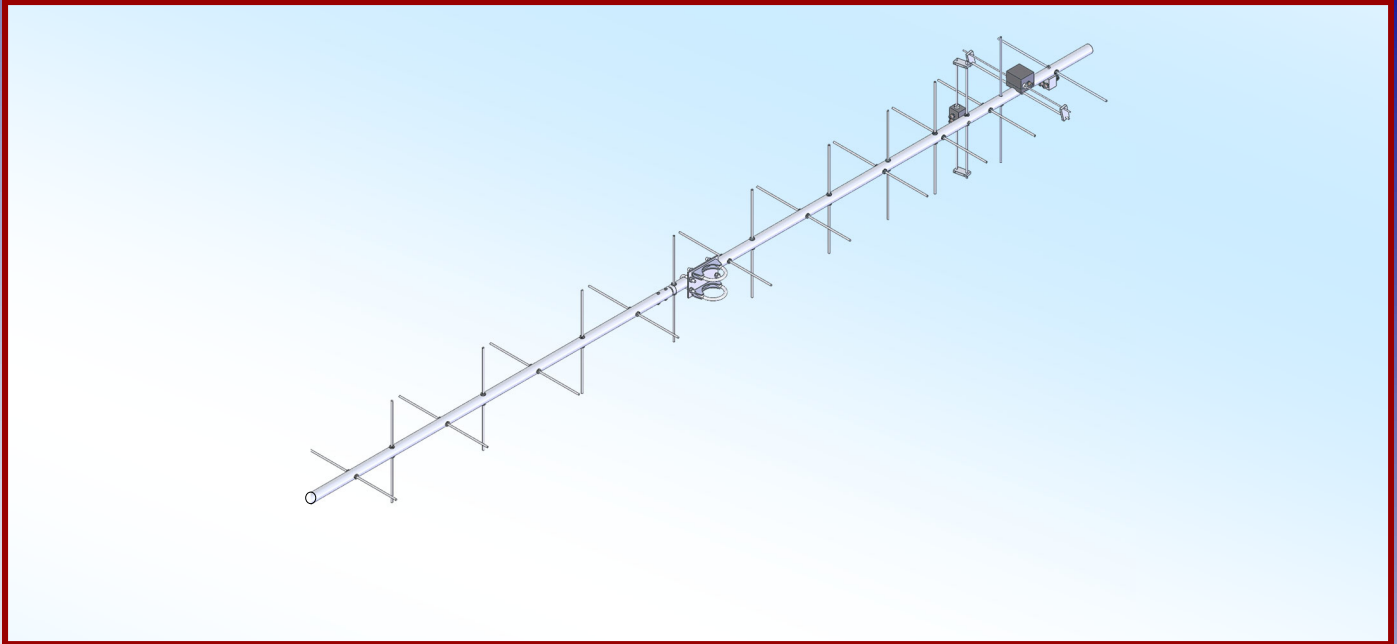




M2 Antenna Systems, Inc. Model No: 403CP20



SPECIFICATIONS:

Model	403CP20	Power Handling	1.5 kW (250W PS-I)
Frequency Range	398 To 408 MHz	Boom Length / Dia	77" / 1"
*Gain	14 dBic	Maximum Element Length	15"
Front to back	16 dB Typical	Turning Radius:.....	Call
Elipticity	<3dB	Stacking Distance	Call
Feed type	"T" Match	Mast Size	1-1/2" to 2" Nom.
Feed Impedance.....	50 Ohms Unbalanced	Wind area / Survival	0.08 Sq. Ft. / 100MPH
Maximum VSWR.....	1.5:1 Typical	Weight / Ship Wt.	6 Lbs. / 8 Lbs.
Input Connector	"N" Female		

***Subtract 2.14 from dBi for dBd**

FEATURES:

The 403CP20 is a light, medium performance circularly polarized antenna. Optimum match and gain are between 398 & 408 MHz for the satellite band. 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 M² Yagi antennas. This insures years of trouble free performance regardless of weather.

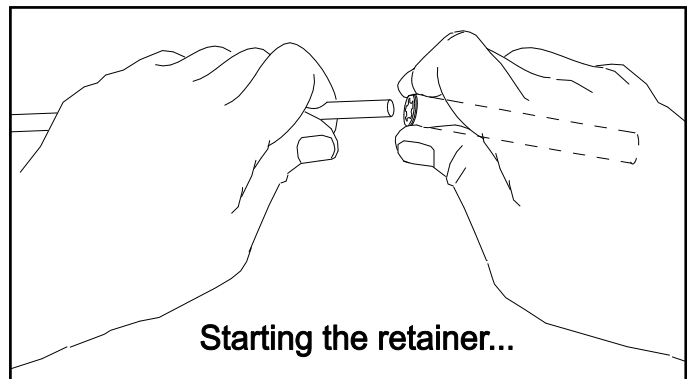
403CP20 ASSEMBLY MANUAL

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

1. Assemble the boom using 8-32 X 1-1/4 screws and locknuts to join sections. Sections may be swaged to each other or use 7/8" internal splice sections.

