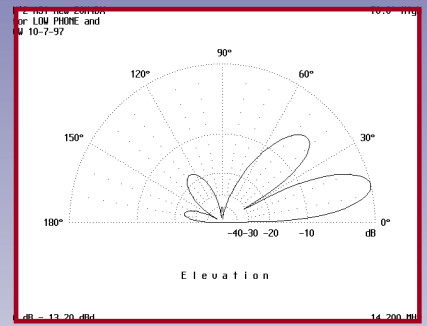
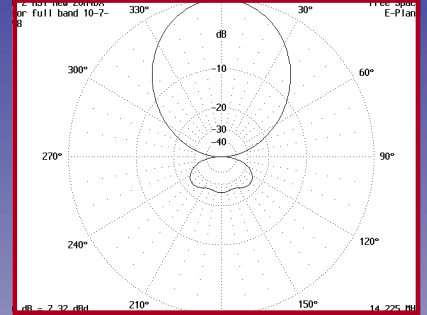
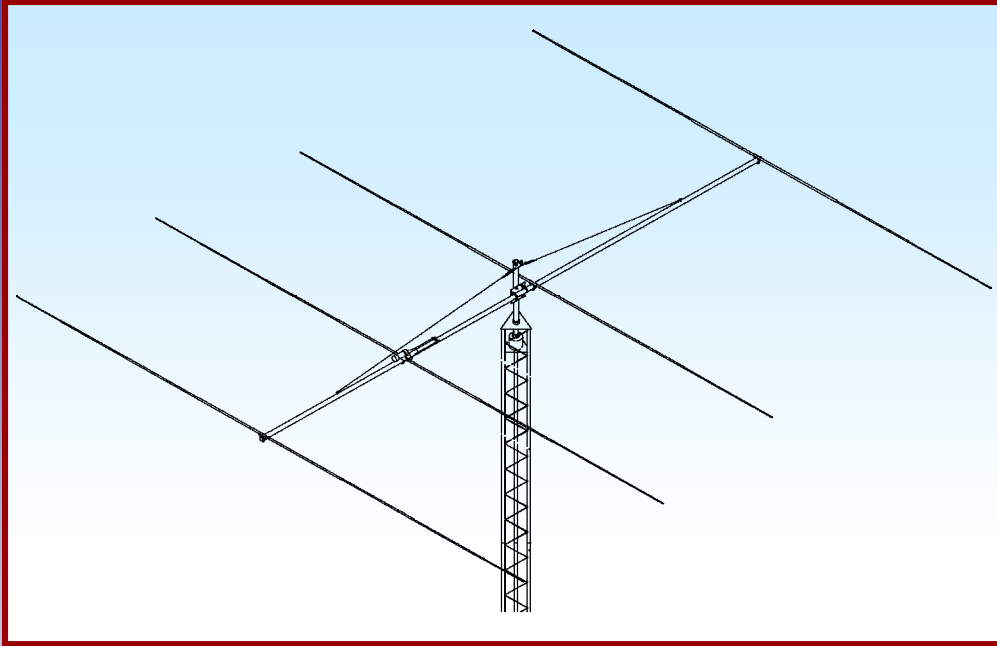




# M2 Antenna Systems, Inc.

## Model No: 20M4DX



### SPECIFICATIONS:

|                              |                          |                            |                      |
|------------------------------|--------------------------|----------------------------|----------------------|
| Model .....                  | 20M4DX                   | Power Handling .....       | 5 kW                 |
| Frequency Range / Gain ..... | 14.0 To 14.350 / 7.3 dBd | Boom Length / Dia .....    | 34' 8" / 2-1/2"      |
| Frequency Range / Gain ..... | 14.0 To 14.275 / 7.6 dBd | Element Length / Dia ..... | 35 Ft. / 1" To 3/8"  |
| Front to back .....          | 23 dB                    | Turning Radius: .....      | 25 Ft.               |
| Beamwidth .....              | E=58° / H=78°            | Stacking Distance .....    | 56 Ft.               |
| Feed type .....              | Hair pin match           | Mast Size .....            | 2" to 3" Nom.        |
| Feed Impedance .....         | 50 Ohms Unbalanced       | Wind area / Survival ..... | 6.9 Sq. Ft. / 85 MPH |
| Maximum VSWR .....           | 1:1                      | Weight / Ship Wt. ....     | 56 Lbs. / 61 Lbs.    |
| Input Connector .....        | SO-239                   |                            |                      |

### FEATURES:

The 20M4DX is the first in a NEW SERIES of mid-sized, **UPS shippable** HF antennas for all bands from 20 meters to 10 meters. Computer designed and VERIFIED with NEC, you will soon see the GAIN and other characteristics advertised in QST magazine. That should separate the players real fast! A very clean pattern makes it ideal for **STACKING** (3 dB OF STACKED GAIN!). We now spec FRONT TO REAR which defines the pattern from 90 to 270 degrees. On your request we can supply E and H patterns in free space or over ground. Careful, computer aided mechanical design for LOW WIND AREA, yet long term electrical and mechanical integrity are assured with CNC machined element-to-boom ring clamps and other key components. The Teflon coax 1:1 balun and rugged, low loss hairpin match insure all you power gets to the airwaves! With a little thought, you **WILL** choose **M<sup>2</sup>**. Contact your favorite dealer for pricing.

