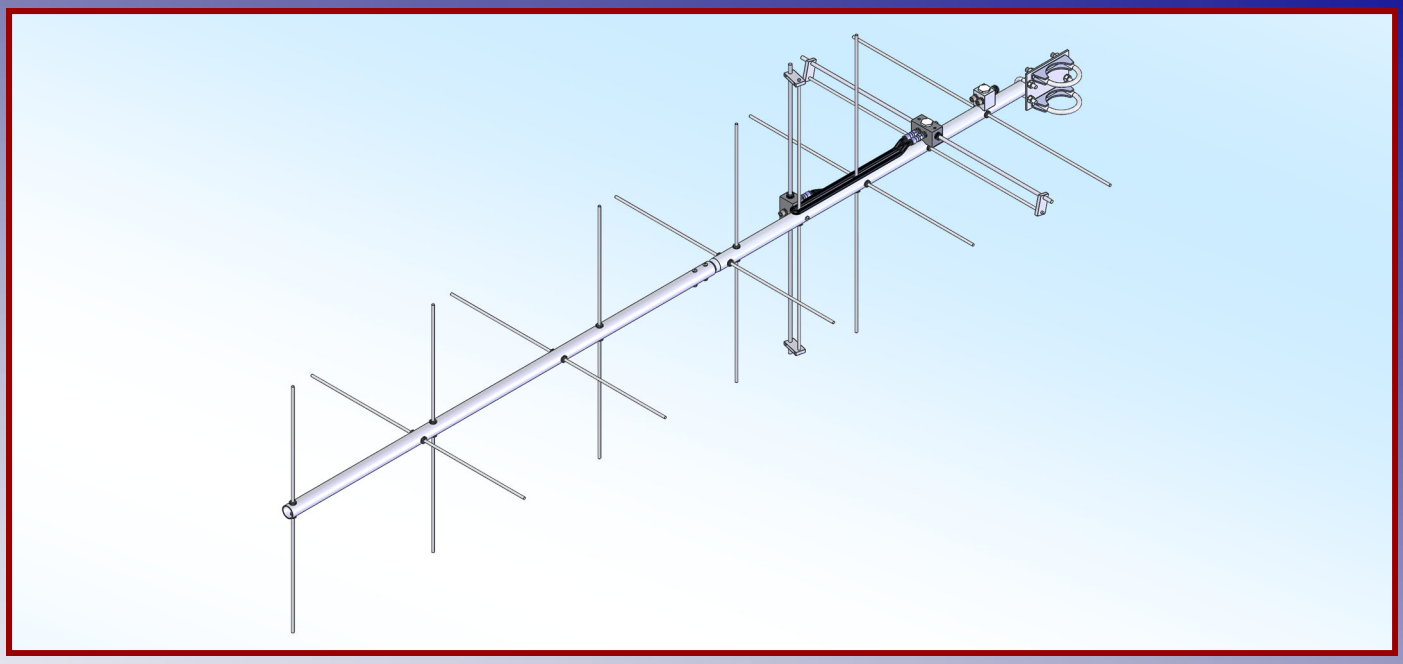
M2 Antenna Systems, Inc.
Model No: 224XP12



SPECIFICATIONS:

Model	224XP12
Frequency Range	221 To 227 MHz
*Gain	11.58 dBi
Front to back	14 dB Typical
Feed type	"T" Match
Feed Impedance.	50 Ohms Unbalanced
Maximum VSWR	1.5:1 Typical
Input Connector	"N" Female
Power Handling	1.5 kW

Boom Length / Dia	75" / 1"
Maximum Element Length	27"
Turning Radius:	Call
Stacking Distance	Call
Mast Size	1-1/2" to 2" Nom.
Wind area / Survival	0.7 Sq. Ft. / 100 MPH
Weight / Ship Wt.	5 Lbs. / 7 Lbs.

***Subtract 2.14 from dBi for dBd**

FEATURES:

The 224XP12 is high performance cross polarized antenna with a remarkably clean pattern. The pattern is important in order to match the antenna's noise temperature with modern low noise preamps. This antenna is ideal for satellite work but is also excellent for terrestrial uses.

The CNC machined driven element module is O-ring sealed and weather tight for low maintenance and long-term peak performance. Internal connections are encapsulated in a space-age silicone gel that seals out moisture and improves power handling. The 3/16" 6061-T6 rod elements are centered to minimize interaction and maintain good ellipticity. Insulators are UV stabilized and locked in place with stainless keepers. Rugged construction, uncompromising performance for the boom length.

M2 Antenna Systems, Inc. 4402 N. Selland Ave. Fresno, CA 93722
Tel: (559) 432-8873 Fax: (559) 432-3059 Web: www.m2inc.com

08/25/22
Rev.00

224XP12 ASSEMBLY MANUAL

TOOLS REQUIRED FOR ASSEMBLY: Screwdriver, 11/32 nut driver or wrench, 7/16” and 1/2” socket or end wrenches, measuring tape.