ASSEMBLING THE HORIZONTAL ELEMENTS

2. Lay out the elements by "H" 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 holes 1.937" from the rear of the boom and install the second button, snugging it up into 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. 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.**
4. 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.
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 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 secured.
6. 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.
7. Install the 8-32 x 1/4" set screws (internal Allen head - tool supplied) into the SHORTING BARS. Slide the bars onto the 1/8" Driven Element Block Rods and the 3/16" driven element rod. **Position the Shorting Bars at 1/8" from the tips of the 3/16" rods.** Align the bars with each other and tighten the set screws.



ASSEMBLING THE VERTICAL ELEMENTS

Note: The vertical element set is shifted forward on the boom by 1/4 wavelength. This increases isolation between element planes, improving circularity and ease of phasing / matching the two element sets.

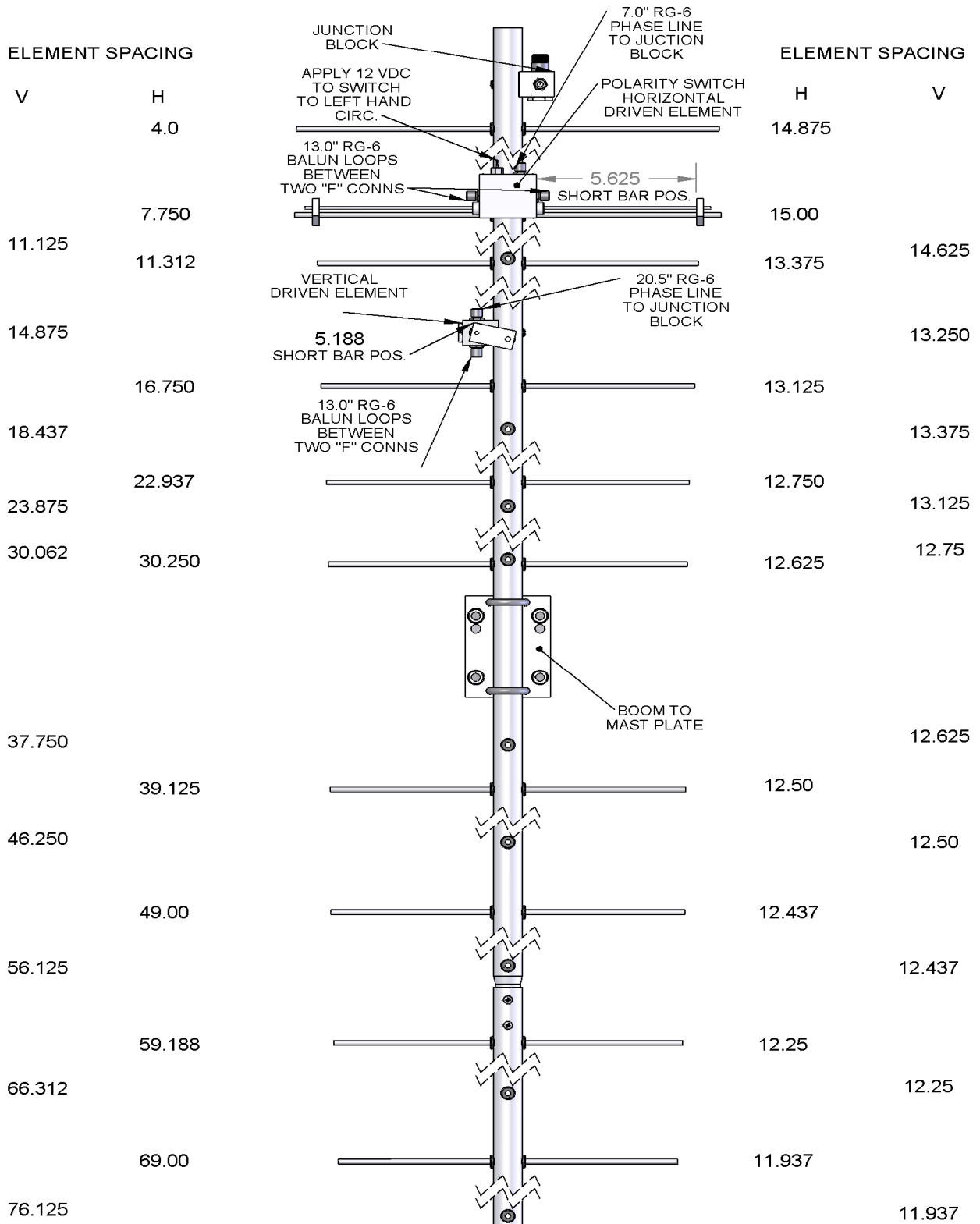
8. Repeat steps #2 through #5 for the Vertical elements, using the Dimension Sheet as your guide to lengths and spacing.