# 20M4DX ASSEMBLY MANUAL

Note: A cup of zinc paste (PENETROX, NOALOX, or equivalent) has been provided to enhance the quality of all the electrical joints and make assembly and disassembly easier. Apply a thin coat wherever two pieces of aluminum come in contact. Use it also to lube the stainless screws and bolts.

REFER TO THE DIMENSION SHEET FIRST. YOU MAY BE ABLE TO ASSEMBLE THE ANTENNA REFERRING TO THE WRITTEN INSTRUCTIONS ONLY AS A GUIDE.

1. BOOM ASSEMBLY: Note the different boom sections and the relative positions of each element. ALSO NOTE THAT TWO BOOM SECTIONS HAVE LARGE EYEBOLT MOUNTING HOLES. Begin by sliding the INNER TWO 2-1/2" RING CLAMPS into position on the appropriate boom sections. Spread the ring clamp fingers with a flat blade screwdriver to ease movement on boom. Loosely add a 1/4-20 x 1" bolt and locknut to fingers of all clamps. Add 1/4-20 x 3" bolts and locknuts to each joint and tighten securely. Add the eyebolts and secure with 5/16 nuts and lock washers.

2. Return to the first boom section from the rear. Position the 2-1/2" ring clamp ABOUT 81" from the un-swaged end. This is the DRIVEN ELEMENT and ALL spacing dimensions are referenced to it. Orient the ring clamp so its long grooved top is perpendicular to the EYEBOLT HOLE just to the rear in the first section. Tighten the 1/4-20 x 1" bolt and locknut to hold the clamp in position.

3. Refer to the figure "DRIVEN ELEMENT ASSEMBLY." Push two 1/4-20 x 2" bolts through the small holes in the 2 x 5" BALUN MOUNTING PLATE. Now feed these bolts down through the inner two holes of the 7/8 x 30" fiberglass rod. Mount this assembly onto the ring clamp holes and add the locknuts to the underside of the ring clamp. Tighten securely. Then push on a 2" diameter white POLYETHYLENE RING on each side tight up against the ring clamp. These rings for a long path to prevent water and residue induced arcing.

4. Select the two 1" x 60" element sections with 9/32 holes 1" in from the butts. Slide them onto the the 7/8" dia. fiberglass rod, align the holes and add the 1/4-20 x 2" bolts so the threaded ends protrude upwards. Add a locking nut to each side and tighten loosely for now, forming a threaded stud. (The balun leads will attach to these studs later on).

5. Locate and mount the 1-1/4 x 60" element section with both ends swaged to fit 1" tube. It is the center section of the REFLECTOR element. Use two more 1/4-20 x 2" bolts and locknuts. Tighten securely. Now add the 1" x 60" tubes with the two small holes at the large end. Secure these to the inner section with 8-32 x 1-1/2 screws and locknuts. Tighten the screws alternately until each joint is secure and further tightening becomes difficult.

6. Pair up the remaining 1" inch element sections and slide the butts over the 7/8" x 30" sleeves. Align the holes and mount to the ring clamps using more 1/4-20 x 2" bolts and locknuts.

7. Assemble the rest of the element halves using the 8-32 screws, locknuts and compression clamps see DIMENSION SHEET and COMPRESSION CLAMP & TIP ASSEMBLY DETAIL SHEET. Tighten each joint securely by alternating back and forth between the two screws at each joint until no movement is noted. BE SURE TO PAIR UP the 3/8" tip sections. DETERMINE YOUR CHOICE OF BAND SEGMENT. INSERT TIPS TO CHOSEN DIMENSIONS AND SECURE USING COMPRESSION CLAMPS.

8. Now adjust **ELEMENT SPACING** following the Dimension Sheet. Since the Driven Element is fixed, use it as the primary measurement reference. Dimensions given are "center to center." After setting spacing, align elements with the Driven Element and tighten the 1/4-20 x 1" bolts at the bottom of each ring clamp.

