

435-40CX

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THE NEW KLM 435-40CX IS THE HIGHEST GAIN CIRCULARLY POLARIZED ANTENNA ON THE MARKET TODAY. IT HAS BEEN SPECIFICALLY DESIGNED TO IMPROVE SATELLITE PERFORMANCE BOTH ON MODE "B" INPUT AS WELL AS MODE "Y" RECEIVE. BECAUSE OF ITS EXCEPTIONAL BANDWIDTH AND ULTRA HIGH GAIN, IT IS DESTINED TO BECOME A FAVORITE FOR ATV ENTHUSIASTS WHETHER THEY CHOOSE 438 OR 425 MHz. OF COURSE BECAUSE OF ITS HIGH PERFORMANCE CHARACTERISTICS, IT IS A NATURAL TO FILL THE VOID IN THE 432 MHz ANTENNA WORLD BOTH FOR TERRESTRIAL AND MORE SO FOR THE EME (MOONBOUNCERS) BECAUSE IT WILL VIRTUALLY ELIMINATE THE TROUBLESOME FARADAY FADING. MORE AND MORE AMATEURS ARE LEARNING WHAT COMMERCIAL USERS HAVE COME TO EXPECT FROM THE ADVANTAGES OF CIRCULAR POLARITY (CP) AND THE 435-40CX WILL DEFINITELY LEAD THE PARADE OF CONVERTS TO CP.

SPECIFICATIONS

ELECTRICAL

SPEC. FREQUENCY RANGE.....420 TO 440 MHz
USABLE FREQUENCY RANGE.....410 TO 450 MHz
POLARITY.....CIRCULAR, RIGHT & LEFT HAND
SWITCHABLE USING CS-2 SWITCHER
GAIN.....15.2 dBd @ 436 MHz
BEAMWIDTH.....25 DEGREES
FRONT-TO-BACK RATIO.....20 dB MIN.
FRONT-TO-SIDE RATIO.....25 dB TYPICAL
ELIPTICITY.....3 dB MAXIMUM
FEED IMPEDANCE.....50 OHMS UNBALANCED
VSWR.....1.5:1 MAXIMUM
POWER HANDLING.....250 WATTS MAX. WITH CS-2
POWER REQUIREMENT.....12 VDC @ 100 MA.

MECHANICAL

BOOM LENGTH.....175.5 INCHES
BOOM DIAMETER.....TAPERED 1 - 1 1/4" - 1" DIA.
DRIVEN ELEMENTS.....2 FOLDED DIPOLES; 3/8" DIA.
PARASITIC ELEMENTS.....38 3/16" DIA. ALUMINUM ROD
TURNING RADIUS.....109 INCHES
WIND LOAD.....1.16 SQUARE FEET
WEIGHT.....10 LBS.
MOUNTING.....NON-METALLIC MAST 30"X1 1/2"

REVISED: 10/90

KLM 435-40CX ASSEMBLY INSTRUCTIONS

PRELIMINARY CHECKS

After unpacking your new 435-40cx antenna kit, check the parts carefully against the part list in this manual. Contact KLM regarding any discrepancies.

TOOLS REQUIRED

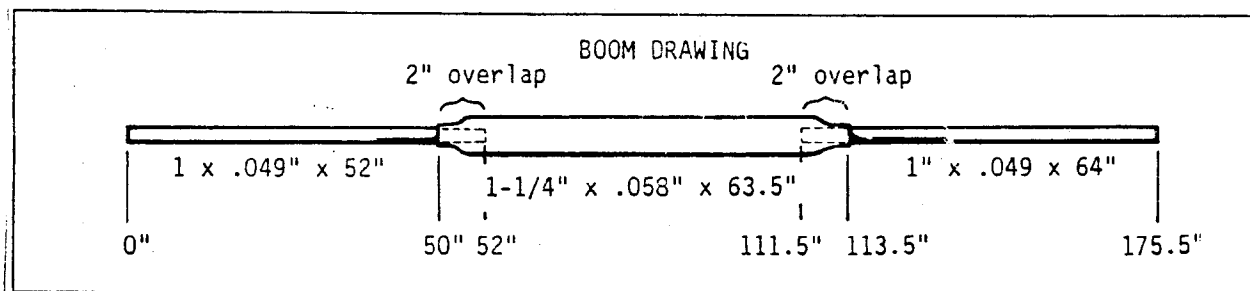
A standard flat blade screw driver, tape measure and wrenches or sockets (spintites) to fit 5/16, 11/32 and 7/16 inch nuts are all that is required.

