MIRAGE /KLM

COMMUNICATIONS EQUIPMENT, INC.

435-18C

13602

KLM's 435-18C Circular Polarized antenna brings all the advantages of circular polarity of UHF, for optimized satelite and terrestrial communications. Although originally inspired and designed for the Phase III satellite, OSCAR 9, the 18C is finding wide appeal and acceptance amoung DX'ers, ATV'ers, and the 440-450 FM group.

Totally new design and construction techniques were necessary for the 18C because of the strict electrical requirements for good circularity at UHF frequencies. The parasitic elements (3/16" 6061-T6 rod) pass through the center of the boom in both planes, and are isolated from it with polyethylene insulators and locking snap rings. Folded dipoles of 3/8" O.D. tubing are used for the driven elements. These provide excellent bandwidth, and, being looped around the boom, maintain perfect element symmetry. Circularity is held within 1 dB, 430-440 Mhz and 3 dB, 420-450 MHz.

Electrically, the 18C has nine elements in the vertical plane and nine in the horizontal. Offset between them is 1/4 wavelength. Each dipole has a feed impedance of 50 ohms, and two coaxial baluns are supplied.

The 18C may be fed in several ways. Two equal lengths of 50 ohm feedline will produce righthand circularity (RHC) which is reversible to LHC ay adding 1/2 wavelength of additional feedline to the forward antenna. A single feedline is possible through a KLM 400-470-2N two port power divder and two short equal lengths of coax to the feedpoints.

For the ultimate in convenience and versatility, KLM offers the optional CS-2 Circularity Switcher. The CS-2 needs only one feedline and mounts at the rear of the boom. RHC and LHC are switchable from the shack with any 12-14 VDC, .1 amp power source. The CS-2 also functions as two port power divider and matching transformer. Two short lengths of RG-142 are supplied for feeding each half of the 18C.

KLM has spared no effort to make the 420-450-18C the BEST, and we know of no antenna on the market that even approaches its performance. Like most KLM antennas, NO TUNING OR MATCHING adjustments are needed afte assembly. Broadband-driven elements and precisely tuned parasitics ensure the rated specifications.

SPECIFICATIONS: KLM's 435-18C
Circular-Polarization Antenna

Frequency of Operation: 420—450 MHz
Number of elements: 18
Gain: 12 dBdc
F/B: 20 dB
VSWR: 1.5:1
Ellipticity: 1 dB @ 430—440, 3 dB max. @ 420—450 MHz
Beamwidth: 22 degrees
Feed Impedance: 50 ohms, unbalanced
Baluns: Two 4:1 coax supplied
Boom Length/Dia: 88" x 1" O.D.
Mounting: Center or rear, 1-1/2" mast
Weight: Under 5 lbs
Windload: .5 sq ft
Options: CS-2 Circularity Switcher, left-hand/right-hand switch, boom-mounted, keyed @ 12-14 VDC @ .1 Amp

4/30/85

P.O. BOX 1000 MORGAN HILL, CALIFORNIA 95037 (408) 779-7363

ANTENNA ASSEMBLY

I. BEFORE YOU BEGIN.....

1. Select an assembly area large enough to comfortably accommodate overall antenna dimensions. A shallow box is handy for holding and sorting the smaller hardware, as is a marking pen for identifying components.

2. Some simple tools are required: A tape measure, screwdriver, and a set of spin-tite, socket or end wrenches. Common nut sizes are:

5/16" ..... 6-32 hdwe	7/16" ..... ¼-20 hdwe
11/32"..... 8-32 hdwe	1/2"..... 5/16-18 hdwe

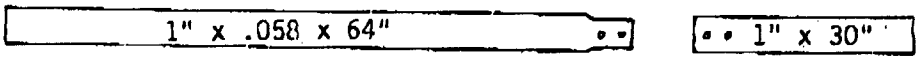
To avoid damage to antenna components, be aware that most hardware need only be moderately hand tightened with screwdriver or spintite to be secure. When using tools with mechanical leverage, such as socket or end wrenches, care must be taken not to over-torque nuts and damage components.

3. Thoroughly unpack shipping box and check components and hardware against the Parts List. If there is a difference, look for a "Factory Update/Change" sheet accompanying the assembly instructions prior to contacting your KLM dealer or the factory.