# 20M4DX ASSEMBLY MANUAL

9. Now, if you haven't already done so, attach the 3/4, 1/2" and 3/8" element sections to the 1" tubes at the correct location. Secure with 8-32 x 1-1/4" screws and locknuts. Repeat for all elements. **MAKE SURE TIPS LENGTHS ARE IN THE RIGHT ELEMENT POSITIONS!**

10. Refer to the figure "DRIVEN ELEMENT ASSEMBLY." Attach the 3-30 MHz 1:1 BALUN to the plate at the center of the DRIVEN ELEMENT. Secure with a 2-1/2" U-bolt and cradle but do not over tighten. The balun connector should be facing forward and be positioned so the connector face is just ahead of the Poly Disk insulator under it. Remove the two 1/4-20 locknuts from the two studs, slide on a pair of clamp blocks to both. Now connect the balun leads on top of the clamp blocks and rethread the 1/4-20 locknuts onto the studs. A short section of main feed line can be added at this time. Large nylon ties are provided to secure the feed line along the boom to the mast mounting plate. Seal the feedline connector as required with vinyl tape and coax seal or equivalent.

11. Add a 1/4-20 x 2" bolt to the BAND CLAMP and form another STUD by locking the bolt in place with a plain 1/4-20 nut. Place the band clamp loosely around the boom about 22 inches in front of the DRIVEN ELEMENT place the 1/2 x 1/2" x 5" hairpin SHORTING BAR on the stud and add a locknut loosely. Install the 1/4-20 x 1/4" set screws in the SHORTING BAR. Now insert the HAIRPIN TUBES into the clamp blocks and slide the shorting bar assembly over the tubes. Align the tubes and tighten the 1/4-20 locknuts securely. Tighten the SHORTING BAR to the BAND CLAMP. Adjust the shorting bar to 22" between it and the 7/8" rod insulator. Tighten the SHORTING BAR SET SCREWS. Now tighten the band clamp to the boom. **NOTE: THIS ASSEMBLY DC GROUNDS THE DRIVEN ELEMENT. THE REST OF THE ELEMENTS ARE ALREADY GROUNDED.**

12. Pick up the boom and determine the balance point. Mark this location and center the BOOM TO MAST PLATE here. Secure the plate with two 2-1/2" U-bolts, cradles, stainless lockwashers and nuts. Four, 2" U-bolts are supplied for attaching the antenna to the mast.

13. To prepare the overhead guy system, begin by *temporarily* installing a 2" U-bolt through the TURNBUCKLE PLATE and INTO the top set of 2" U-bolt holes on the boom to mast plate. Add a couple of 5/16" nuts to hold in place. Unscrew turnbuckle eyes / hooks until only a thread or two shows inside the turnbuckle body and hook them into the turnbuckle plate.

14. Uncoil DACRON CORD. Secure one end to rear eyebolt, taking two turns through the eyebolt, and securing with three TIGHT half-hitches. Pull hard on cord to set the knots. Repeat for the front eyebolt. Seal cord ends with heat (lighter, propane torch, etc) and tape to main length.

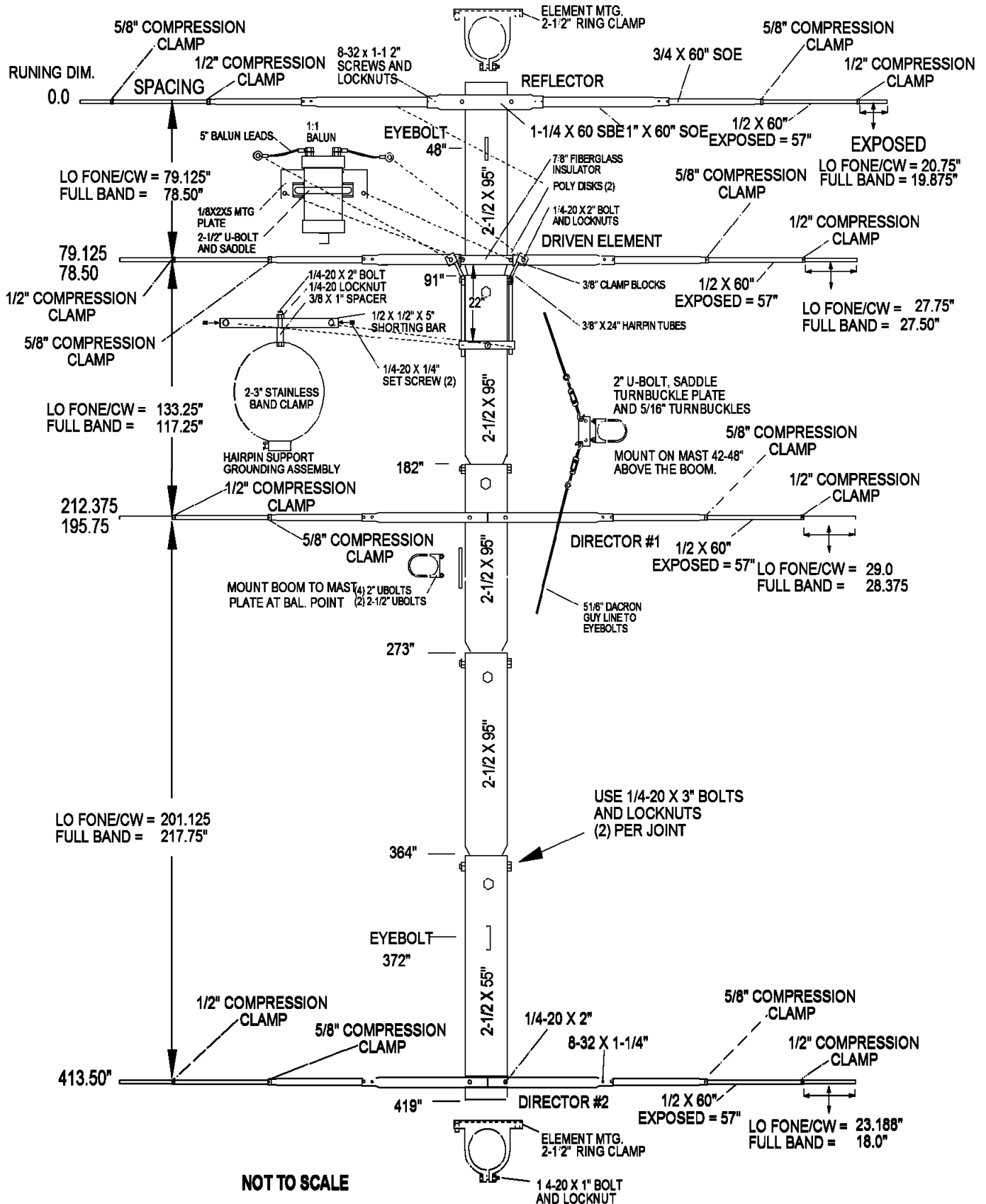
15. Equalize cord length at turnbuckle plate and cut. Put two turns through the rear turnbuckle eye, pull slack out of rope. Secure with three TIGHT half-hitches. Repeat for front cord section. Seal and tape cord ends.

