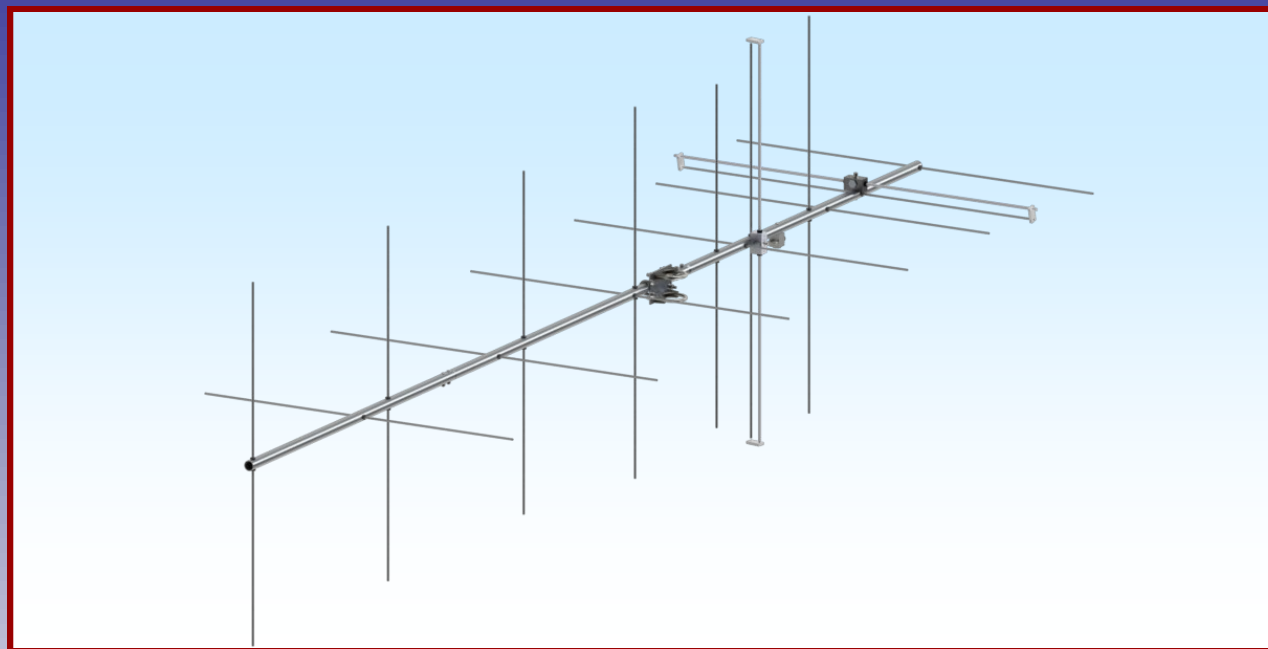




# M2 Antenna Systems, Inc.

## Model No: 146CP14



### SPECIFICATIONS:

Model .....	146CP14	Input Connector .....	"N" Female
Frequency Range .....	144 To 151 MHz	Power Handling .....	1.5 kW
*Gain .....	11.8 dBi	Boom Length / Dia .....	126-1/8" / 1"
Front to back .....	18 dB Typical	Maximum Element Length.....	40"
Beamwidth .....	54°	Turning Radius: .....	76-5/8"
Ellipticity .....	>3dB	Stacking Distance.....	84"
Feed type .....	Folded Dipole	Mast Size .....	1-1/2" to 2" Nom.
Feed Impedance. ....	50 Ohms Unbalanced	Wind area / Survival .....	0.85 Sq. Ft. / 100MPH
Maximum VSWR.....	1.2:1 Typical	Weight / Ship Wt.....	6 Lbs. / 9 Lbs.