BOOM ASSEMBLY

The boom consists of a double swaged 1-1/4" dia. center section and two 1 inch dia. ends. Locate the 1" x 52" section and insert it into the swaged end of the 1-1/4" dia. section that has a 5/16" dia. hole right at the edge of the swage. Install two 8-32 x 1 -1/2" screws, lockwashers and nuts and tighten.

Install the remaining 1" dia. section into the swage at the other end of the 1-1/4" section, insert two more 8-32 x 1 -1/2" screws, lockwashers and nuts and tighten.

The 1 -1/2" U-bolt and cradle can be installed at this time through the holes located about 66" from the rear of the boom. Add 1/4-20 nuts and lockwashers but do not tighten at this time. This completes the boom assembly.



DRIVEN ELEMENT MOUNTING

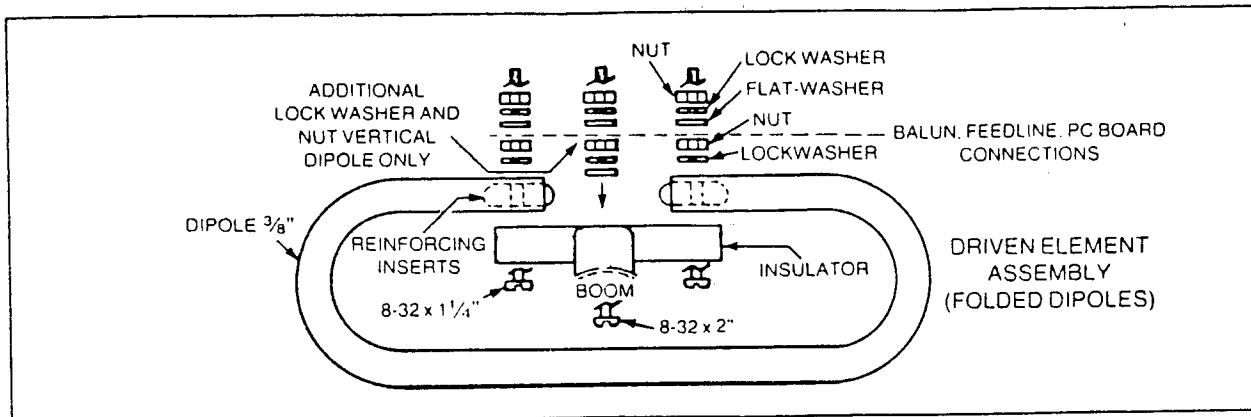
Mount the two Type II driven element insulators with the mounting holes for both away from the rear of the rear of the boom. Refer to the sketch for position and orientation. Use 8-32 x 2" screws, lockwashers and nuts and tighten. Note the screws pass through the boom first, then up through the insulator forming a grounding stud for the coax baluns installed later.

Next, insert the "peanuts" into the ends of the folded dipoles matching the holes. Set the first dipole into the insulator and insert the 8-32 x 1 1/4" screws first through the insulator then up through the element forming a stud for feedline and balun attachment coming next. Add the lockwashers and 8-32 nuts and tighten. Repeat for the second dipole.

Now mount the CS-2 at the very rear to the boom, rotate to the proper orientation (parallel with the rear reflector) and tighten in place. Again refer to the sketch for this portion of the assembly.

Route the RG-303 teflon-silverplated coaxes from the CS-2 up to the dipole feed-points according to the routing in the sketch. Attach the forward dipole cable and place the RG-303 balun over the top. Install the #6 flatwashers, lockwashers and nuts and tighten.