16. Disconnect the 2" U-bolt holding the turnbuckle plate and lift it up until the boom bows up slightly. This is approximately how high the plate will be when the antenna is installed on the mast.

17. During final installation on the tower / mast, secure the turnbuckle plate at the appropriate height with the 2" U-bolt. Then lean or pull on the cords to increase the tension and help the knots take their final "set." Make sure the knots are not slipping. When the guy system has taken a "set", loosen the 2" U-bolt and adjust turnbuckle plate height until boom is straight and level. Finer adjustments can be made at any time, if necessary, with the turnbuckles.

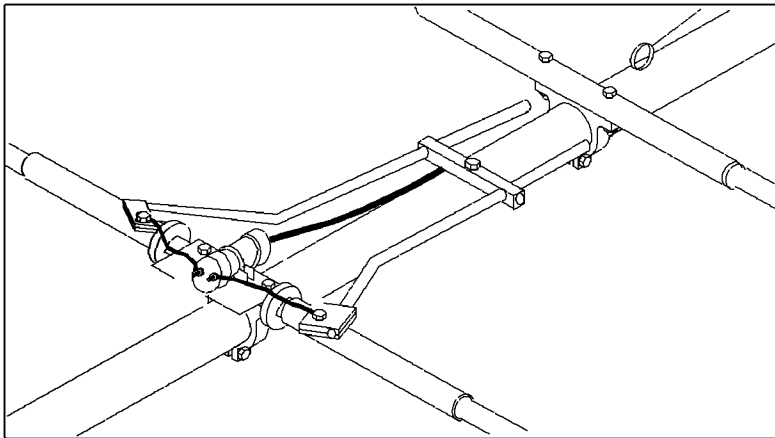
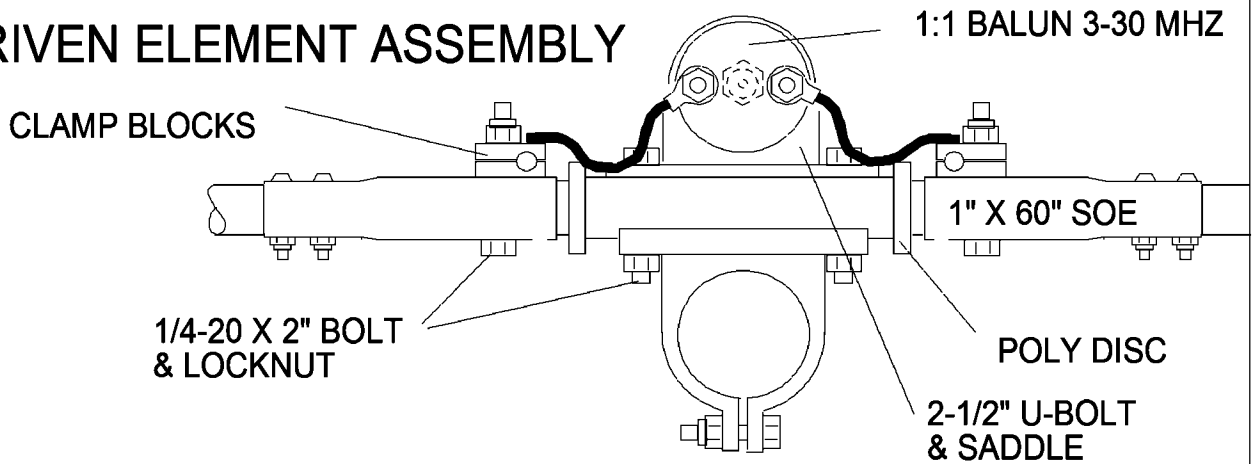
18. This completes the ASSEMBLY. REMEMBER to support the feedline at the antenna boom and on the mast. Leave an adequate feedline loop for rotation around the tower. Mount any horizontally polarized VHF and UHF antennas AT LEAST 40" above or below this antenna to minimize interaction.

