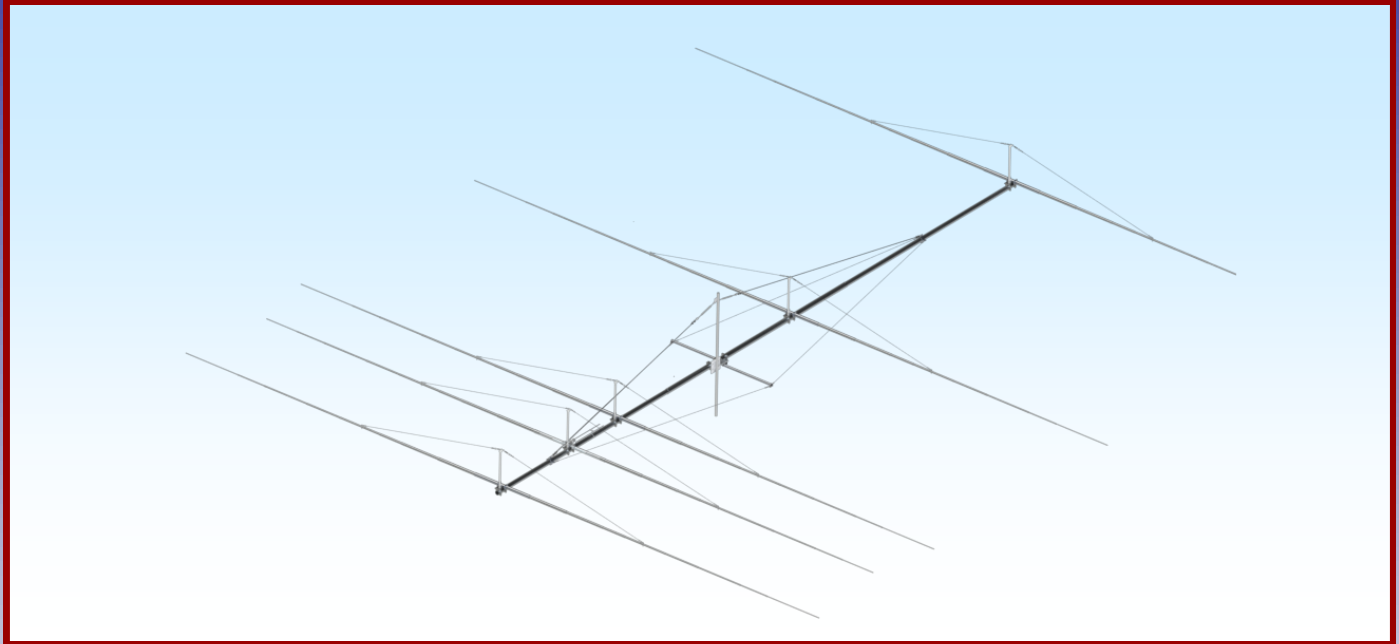




M2 Antenna Systems, Inc. Model No FG9.2-5-160



SPECIFICATIONS:

Model	9.2-5-160	Boom Length / Dia	58' 2" / 4-1/2" To 4"
Frequency Range	9.075-9.325 MHz	Element Length / Dia.	57 Ft. / 3" To 1/2"
*Gain.....	9.7 dBi	Turning Radius:	28.75 Ft.
Front to back.....	23 dB	Mast Size	2" to 3 " Nom.
Beamwidth	E=54°	Wind area / Survival.....	32 Sq. Ft. / 160 MPH
Feed type.....	Hair pin match	Weight / Ship Wt.	590 Lbs. / 650 Lbs.
Feed Impedance.....	50 Ohms Unbalanced		
VSWR.....	1.3:1 typ. 2:1 max		
Input Connector	SO-239 Others optional		
Power Handling	3 kW Higher Opt.		

***Subtract 2.14 from dBi for dBd**

FEATURES:

The 9.2-5-160 is a full sized 9.2 MHz Yagi designed to withstand 160 MPH winds, This is by fare our most rugged design providing full band coverage. The 9.2-5-160 is a powerful package of clean mechanical design, quality materials, littered with machined parts. The design produces outstanding performance that will keep the performance steady for year and years. Mechanically the boom is a 20 foot, 4-1/2" X 1/4" wall center with 4" x 1/8" wall tips. The mast mounting plate is 3/8" and the boom mounts with rugged machined cradle clamps. The element sections have been computer optimized for 160 MPH winds. The boom section is side guy supported by HPTG 1200 Phillystran and an HPTG 6700 overhead guy system is supplied for the boom as well. A hairpin type match couples the 3 kW 1:1 balun to the feed line. The antenna is completely DC grounded. Compare performance, construction, and durability with the competition...no one can even come close!

9.2-5-160 ASSEMBLY MANUAL

TOOLS NEEDED: Tools handy for assembly process: Phillips head Screwdriver, 11/32, 7/16, 1/2, & 9/16 nut drivers, end wrenches and/or sockets, measuring tape.

Small containers' of zinc paste (Penetrox, Noalox, or equiv.) has been provided to enhance and maintain the quality of all electrical junctions on this antenna. Apply a thin coat wherever two pieces of aluminum come in contact or other electrical connections are made. Also use it on the threads of bolts and screws as an anti seize compound. **NOTE: Some element inserts or sleeves may be factory installed. Check before assembly!**

BEFORE YOU BEGIN:

Look over the ELEMENT ASSEMBLY and DIMENSION SHEET drawings to get familiar with the various parts of the antenna. If you are familiar with the construction of M² HF antennas, the 9.2-5-160 can be assembled mainly using the drawings. Otherwise, M² strongly recommends using this assembly manual. It will provide you with detailed assistance in critical areas and give overall order and efficiency to the construction process. Take your time: Let your assembly skills enhance the 9.2-5-160's quality construction and performance.

1. ELEMENT BRACKET ASSEMBLY

Locate the FIVE 8" x 8" x 1/4" ELEMENT TO BOOM PLATES and attach the welded ELEMENT SUPPORT BRACKETS. Use 1/4-20 x 1" bolts and locknuts. Loosely mount two 1-1/2" U-bolts and cradles in each bracket.

2. Now attach the ELEMENT SUPPORT RISERS, align the welded top plate so it points away from the bracket and over the element location. Tighten the U-bolts.

3. DRIVEN ELEMENT

Mount the 2" x 36" CENTER INSULATOR fiberglass rod on one of the plate assemblies, using 2" saddles and 3/8-16 x 3-1/2" bolts and locknuts. Center the insulator, align the element mounting holes in the coupling rings perpendicular to the plate and tighten the saddle clamp bolts.