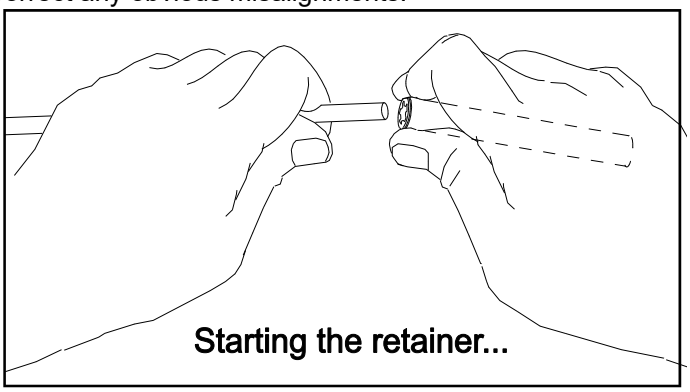
1. Install the horizontal Driven element assembly with the “N” connector to the rear of the boom as shown in the DIMENSION SHEET.

ASSEMBLING THE HORIZONTAL ELEMENTS Note: the polyethylene button insulators used in the following steps may be excessively tight on the tube elements. “Cleaning” the hole with a 3/16” drill bit is recommended particularly if assembly is done in cold temperatures.

2. Layout the elements by “H” length and position as shown on 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 holes 10.00” from the rear of the boom and install the second button, pressing it up into the boom. DO NOT BOTHER 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.

3. 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.

4. Now begin centering the elements. Use a tape measure to EQUALIZE, withing 1/32”, 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. Correct any obvious misalignments.


Starting the retainer...

5. Stainless steel SHAFT RETAINERS lock the elements in place. They should always be used for permanent and long term antenna installations. For portable or temporary use, the button insulators are adequate for holding the elements and the retainers may be left off. To install the stainless steel SHAFT RETAINERS, use thumb and forefinger to hold the retainer over the small end of the PUSH TUBE (5/8” 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 the 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 secured.

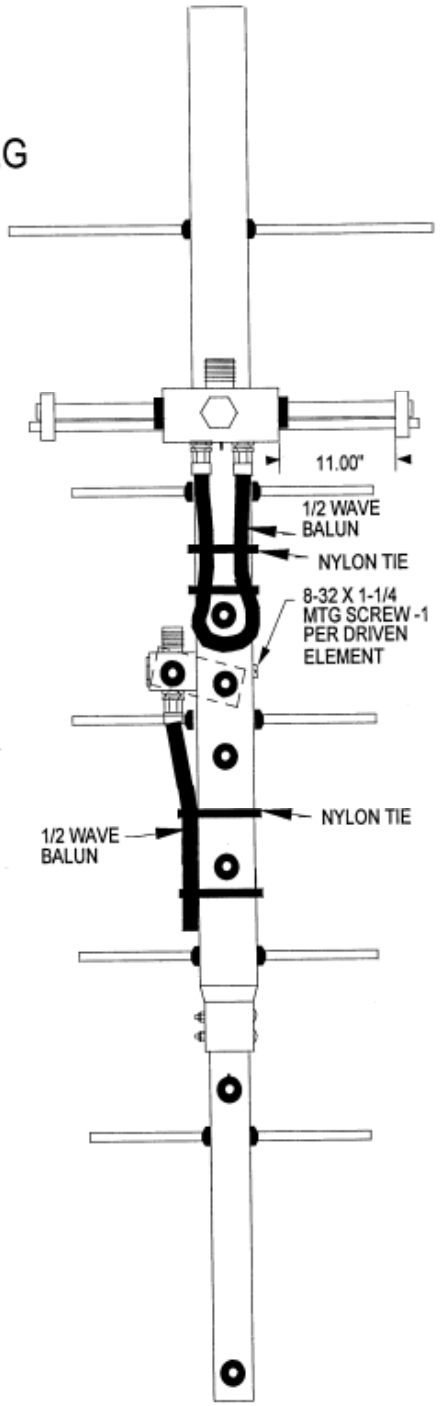
6. Mount the VERTICAL DRIVEN ELEMENT ASSEMBLY to the SIDE of the boom using a single 8-32 x 1-1/4” screw. Orient the assembly with the “N” connector facing to rear as shown on the dimension sheet.

ASSEMBLING THE VERTICAL ELEMENTS

7. Repeat steps #2 through #5 to install the Vertical elements, using the Dimension Sheet as your guide to lengths and spacing. Note: The vertical element set is shifted forward o the boom by 1/4 wavelength. This increases isolation between element planes, improving circularity and ease of phasing / matching the two element sets.