**\*Subtract 2.14 from dBi for dBd**

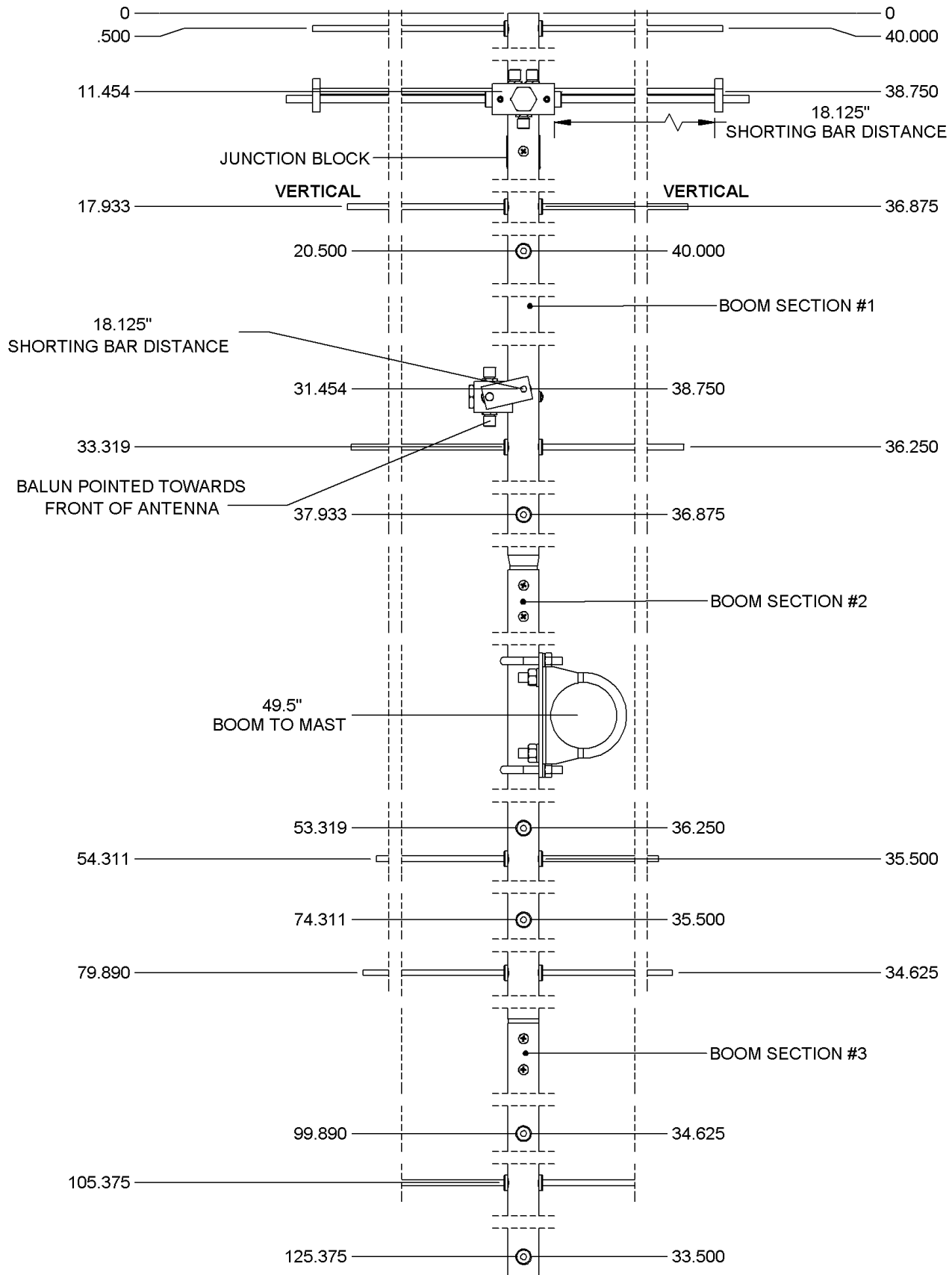
### FEATURES:

The 146CP14 is a light weight, circularly polarized antenna optimized for Low Earth Orbit (LEO) satellite communications or other applications where a small circular polarized antenna is required. Optimum match and gain are between 144 & 151 MHz for the satellite band. A preamp can be mounted close to the antenna for almost no coax loss before the preamp, maximizing your receive performance. Computer design techniques help keep spurious side lobes low down for optimum signal to noise ratios. This antenna features the same CNC machined, O-ring and silicone-gel sealed, driven element assemblies common to all M<sup>2</sup> Yagi antennas. This insures years of trouble free performance regardless of weather.

