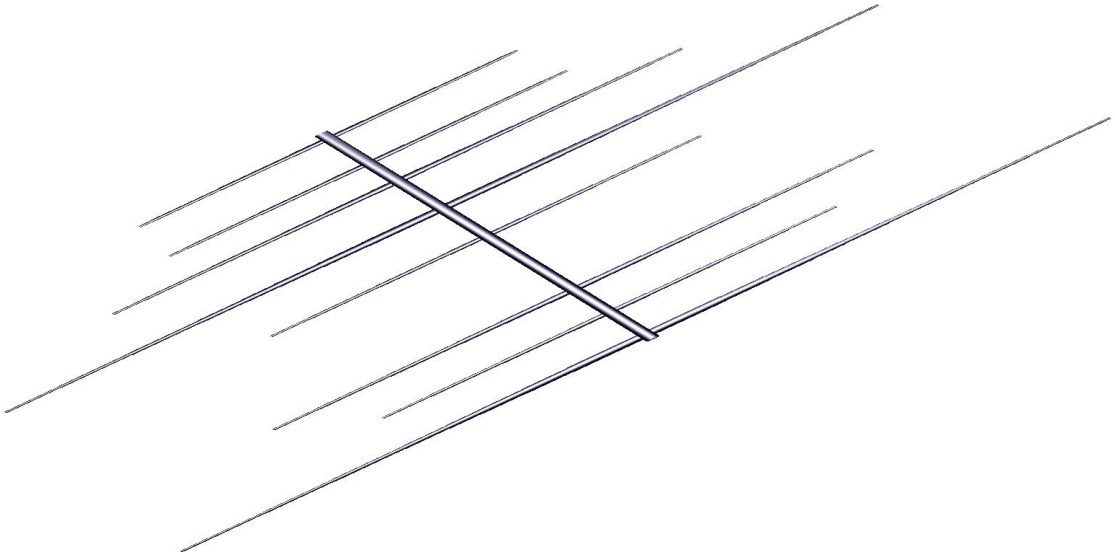

Owner's Manual

2X Arrays Model 2XA-3B-8L
WRTC TX38-100 (100 MPH Edition)

Triband Yagi Antenna
14 MHz / 21 MHz / 28 MHz

2X Arrays Limited Warranty and Liability

2X Arrays ("Manufacturer") warrants to the original purchaser that this product will be free from defects in material, and workmanship for a period of one (1) year from the date of purchase. The determination of whether any part or parts will be covered by this limited warranty and whether any part or parts will be repaired, replaced or refunded will be solely determined by 2X Arrays. Such determination will be made following evaluation of claim of alleged defect and subject to evaluation of possible misuse, abuse, unauthorized modifications, extreme weather conditions or improper installation. This warranty does not cover delivery, transportation, installation or any other costs that may be incurred from any defect.

The purchaser, final customer, installer and user of these products individually and collectively acknowledge that these products can cause injury or death and individually and collectively accept full responsibility and liability for any and all personal and property damage (direct, indirect and punitive) caused during installation and subsequent use.

Copyright Notice

Warning

Installation of this antenna near power lines is dangerous. Contact with any high voltage power lines could result in electric shock or loss of life. Do not install this antenna where there is any possibility that the antenna or any part of the supporting structure could come in contact with power lines.

Also ensure that no persons or pets can come in any contact with the antenna after it is installed. Dangerous voltages can exist on the antenna when it is in operation and no part of the system is insulated to prevent shock.

Consult with FCC OET Bulletin 65 to properly evaluate whether the chosen installation site for this antenna will comply with the FCC guidelines for human exposure limits to radio frequency electro-magnetic fields.

This antenna structure is not designed to be used as a support structure. No persons or objects should be supported by or suspended from the antenna structure at any time.

Because most antenna systems are installed at high heights, the installed location must take into account that falling debris may pose a hazard to humans, animals and property on the ground below.

Be aware of and follow all local codes and ordinances when installing this antenna.

Contact

If you have any questions regarding the assembly or operation of this antenna, you may contact 2X Arrays:

2X Arrays
5 Roe Dr.
Hyde Park, NY 12538

(845) 554-3003

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http://www.2XArrays.com/

Manufactured in the USA by
JK Antennas & Systems

http://www.JKAntennas.com/

Foreword

Thank you for selecting the 2X Arrays TX38-100, the official antenna of the 2014 WRTC. This Yagi-Uda antenna covers three Amateur Radio bands; 14 Mhz , 21 Mhz and 28 Mhz, using 8 elements on a 14'6" boom. This lightweight antenna utilizes 2 elements on 20 meters, 2 elements on 15 meters and 4 elements on 10 meters, providing the highest possible performance available for its size. There is a single 50 ohm feedpoint on the 20 meter driven element and the 15 meter and 10 meter driven elements are connected to the 20 meter driven element via balanced transmission lines.

