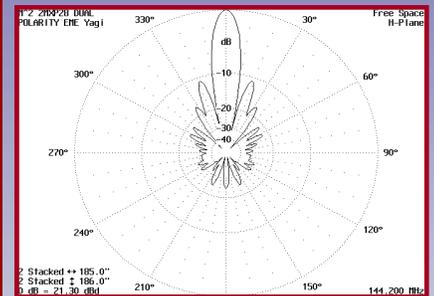
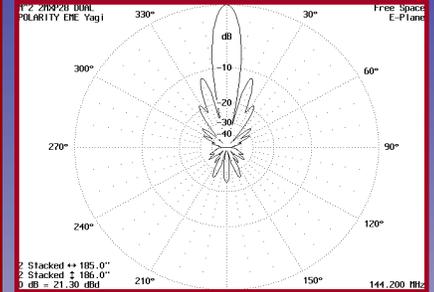
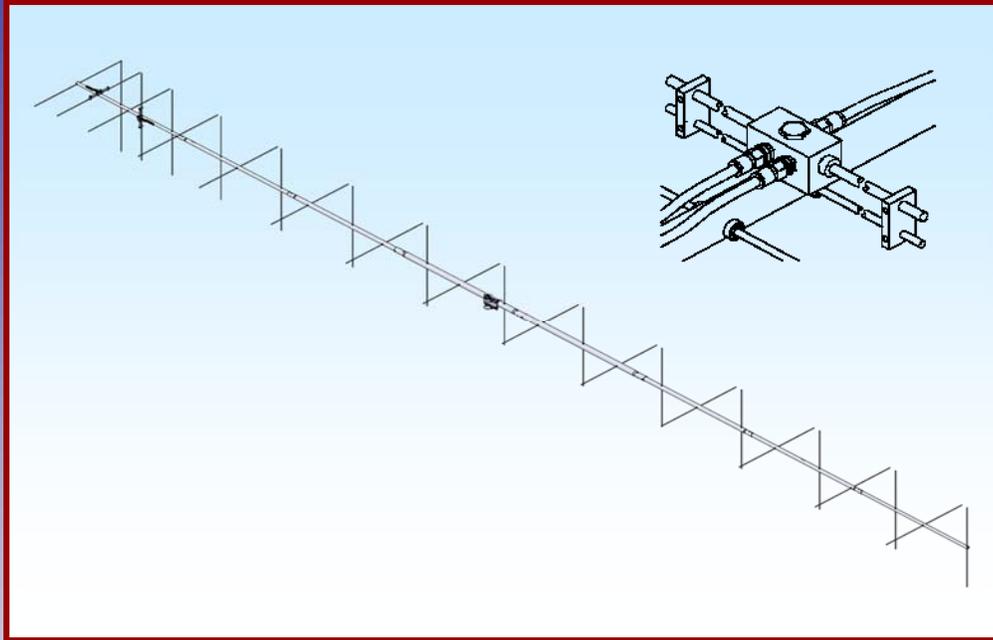




# M2 Antenna Systems, Inc.

## Model No: 2MXP28



### SPECIFICATIONS:

Model .....	2MXP28	Power Handling .....	1.5 kW
Frequency Range.....	144 To 145 MHz	Boom Length / Dia.....	34' 6" / 2" To 1"
*Gain .....	17.2 dBi	Maximum Element Length.....	40-3/8"
Front to back .....	22 dB Typical	Turning Radius: .....	17'
Beamwidth .....	E=25° H=26°	Stacking Distance.....	15' High & 15' Wide
Feed type .....	Folded Dipole	Mast Size.....	1-1/2" to 2" Nom.
Feed Impedance. ....	50 Ohms Unbalanced	Wind area / Survival .....	3.3 Sq. Ft. / 100 MPH
Maximum VSWR.....	1.4:1	Weight / Ship Wt.....	17 Lbs. / 20 Lbs.
Input Connector.....	"N" Female		