# 146CP14 DIMENSION SHEET

ELEMENT SPACING  
HORIZONTAL

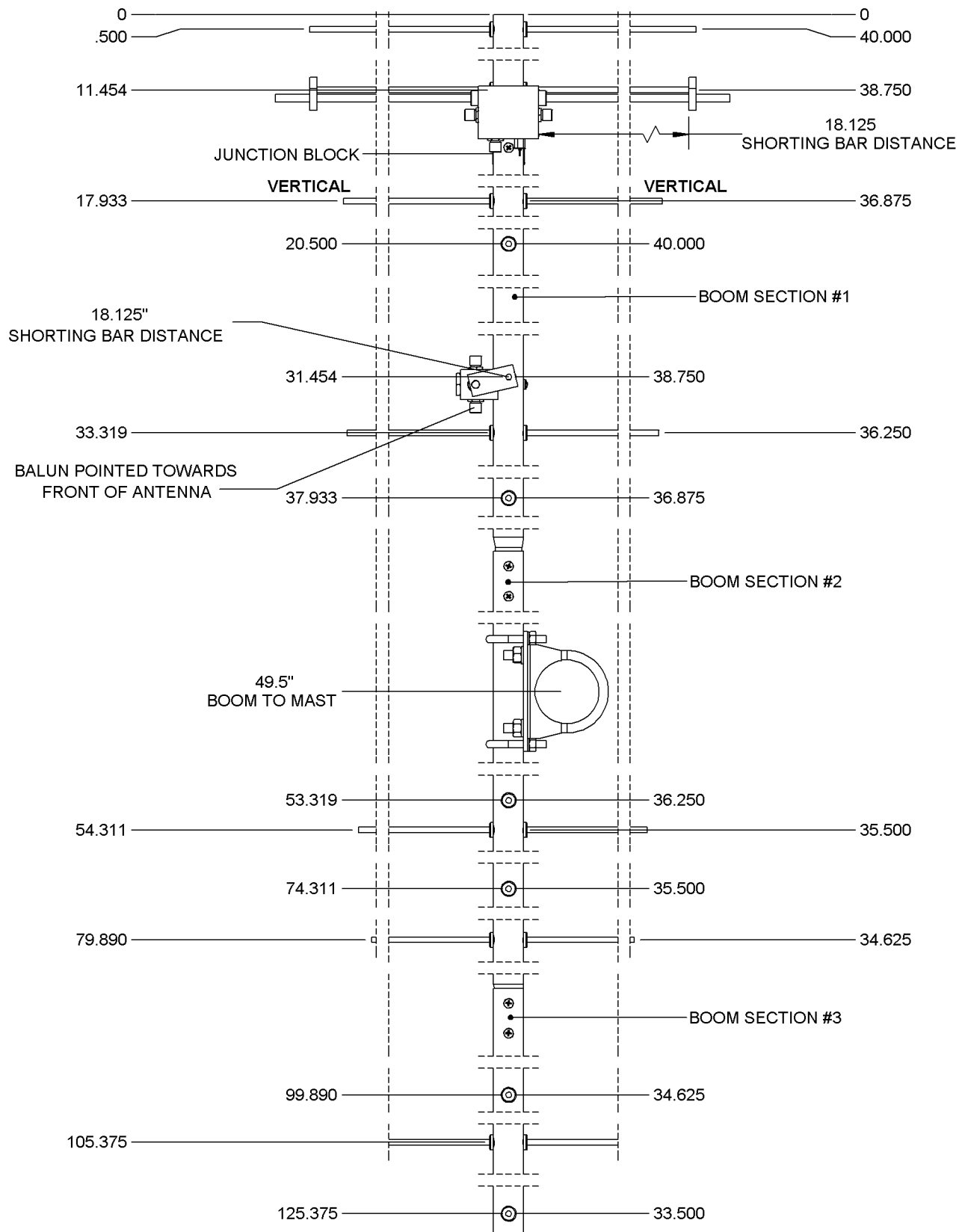
ELEMENT LENGTH  
HORIZONTAL



# 146CP14 WITH POLARITY SWITCH DIMENSION SHEET

ELEMENT SPACING  
HORIZONTAL

ELEMENT LENGTH  
HORIZONTAL



# 146CP14 ASSEMBLY MANUAL

**TOOL REQUIRED FOR ASSEMBLY:** screwdriver, 11/32 nut driver or wrench, 7/16" and 1/2" end wrenches and sockets, measuring tape. Start by laying out the boom sections using the DIMENSION SHEET as a guide. Use 8-32 X 1-1/4" screws and locknuts to join sections.

**NOTE:** *If mounting antenna to a standard H-frame with a T-brace kit, it is important to install the T-brace coupling bars to antenna before elements. Refer to H-Frame and T-brace drawings for placement and more information.*

## ASSEMBLING THE HORIZONTAL ELEMENTS

1. Separate elements by length into two identical sets, "H" and "V". Lay out the "H" elements by length and position as shown the DIMENSION sheet. Start with the reflector (longest) element. Balance it on your finger to find rough center and push on a black button insulator to about 1/2" off center. Push the element through the hole on the boom and install the second button, snugging it up into boom. **DO NOT BOTHER ACCURATELY CENTERING** the element at this time and **DO NOT INSTALL** the stainless steel shaft retainers yet. It is easier to do it after all the horizontal elements are installed in the boom.
2. Install the 3/16" rod **DRIVEN ELEMENT** as you did the reflector. Then continue with the installation of the **DIRECTORS**. ***Note that the Director Elements do not consistently diminish in length from rear to front, so pay close attention to length and position.***