Put the one small loop in the other coax lead and place the lugs over the dipole studs as shown. Add the balun, flatwashers, lockwashers, and nuts and tighten. Using the black nylon cable ties, secure the cables next to the boom as shown in the sketch. This completes the driven element assembly.



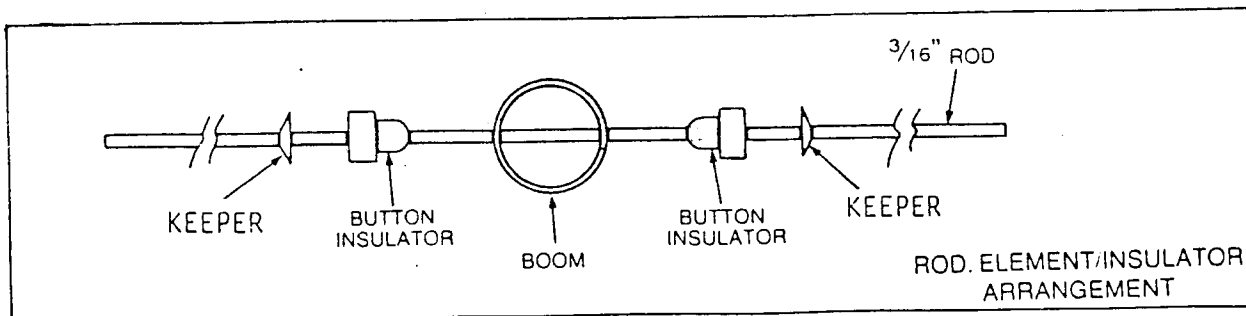
REFLECTOR/DIRECTOR INSTALLATION Read this section carefully before proceeding.

NOTE: The elements taper in length in this optimized design except for director #1 and director #2 but since the taper is gradual we have color coded the element tips of the DIRECTORS the same as the standard resistor color code.

Below is a reminder of the color code used.

1	brown
2	red
3	orange
4	yellow
5	green
6	blue
7	violet or pink
8	gray
9	white
0	black

EXAMPLE: An element with a tip color band of brown and inner color band of yellow designates director #14. Remember, read the tip color band first.



Element installation is easiest if the boom is held in a vice or on a vertical pole. A comfortable height is about "stomach high".

Begin by locating directors #1 through #5. It is easiest to just work on one plane of elements at a time. Complete installing all 18 directors in one plane then go to the other plane. Install one button insulator on each element near the center. To quickly find the center, balance the element over your forefinger, note the center spot and hold the element on this spot while sliding on one button insulator. Now insert the first #1 into the large hole directly in front of the rear dipole. Don't bother installing the second button insulator at this time. Continue inserting #2, #3, #4, and #5 elements in the successive holes. Now install the second button insulators and center the elements "by eye" at this time.

NOTE: Two button insulators require trimming to clear driven element insulators.

Continue on, working in successive groups of five directors until you have all the directors in the proper location along the boom. Lastly, install the two reflectors (no color band) and center as described above. Refer to the dimension sheet for further clarification and centering dimensions.

NOTE: There are slight element length variations from one set of directors to the other at D6. Since there is a 90 degree shift along the boom from one set of elements to the other, this causes D6 in one set to pass through a 1" dia. boom section while D6 in the other set passes through a 1 1/4" dia. boom section. The length variation is caused by the boom diameter length compensation factor.

Now measure and equalize the amount of element protruding on each side of the boom to at least 1/32" accuracy. When centering has been completed, make a quick "eye" check by sighting down the rows of element tips. Gross measurement errors will be spotted easily. Correct and recheck if necessary.

NOTE: Performance and VSWR will suffer if elements are not centered properly.

Once each element is centered within 1/32", carefully add the element keepers and push the tight against the button insulators. REMEMBER, the element centering cannot be changed after the keepers are installed, so be sure the elements are perfectly centered before completing the keeper installation. A few extra keepers have been provided in case of assembly error. This completes the element installation.