\*Subtract 2.14 from dBi for dBd

### FEATURES:

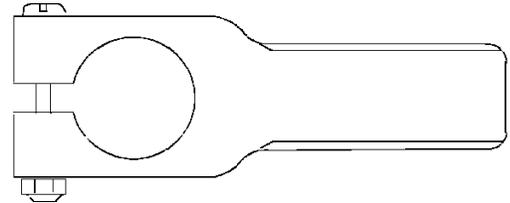
This dual polarized yagi was computer designed for the *serious* Moonbouncer. The very good G/T is a result of low side and back lobes. and the design has been optimized for stacking (see patterns). This antenna is **remarkable** in that the **stacking gain** for four antennas **exceeds 6 dB**. Coupled with various Polarity Diversity Switching schemes, you have a moonbounce package that easily outperforms larger, conventional arrays in receive capabilities. Simple relay switching can provides 4 different types of discrete receiving polarizations: Horizontal, Vertical, Right Orthogonal, and Left Orthogonal. You are always within a few 10ths of a dB of the peak signal you are seeking. Signal losses from spacial polarity and Faraday rotation virtually disappear. EME reliability approaches 100%. M2's new 2MXP28 antennas, power dividers and phasing lines (using Times' new light-weight, low-loss LMR400 and/or LMR600 cable) coupled with 'T' brace kits and fiberglass H-frame packages, provide the building blocks for a whole new generation of high performance EME arrays.

# 2MXP28 ASSEMBLY MANUAL

**TOOL REQUIRED FOR ASSEMBLY:** Screwdriver, 11/32 nut driver or wrench, 7/16" and 1/2" end wrenches, pliers, measuring tape.

1. Start by laying out the boom sections, noting hole positions and matching to BOOM LAYOUT PAGE AND DIMENSION SHEET.

2. If you are also using the M<sup>2</sup> XP H-frame Kit, open that kit and find one of the 'T' brace clamps shown at right. Loosely install an 8-32 x 1-1/2" screw and locknut into the clamp fingers. Then slide the clamp on the rear boom section (1") and position at 16" from end (between holes for horizontal driven element and vertical reflector). Do not tighten clamp at this time.



3. Separate elements by length into two sets, "H" (rear) and "V" (forward). Offset between the two element sets is 1/4 wave length. **Follow the DIMENSION SHEET lengths carefully because SETS ARE NOT IDENTICAL.** Lay out the "H" element set along the boom by length and position as shown on the DIMENSION SHEET. Begin with the reflector (longest) element. Balance it across your finger to find rough center and push on a black button insulator to about 1/2" off center. Insert the element through the holes 1/2" from the rear of the boom and install the second button, pressing it up into boom. **DO NOT BOTHER TO ACCURATELY CENTER** the elements at this time and **DO NOT INSTALL** the stainless steel shaft retainers. This is easier to do after ALL the horizontal elements are installed in the boom.

4. 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.**

5. Now begin centering the elements. Use a tape measure to EQUALIZE the length of rod showing 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 - or chamfer the inside edges of the PUSH TUBE (3/8" x 3" tube, supplied in the kit) to allow the retainer fingers to flex into the tube during installation. Use thumb and forefinger to hold the retainer over the end of the Push Tube with the 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 it 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.

**NOTE:** The SHAFT RETAINERS (used in securing the elements) should always be used for permanent and long term antenna installations. For portable or temporary use, or whenever it is anticipated that the antenna will be disassembled within a short time, the retainers may be left off. The button insulators, normally a tight fit, hold the elements quite securely.

7. 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 3/16" driven element rods and the 1/4" Driven Element Block Rods. Position the Shorting Bars as specified on the DIMENSION SHEET. The given dimension is between the outer face of the driven element block and the inner face of the shorting bar. Align the bars with each other and tighten the set screws.

# 2MXP28 ASSEMBLY MANUAL

8. **ASSEMBLING THE VERTICAL ELEMENTS:** Repeat steps #2 through #5 for the Vertical (forward) elements, using the DIMENSION SHEET as your guide to lengths and spacing.