3. Now begin centering the elements. Use a tape measure to **EQUALIZE** the amount the element sticking out on each side of the boom. Once you have all the elements centered, sight down the element tips from the rear comparing each side. Look for any obvious discrepancies and correct if found.

**NOTE:** *The SHAFT RETAINERS, for securing the elements, should always be used for permanent and long term antenna installations. For portable or temporary use the retainers may be left off. The button insulators, normally a tight fit, hold the elements quite securely.*

4. To install the stainless steel **SHAFT RETAINERS**, use thumb and forefinger to hold the retainer over the end of the **PUSH TUBE** ( 3/8" x 3" tube, supplied in the kit), internal fingers on retainer dished into tube. **HOLD THE ELEMENT FIRMLY TO PREVENT IT FROM SLIDING OFF CENTER** and press the retainer onto the element end and continue until retainer butts on insulator button. Locking pliers, **lightly** clamped up against opposite button insulator will help maintain center reference. If you push the first retainer too far, remove element from boom, push retainer completely off the element, and start over. Install another retainer to the opposite side of the element. Continue installing retainers until all elements are locked in place.
5. Mount the **HORIZONTAL DRIVEN ELEMENT BLOCK / ROD ASSEMBLY** to the **TOP** of the boom using a single 8-32 X 1-1/4" screw. Orient the block with the two balun connectors facing to rear. Install the 8-32 x 1/4" set screws (internal Allen head - tool supplied) into the **SHORTING BARS**. Slide the bars onto the Driven Element Block Rods as shown on the Dimension Sheet and tighten the set screws.
6. Mount the **JUNCTION BLOCK** as shown on the Dimension Sheet. Secure with 8-32 x 1-1/4" screw. See FIG. 3 AND 4 for more information.