# 20M4DX DIMENSION SHEET

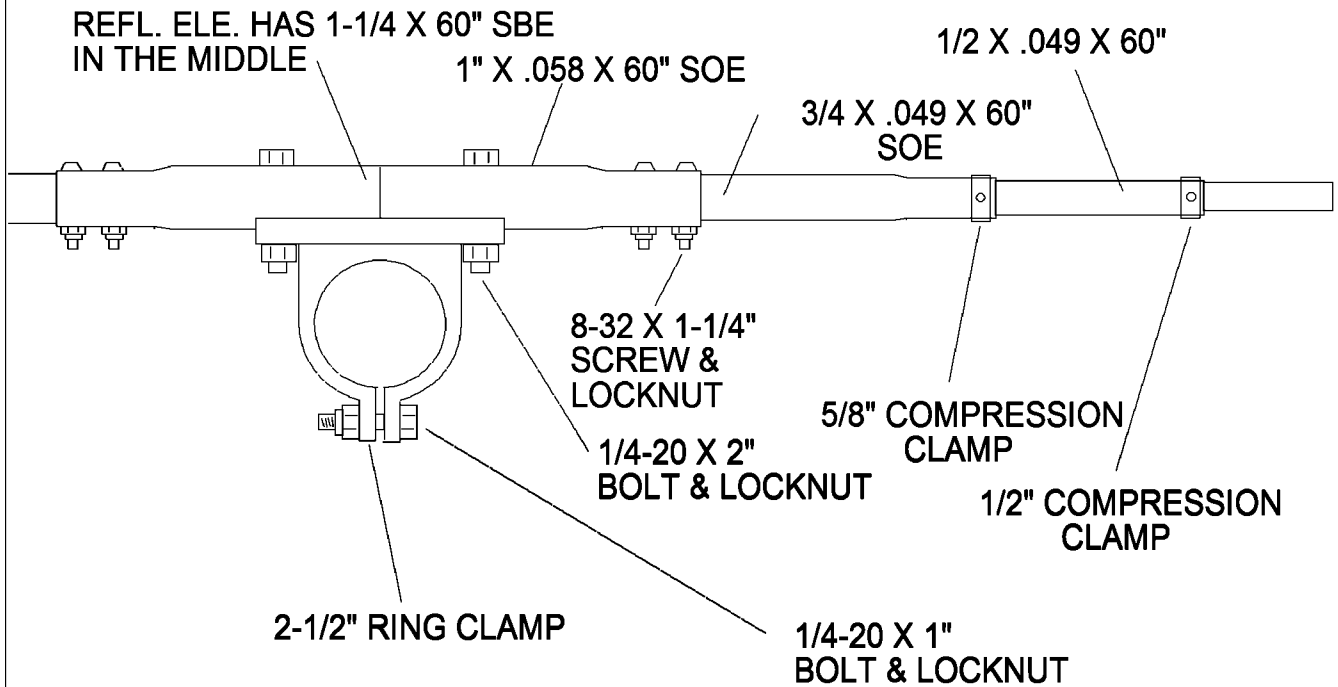


# 20M4DX ASSEMBLY DETAIL

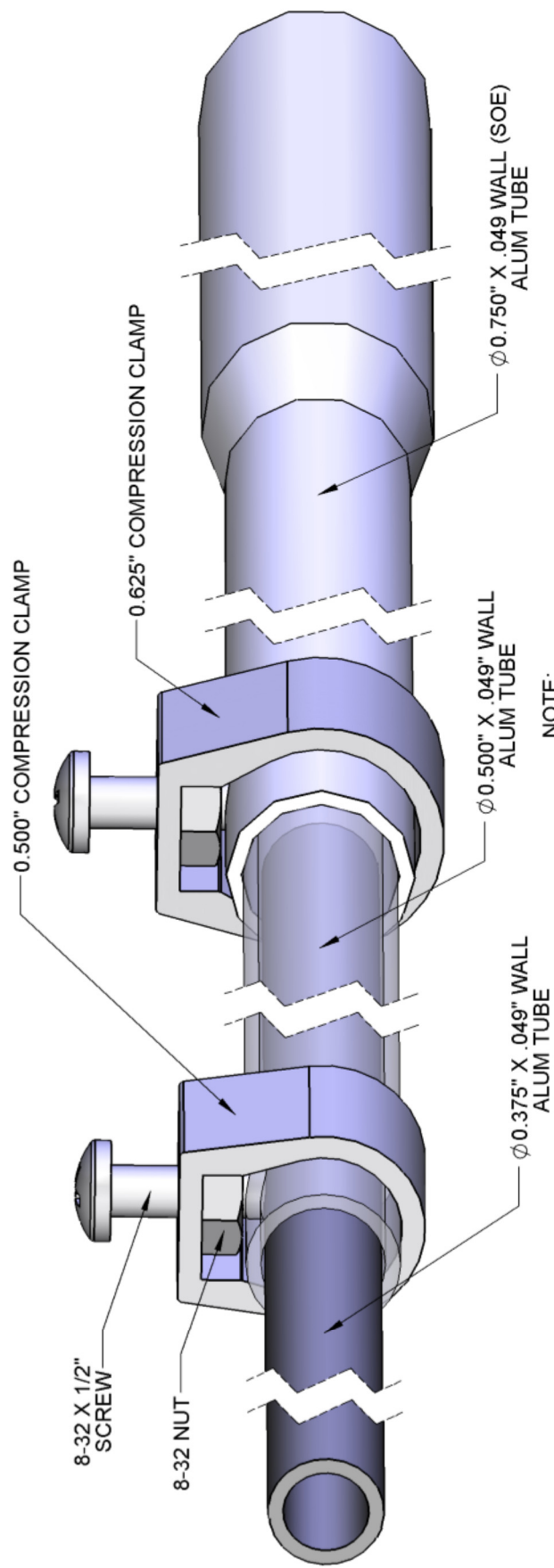
## DRIVEN ELEMENT ASSEMBLY



## PARASITIC ELEMENT ASSEMBLY

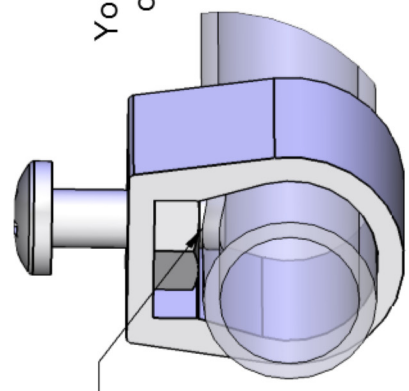


# GENERIC COMPRESSION CLAMP DETAIL



NOTE:  
TUBES SHOWN TRANSPARENT  
TO SHOW MORE DETAIL

**NOTE:**  
Generic layout to show  
how compression clamps work.  
Your antenna may have one or the other  
or may even have both compression  
clamp sizes.