9. **INSTALLATION OF THE VERTICAL DRIVEN ELEMENT BLOCK:** Refer to the DIMENSION SHEET for block orientation and Balun direction. All driven element blocks in the final array must be mounted in the same position – such as all horizontal driven element blocks down with Balun to the rear and all vertical blocks on the same side with the Balun going forward. Install the shorting bars as specified on the DIMENSION SHEET.

10. Before installing the Baluns, thread 3/8" SEAL NUTS fully onto all connectors, with the black Neoprene side facing out. Attach Baluns to the Driven Element Blocks connectors as shown on the drawing. Coil rear Balun once to keep length on boom. Tighten the connectors **gently** using a 7/16" end wrench. Once the connectors are tight, back the Seal Nuts out and finger-tighten firmly up against the face of the connectors (or tighten **gently** with 1/2" end wrench). A lot of torque is unnecessary. The Vertical Balun may loop around a horizontal element. This is normal. Form Balun coax close to the boom and secure with nylon cable ties. Ties should be snug, but not crushing or kinking the coax.

11. Use top quality coax and "N" connector for your phasing / matching lines. If using with the M<sup>2</sup> XP H-frame Kit, secure coax near feed connectors on driven element blocks, to provide stress relief, route to 'T' brace clamp, and down 'T' brace tube to power divider. Secure at regular intervals. See the '**T' Brace Assembly for 2MXP28 4 Bay System (side view)**' drawing for important details on orientation of antennas: driven elements must be correctly phased. In homebrew arrays, phasing / matching lines should at least exit from the boom behind, and parallel to, the forward reflector and at right angles to, and slightly forward of, the rear-most driven element. Another alternative is to have both lines exit at the rear of the boom. **Do not route lines forward to boom-to-mast plate as exiting antenna, in any plane, here will adversely affect pattern.**

12. The boom to mast plate is normally mounted to the boom at or near 195" from rear of boom. The plate on each antenna should be mounted at the identical location. When used in an array, the rear 'T' brace, coax, and power dividers add considerable weight to the rear of the antenna. When used with an M<sup>2</sup> XP H-frame Kit, vertical elements are aligned with the boom to mast plate. Secure plate with U-bolts and the stainless nuts and lock washers provided. DO NOT OVER TIGHTEN. 2" and 3" U-bolts and stainless hardware are provided for mounting the antenna to a NON-CONDUCTIVE mast or crossboom.

## BOOM SUPPORT GUY SYSTEM

13. To prepare the guys, install a 2" U-bolt into the 2" x 5" TURNBUCKLE PLATE and slide the U-bolt studs through the top set of U-bolt holes in the boom-to-mast plate and loosely secure with a couple of 5/16" nuts. This "locks" the alignment of the turnbuckle plate to the mast position. The turnbuckles should be extended until just a thread or two shows inside the body of the turnbuckle. Then hook into turnbuckle plate. Install Cable Eyes on each turnbuckle loop.

14. Install the two U-clips into the holes offset 45° from the elements in the front and rear 1-1/4" boom sections. Secure with shaft retainers. Clip loops should be "up". When building more than one antenna for an array, make sure all clips are installed in a consistent relationship to the driven elements. Install cable eyes in each clip.

15. Uncoil the Dacron cord. Secure one end to the rear U-clip using non-slip knots. Repeat for the front clip.

16. Equalize Dacron cord length at turnbuckle plate and cut. Secure with non slip knots Repeat for front cord section. Trim excess length and tape to main line.

# 2MXP28 ASSEMBLY MANUAL

17. Both cords should now be fairly taut and parallel with boom. Disconnect the 2" U-bolt securing the turnbuckle plate. During final installation, secure the turnbuckle plate to the fiberglass mast, raise, and tighten when the boom is straight. Finer adjustments can be made with the turnbuckles at any time. Safety wire the turnbuckles to maintain settings.

