

MIRAGE/KLM
COMMUNICATIONS EQUIPMENT

2M-16-LBXM

ANTENNA

14142

Mirage/klm's 2M-16-LBXM utilizes the latest in ultra high gain, low side lobe design. The parasitic elements are pseudo log tapered in length and spacing to produce wide usable band-width with low side lobes. This structure is coupled with Mirage/klm's proven multidriven element assembly to produce unbeatable performance.

Because of its light weight and low windload it is perfect for use in higher gain arrays. Used singularly, of course, it is just the answer for crowded masts where high gain and clean pattern are still a must. The multidriven log-cell with its characteristic high efficiency and built-in front-to-back ratio eliminates the need for bulky, heavy multiple reflector structures.

The use of a tapered boom again provides minimum windload and maximum strength. This makes array construction simpler and cleaner. We expect to see a lot of DXpeditions utilizing 4 or 8 of these antennas because of their light weight, guaranteed high performance, and quick setup and takedown.

Mirage/klm has stacking frameworks available to allow stacking up to 8 antennas. Upgraded 2 and 4 port power dividers are also available.

PRELIMINARY SPECIFICATIONS

ELECTRICAL

Frequency Range 144 - 148 MHz
 F/B 24 dB average
 F/S 30 dB min.
 Maximum E Plane Side Lobe 17 dB
 E Plane Beamwidth (Horizontal)..... 30 Degrees
 H Plane Beamwidth (Vertical) 32 Degrees
 Feed Impedance using 4:1 RG303 Silver/Teflon balun
 50 ohms unbalanced.

GAIN:

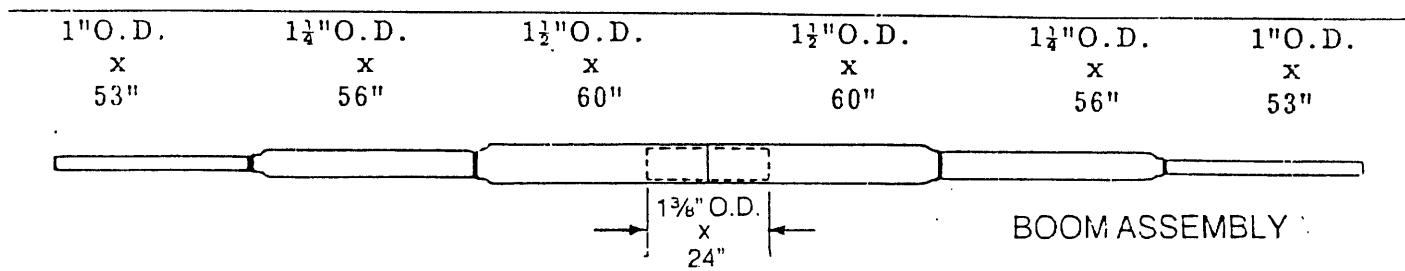
144 Frequency Range 13.8
 145 " " 14.0
 146 " " 14.1
 147 " " 14.1
 148 " " 14.0

MECHANICAL

Boom Length 28'1" (337") 4.08 Wave Lengths
 Driven Element 2, Dual Driven 3/8" Diameter Tube
 Parasitics 14, 3/16" Rod Insulated
 Weight 10 Lbs.
 Turning Radius 185"
 Wind Load Horizontal Polarity -1.75 sq ft
 Vertical Polarity - 2.44 sq ft

To provide a more accurate and consistent gain figure, performance of this Mirage/klm antenna has been carefully measured and correlated in accordance with the National Bureau of Standards Note #688. This gain figure may appear somewhat conservative when compared with others commonly found in conventional industry literature and based on older, less exacting rating methods.

Assembly of the 2M-16-LBXM antenna is easy and quick but, as with any high performance antenna, close attention to dimensions and centering is extremely important if top performance is to be realized. This unique design uses continuously tapering directors so each element is a different length. The first director in front of the driven element (D1) is the longest director, and the directors progressively get shorter to the end (D13).