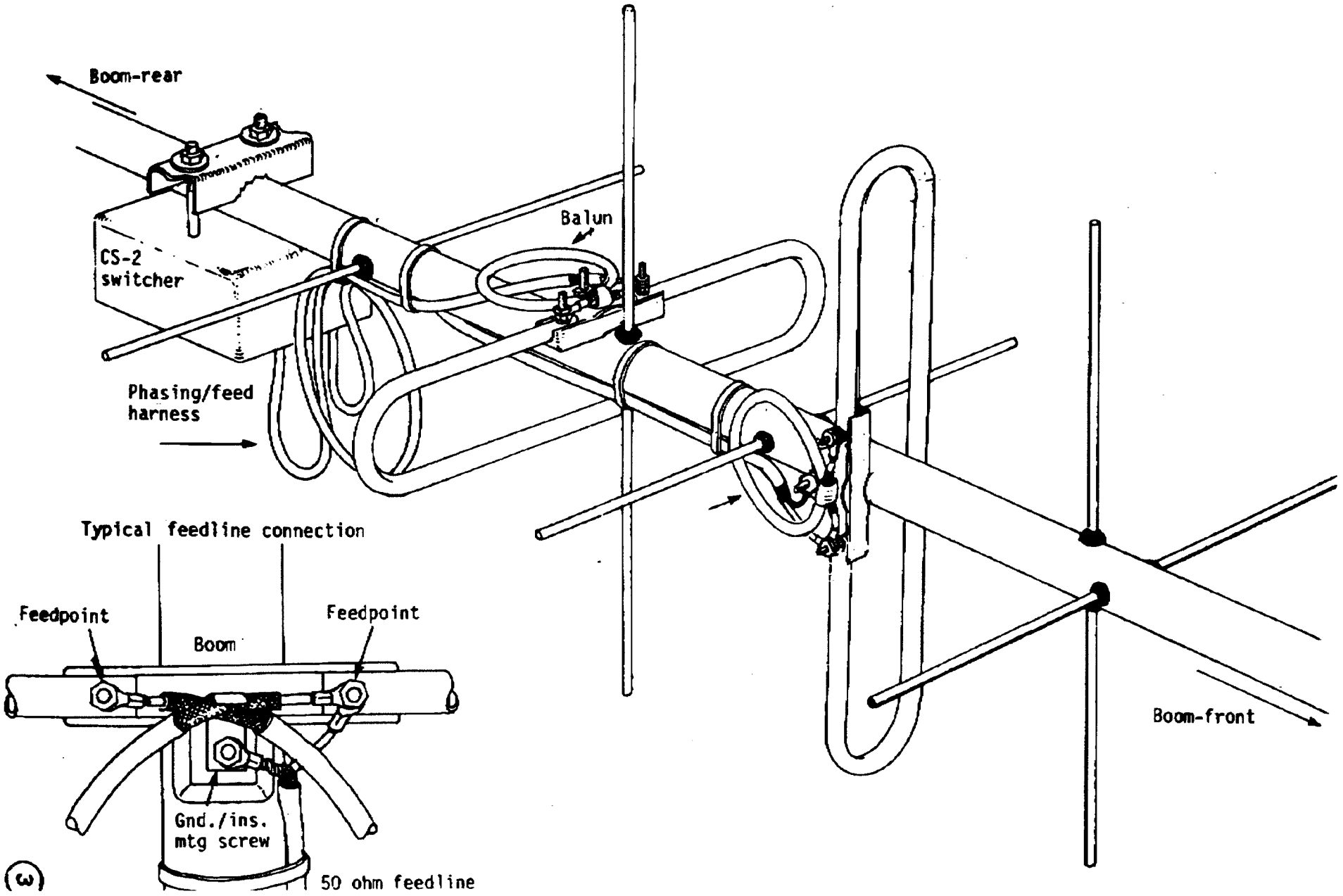
4. For the best results, use the pictorials to identify the various antenna components before you begin assembly.