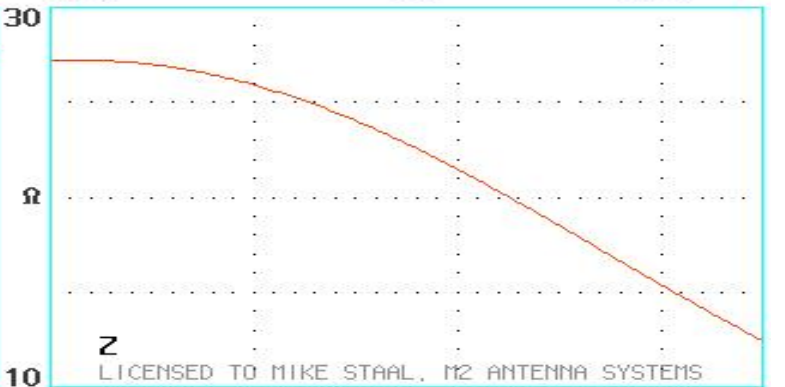
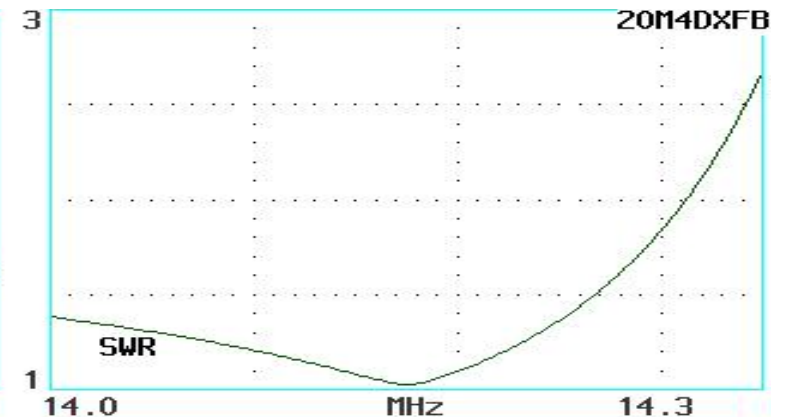
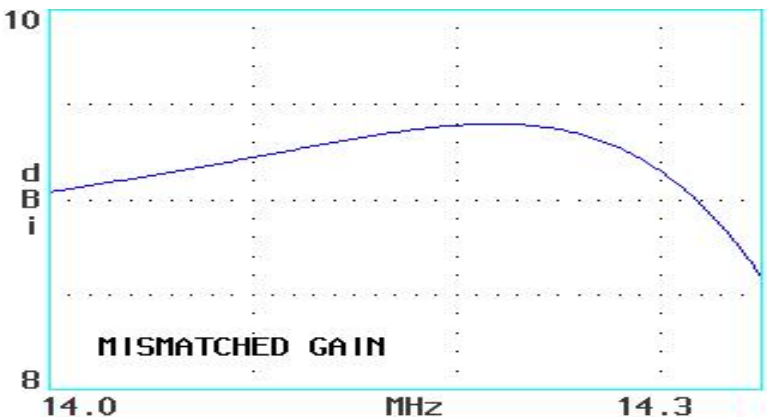