FEEDLINE AND CS-2 CONTROL LINE INSTALLATION

Since this antenna generates a circular wavefront, it creates an equal field all around the antenna and not just in the plane of the elements. Because of this circular field no metallic object can be in close proximity without cutting this field and thereby disturbing the gain, VSWR, pattern and ellipticity of the antenna. This includes the feedlines and mounting mast or boom.

Since the CS-2 is rear mounted this makes it easy to come off the rear of the antenna with the 50 ohm coax and shielded 12 VDC switching line. These two cables can be taped or laced together as they leave the CS-2 and run over to the support pole. Secure at the support boom or mast with nylon ties at least 24" away from the closest element tip.

PHASING OF MULTIPLE ANTENNA ARRAYS

If more than one antenna is used and a higher gain array is planned, proper phasing of each antenna is essential. This means that you must pick a physical and electrical mounting position and it then must be the same for all identical antennas in the array. If the rear dipole is horizontal and has its coax feed line center conductor attached to the left side of the dipole, then all the other antennas in the array must be the same way. If a center conductor side is reversed, a 180 degree phase reversal occurs and the array pattern will be destroyed or badly distorted. However this phasing error will have little or no effect on the VSWR so a visual check for proper phasing is the only practical way to make sure you have the array phased correctly. With circularly polarized antennas an extra parameter is included in the phasing requirement and that is that all antennas must be in either right or left hand mode but not a mixture.

SPACING for the 435-40CX when two or more are used should be between 54 and 60 inches. A good check for proper spacing and phasing is to look at the level of the first side lobes on either side of the main lobe. When spaced properly for maximum gain, the first side lobes should be down 13 dB. Closer spacing should reduce the side lobes further with a few tenths of dB reduction in gain and wider spacing will bring up the side lobes and narrow the main lobe 3 dB beamwidth with again a few tenths reduction in array gain. This statement assumes no more than a 10% spacing change from optimum.

PHASING LINE lengths should all be the same electrical length (phased matched) and good engineering practice dictates these lines be multiples of half wave lengths of coax with the coax velocity factor figured in. Half wave multiples are used so feedline impedance variations do not effect the match when coupling multiple antennas together through power dividers.