BOOM ASSEMBLY

This antenna has been designed with a tapered boom to maximize strength where needed and minimize wind load. Locate the two 1-1/2" diameter sections and the 1-3/8" diameter center coupling section. Note the markings on the ends. Slide the spliced section into the matching un-swaged end of the 1-1/2" diameter section. Align the #8 size screw holes and add the 1-3/4" stainless screws, nuts and lockwashers. Slide on the other 1-1/2" diameter boom section and install the hardware as before.

Next, matching the markings of the partly assembled boom to the 1-1/4" diameter sections, insert the sections and secure with 1-3/4" stainless screws, nuts and lockwashers.

Now, add the matching 1" diameter sections and secure with 1-1/2" stainless screws, nuts and lockwashers.

Now, add the matching 1" diameter sections to each end and secure with 1-1/2" stainless screws, nuts and lockwashers.

Lay the semi-completed boom flat and straight and tighten the hardware with an 11/32 nut driver and screwdriver.

DRIVEN ELEMENT ASSEMBLY

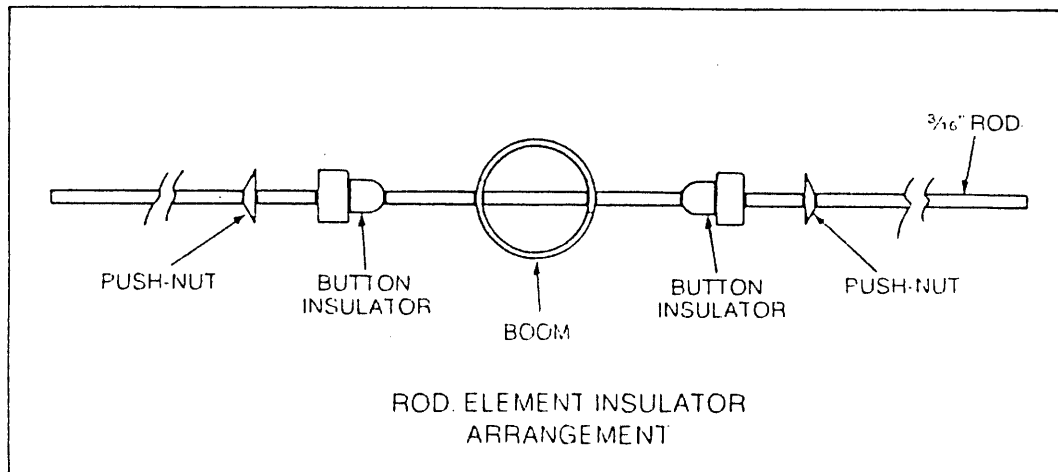
This antenna utilizes Mirage/klm's unique, efficient DUAL DRIVEN element. Near one end of the boom locate two #8 screw holes about 10" apart. Mount the two black insulators on the boom at this point using 2" screws, nuts and lockwashers.

NOTE: The screw head rests on the boom and the insulator slips over the screw on the opposite side of the boom. Place the insulator so the mounting hole is closest to the center of the boom. Tighten the hardware.

Locate the long and short driven element halves. Insert the plastic peanut shaped reinforcing slugs so the holes in the slugs match the element mounting holes. Place one of the short element halves into the insulator closest to the boom center. Pass a 1-1/4" screw up through the insulator first then through the element. Place a 1/2" wide phasing strap over the screw stud and add a nut and lockwasher. Repeat for the other element half.

Slide a phasing strap spacer onto the two straps with the curved end of the spacer toward the boom. Center the spacer and proceed to mount the longer, rear driven elements. Tighten all hardware.

Place the premade silver plated, Teflon coax balun over the three studs at the front driven element (closest to the boom center). An SO-239 and bracket assembly have been provided for feedline attachment. Follow the Assembly Pictorial, page 7, carefully. Attach the feedline in the desired manner and tighten the hardware. Route the feedline away from the feedpoint to the boom balance point (180" from driven element end) and down the mast if the antenna is mounted horizontally. If the antenna is mounted vertically, route the feedline off the rear of the boom and loop it back to the mast or tower. This is necessary to avoid affecting gain, pattern and VSWR.