To complete this sub assembly, place two 1/4" diameter 2" stainless steel U-bolts around the center fiber glass insulator and drop the 4 x 4" BALUN MOUNTING PLATE over the U-bolt ends. Add 4 locknuts, align and center the plate and tighten the nuts. Add the 1:1 balun to the plate using a 2-1/2" U-bolt, 5/16"-18 nuts and lock washers. Orient the balun so the leads face the riser tube and come out each side toward the coupling rings on the center insulator Tighten the 2-1/2" U-bolt carefully until the lock washers just flatten. **Be sure the balun vent / drain hole is DOWN.** Set this sub assemblies aside for now.

4. DRIVEN ELEMENT CENTER SECTION

Slide a 3" x .250 x 34" element section over the CENTER INSULATOR coupling rings.

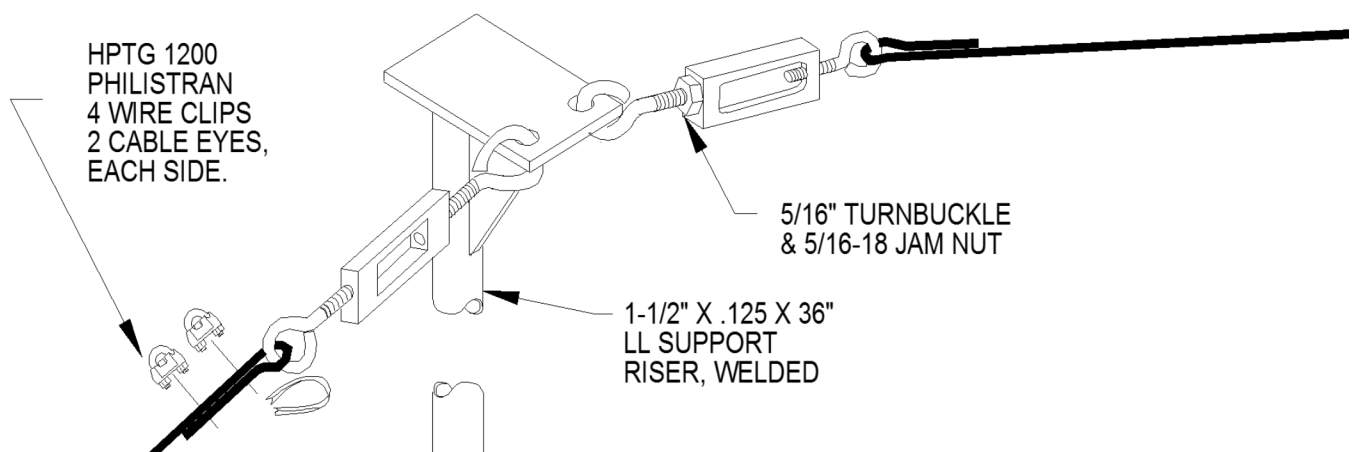
9.2-5-160 ASSEMBLY MANUAL

NOTE: THIS ASSEMBLY HAS BEEN LINE DRILLED AND MARKED AT THE FACTORY. MATCH THE MARKINGS. Align the holes and from underneath insert a 1/4-20 x 4" bolt through the inner hole and add two 3/8" COUPLING BLOCKS, face to face followed by a BALUN wire lug, and 1/4" LOCKNUT. Tighten lightly at this time. (These 3/8" clamp blocks connect the hairpin tubes to the DRIVEN ELEMENT). Some block alignment may be necessary when the hairpin tubes are attached.

5. REFLECTOR AND DIRECTOR CENTER SECTION

Find and mark the measured center of the 3" x .250 x 60" center tube sections. Set two 3" heavy duty saddle clamps over the matching holes in the plate and place the element section into the saddles. Place two more saddles over the top and add four 3/8-16 x 4-1/2" bolts and locknuts. Center and rotationally align the element tip holes perpendicular to the plate and tighten the bolts. Repeat for the other parasitic elements center sections. Label one "REFLECTOR" and the others "DIRECTOR #1, DIRECTOR #2, DIRECTOR #3

6. ELEMENT ASSEMBLY (SEE ELEMENT ASSEMBLY DRAWINGS) Refer to the element taper detail pages for information of element construction. Note: some of the elements have been preassembled AND MARKED at the factor for quality control. After reviewing the element detail sheets you will find that the basic element parts are all the same except for the center section of the driven element and the tips of each element are different. All of the elements are supported by a guy wire attaching to an eyebolt on the 1.50" TUBE section of each element. While the elements are on the ground add the Phillystran guy rope and tension using the turnbuckle to just pull the element up to have just a slight droop. Do not pull the element above level as the elements can become unstable.



7. BOOM ASSEMBLY (things start to get big now!).

Note these boom sections have been line drilled and marked at the factory. Match the markings and slide the 4" x .125 x 240" sections into the 4-1/2 x .240 x 240" center section. Align the holes and secure with 3/8-16 x 5" bolts and locknuts. Add the GUY CLAMP to each

9.2-5-160 ASSEMBLY MANUAL

end. Attach the HPTG 6700 Phillystran cables to the GUY CLAMP using a cable eye or “thimble” and two, 3/8” “wire clips”.

8. OVERHEAD AND SIDE GUY SUPPORT SYSTEM

It is a good idea to mock up the over head guy and side guy support ropes while the antenna is on the ground. Refer to the dimension sheet to find the positions of the BTM plate, side guy plate and the guy clamps. Attach the BOOM TO MAST PLATE using 4-1/2” saddle clamps and 3/8-16 x 6” bolts and locknuts. Orient the plate perpendicular to the elements and tighten the bolts. Add the side guy plate just 1 inch in front of the BTM plate, attach using 4-1/2 saddle clamps. Slide the guy clamps into position, add the bolts, 3/8-24x1.50 and lock washers and tighten into position.

9. Insert a temporary mast at this time if possible so you can set your over head guy system up correctly before installation on the tower. Almost any tube diameter between 1-1/2 and 3-1/8” can be used for this setup. Add the turnbuckle plate to the mock mast to about 60” above the boom of the antenna. 1/2” turnbuckles have been supplied to be used to tension the overhead guy ropes. Tighten the guy ropes to lift the ends of the boom to a level position. Install the side guy tubes to the side guy plate using 2” u-bolts and cradles, add the turnbuckle plates to the ends of the side guy tubes. Add the ropes to the side guy clamps and to the turnbuckle plates at the end of the side guy tubes. It is not necessary to over tension the side guys ropes. The ropes only need to be in place to keep the boom of the antenna supported during extreme side winds. After layout the side guys and overhead guys can be disconnected and taped to the boom of the antenna and reinstalled during final installation on the tower.