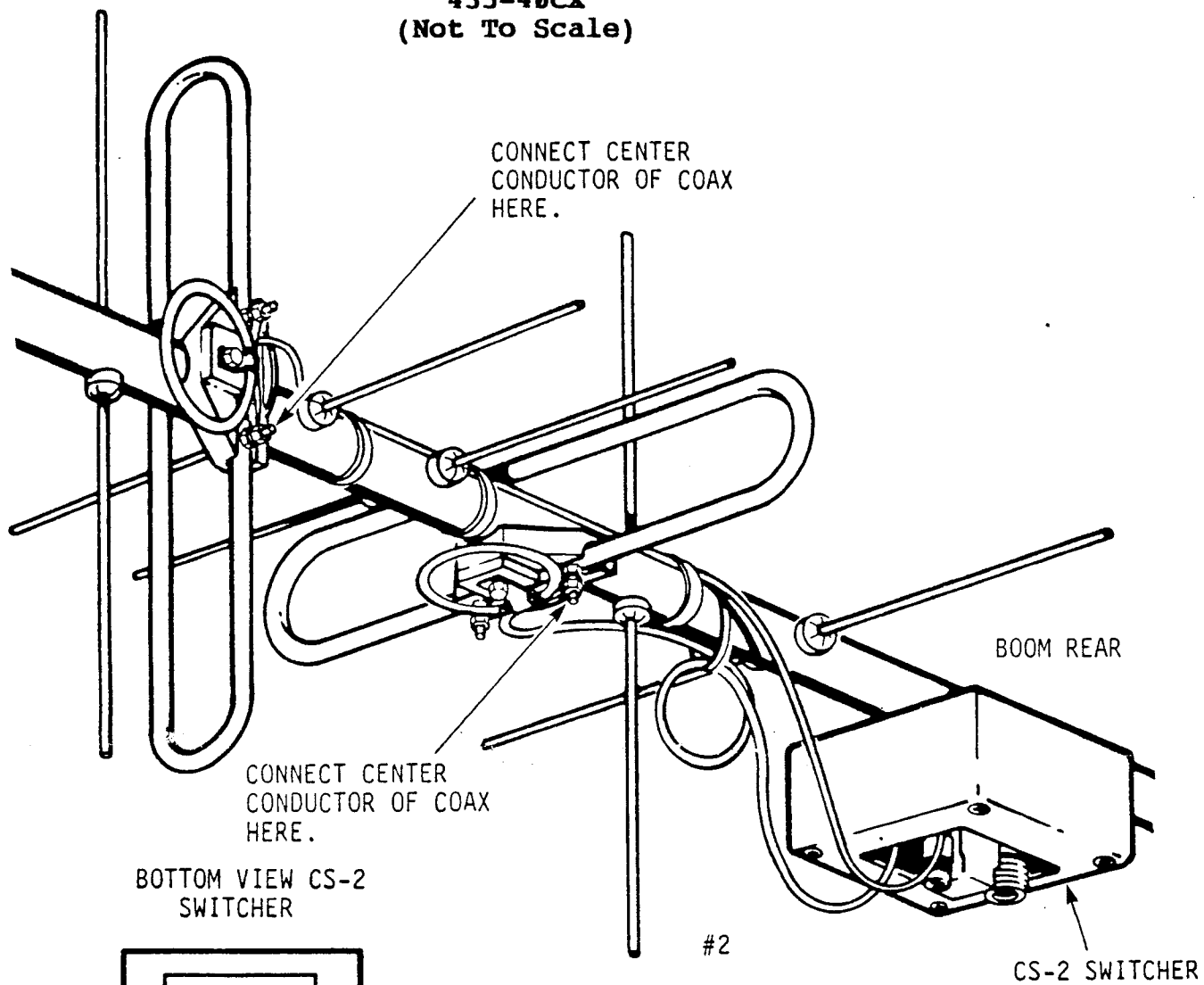
PHYSICAL MOUNTING POSITION is just as important as matched electrical phasing. Identical positioning of the antenna boom to the support mast or boom is essential in maintaining correct phase in the array.