REFLECTOR - DIRECTOR ASSEMBLY

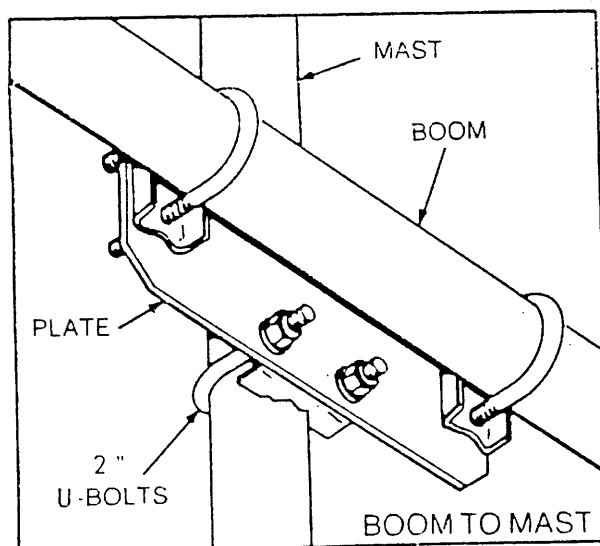
Locate the longest 3/16" diameter element (REFLECTOR). Slide on one of the "button" mounting insulators, small end first. Push the insulator to the element balance point. DO NOT WORRY ABOUT THE EXACT LOCATION AT THIS POINT. Repeat this operation for each of the remaining rod elements.

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 OPERATION IS VERY CRITICAL FOR PROPER PERFORMANCE OF THE ANTENNA.

Move to 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.



BOOM-TO-MAST PLATE

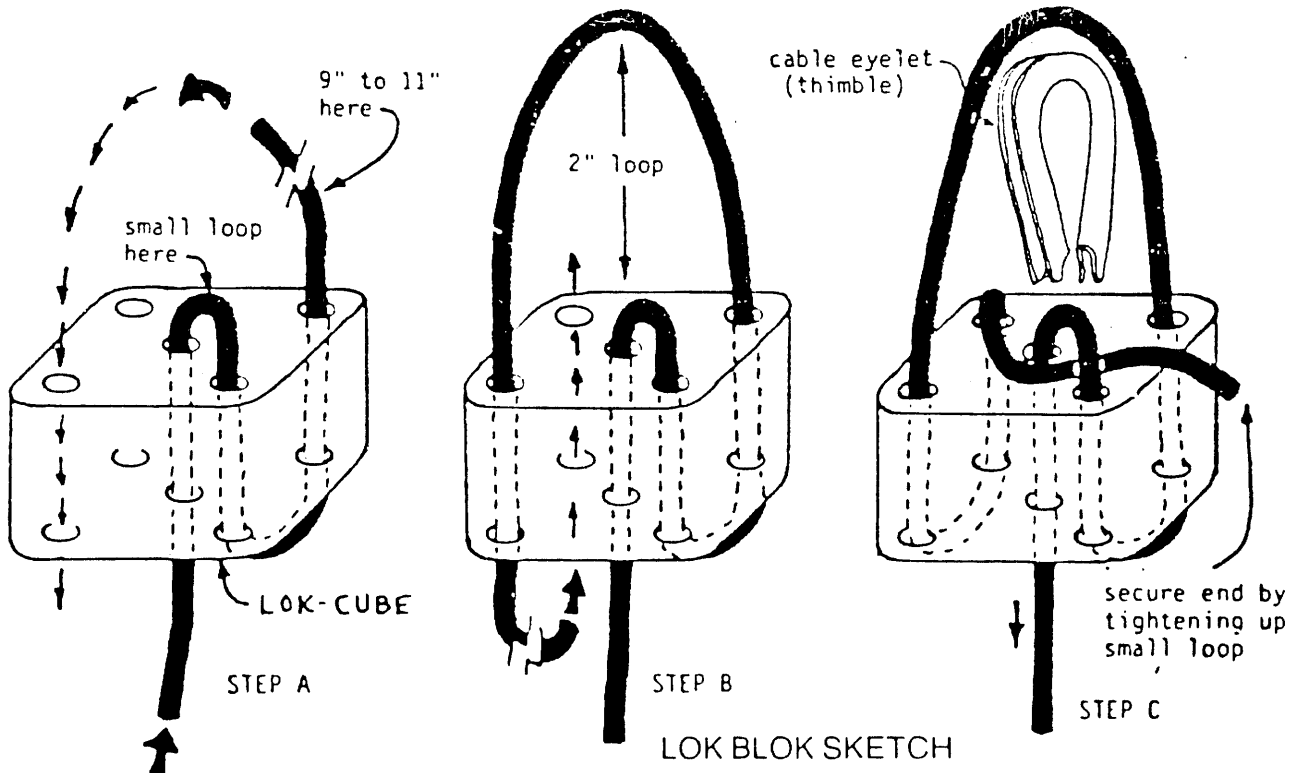
Locate the balance point of the completed antenna. This should be done with the feedline mounted on the antenna as it will be in its final mounting position as the weight of the feedline can affect the physical balance point. Typically the balance point is 150" from the rear of the boom. Install the boom-to-mast plate to the boom using the 1-1/2" U-bolt and cradles that have been provided for mast mounting. This size U-bolt will mount to mast diameters between 1-1/2" and 2-1/8".