224XP12 DIMENSION SHEET

224XP12 DIMENSION SHEET



ELEMENT SPACING HORIZ.	ELEMENT SPACING VERT.	ELEMENT LENGTH VERT.	ELEMENT LENGTH HORIZ.
10.00			26.750
14.00			26.00
18.313			24.125
	23.125	26.750	
	27.125	26.00	
30.188			23.750
	31.437	24.125	
	43.188	23.750	
47.125			23.25
	60.250	23.125	
61.00			23.00
	74.125	23.00	

DECIMAL TO FRACTION CONVERSION
.062 = 1/16
.125 = 1/8
.188 = 3/16
.250 = 1/4
.313 = 5/16
.375 = 3/8
.437 = 7/16
.500 = 1/2
.562 = 9/16
.625 = 5/8
.688 = 11/16
.750 = 3/4
.813 = 13/16
.875 = 7/8
.937 = 15/16

NOT TO SCALE

224-6RMX
M. STAAL
7-26-06

224XP12 ASSEMBLY MANUAL

8. **INSTALLATION OF THE VERTICAL DRIVEN ELEMENT BLOCK DETERMINES THE CIRCULARITY OF THIS ANTENNA.** THE ORIENTATION OF THE BLOCK FOR RHC-RIGHT HAND CIRCULARITY, IS SHOWN ON THE DIMENSION SHEET ASSUMING EQUAL LENGTH PHASING LINES ARE USED. CIRCULARITY CAN BE REVERSED BY MOVING ONE OF THE DRIVEN ELEMENT BLOCKS TO THE OPPOSITE SIDE OF THE BOOM OR INSERTING A HALF WAVE MORE PHASING LINE TO ONE SIDE.
Viewed from the rear of the boom (rearmost Reflector HORIZONTAL), the VERTICAL Driven Element Block mounts to the RIGHT hand side of the boom with the “F” connector oriented to the REAR. Secure with 8-32x 1-3/4” screw.

NOTE: THE M2 CP OPTIONS KIT REQUIRES ONE (1) 1/4 WAVE PHASING LINE AND ONE (1) 3/4 WAVE PHASING LINE TO REACH THE JUNCTION BLOCK MOUNTED JUST BEHIND THE REAR REFLECTOR ELEMENT. THIS REQUIRES THAT THE REAR DRIVEN ELEMENT BE MOUNTED ON THE OPPOSITE SIDE OF THE BOOM TO MAINTAIN RIGHT HAND CIRCULARITY.

10. Use good quality coax and “N” connector for your PHASING LINES. (see installation Tips). Secure coax near connector on each DRIVEN ELEMENT block, to provide stress relief. Rout the coax lines to the rear of antenna keeping them tight against the antenna boom to minimize coupling back to the antenna elements.

11. The BOOM TO MAST PLATE is mounted at the ear of the boom. Using the 1-1/2” or 2” U-bolts and cradles provided to mount the BOOM TO MAST plate to the mast. Use the `1-1/2” machined saddles and 1/4-20 x 2 3/4” bolts and lock nuts provided to mount antennas to the plates.

INSTALLATION TIPS
12. A circular polarized antenna crates fields in all planes or polarities. Performance DETERIORATES SIGNIFICANTLY if it is mounted on a metal (conductive) mast or crossboom. Unless the metal boom is behind the rear most reflector element. For center mounted antennas a mast or crossboom of any NON-CONDUCTIVE material can be used. Fiberglass is the prime choice for its strength and weather resistance. The feedline which is metallic must still exit the rear of the antenna to prevent performance degradation. Mount the antenna so that element tips are at least 12” from any conductive material (mast, tower, feedline, etc).

13. Try to keep the cable run to under 100 ft. to prevent excessive signal loss.
Recommended feedlines, in order of preference:
Andrews or Celwave 1/2” hardline
Times Microwave LMR-400 or Belden 8214

14. To maintain proper phasing when stacking two or more antennas, mount each with the same orientation of Driven Element blocks. DO NOT MOUNT IN MIRROR IMAGE. Contact the manufacturer for optimum stacking distance between antennas. For more detailed stacking information contact M2.

M2 Antenna Systems, Inc.
4402 N. Selland Ave.
Fresno, CA 93722
(559) 432-8873 Fax (559) 432-3059
www.m2inc.com email: sales@m2inc.com

224XP12 PARTS & HARDWARE

224XP12 PARTS LIST

DESCRIPTION	QTY
BOOM SECTION, 1.0 X .058 X 51.00 SOE	1
BOOM SECTION, 3/4 X .049 X 27.0 PLAIN	1
ELEMENTS, 3/16” ROD ALUM (SEE DIM SHEET)	12
BTM PLATE, .125 X 3.0 X 4.0	1
DRIVEN ELEMENT ASSEMBLY	2
BALUN, RG-6 X 23”	2
U-BOLT, 1”	4
U-BOLT, 2”	2
UNI-CLAMP	2
ASSEMBLY INSTRUCTIONS	1

IN HARDWARE BAG

BUTTON INSULATOR, 3/16”	24
SHAFT RETAINER, 3/16” SS	24
SHORTING BAR, 1/4 X 3/4 X 1.532”	4
SCREW, 8-32 X 1-1/4” SS	4
NYLOCK NUT, 1/4-20 SS	8
SET SCREW, 8-32 X 1/4” SS	8
NUT, 5/16” SS	4
LOCKWASHER, 5/16” SPLIT RING SS	4
PUSH TUBE, 3/8” X 3”	1
CABLE TIES, 8”	4
NUT SEAL	4
ALLEN WRENCH, 5/64	1

M² ANTENNA SYSTEMS, INC.
4402 N. SELLAND AVE.
FRESNO, CA 93722
(559) 432-8873 FAX: 432-3059
www.m2inc.com Email: sales@m2inc.com