10. ELEMENT TO BOOM ASSEMBLY – SEE DIMENSION SHEET

Loosely install bottom 4” or 4.5” SADDLE CLAMPS to the reflector and director ELEMENTS using 3/8-16 x 5-1/2” or 6” bolts and locknuts. LUBRICATE THE BOLTS. Using the DIMENSION SHEET place the elements at the specified position along the boom, align the element with one another and tighten saddle clamp bolts.

11. Place the DRIVEN ELEMENT on the boom, spacing it per YOUR DIMENSION SHEET. Use 4-1/2” saddles and 3/8-16 x 6” bolts and locknuts. Align the element with the other two and tighten the hardware. Insert a 1/4-20 x 4” bolt from inside, through the hole in the #74 band clamp and install the band clamp on the boom at the chosen distance for the HAIRPIN SHORTING BAR from the driven element. Run a plain 1/4-20 nut all the way on to the bolt. Next, insert the hairpin tubes into the 3/8” clamp blocks and tighten gently to hold them in position. Add the SHORTING BAR to the other end and slide it to the desired dimension. Drop the shorting bar over the 4” bolt at the band clamp and add a 1/4-20 locknut. Insert the 1/4-20 x 1/4” set screws into the ends of the shorting bar. Align and tighten all hardware.

12. If you have not already done so, add the element tip sections NOTE: The tip pairs are different. Be sure to attach the correct tips on the matching inner element. We have supplied our compression clamps for easy adjustment of the tips during antenna tune up. After final tune up, an additional screw can be added by drilling through the existing hole to secure the tip. Use 8-32 x 1” screw and locknuts and tighten securely.

13. TUNE UP INSTRUCTIONS

9.2-5-160 ASSEMBLY MANUAL

After complete general assembly of the boom and the elements spaced at the proper dimensions, the 1/2 tip lengths and the hair pin shorting bar position will be the focus of the adjustments. We have provided the 1/2 element tip with a 6" overlap as to give extra material if needed. We have also added extra long hair pin tubes to give more than enough adjustment if necessary.

We have provided the starting point exposed 1/2 tip dimensions on the dimension sheet. We have also provided a starting dimension for the hair pin shorting bar.

Normally we would review the VSWR/return loss first, then adjust the hairpin shorting bar for best match and review the frequency of the best match. After review we determine to either raise or lower the frequency. A slight adjustment of the Driven element tips and a readjustment of the hair pin shorting may be all that is necessary. Continue this adjustment process until satisfied.

If you find that you can not get the antenna resonate with a good match at the correct frequency. It maybe necessary to make an equal global change to all the element tips to slide the whole pass band up or down in frequency. Be sure to put the Driven element tip back to the starting point. Continue the same adjustment process until satisfied. Good luck.

14. This completes the assembly of the 9.2-5-160. *PLEASE BE SAFETY CONSCIOUS DURING INSTALLATION AND ALWAYS USE GOOD QUALITY 50 OHM FEEDLINE AND CONNECTORS. If this antenna is to be placed on the same tower with other antennas, it is best to have it at least 8 feet away from all the others . It is never a good idea to have a 15 meter antenna on the same tower with 40m as they are 3rd harmonically related and WILL interact. Usually the 15m antenna will suffer more.*

Carefully designed and manufactured by:

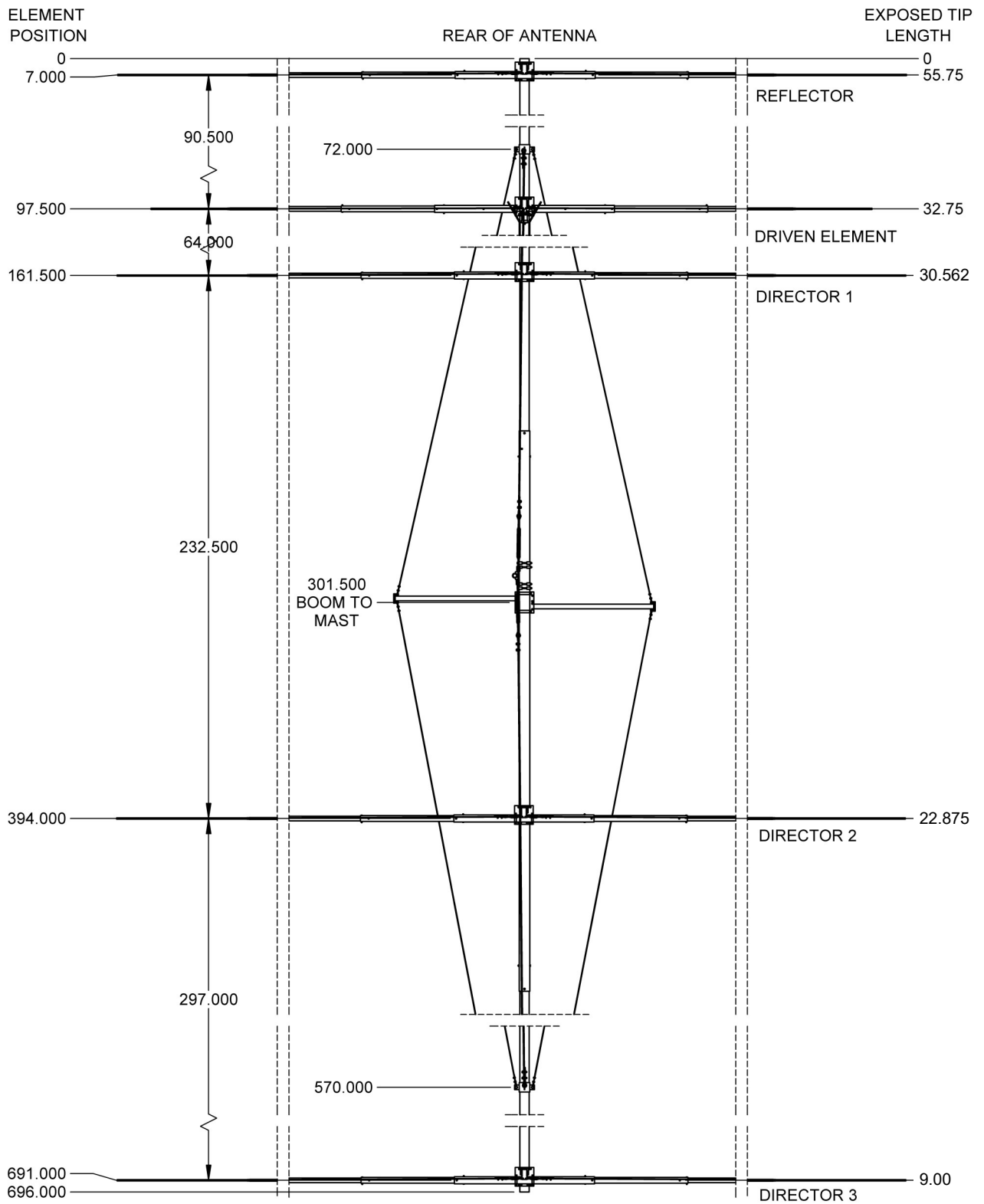
M² ANTENNA SYSTEMS, INC.