REVISED 10-90

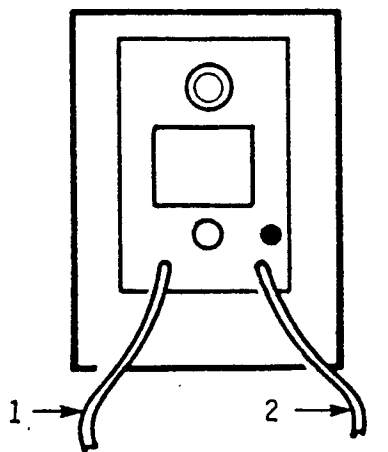
ASSEMBLY PICTORIAL

435-40CX

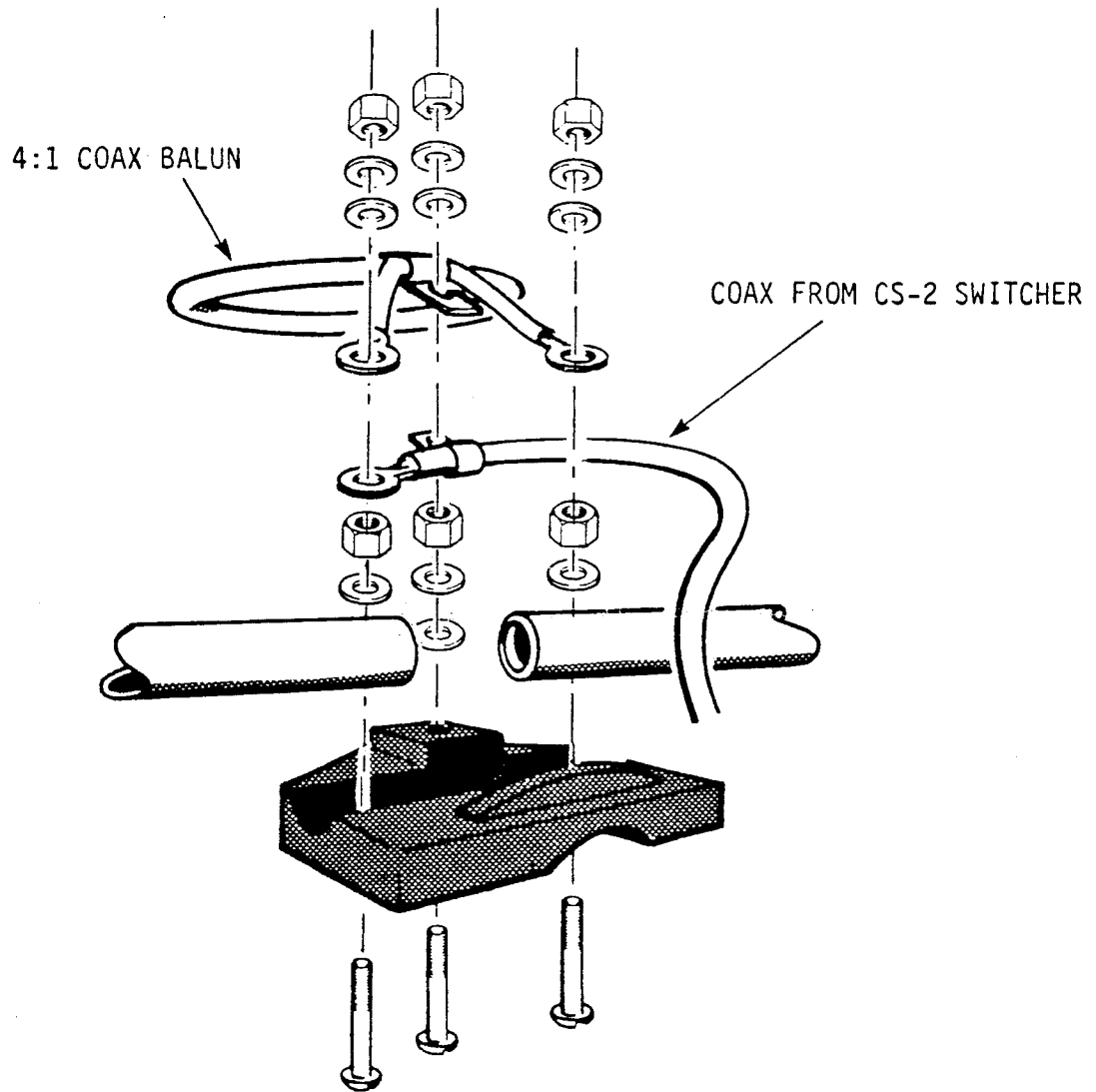
(Not To Scale)



BOTTOM VIEW CS-2 SWITCHER



TO REAR
DIPOLE



FEEDLINE/BALUN MOUNTING DETAIL

435-40CX DIMENSION SHEET

ELEMENT SPACING		ELEMENT LENGTH			1/2" LEN.
CM	INCHES	DIR. NO.	INCHES	CM	SHOWING
444.82	175.125	O D18	10.657	27.07	4.828
427.67	168.375	-----D18			
417.13	164.223	O D17	10.688	27.15	4.844
399.98	157.473	-----D17			
389.42	153.316	Ø D16	10.750	27.31	4.875
372.27	146.563	-----D16			
361.72	142.409	O D15	10.813	27.47	4.907
344.57	135.657	-----D15			
334.02	131.502	O D14	10.843	27.54	4.922
316.87	124.75	-----D14			
306.87	120.814	O D13	10.907	27.70	251.64
289.72	114.062	-----D13			
280.12	110.282	O D12	11.062	28.10	4.907
262.97	103.532	-----D12			
253.76	99.907	O D11	11.125	28.26	4.938
236.62	93.157	-----D11			
228.05	89.782	O D10	11.188	28.42	4.969
210.90	83.032	-----D10			
203.28	80.032	O D9	11.25	28.58	5.00
186.14	73.282	-----D9			
179.47	70.657	O D8	11.313	28.74	5.032
162.32	63.907	-----D8			
156.68	61.687	O D7	11.375	28.89	5.062
139.54	54.937	-----D7	11.375	28.89	5.062
134.94	53.125	O D6	11.50	29.21	5.125
117.79	46.375	-----D6	11.375	28.89	5.188
114.14	44.937	O D5	11.50	29.21	5.250
97.00	38.188	-----D5	11.50	29.21	5.250
95.25	37.50	O D4	11.625	29.53	5.313
78.27	30.813	O D3	11.75	29.85	5.375
77.63	30.563	-----D4	11.625	29.53	5.313
63.82	25.125	O D2	12.032	30.56	5.516
60.49	23.813	-----D3	11.75	29.85	5.375
51.75	20.375	O D1	11.875	30.16	5.437
61.06	18.625	O DIPOLE, FRONT			
45.72	18.00	-----D2	12.032	30.56	5.516
33.66	13.25	-----D1	11.875	30.16	5.437
		X X			
29.21	11.5	-----DIPOLE, REAR			
19.05	10.875	O Refl.	13.625	34.61	6.313
10.16	4.00	-----	13.625	34.61	6.313