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.

9. Viewed from the rear of the boom, the VERTICAL Driven Element Block mounts to the RIGHT hand side of the boom with the Balun connectors oriented to the **front**. Secure with 8-32 x 1-1/4" screw. Install the Shorting Bars as in step #7. The HORIZONTAL Driven element block mounts on top of the boom with the feed connector and power feed through oriented to the rear.
10. Before installing the Baluns and Matching / Phasing Harness, thread 3/8" SEAL NUTS fully onto all connectors, with the black Neoprene face of the nuts facing out. Attach Baluns and Phasing lines to the

403CP20 DIMENSION SHEET

403CP20 WITH POLARITY SWITCH ANTENNA DIMENSIONS



403CP20 ASSEMBLY MANUAL

10. Before installing the Baluns and Matching / Phasing Harness, thread 3/8" SEAL NUTS fully onto all connectors, with the black Neoprene face of the nuts facing out. Attach Baluns and Phasing lines to the Driven Element Blocks and Junction Block as shown on the Dwg. 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. Depending on model and polarity, the Vertical balun may loop around another element. This is normal. Form balun coax until it is close to the boom and secure with a nylon cable tie. Also secure the other balun and the matching / phasing harness coax with cable ties. Ties should be snug but not crushing or kinking the coax.
11. Use good quality coax and "N" connector for your feedline (see Installation Tips). Secure feed coax near connector on Junction Block, to provide stress relief. 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 crossboom. **Do not route feedline to boom to mast plate as exiting antenna here will adversely affect circular field.**
12. The boom to mast plate is normally mounted to the boom at the balance point. Since the feed line represents significant weight it is best to have it attached and fastened to the boom with cable ties before final mounting the plate. Use two 1" U-bolts and the stainless nuts and lock washers provided. DO NOT OVER TIGHTEN. 1-1/2" and 2" U-bolts (and stainless steel nuts / lockwashers) are provided for mounting the antenna to your NON-CONDUCTIVE mast or crossboom.

THIS COMPLETES THE ANTENNA ASSEMBLY.

INSTALLATION TIPS

13. The 403CP20 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 crossboom. A mast or crossboom of any NON-CONDUCTIVE material must be used. Fiberglass is the prime choice for its strength and weather resistance. Mount the 436CP30 so that element tips are at least 12" from any conductive material (mast, tower, feedline, etc.).
14. Recommended feedlines, in order of preference: Andrews or Celwave 1/2" hardline Times FM-8 or Belden 8214
Try to keep the cable run to under 100 ft. to prevent excessive signal loss.
15. 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. See the Specification Sheet for stacking distances. For more detailed stacking information contact M².

CAREFULLY MANUFACTURED BY:
M2 Antenna Systems, Inc.
4402 N. Selland Ave. Fresno, CA
(559) 432-8873 FAX (559) 432-3059

403CP20 PARTS & HARDWARE

DESCRIPTION	QTY
Boom section #1, 1 x .058 x 59" SOE	1
Boom section #2, 1 x .058 x 19.5"	1
Boom to mast plate, 3 x 4 x .125"	1
Elements, 3/16" alum. rod x (see dims.)	20
Driven element block assembly,	1
Driven element/ Polarity switch assembly.....	1
`T' Block assembly	1
Balun, RG-6U halfwave length 13.00"	2
Phasing line, RG6-U quarterwave length 20.00".....	1
Phasing line, RG6-U three quarterwave length 7.00" ..	1
U-bolt and cradle, 2"	2
U-bolt, 1" no cradle	2
Assembly instructions	1