4402 N. Selland Ave., Fresno, CA 93722

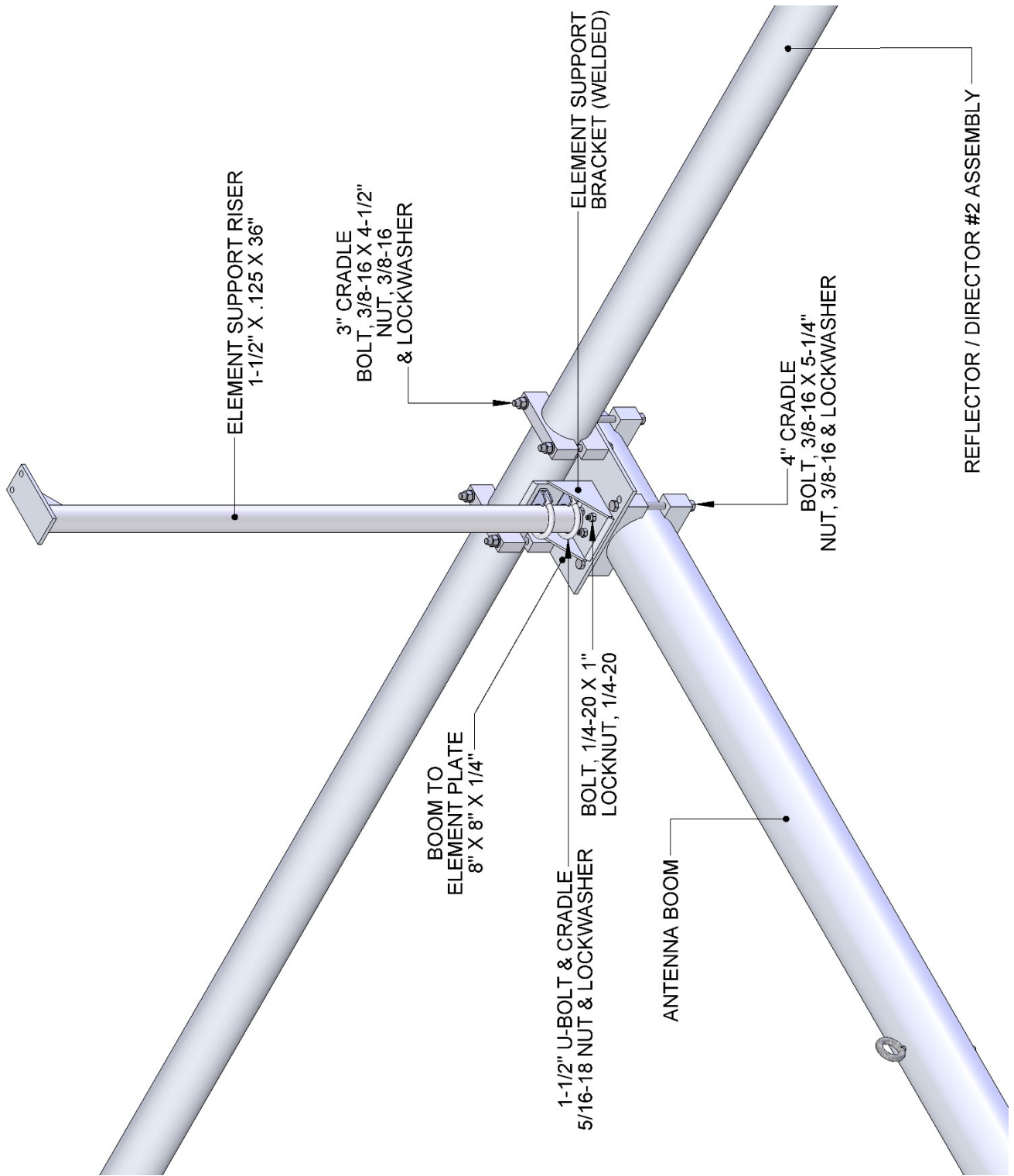
(559) 432-8873 Fax: 432-3059

www.m2inc.com Email: sales@m2inc.com

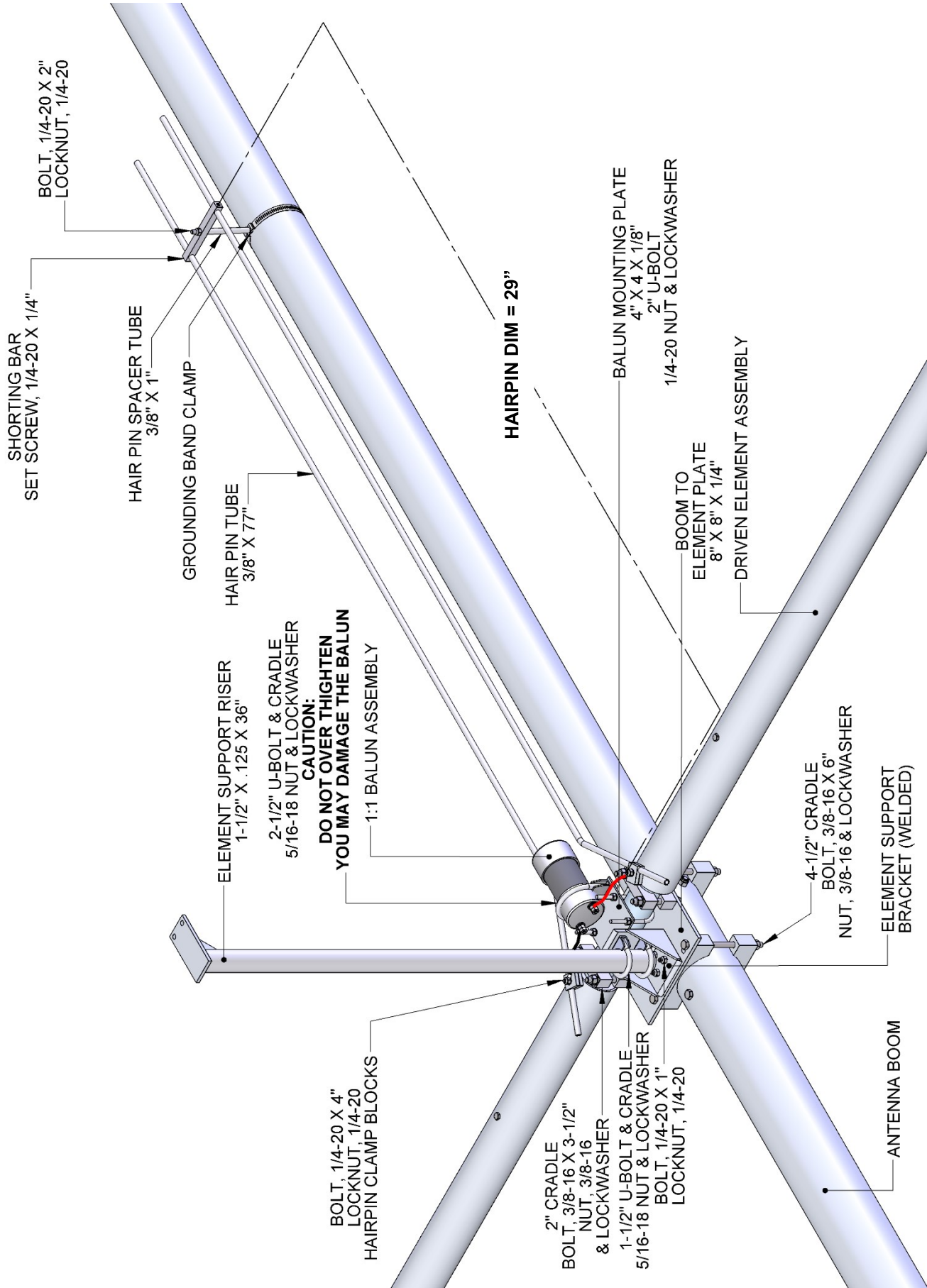
9.2-5-160 DIMENSION SHEET



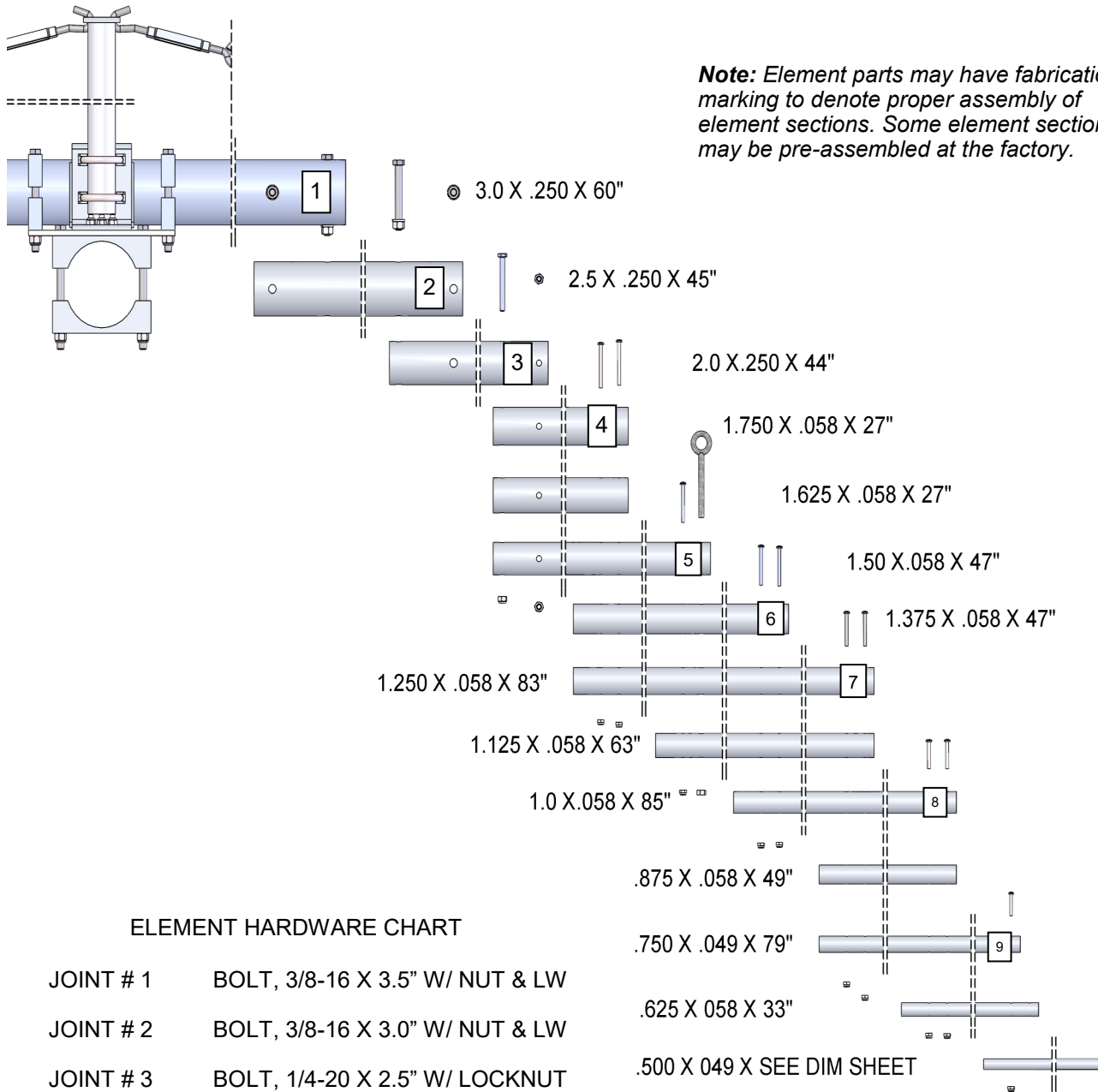
9.2-5-160 REFLECTOR/ DIRECTOR



9.2-5-160 DRIVEN ELEMENT



9.2-5-160 REFLECTOR & DIRECTOR ELEMENT TAPER DETAIL