# 146CP14 ASSEMBLY MANUAL

## ASSEMBLING THE VERTICAL ELEMENTS

7. Repeat steps #2 through #5 for the Vertical elements, using the Dimension Sheet as your guide to lengths and spacing.
8. Attach Baluns and Phasing lines to the Driven Element Blocks and Junction Block as shown in the picture. Depending on model and polarity, the Vertical balun may loop around another element. This is normal. Coil rear balun if single loop overhangs rear of boom. Form balun and phasing line coax close to the boom and secure with nylon cable ties. Ties should be snug but not crushing or kinking the coax. Tighten the connectors *gently* using a 7/16" end wrench.
9. Use good quality coax and "N" connector for your feed line. Secure feed coax near connector on Junction Block, to provide stress relief, route to rear of boom, and secure again. Allow about 60" of coax to hang in a loop between the rear end of the boom and the reattachment point (at least 12" beyond element tips) on the mast or cross boom. ***Do not route feed line to boom to mast plate as exiting antenna here will adversely affect circular field.***
10. The boom to mast plate is normally mounted to the boom at the balance point (with feed line attached). Use two 1" U-bolts and the stainless nuts and lock washers provided. DO NOT OVER TIGHTEN. 2" U-bolts are provided for mounting the antenna to your NON-CONDUCTIVE 2" mast or cross boom.

## INSTALLATION TIPS

The 146CP14 is a circular polarized antenna and creates a field in all planes or polarities. Performance DETERIORATES SIGNIFICANTLY if it is mounted on a metal (conductive) mast or cross boom. A 2" mast or cross boom of any NON-CONDUCTIVE material can be used. Fiberglass is the prime choice for its strength and weather resistance. Mount the 146CP14 so that element tips are at least 12" from any conductive material (mast, tower, feed line, etc.).

**THIS COMPLETES THE ANTENNA ASSEMBLY.**

Carefully manufactured by:

**M<sup>2</sup> ANTENNA SYSTEMS, INC.**

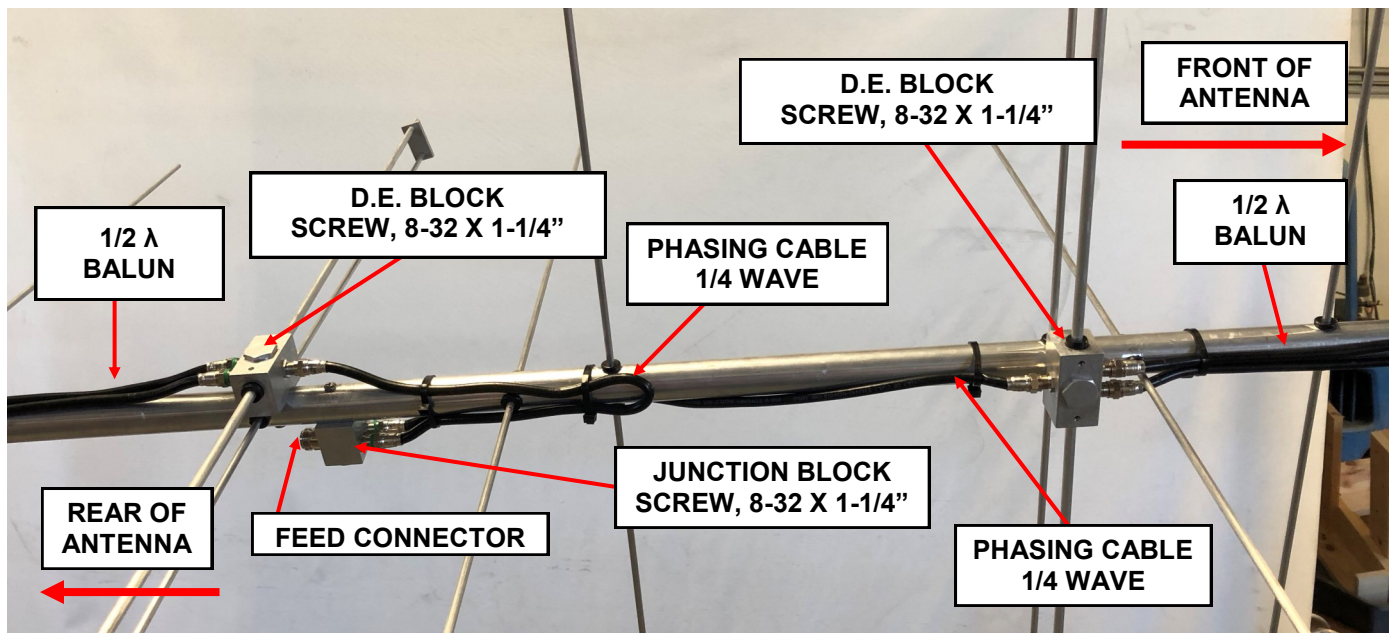
4402 N. Selland Ave.