II. BOOM ASSEMBLY: (Multiple sections only)

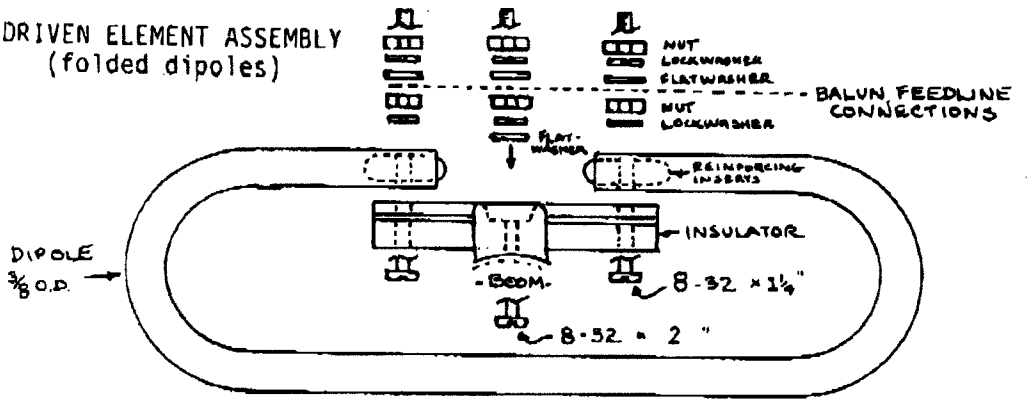
1. The end of each boom section to be assembled is letter-marked in felt pen. Assemble boom sections matching like letters ("A" to "A", etc.) and aligning screw holes. The joint is secured by one 8-32 x 1-1/4" screw, nut and lock-washers. The larger hole receives one of the 11-1/4" director elements. Tighten nuts securely. Section placement and length will follow the sketch below:



ASSEMBLY PICTORIAL - KLM 435-18C



III. DRIVEN ELEMENT ASSEMBLY
(folded dipoles)



1. Select one of the folded dipoles and insert the reinforcing inserts into the tubing ends, aligning the holes.

2. Mount the dipole element to the insulator using the 8-32 x 1¼" screws, nuts, and lockwashers. See the sketch above for the correct arrangement of the hardware.

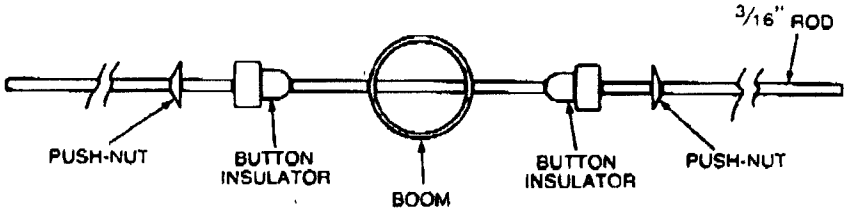
See Assembly Pictorial...

3. Mount the horizontal dipole assembly on the boom, orienting the dipole to the front and the insulator mounting screw to the rear. Insert the 8-32 x 2 " mounting screw from the opposite side of the boom. Place a #8 flatwasher, lockwasher and nut on the screw and handtighten down into the insulator cavity. Extra screw length forms grounding stud for the balun. Mounting hole is about 17½" from the rear of the boom.

4. Place the preformed balun over the feedpoint studs and the insulator/ground stud. Secure loosely with #8 flatwashers, lockwashers, and nuts; feedline lugs attach here later.

5. Repeat steps 1 through 4 for vertical dipole assembly. Orient insulator on right side of boom (viewed from rear). Mounting hole is about 24¼" from rear.

IV. DIRECTOR/REFLECTOR MOUNTING (Parasitic elements)



ROD, ELEMENT/INSULATOR ARRANGEMENT

Separate the parasitic elements into two groups of vertical and horizontal elements. Install one group (vertical or horizontal) at a time.

Locate the longest 3/16 inch diameter element (reflector). Slide on one of the "button" mounting insulators small end first Push the insulator to the element balance point. DON'T WORRY ABOUT THE EXACT LOCATION AT THIS POINT. Repeat this operation f each of the remaining rod elements.

ROD ELEMENT/INSULATOR ARRANGEMENT (con't)

Pick up all the rod elements and settle them in your grasp on a flat smooth surface. Starting with the longest rod, insert it through the end hole in the boom near the driven elements. Next move to the hole directly in front of the driven elements and insert the next longest element. Continue inserting the next longest rod director in the next hole, and the next, and the next, until all the rod directors are in place.

Now return to the reflector and slide on the second button insulator from the opposite side of the boom. Visually center the element in the boom. Consult the antenna dimension sheet and, using a tape measure, set the element position so the element is centered in the boom. THIS CENTERING OPERAITON IS VERY CRITICAL FOR PROPER PERFORMANCE OF THE ANTENNA.

Move the next rod director and repeat the second button insulator installation and centering operation. Continue until each rod director is fully mounted and centered.