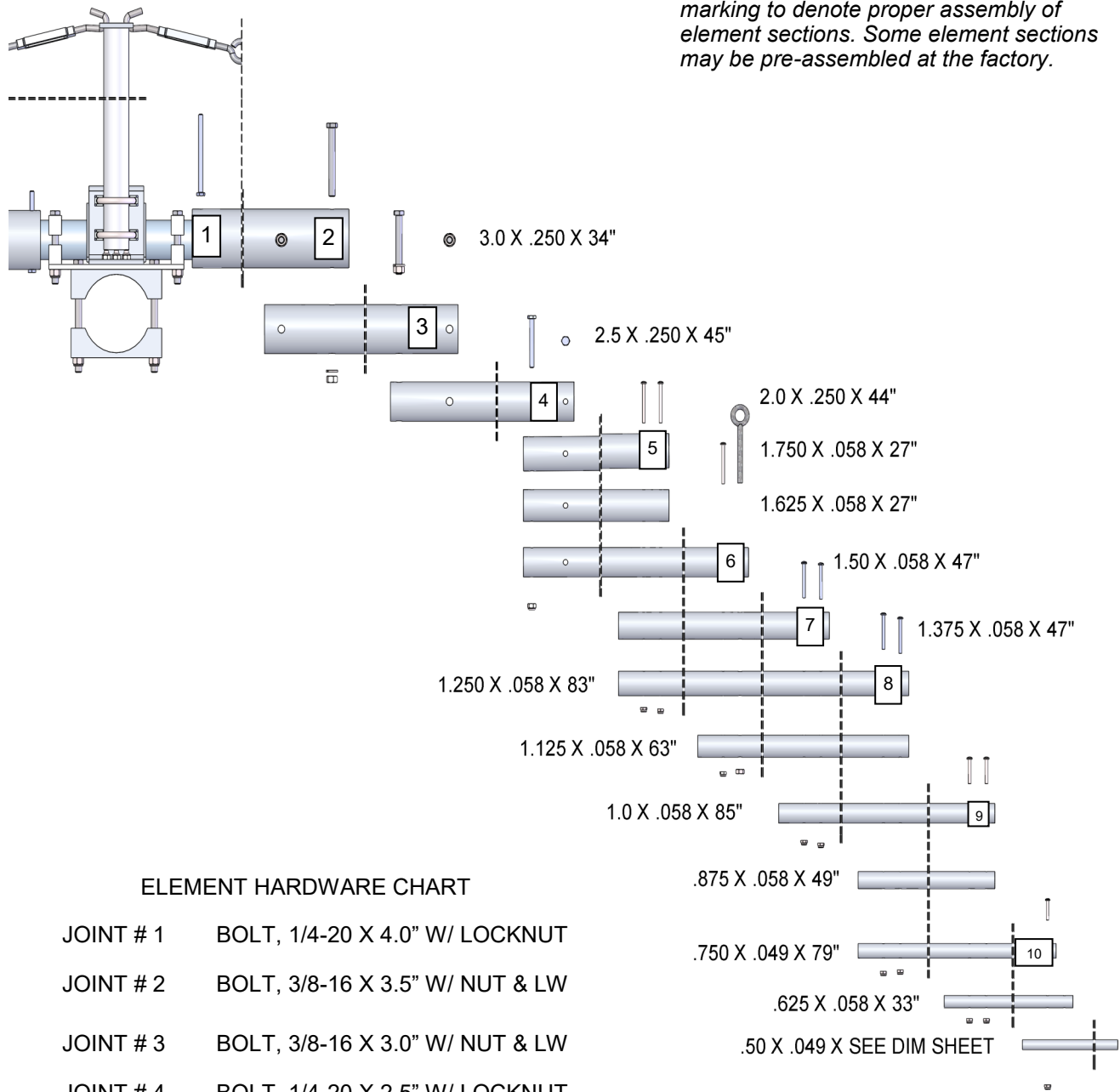


ELEMENT HARDWARE CHART

JOINT # 1	BOLT, 3/8-16 X 3.5" W/ NUT & LW
JOINT # 2	BOLT, 3/8-16 X 3.0" W/ NUT & LW
JOINT # 3	BOLT, 1/4-20 X 2.5" W/ LOCKNUT
JOINT # 4	SCREW, 8-32 X 2.0" W/ LOCKNUT
JOINT # 5	SCREW, 8-32 X 1.750" W/ LOCKNUT EYEBOLT, 1/4-20 W/ NUT
JOINT # 6	SCREW, 8-32 X 1.750" W/ LOCKNUT