18. The 2MXP28 ANTENNA creates a field in all planes or polarities. PERFORMANCE DETERIORATES SIGNIFICANTLY if it is mounted to a metal (conductive) mast / crossboom or if the feedline exits the boom anywhere but at the rear. A 2" mast of any NON-CONDUCTIVE material can be used. Fiberglass is the prime choice for its strength and weather resistance. Array hardware that does not intersect or intrude on the element planes may be of conductive material; for instance, the main crossboom in a 4- or 8-bay array or the center 5-6 feet of the vertical support masts.

19. Orientation of multiple antennas in an array is critical to optimum performance. See the attached array harnessing, spacing, and hardware arrangement drawings. Also see assembly information supplied with the M<sup>2</sup> XP H-frame Kit.

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

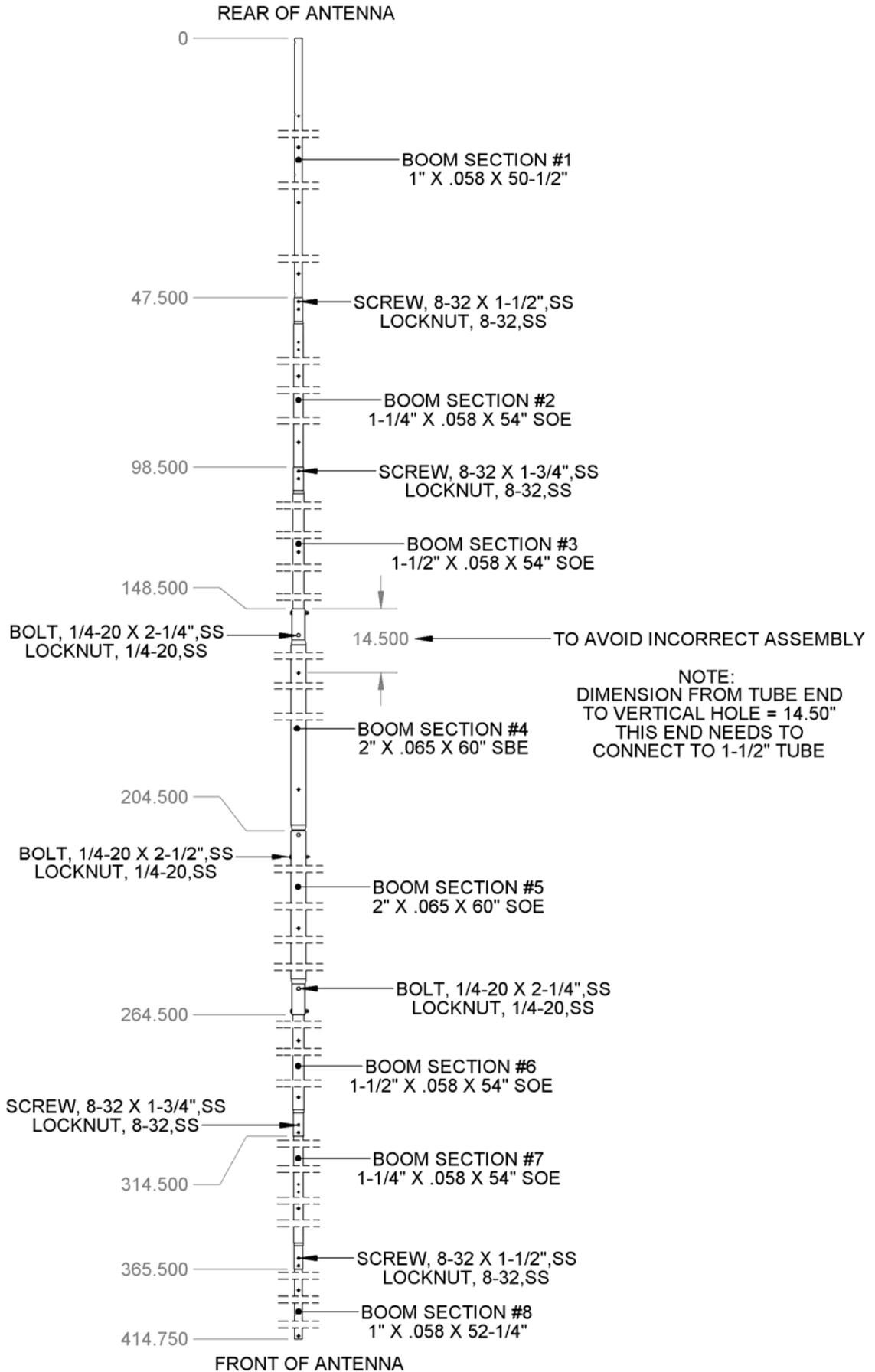
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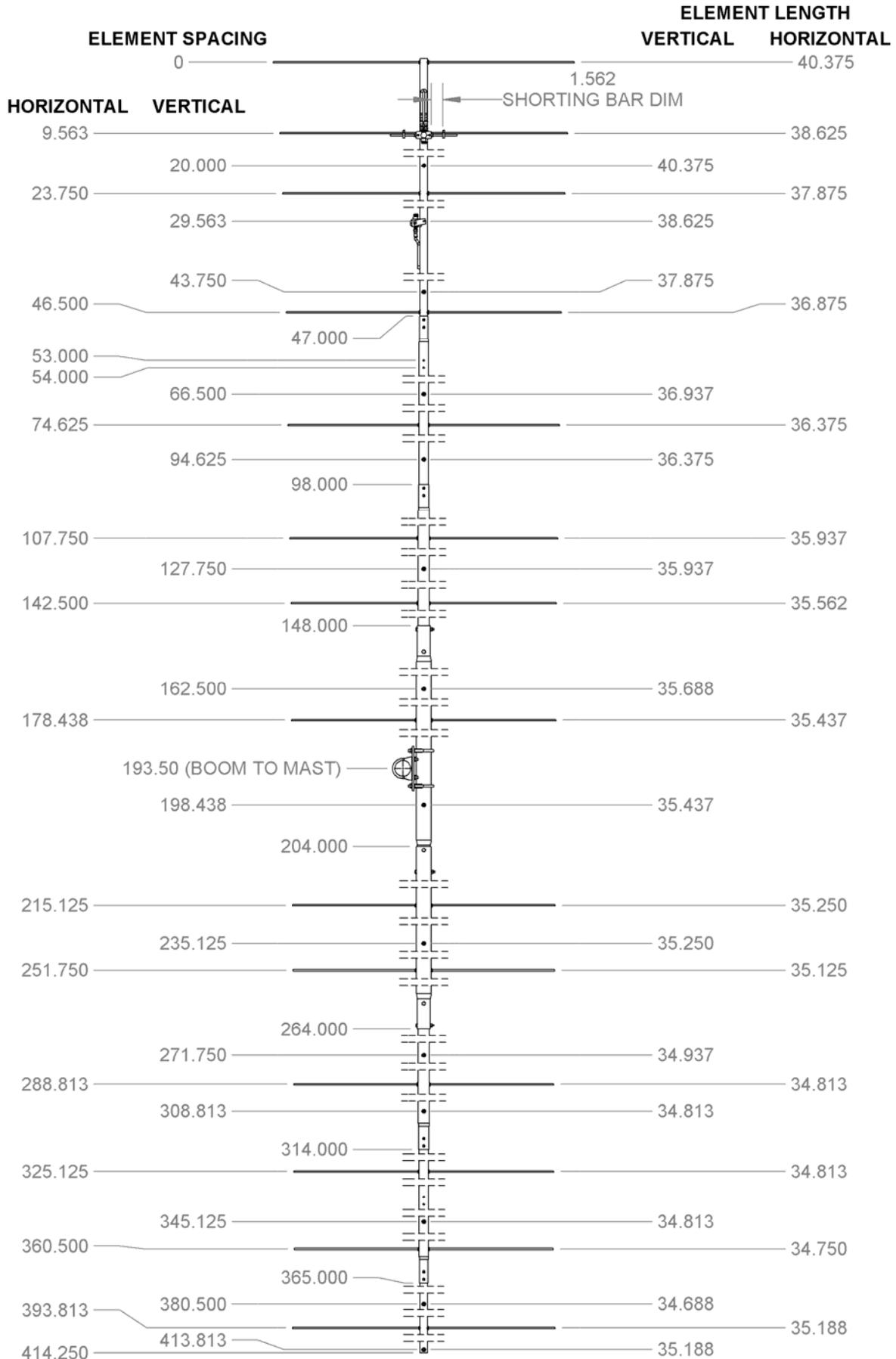
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[www.m2inc.com](http://www.m2inc.com) Email: [sales@m2inc.com](mailto:sales@m2inc.com)