Return to the reflector now and install the element keeper washers on each side. BEFORE PUSHING THEM TIGHTLY UP AGAINST THE BUTTON INSULATORS, CHECK FOR PROPER CENTERING ONE MORE TIME. Proceed by adding the keeper washers to the rest of the rod directors until all have been center-checked and have the keepers installed.

KLM 435-18C

ELEMENT SPACING			ELEMENT LENGTH
	89-3/4	11-1/4	
83			11-1/4
	82	11-1/4	
75-1/4			11-1/4
	70-1/4	11-1/4	
63-1/2			11-1/4
	60	11-1/4	
53-1/4			11-1/4
	51-3/8	11-3/8	
44-5/8			11-3/8
	38-7/8	11-1/2	
32-1/8			11-1/2
	31-1/2	11-3/4	
	26-3/4	A B Dipole	
24-3/4			11-3/4
	20-3/4	13-1/4	
20	A B		Dipole
		Dipoles may be grounded here for lighting protection	
14			13-1/4

A-B 200 OHM BALANCED FEED POINTS
ATTACH 4:1 COAX BALUNS HERE

V. INSPECTION

1. Use tape measure and Dimension Sheet to check all elements for correct length and spacing. Use Assembly Pictorial and sketches to check for correct placement of all hardware. Check all nuts and screws for tightness.

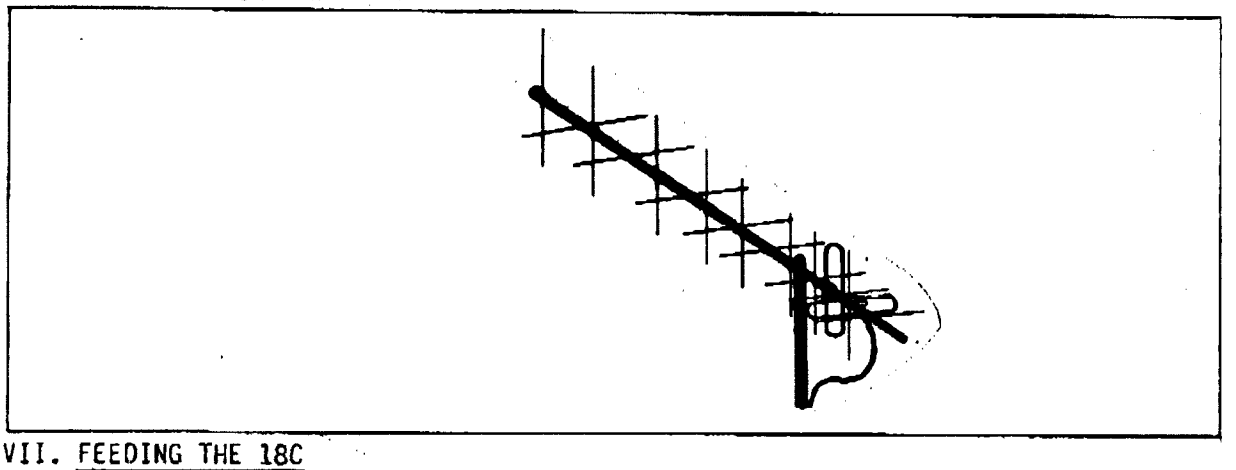
VI. MOUNTING

1. The 18C may be mounted near it's balance point or at the rear.

   A. CENTER MOUNTING: A FIBERGLASS OR OTHER NON-CONDUCTING MAST MUST BE USED WHEN CENTER MOUNTING. Determine the balance point with feedline(s) and switcher (if used) attached. Attach the boom-to mast plate near this point.

   B. REAR MOUNTING: a metal mast can be used when rear mounting the 18C.

   ALWAYS ROUTE THE DC AND FEEDLINES OFF THE REAR OF THE BOOM REGARDLESS OF HOW IT IS MOUNTED. Takeoff point is at least 4" behind the rearmost vertical element, or at the CS-2 Switcher (if used). When the 18C is center mounted, route feed/DC lines off the rear of the boom and back to the mast in a gentle loop. Reattach to mast at least 6" below the level of the lowest vertical element tip.



VII. FEEDING THE 18C

1. COAX: High quality coax is a necessity at UHF frequencies and will eliminate a frequent source of losses, mismatches, and distorted patterns. KLM recommends the shortest possible run of Times FM-8 or Belden 8214. Better still is any brand of ½" or larger hardline.

2. CS-2 SWITCHER: If the CS-2 is used, coax from the CS-2 to the individual feedpoints is provided. Install per instructions. A type "N" connector is mounted on the switcher case for direct hookup to your 50 ohm feed.