JOINT # 7	SCREW, 8-32 X 1.50" W/ LOCKNUT
JOINT # 8	SCREW, 8-32 X 1.250" W/ LOCKNUT
JOINT # 9	SCREW, 8-32 X 1.0" W/ LOCKNUT

9.2-5-160 DRIVEN ELEMENT TAPER DETAIL

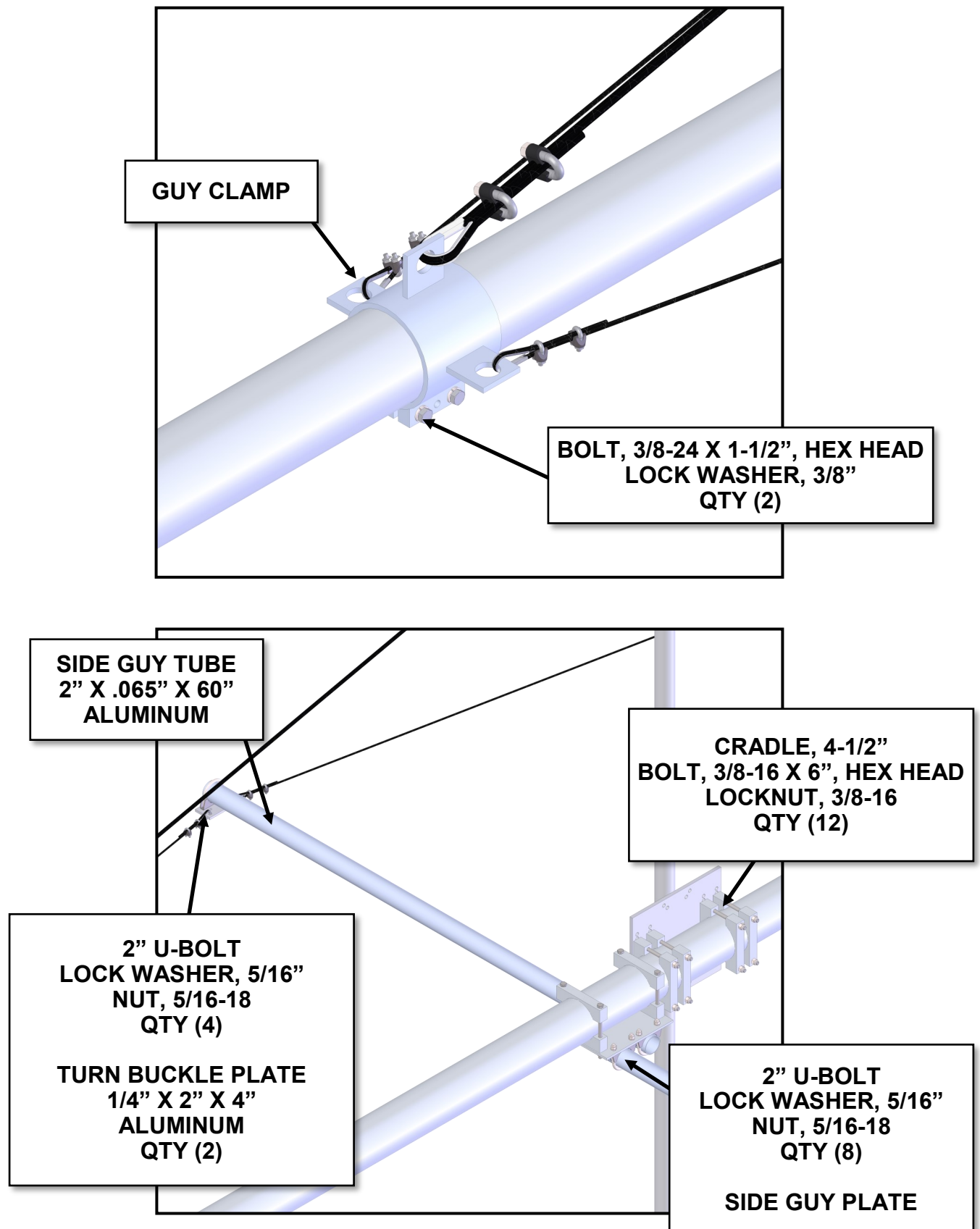
Note: Element parts may have fabrication marking to denote proper assembly of element sections. Some element sections may be pre-assembled at the factory.