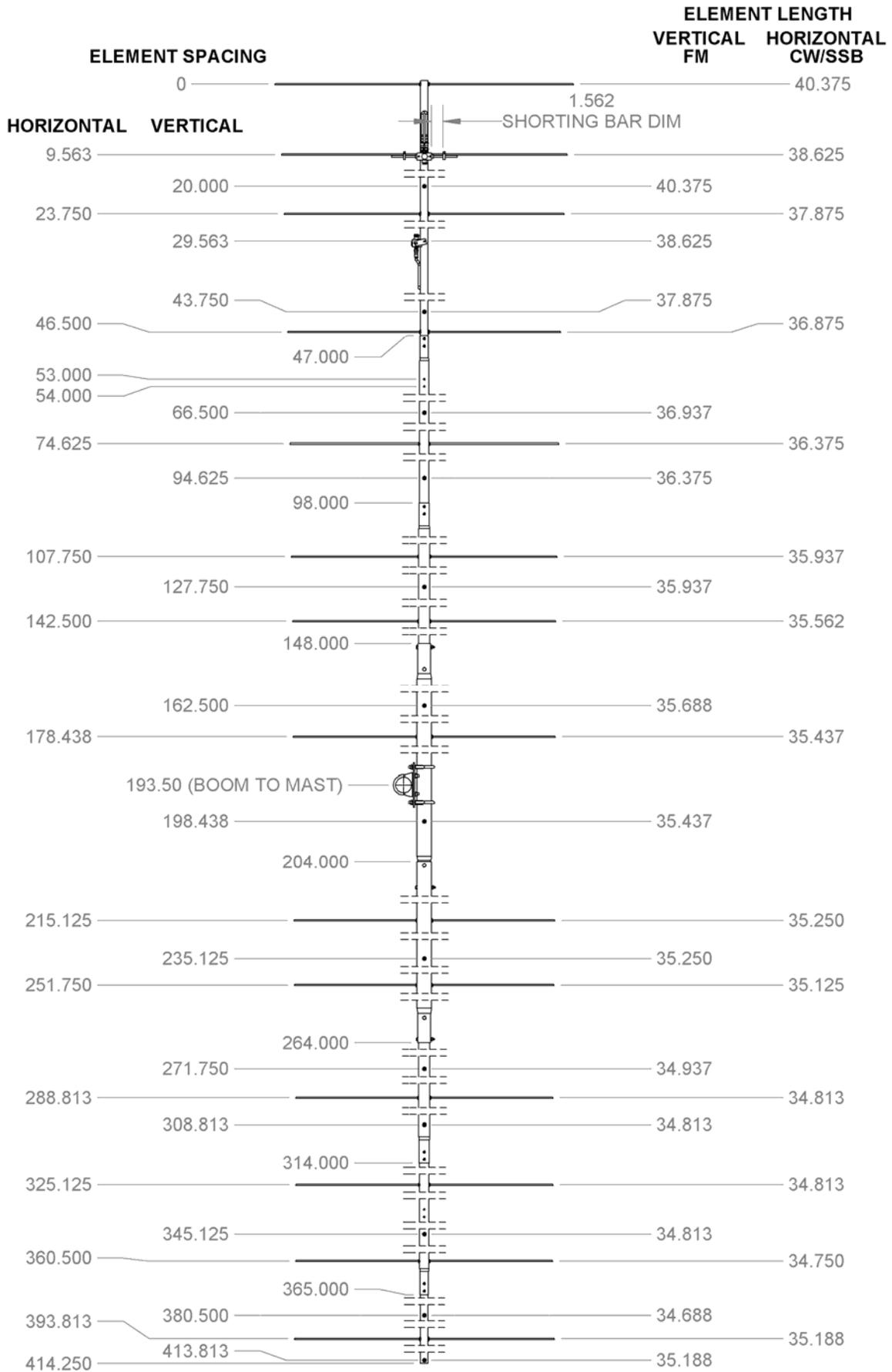
# 2MXP28 BOOM LAYOUT



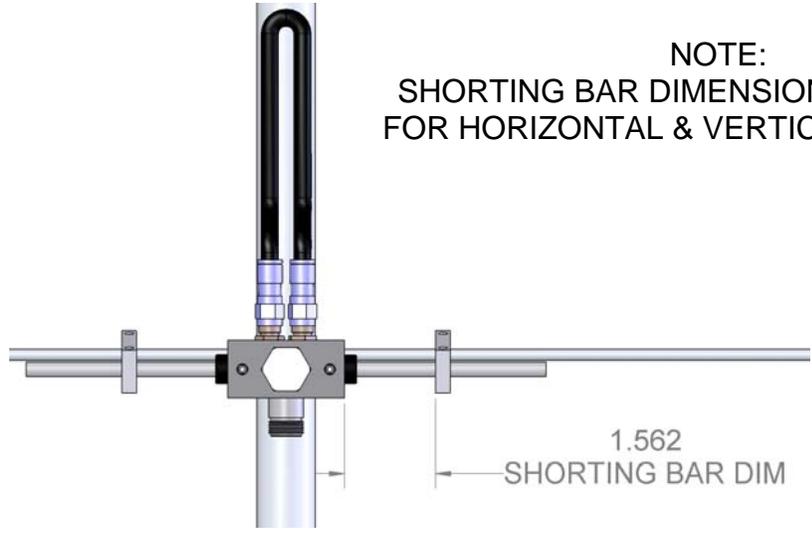
# 2MXP28 DIMENSION SHEET CW/SSB



# (OPTIONAL) DIMENSION SHEET CW/FM

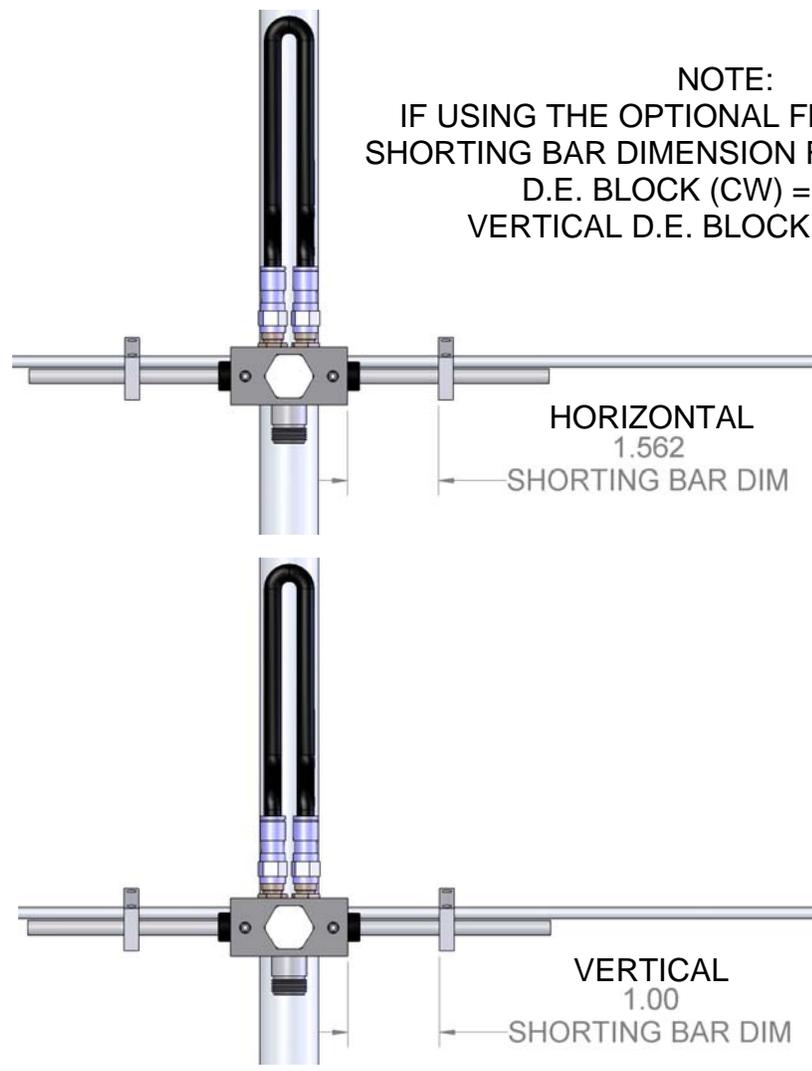


# 2MXP28 SHORTING BAR DIM CW/SSB



NOTE:  
SHORTING BAR DIMENSION IS THE SAME  
FOR HORIZONTAL & VERTICAL D.E. BLOCK.

# (OPTIONAL) SHORTING BAR DIM CW/FM



NOTE:  
IF USING THE OPTIONAL FM ELEMENT KIT  
SHORTING BAR DIMENSION FOR HORIZONTAL  
D.E. BLOCK (CW) = 1.562 &  
VERTICAL D.E. BLOCK (FM) = 1.00

# 2MXP28 PARTS & HARDWARE

DESCRIPTION	QTY
BOOM SECTION #1, 1 X .058 X 50.5" .....	1