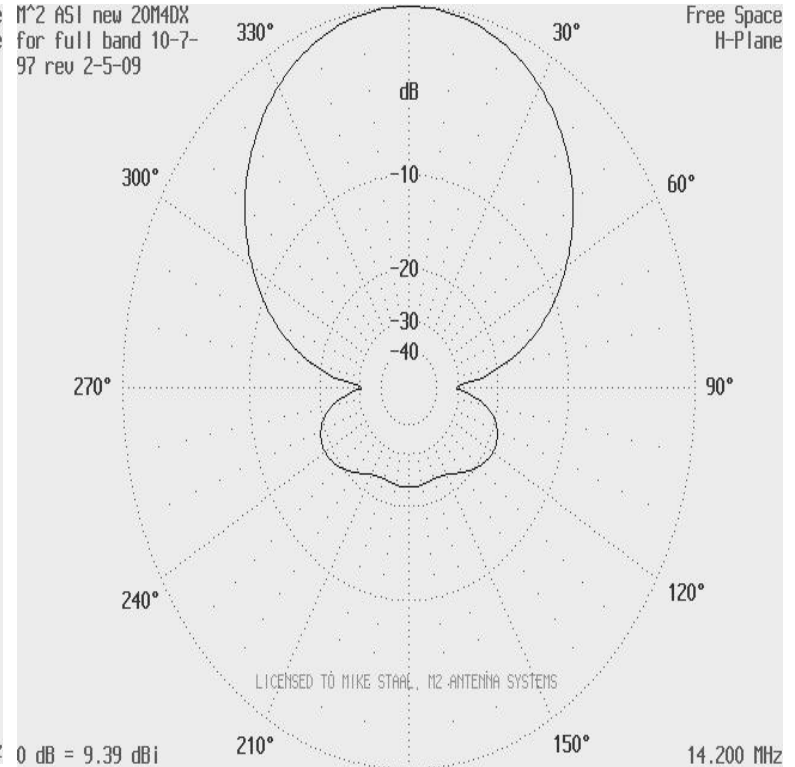
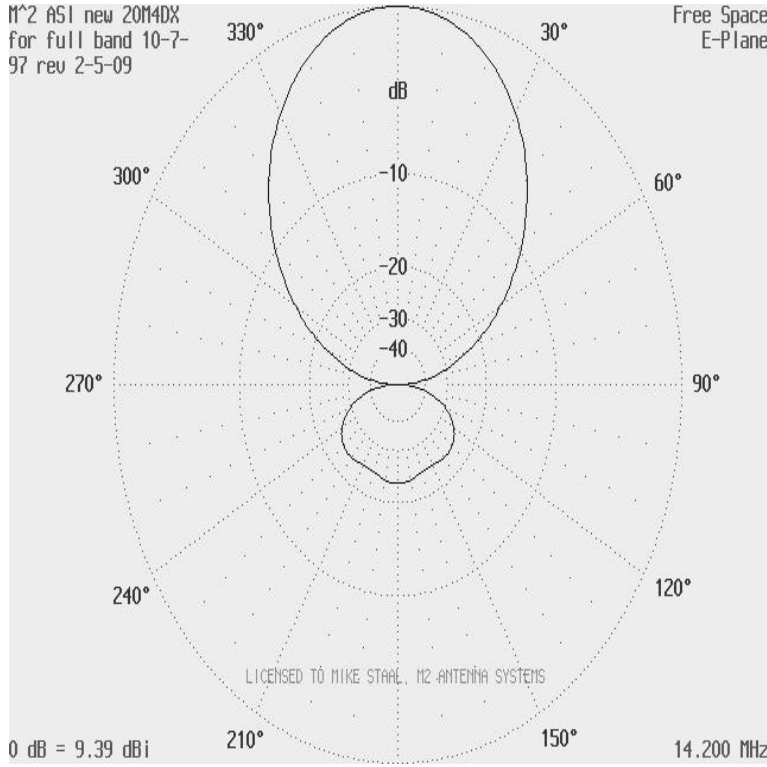