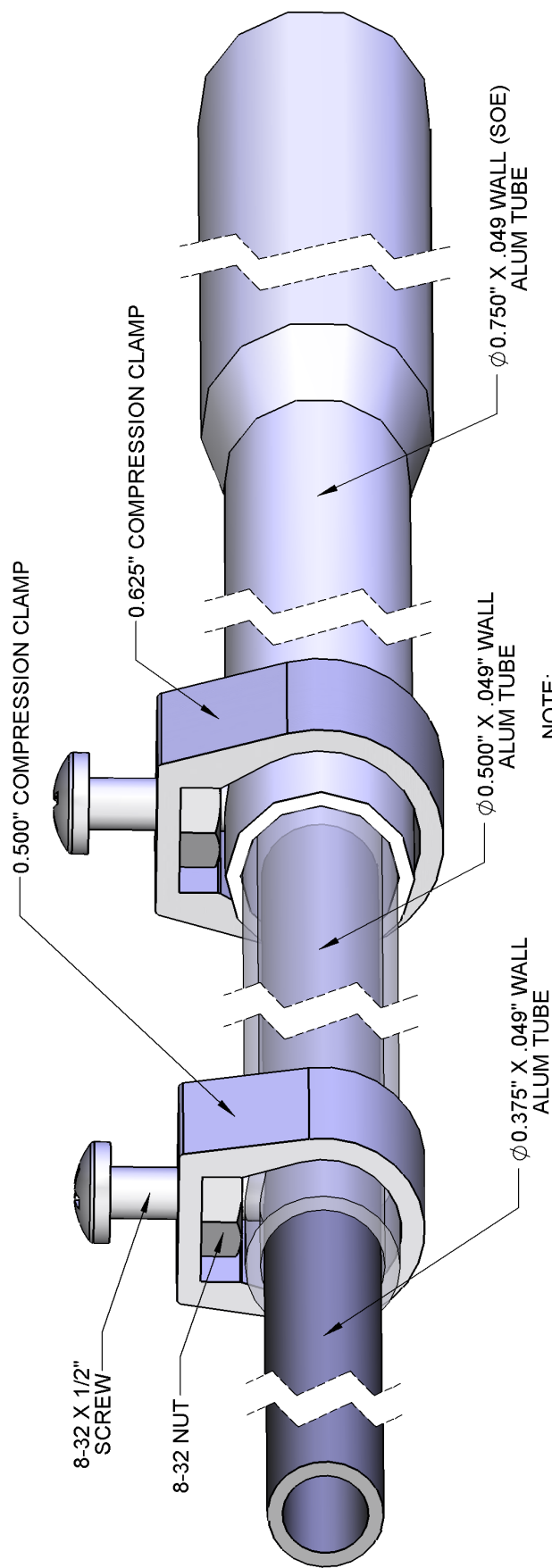
ELEMENT HARDWARE CHART

JOINT # 1	BOLT, 1/4-20 X 4.0" W/ LOCKNUT
JOINT # 2	BOLT, 3/8-16 X 3.5" W/ NUT & LW
JOINT # 3	BOLT, 3/8-16 X 3.0" W/ NUT & LW
JOINT # 4	BOLT, 1/4-20 X 2.5" W/ LOCKNUT
JOINT # 5	SCREW, 8-32 X 2.0" W/ LOCKNUT
JOINT # 6	SCREW, 8-32 X 1.750" W/ LOCKNUT EYEBOLT, 1/4-20, W/ NUT
JOINT # 7	SCREW, 8-32 X 1.750" W/ LOCKNUT
JOINT # 8	SCREW, 8-32 X 1.50" W/ LOCKNUT
JOINT # 9	SCREW, 8-32 X 1.250" W/ LOCKNUT
JOINT # 10	SCREW, 8-32 X 1.0" W/ LOCKNUT