- NOTES:
1. Directors D1 and D2 do not taper in length.
 2. Directors D6 are different physical lengths because they pass through different boom diameters and their lengths have been compensated accordingly.

435-40CX
PARTS LIST

DESCRIPTION	PART #	QTY.
Boom, 1-1/4" o.d. x .058" x 63-1/2" Swaged	T1140	1
Boom, 1" o.d. x .049" x 64" Straight	T1000	1
Boom, 1" o.d. x .049" x 52" Straight	T1000	1
Rod Element, 3/16" o.d. x 13.625	R0316	2
Rod Element, 3/16" o.d. x 12.032"	R0316	2
Rod Element, 3/16" o.d. x 11.875"	R0316	2
Rod Element, 3/16" o.d. x 11.75"	R0316	2
Rod Element, 3/16" o.d. x 11.625"	R0316	2
Rod Element, 3/16" o.d. x 11.5"	R0316	3
Rod Element, 3/16" o.d. x 11.375"	R0316	3
Rod Element, 3/16" o.d. x 11.313"	R0316	2
Rod Element, 3/16" o.d. x 11.25"	R0316	2
Rod Element, 3/16" o.d. x 11.188"	R0316	2
Rod Element, 3/16" o.d. x 11.125"	R0316	2
Rod Element, 3/16" o.d. x 11.062"	R0316	2
Rod Element, 3/16" o.d. x 10.907"	R0316	2
Rod Element, 3/16" o.d. x 10.843"	R0316	2
Rod Element, 3/16" o.d. x 10.813"	R0316	2
Rod Element, 3/16" o.d. x 10.75"	R0316	2
Rod Element, 3/16" o.d. x 10.688"	R0316	2
Rod Element, 3/16" o.d. x 10.657"	R0316	2
Dipole Element, 3/8" x 25-3/8" (12-3/4" after bend)	T0380	2
Coax Balun, 435 4:1	B7041	2
CS-2 Circularity Switcher	CS-2	1

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PARTS LIST CONT'D

DESCRIPTION	PART #	QTY.
Bag of Hardware:		
Screws, 8-32 x 2"	28017	2
Screws, 8-32 x 1-1/2"	28015	4
Nuts, 8-32	28202	16
Screws, 8-32 x 1-1/4"	28014	8
Lockwashers, #8	28352	16
Flatwashers, #8	28302	8
Driven Insulators, Type II, 3/8" x 1" x 2-3/4"	66113	2
Button Insulators	66125	76
Pushnuts, 3/16"	28218	85
Peanut Inserts, 1/4" x 1"	66106	4
Nylon Ties, Large Black	66119	6
U-Bolts & Cradles, 1-1/2", Long	28404	1
Nuts, 1/4-20	28204	4
Lockwasher, 1/4-20	28354	4
Assembly Manual	84077	1

OCTOBER 25, 1990

Use the piece of 3/8" tubing supplied in this kit for installing the button insulators and the pushnuts. This piece of tubing is not part of the finished antenna.