IN HARDWARE BAG

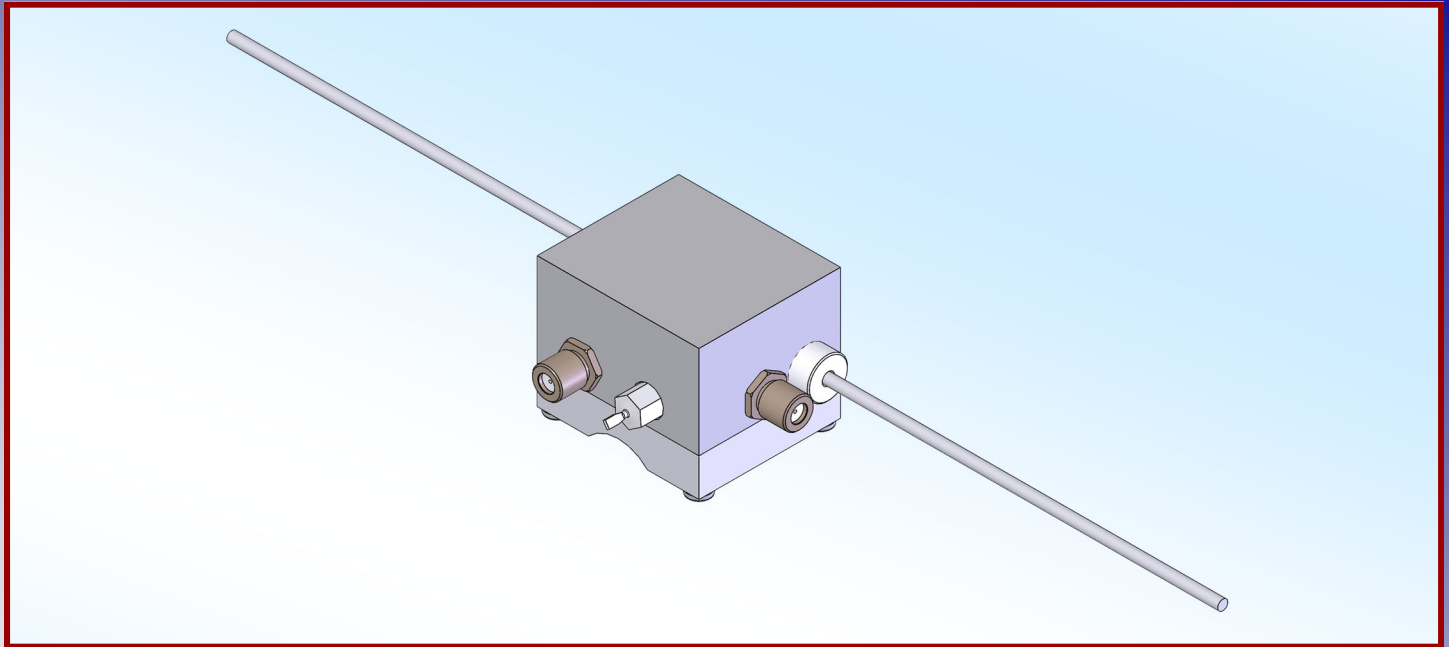
Shorting bars, .75 x 1.532 x .250" mach. alum.	4
Button insulators, 3/16" black	40
Shaft Retainers, 3/16" ss	40
Nut, 5/16-18 ss	4
Lockwasher, 5/16" ss.....	4
Screw, 8-32 x 1-1/4" panhead	5
Set screw, 8-32 x 1/4" ss	8
Locknut, 8-32 ss	2
Nuts, 1/4-20 ss.....	4
Lockwasher, 1/4-20 ss	4
Seal nuts, 3/8-32 gold zinc.....	8
Allen wrench, 5/64"	1
Push tube, 3/8 x 3" (for keeper installation)	1
Cable ties, 8".....	4

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M2 Antenna Systems, Inc. Model No: PS-400CM



SPECIFICATIONS:

Model	PS-400CM	Switch Time, In / Out	20ms / 15ms
Frequency Range.....	300 to 500 MHz	Power Handling 2M / 440	200 W / 150 W
Isolation, 2M / 440	50 dB / 40dB	DC power req.	12 VDC @ 80mA
Feed Impedance.	50 Ohms Unbalanced	Block size / Rod Dia	2" X 2" X 1-1/4" / 1/4"
VSWR.....	1.2:1 or better	Maximum Element Length.....	16"
Connectors	"F" Females	Operating Temp range	-50°C to 150°C
Ins. Loss, 2M / 440	0.1 / 0.2 dB	Weight / Ship Wt.....	2.0 Lbs. / 4 Lbs.

***Subtract 2.14 from dBi for dBd**

FEATURES:

The PS-400CM polarity switch kit is designed to work with any M2 circular polarized antenna. It allow instantaneous selection of right or left hand circularity. Originally designed for Nasa for many of their 100 to 500 MHz satellite and space craft applications, the PS-400CM is now used by many amateur VHF enthusiasts to performance flexibility to both terrestrial and satellite applications.

The heart of the unit is a small, low loss coaxial switch carefully designed into the driven element block. Only one driven element block PS-400CM is required to achieve full right hand and left hand selection. There are no frequency sensitive elements in the block assembly so the PS-400CM or its UHF equivalent can be used on most M2 CP antenna from 100 to 500 MHz. The PS-400CM can handle 250W of continuous RF transmission power. Losses are less than 0.2 dB.

Installation is easy and involves only the removal of one of the original Driven Element assemblies and then mounting the PS-400CM in its place.