3. WITHOUT THE CS-2: For fixed circular polarization, either RHC or LHC, two short equal lengths of 50 ohm coax from the feedpoints to a KLM 420-470-2N Power Divider will work fine and permit a single feedline to be used.
   Another alternative is to run two separate 50 ohm feedlines (of equal length) from your rig to the 18C.

   CONNECTING FEEDLINES FOR DESIRED POLARITY: reference from the rear of the boom, with rear dipole in the horizontal position, vertical dipole with insulator on right hand side of boom.

   RHC: horizontal dipole=attach center lead to left hand feedpoint stud.
   vertical dipole=attach center lead to LOWER feedpoint stud.
   Braid lugs of both feedlines mount on Gnd/insulator mounting screw studs

   LHC: horizontal dipole=attach center lead to left hand feedpoint stud.
   vertical dipole=attach center lead to UPPER feedpoint stud.
   Braid lugs of both feedlines mount on GND/insulator mounting screw studs

3. (continued)

POLARITY SWITCHING WITHOUT THE CS-2: Run two separate lines of equal length from your rig to the 18C. Connect for RHC as outlined above. Polarity can be reversed to LHC by adding or switching-in an additional 1/2 wavelength of feedline to the forward antenna feedpoints.

4. The 18C may also be used as two separately fed antennas, one horizontally polarized and one vertically polarized. Leave baluns in place. Run separate feedlines (50 ohms). Shield lugs mount on Gnd/insulator mounting screw studs. Attach center lead lugs to either of the feedpoint studs.

5. Use harness ties liberally to keep feed/DC lines flat against boom.

6. The 18C should be separated from other antennas or metallic objects by a minimum of 1/4 wavelength (6.8" @ 432 MHz).

435-18C PARTS LIST

DESCRIPTION	PART NUMBER	QUANTITY
1"OD X 64" SWAGED BOOM SECTION	T1000	1
1"OD X 30" STRAIGHT BOOM SECTION	T1000	1
3/8"OD X 22 5/8" DIPOLE ELEMENT BEFORE BEND	T0380	2
3/16"OD X 13¾" ROD ELEMENT	R0316	2
3/16"OD X 11 3/4" ROD ELEMENT	R0316	2
3/16"OD X 11½" ROD ELEMENT	R0316	2
3/16"OD X 11 3/8" ROD ELEMENT	R0316	2
3/16"OD X 11¼" ROD ELEMENT	R0316	8
435-4:1 COAX BALUN	B7041	2
1/8" X 4" X 6" BOOM-TO-MAST PLATE	P0406	1
CS-2 SWITCHER	CS-2	1
HARDWARE BAG #1:		
8-32 X 2" SCREWS	28017	2
8-32 X 1¼" SCREWS	28014	6
8-32 NUTS	28202	14
#8 LOCKWASHERS	28352	14
#8 FLATWASHERS	28302	8
¼" X 1" PEANUT INSERTS (PLUGS)	66106	4
3/16" PUSHNUTS	28218	36
5/16-18 NUTS	28206	8
5/16" LOCKWASHERS	28356	8
HARDWARE BAG #2:		
LARGE NYLON TIES	66119	6
3/8" X 1" X 2 3/4" INSULATOR, TYPE II	66113	2
1 1/8" U-BOLTS & CRADLES	28409	2
1½" U-BOLTS & CRADLES	28401	2
1" END CAPS	66116	2
BUTTON INSULATORS	66125	32
10 PAGE ASSEMBLY MANUAL	84057	1

CS-2

The CS-2 is the optional circularity reversing switch designed specifically for use with the KLM 435-18C.

The unit comes complete with cables cut to the proper length and provides a microstripline matching section to transform the 18C system impedance to your 50-ohm unbalanced feedline. It also provides a Type "N" connector for attaching your feedline to the CS-2.

The unit requires 9-15VDC at about 100 mA to key the switching relay and provides right-hand circular polarization in the unenergized state.

CS-2 MOUNTING:

1. The CS-2 mounts at the rear of the boom on the 18C as shown in the illustration. After determining which side of the 18C will be down in your installation, mount the CS-2 as shown.

   a. Slide the CS-2 on to the boom until it is 2" inches behind the last element.

   b. Tighten down the ¼-inch/20 hardware to fix the unit in place so that the cables are facing down.

   c. Note the numbers of the PC board next to the cables, then route number 2 (or a black dot) forward to connect to the front (vertical) dipole. The ground strap goes to the center, "hot" to the lower element feed point (looking from back of antenna).