9.2-5-160 CABLE GUY



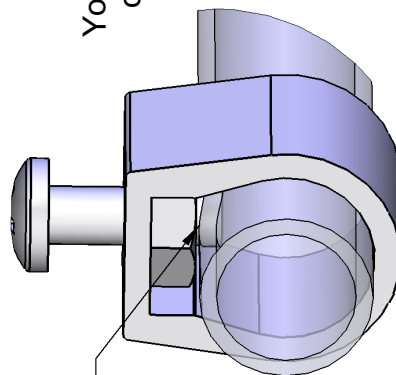
GENERIC COMPRESSION CLAMP DETAIL



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

9.2-5-160 PARTS & HARDWARE

DESCRIPTION	QTY
CROSS BOOM TUBE, 4" X .125" X 240", ALUMINUM (M2ABS20M6160-1-3).....	2
CENTER CROSS BOOM TUBE, 4.5 X .250 X 240", ALUMINUM (M2ABS9.2-5-160-2)	1
ELEMENT CENTER SECTION #1, 3.0" X .250" X 60", AL. (M2AEP9.2-5-160-1).....	4
DE ELEMENT CENTER SECTION #1D, 3.0" X .250" X 34", AL. (M2AEP9.2-5-160-1D).....	2
ELEMENT SECTION #2, 2.5" X .250" X 45", ALUMINUM (M2AEP9.2-5-160-2).....	10
ELEMENT SECTION #3, 2.0" X .250" X 44", ALUMINUM (M2AEP9.2-5-160-3).....	10
ELEMENT SECTION #4, 1.750" X .058" X 27", ALUMINUM (M2AEP9.2-5-160-4).....	10
ELEMENT SECTION #5, 1.625" X .058" X 27", ALUMINUM (M2AEP9.2-5-160-5).....	10
ELEMENT SECTION #6, 1.5" X .058" X 47", ALUMINUM (M2AEP9.2-5-160-6).....	10
ELEMENT SECTION #7, 1.375" X .058" X 47", ALUMINUM (M2AEP9.2-5-160-7).....	10
ELEMENT SECTION #8, 1.250" X .058" X 83", ALUMINUM (M2AEP9.2-5-160-8).....	10
ELEMENT SECTION #9, 1.125" X .058" X 63", ALUMINUM (M2AEP9.2-5-160-9).....	10
ELEMENT SECTION #10, 1.0" X .058" X 85", ALUMINUM (M2AEP9.2-5-160-10).....	10
ELEMENT SECTION #11, .875" X .058" X 49", ALUMINUM (M2AEP9.2-5-160-11).....	10
ELEMENT SECTION #12, .750" X .049" X 79", ALUMINUM (M2AEP9.2-5-160-12).....	10
ELEMENT SECTION #13, .625" X .058" X 33", ALUMINUM (M2AEP9.2-5-160-13).....	10
ELEMENT TIP, .500" X .049" X (SEE DIM SHEET), ALUMINUM	10
HAIR PIN TUBES, .375" X .049" X 47" (M2ADP7447).....	2
CENTER INSULATOR, 2.0" X 36" FG ROD W/ COUPLING RINGS (4) (SABS0010).....	1
ELEMENT SUPPORT RISERS 1-1/2 X .125 X 36", WELDED (M2AVR0027)	5
VERTICAL RISER BRACKET, (MA2VR0067).....	5
SIDE GUY TUBE, 2.0" X .065" X 96" (M2AEP14.66-160-9)	2
BOOM TO ELEMENT PLATE 8" X 8" X 1/4" (M2APT0076)	5
SIDE GUY PLATE, (M2APT0091)	1
GUY CLAMP, 4.0 (SABM4000)	2
TURNBUCKLE PLATE HD 4" X 6" X 1/4" (M2APT0130).....	1
PHILLYSTRAN HPTG-6700, 50'	1
WIRE CLIP, 3/8", GALV	8
THIMBLE, 3/8", SS	4
TURNBUCKLE, 1/2" X 12", FORGED GALV	2
PHILLYSTRAN HPTG-1200, 100'.....	1
PHILLYSTRAN HPTG-1200, 15'.....	10
WIRE CLIPS, 1/8".....	56
THIMBLES, 3/16".....	28
TURNBUCKLE, 5/16" X 4", HOOK AND EYE.....	10
EYEBOLT, 1/4 X 2.0", FORGED GALV.....	10
MACHINED CRADLE, 4-1/2", ALUMINUM, HEAVY DUTY (M2AMC0139).....	16
MACHINED CRADLE, 4", ALUMINUM, HEAVY DUTY (M2AMC0138).....	16
MACHINED CRADLE, 3", ALUMINUM, HEAVY DUTY (M2AMC0140).....	16
U-BOLT & CRADLE, 2-1/2",.....	1
MACHINED CRADLE, 2", ALUMINUM, HEAVY DUTY (M2AMC0131).....	4
U-BOLT & CRADLE, 2",.....	6
U-BOLT, 2", SS (HINDLEY).....	2
UNI-CRADLE, 1-1/2" - 2", ALUMINUM (M2AMC0076).....	2
U-BOLT & CRADLE, 1-1/2", SS.....	10
COMPRESSION CLAMP, 5/8" (M2AMC0145) FOR TUNE UP	10
GROUNDING/ SUPPORT BAND CLAMP, #72 WITH HOLE 4" TO 5" (M2ADP0700)	1

9.2-5-160 PARTS & HARDWARE

SHORTING BAR, 1/2" X 1/2" X 5", ALUMINUM (M2ASB0262)	1
CLAMP BLOCKS, 3/8", ALUMINUM (M2AMC0261)	4
HAIRPIN SPACER, 3/8" X 3.062" (M2ADP7449).....	1
TURN BUCKLE PLATE, 1/4" X 2" X 4", ALUMINUM (M2APT0100)	2
BALUN, 1:1 (FGBL0100).....	1
BALUN MOUNTING PLATE, 1/8" X 4" X 4", ALUMINUM (M2APT0011)	1
ANTI SEIZE COMPOUND.....	2

HARDWARE

	<u>QTY</u>
BOLT, 3/8-16 X 6", HEX HEAD, SS	16
BOLT, 3/8-16 X 5-1/2", HEX HEAD, SS	16
BOLT, 3/8-16 X 5", HEX HEAD, SS	4
BOLT, 3/8-16 X 4-1/2", HEX HEAD, SS	16
BOLT, 3/8-16 X 3-1/2", HEX HEAD, SS	26
BOLT, 3/8-16 X 3", HEX HEAD, SS	20
BOLT, 3/8-16 X 2-1/2", HEX HEAD, SS	20
BOLT, 3/8-24 X 1-1/2", HEX HEAD, SS	4
LOCK WASHER, 3/8", SS	66
LOCKNUT, 3/8-24, SS	4
LOCKNUT, 3/8-16, SS	52
NUT, 3/8-16 SS	62
LOCK WASHER, 5/16", SS	34
NUT, 5/16-18, SS	32
BOLT, 1/4-20 X 4", HEX HEAD, SS	3
BOLT, 1/4-20 X 2.5 HEX HEAD SS.....	20
BOLT, 1/4-20 X 1", HEX HEAD, SS	15
SET SCREW, 1/4-20 X 1/4" SS.....	2
LOCK WASHER, 1/4", SS	4
LOCKNUT, 1/4-20, SS	48
NUT, 1/4-20, SS	4
SCREW, #8-32 X 2", PHILLIPS PAN HEAD, SS.....	22
SCREW, #8-32 X 1-3/4", PHILLIPS PAN HEAD, SS.....	32
SCREW, #8-32 X 1-1/2", PHILLIPS PAN HEAD, SS.....	16
SCREW, #8-32 X 1-1/4", PHILLIPS PAN HEAD, SS.....	20
SCREW, #8-32 X 1", PHILLIPS PAN HEAD, SS.....	20
SCREW, #8-32 X 1/2" PHILLIPS PAN HEAD, SS.....	10
NUT, #8-32, SS	10
LOCKNUT, #8-32, SS	110
ALLEN WRENCH, 1/8".....	1

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