NOTE:  
8-32 X 1/2" SCREW  
PRESSES ON INNER TUBE

NOTE: INSIDE TUBE NOT SHOWN FOR CLARITY

# 20M4DX VSWR PLOTS

Below is the E plane, the H plane and the GAIN and VSWR plots for the FULL BAND tuning adjustments. If LO FONE/CW tuning adjustments are chosen the gain will go up slightly and the VSWR curve will flatten to 1.5: or better at the tuning edges.



# 20M4DX PARTS & HARDWARE

| <b>DESCRIPTION</b>   | <b>Qty</b> |
|--|------------|
| Boom section, 2-1/2" x .065 x 55" STR .....                                  | 1          |
| Boom section, 2-1/2" x .065 x 95" SOE .....                                  | 4          |
| Element section, 1-1/4" x .058 x 60" SBE .....                               | 1          |
| Element section, 1" x .049 x 60" TYPE I swaged one end (SOE).....            | 2          |
| Element section, 1" x .049 x 60" TYPE II swaged one end (SOE).....           | 2          |
| Element section, 1" x .049 x 60" TYPE III swaged one end (SOE).....          | 4          |
| Element section, 3/4" x 0.049 x 60" swaged one end (SOE) .....               | 8          |
| Element section, 1/2 x .049 x 60" .....                                      | 8          |
| Element tip, 3/8 x .049 x see DIMENSION SHEET.....                           | 8          |
| Sleeve, element, 7/8" x .058 x 30" (for 2-1/2" clmp, 4.5" holes spcng) ..... | 2          |
| Center insulator, 7/8" x 30" Fiberglass (M2AFG0040) .....                    | 1          |
| Boom to mast plate, 6" x 8" x .250" (M2APT0010).....                         | 1          |
| Hairpin tubes , 3/8" x 30" formed.....                                       | 2          |
| Balun, 1:1 3-30 MHz with SO-259 connector (FGBL0100) .....                   | 1          |
| Ring clamp, 2-1/2" (M2AEC0220) .....   | 4          |
| Dacron rope, 5/16" x 30' .....   | 1          |
| Eyebolts, 5/16" x 5".....  | 2          |
| Turnbuckles, 5/16", hook & eye.....  | 2          |
| Turnbuckle Plate, 2" x 4" x 3/16" (M2APT0101).....                           | 1          |
| U-bolt and cradle, 2" .....  | 5          |
| U-bolt and cradle, 2-1/2" .....  | 3          |
| Compression clamp, 5/8" .....  | 8          |
| Compression clamp, 1/2" .....  | 8          |
| Assembly Instructions.....   | 1          |
| <br><b>HAIRPIN KIT BAG</b>   |            |
| Balun mounting plate, 1/8 x 2 x 5" (M2APT0017) .....                         | 1          |
| Clamp block, 3/8" (M2AMC0261) .....  | 4          |
| Band clamp, ss, 2-3" dia. range, modified # 52.....                          | 1          |
| Shorting bar, Hairpin 1/2 x 1/2 x 5" (M2ASB0262).....                        | 1          |
| Spacer, 3/8 x 1" .....   | 1          |
| Polyethylene ring, 1/2 x 2" round with 7/8 hole (M2ADI0040).....             | 2          |
| Set screw 1/4-20 x 1/4" ss .....   | 2          |
| Bolt, 1/4-20 x 2" ss.....  | 3          |
| Nut, 1/4-20 locking, ss .....  | 3          |
| Allen wrench 1/8" .....  | 1          |
| <br><b>IN HARDWARE BAG .....</b>   |            |
| Nut, 5/16-18 ss .....  | 18         |
| Lockwasher, split ring 5/16".....  | 18         |
| Bolt, 1/4-20 x 3" ss.....  | 10         |
| Bolt, 1/4-20 x 2" ss.....  | 11         |
| Bolt, 1/4-20 x 1" ss.....  | 4          |
| Nut, 1/4-20 locking, ss .....  | 25         |
| Screw, 8-32 x 1-1/2" ss.....   | 4          |
| Screw, 8-32 x 1-1/4" ss.....   | 16         |
| Screw, 8-32 x 1/2" ss .....  | 16         |
| Nut, 8-32 locking, ss .....  | 20         |
| Nut, 8-32, ss .....  | 16         |
| Nylon tie, large black, 11" .....  | 3          |
| Zinc paste, 1 oz. cup .....  | 1          |

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