Fresno, CA 93722

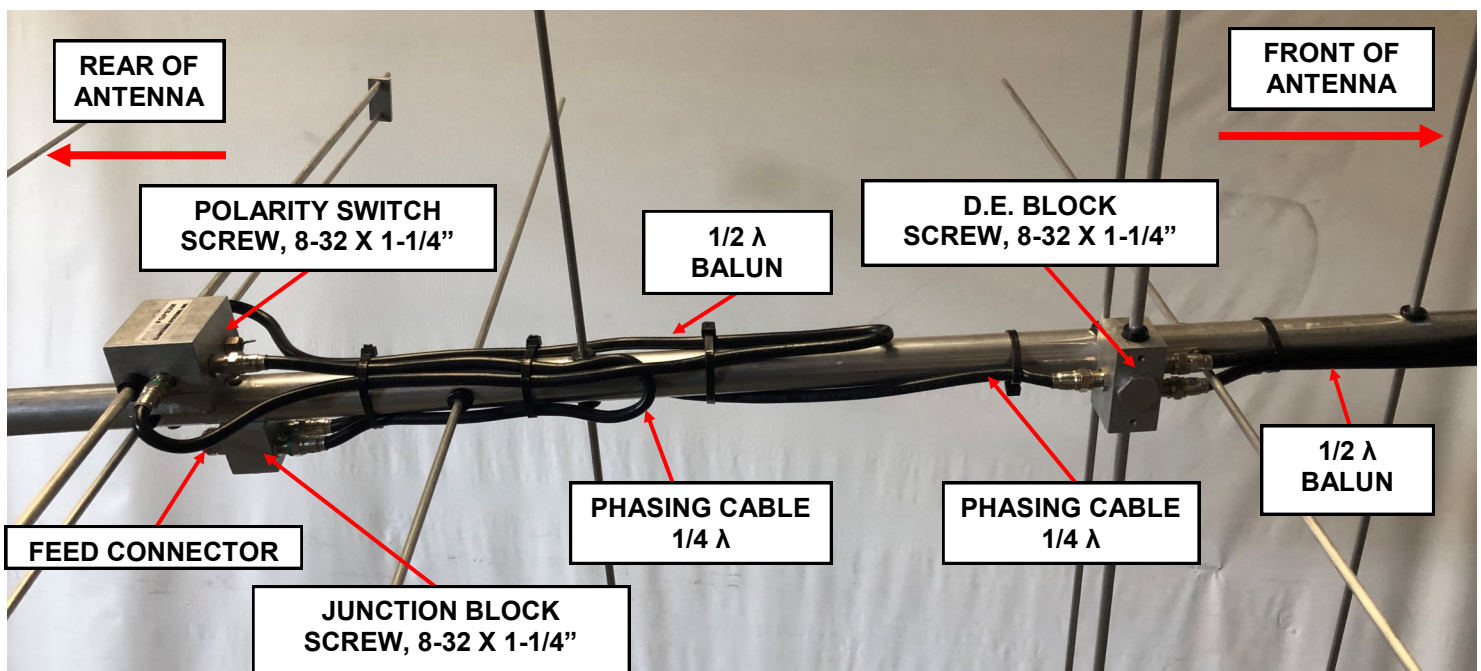
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# 146CP14 CABLE ROUTING DIAGRAMS