BOOM SECTION #2 & #7, 1-1/4 X .058 X 54" SOE .....	2
BOOM SECTION #3 & #6, 1-1/2 X .058 X 54" SOE .....	2
BOOM SECTION #4, 2.0 X .065 X 60" SBE .....	1
BOOM SECTION #5, 2.0 X .065 X 60" SOE.....	1
BOOM SECTION #8, 1" X .058 X 52.250 .....	1
ELEMENTS, 3/16 ROD X Dimension Sheet.....	28
DRIVEN ELEMENT BLOCK ASSEMBLY .....	2
BALUN, RG-6 1/2 WAVE .....	2
BOOM-TO-MAST PLATE, .188 X 6 X 4" (M2APT0021) ....	1
TURNBUCKLE PLATE, 2 X 5 (M2APT0113).....	1
U-BOLT AND CRADLE, 2" .....	5
DACRON ROPE, 3/32 X 32' .....	1
ASSEMBLY MANUAL.....	1

## IN HARDWARE BAG:

TURNBUCKLES, 1/4" .....	2
U-CLIPS, 3/16" ROD.....	2
SHORTING BAR (M2ASB0090) .....	4
BUTTON INSULATORS .....	56
KEEPER, SS.....	60
NUT, 5/16-18 SS.....	10
LOCKWASHER, 5/16 SS.....	10
BOLT, 1/4-20 X 2-1/2 SS .....	2
BOLT, 1/4-20 X 2-1/4 SS .....	4
LOCKNUT, 1/4-20 SS.....	6
SCREW, 8-32 X 1-3/4 SS .....	4
SCREW, 8-32 X 1-1/2 SS .....	5
SCREW, 8-32 X 1-1/4 SS .....	4
LOCKNUT, 8-32 SS.....	12
SET SCREW, 8-32 X 1/4 SS .....	8
CABLE TIE, NYLON .....	4
SEAL NUTS .....	4
ALLEN HEAD WRENCH .....	1
PUSH TUBE, 3/8 X 3" .....	1

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

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