BOOM SUPPORT CABLE MOUNTING

HPTG-1200 Phyllistran non-conductive cable has been supplied with this kit. If the antenna is mounted vertically a non-metallic mast must be used. If a metal mast is used, gain and F/B will be reduced, additional side-lobes will be generated, and the VSWR curve will be degraded.

Mount the two eyebolts through the boom with the eyes on the top side of the boom. Install the cable eyes through the eyebolts. Square, cube lok-bloks secure the cable at the eyebolts and at the center turnbuckles. Refer to the lok-blok sketch for attachment details. Install the cables at each eyebolt and route it back to the turnbuckle assembly. Loosen and center the turnbuckle itself until just one thread shows on each side inside the turnbuckle body. Install the two remaining cable eyes in the turnbuckles. Center the turnbuckle assembly over the boom to mast plate and attach the cables to the turnbuckles using the lok-blok as described before. The height of the turnbuckle assembly over the boom need not exceed one foot (.3 meters) and can be as little as 4" (10cm).

NOTE: Once the cable is routed through the lok-blok put as much tension as possible, by hand, on the assembly to pull out any looseness in the assembly and prevent long term boom sag from loosening cables. These cables don't stretch but they do take a set so some relaxation may be noted.



This completes the assembly. If this antenna is to be part of several in an array of identical antennas the assembly procedures may be modified as required as far as feedline mounting, boom mounting and cable assembly mounting.

Spacing for two or more 2M-16-LBXM antennas is as follows:

1. Two antennas stacked one above the other horizontally polarized or side by side vertically polarized - 12 to 12.5 feet (3.65 to 3.81 meters).
2. Two antennas stacked side by side horizontally polarized or one above the other vertically polarized - 12.5 to 13 feet (3.81 to 3.96 meters).