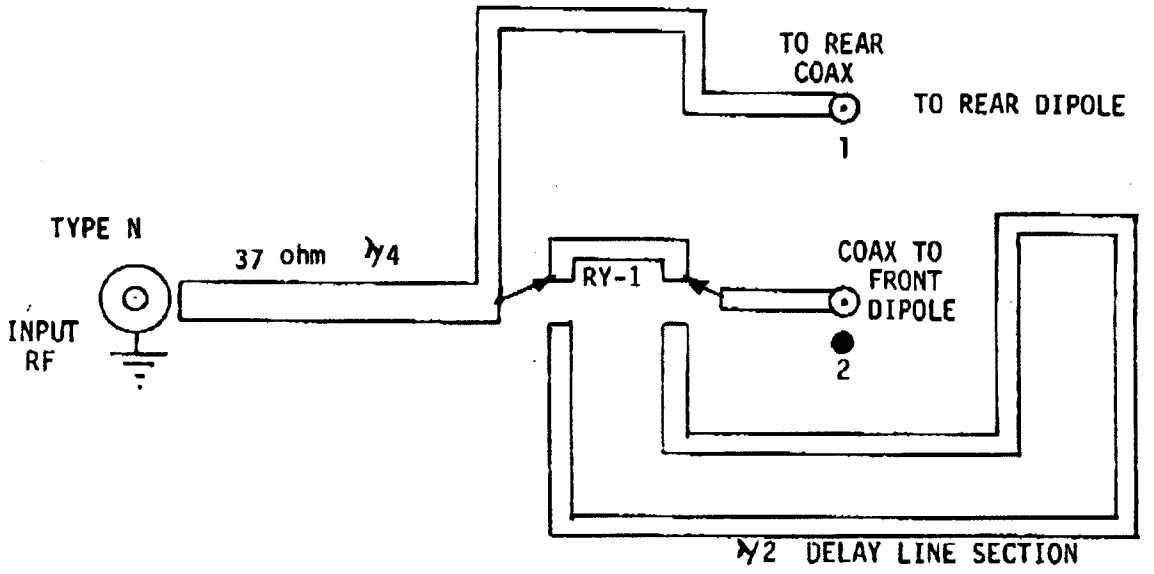
   d. Install the balun loop with "hot" leads to feed points and grounding strap to the ground lug (center).

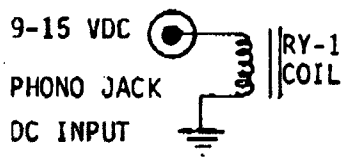
   e. Form a three to four inch diameter loop in the other CS-2 cable (number 1) then connect to the rear driven element. Make sure to connect the feedline as you did to the other driven element ("hot" lead to the left, ground strap to the ground lug). Install balun loop as before.

2. Tidy up the installation using the Nylon ties provided to secure the cables, balun loops, and feedline to the boom or mast. Electricians tape may also be used.

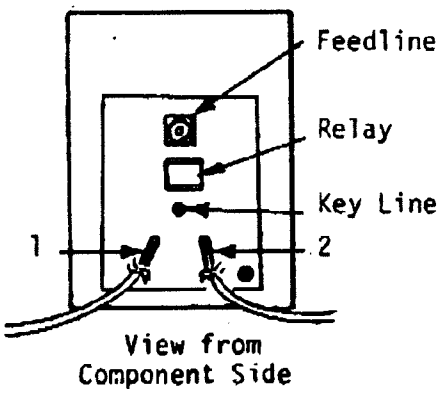
3. The KLM 435-18C can be mounted to the mast by rear mounting it or center mounting it. If it is center mounted, the mast must be made of non-conducting material such as wood or fibreglass. This mast must extend at least two feet beyond the antenna to prevent distortion of circularity and gain/match patterns. DO NOT RUN THE FEEDLINE DOWN THE NON-CONDUCTIVE MAST. The coax shield will also distort the pattern. The coax must be routed off the back of the antenna behind the reflector then down at least 24-30 inches before bringing it back in to the mast below the antenna.

CS-2
ELECTRICAL DIAGRAM





(Foil View)



RY1 = GUARDIAN #1365

MIRAGE/KLM
COMMUNICATIONS EQUIPMENT, INC.

June 1, 1988

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.

P.O. BOX 1000

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