**FIG. 3**  
CABLE ROUTING DIAGRAM WITHOUT POLARITY SWITCH



**FIG. 4**  
CABLE ROUTING DIAGRAM WITH POLARITY SWITCH

# 146CP14 PARTS & HARDWARE

DESCRIPTION	QTY
BOOM SECTION #1, 1" X .058" X 47", SOE (M2ABS146CP14-1).....	1
BOOM SECTION #2, 1" X .058" X 47", SOE (M2ABS146CP14-2).....	1
BOOM SECTION #3, 1" X .058" X 38.125" (M2ABS146CP14-3) .....	1
ELEMENTS, 3/16" ROD X SEE DIMENSION SHEET.....	14
DRIVEN ELEMENT BLOCK ASSEMBLY (SADEA146CP14).....	2
JUNCTION BLOCK (SADE0065) .....	1
BALUN, RG-6 1/2λ.....	2
MATCHING / PHASING CABLE, 1/4λ, .....	2
BOOM-TO-MAST PLATE, 3" X 4" X .125" (M2APT0019).....	1
U-BOLT AND CRADLE, 2" .....	2
U-BOLT, 1" .....	2
ASSEMBLY MANUAL.....	1

## IN HARDWARE BAG:

SHORTING BAR (M2ASB0090) .....	4
BUTTON INSULATOR.....	28
KEEPER, SS .....	28
NUT, 5/16-18, SS.....	4
LOCK WASHER, 5/16, SS .....	4
NUT, 1/4-20, SS.....	4
LOCK WASHER, 1/4", SS.....	4
SCREW, 8-32 X 1-1/4", SS .....	7
LOCKNUT, 8-32, SS .....	4
SET SCREW, 8-32 X 1/4", SS .....	8
CABLE TIE, NYLON .....	6
ALLEN HEAD WRENCH, 5/64".....	1
PUSH TUBE, 3/8" X 3".....	1

## OPTIONAL SPARE PARTS:

DRIVEN ELEMENT BLOCK ASSEMBLY (SADEA146CP14).....	2
JUNCTION BLOCK (SADE0065) .....	1
BALUN, RG-6 1/2λ.....	2
MATCHING / PHASING CABLE, 1/4λ, .....	2
SHORTING BAR (M2ASB0090) .....	4
SET SCREW, 8-32 X 1/4", SS .....	8
CABLE TIE, NYLON .....	6
ALLEN HEAD WRENCH, 5/64".....	1

# 146CP14 WITH POLARITY SWITCH

## PARTS & HARDWARE

DESCRIPTION	QTY
BOOM SECTION #1, 1" X .058" X 47", SOE (M2ABS146CP14-1).....	1
BOOM SECTION #2, 1" X .058" X 47", SOE (M2ABS146CP14-2).....	1
BOOM SECTION #3, 1" X .058" X 38.125" (M2ABS146CP14-3) .....	1
ELEMENTS, 3/16" ROD X SEE DIMENSION SHEET.....	14
DRIVEN ELEMENT BLOCK ASSEMBLY (SADEA146CP14).....	1
POLARITY SWITCH (SAPS146CP14).....	1
JUNCTION BLOCK (SADE0065) .....	1
BALUN, RG-6 1/2λ.....	2
MATCHING / PHASING CABLE, 1/4λ, .....	2
BOOM-TO-MAST PLATE, 3" X 4" X .125" (M2APT0019).....	1
U-BOLT AND CRADLE, 2" .....	2
U-BOLT, 1" .....	2
ASSEMBLY MANUAL.....	1

### IN HARDWARE BAG:

SHORTING BAR (M2ASB0090) .....	4
BUTTON INSULATOR.....	28
KEEPER, SS .....	28
NUT, 5/16-18, SS.....	4
LOCK WASHER, 5/16, SS.....	4
NUT, 1/4-20, SS.....	4
LOCK WASHER, 1/4", SS.....	4
SCREW, 8-32 X 1-1/4", SS.....	7
LOCKNUT, 8-32, SS.....	4
SET SCREW, 8-32 X 1/4", SS .....	8
CABLE TIE, NYLON .....	6
ALLEN HEAD WRENCH, 5/64".....	1
PUSH TUBE, 3/8" X 3" .....	1