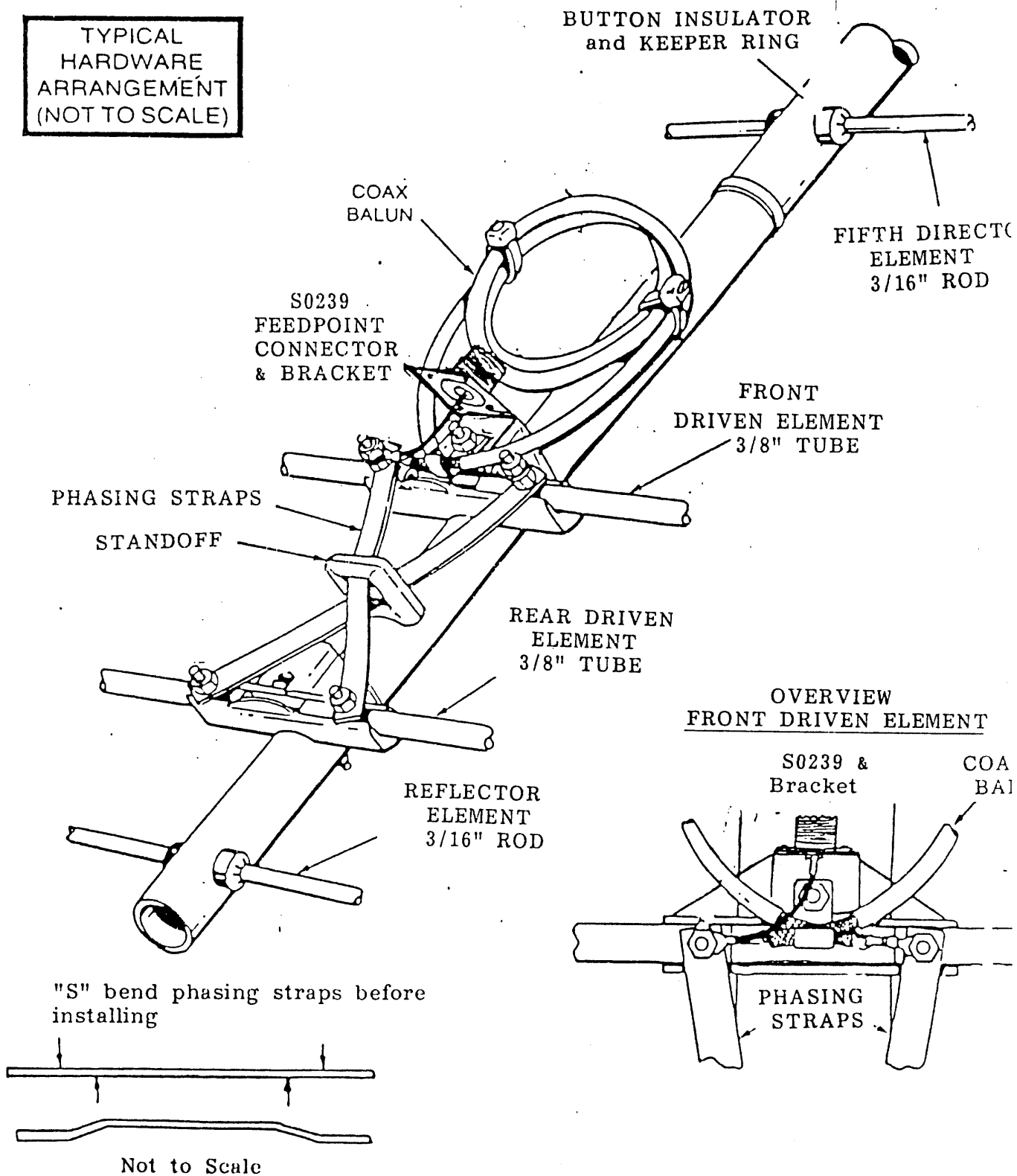
Mirage/klm also manufactures power dividers to couple and match various antenna combinations together.

Stacking frameworks and a new elevation drive mechanism for large arrays are also available.

ASSEMBLY PICTORIAL

2M-16-LBXM

TYPICAL
HARDWARE
ARRANGEMENT
(NOT TO SCALE)



**DIMENSION LAYOUT
2M-16-LBXM**

ELEMENT POSITION (FROM REAR OF BOOM)	ELEMENT LENGTH	CENTER POINT
336"	33-7/8"	17-9/32"
304-1/8"	34"	17-11/32"
272-13/16"	34-1/8"	17-7/16"
242-1/8"	34-3/8"	17-17/32"
212-5/8"	34-1/2"	17-23/32"
184-1/4"	34-5/8"	17-25/32"
157-1/16"	34-7/8"	17-29/32"
131-1/16"	35-1/8"	18"
106-1/4"	35-3/8"	18-1/32"
83-1/16"	35-5/8"	18-3/16"
62-1/2"	36"	18-5/16"
44-3/4"	36-3/8"	18-7/16"
30"	37-1/4"	18-5/8"
23"	15"	(HALF LENGTH)
13"	19-1/8"	(HALF LENGTH)
1"	40-5/8"	20-5/16"

REAR

xx - Feedpoints 200 ohms balanced.
 Fed with Mirage/klm 2M-4:1 2KW.
 Coax Balun for 50 ohm unbalanced feed.

