEN ELEMENTS  
SHOWN AS VIEWED FROM  
THE REAR MOUNT

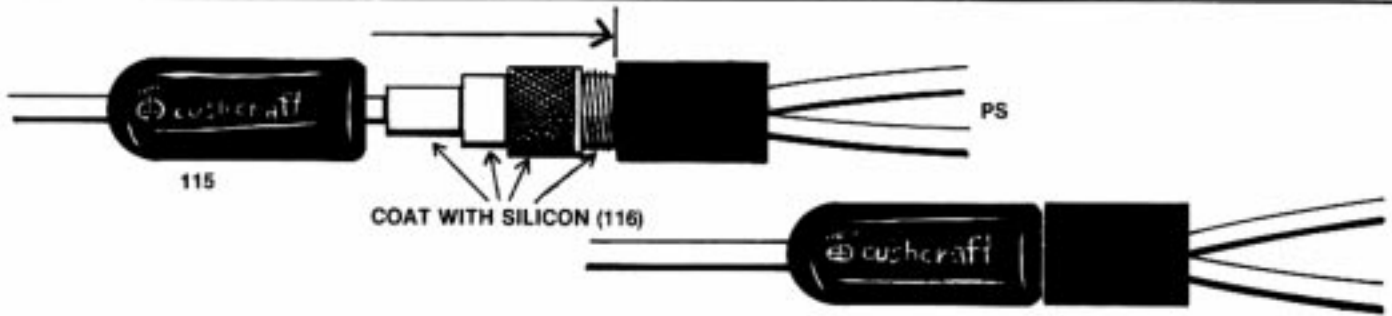


416-TB PHASING HARNESS

TO B FOR CIRCULAR RIGHT  
TO C FOR CIRCULAR LEFT



PIN	KEY	DETAIL	DESC.	SIZE	QTY.
050115	115		VINYL BOOT	—	1
240118	118		SILICONE	—	1
—	PS		PHASING HARNESS	13-1/2" (34.3cm)	1
290326	500		DANGER LABEL	—	1

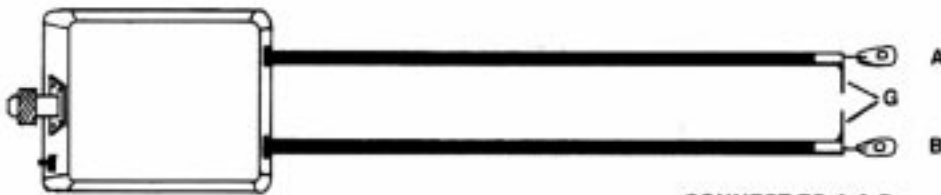


**5 B**

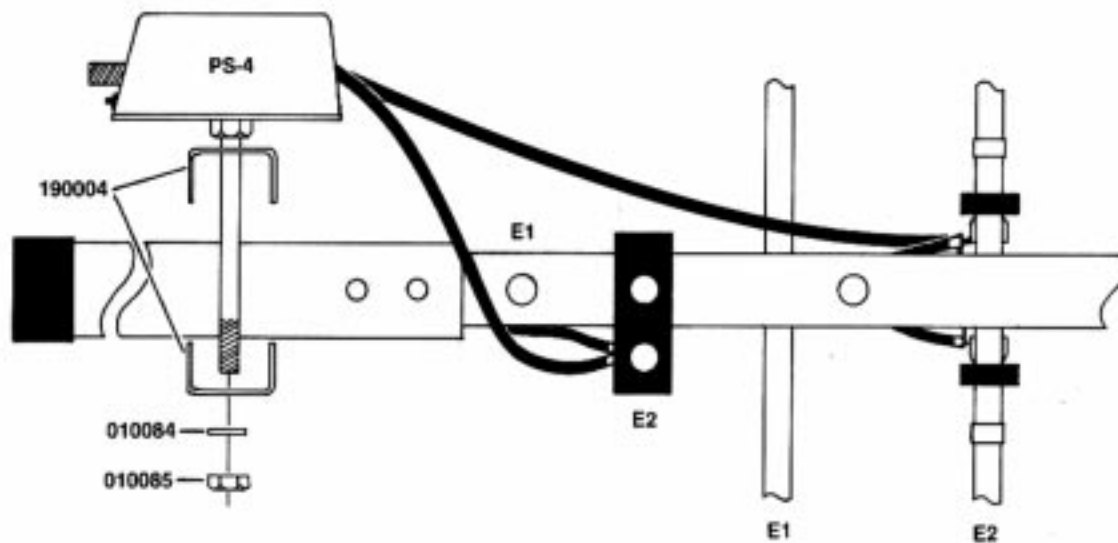
## PS-4 (OPTIONAL)

**6**

CONNECT IN THE SAME MANNER AS PS (PHASING HARNESS)  
WAS CONNECTED



CONNECT TO A & B  
SEE FIGURE 5A





<b>MODEL</b>	416TB
Frequency, MHz	435
2:1 SWR	
Bandwidth, MHz	> 3
Forward Gain, dBd	12.5
3-dB	
Beamwidth, deg	34
F/B Ratio, dB	20
Boom Length, in (m)	80 (2.03)
Longest	
Element, in (m)	13.3 (.34)
Wind Area, ft <sup>2</sup> (m <sup>2</sup> )	.5 (.046)
Weight, lb (kg)	4.9 (2.2)
Max Mast OD, in (cm)	2.0 (5.0)