**PARTS LIST
2M-16-LBXM**

<u>PART DESCRIPTION</u>	<u>PART NUMBER</u>	<u>QTY</u>
Aluminum Boom, Swaged, 1-1/2" x 60"	T1120	2
Aluminum Insert, Spliced, 1-3/8" x 24"	T1380	1
Aluminum Boom, Swaged, 1-1/4" x 56"	T1140	2
Aluminum Boom, 1" x .049 x 53"	T1000	2
Driven Element, Drilled, 3/8" x 19-1/8"	T0380	2
Driven Element, Drilled, 3/8" x 15"	T0380	2
Aluminum Rod, 3/16" x 40-5/8"	R0316	1
Aluminum Rod, 3/16" x 37-1/4"	R0316	1
Aluminum Rod, 3/16" x 36-3/8"	R0316	1
Aluminum Rod, 3/16" x 36"	R0316	1
Aluminum Rod, 3/16" x 35-5/8"	R0316	1
Aluminum Rod, 3/16" x 35-3/8"	R0316	1
Aluminum Rod, 3/16" x 35-1/8"	R0316	1
Aluminum Rod, 3/16" x 34-7/8"	R0316	1
Aluminum Rod, 3/16" x 34-5/8"	R0316	1
Aluminum Rod, 3/16" x 34-1/2"	R0316	1
Aluminum Rod, 3/16" x 34-3/8"	R0316	1
Aluminum Rod, 3/16" x 34-1/8"	R0316	1
Aluminum Rod, 3/16" x 34"	R0316	1
Aluminum Rod, 3/16" x 33-7/8"	R0316	1
Phasing Straps, 1/2" x .063 x 10.75"	S0120	2
Plate Assembly, 2" x 4" x 1/8" (With two 3" turnbuckles P#28451)	PA203	1
Phyllistran Cable, 22' HPTG 1200	H1200	1
Boom-to-Mast Plate, 4" x 6" x .188	P0406	1
Coax Balun with Lugs, 2M-4:1	B7303	1
<u>HARDWARE BAG #1</u>		
Screws, 8-32 x 1-1/4"	28014	4
Screws, 8-32 x 1-1/2"	28015	5
Screws, 8-32 x 1-3/4"	28016	8
Screws, 8-32 x 2"	28017	3
Nuts, 8-32	28202	23
Nuts, 5/16"	28206	10
Nuts, 1/4-20	28204	2
Lockwashers, #8	28352	20
Lockwashers, 5/16"	28356	10
Lockwashers, 1/4"	28354	2
Flatwashers, #8	28302	2
Peanut Inserts	66106	4
Phasing Strap/Spacer, 1" x 1-1/4"	66121	1

PARTS LIST (CONT.)
2M-16-LBXM

<u>PART DESCRIPTION</u>	<u>PART NUMBER</u>	<u>QTY</u>
<u>HARDWARE BAG #1 (cont.)</u>		
Thimbles, 1/8"	28707	4
Eye Bolts, 1/4-20 x 2"	28527	2
Lok Cubes	66128	4
Pushnuts, 3/16"	28218	32
<u>HARDWARE BAG #2</u>		
Driven Element Insulator, 1" Type II	66113	2
U-Bolts and Cradles, 1-1/2"	28401	2
U-Bolts and Cradles, 2"	28402	3
Large Black Nylon Ties	66119	4
L Connector Bracket with S0239	CLB39	1
Button Insulators	66125	28
Assembly Manual	M4064	1

MIRAGE/KLM

COMMUNICATIONS EQUIPMENT

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.

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P.O. BOX 1000

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