The antenna is a direct 50 ohm feed, without any type of matching networks involved. As long as the balun guidelines (page 47) are met, there isn't any tuning required, there are no hairpins, gamma matches or element lengths to adjust. The antenna has been designed for wide bandwidth on each band, with the 2:1 SWR points falling outside of the band to provide extra headroom.

Gain and front to rear on all bands is consistent with a contemporary monoband antenna on each band with an equivalent number of elements and boom length. Front to rear, rather than front-to-back was selected to be maximized, resulting in a much cleaner rear pattern.

This model is the 100 MPH edition of the antenna used in the WRTC 2014. The original model was a light duty, 80 MPH model. The elements and boom have been redesigned, but electrically the two models are equivalent.

Parts List

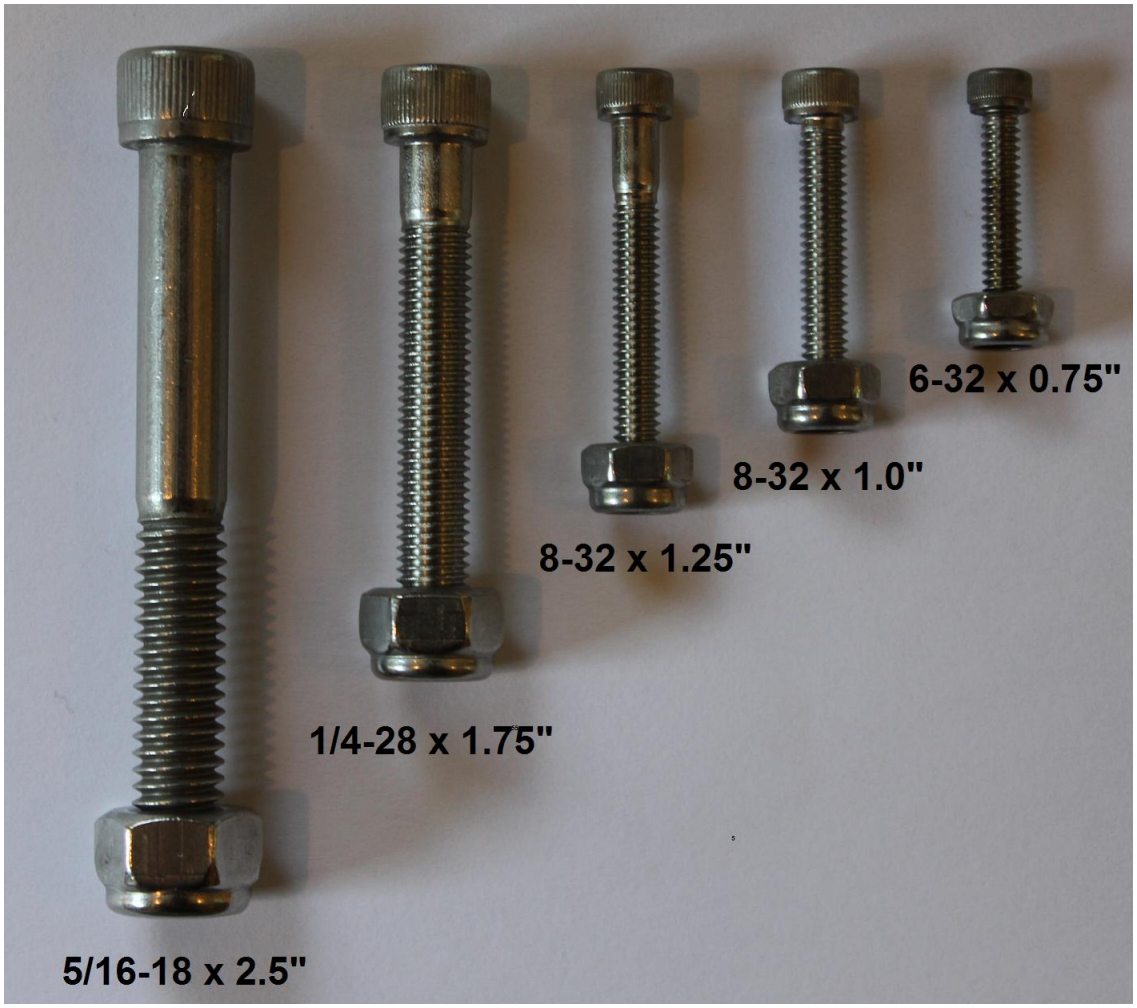
Refer to part numbers by antenna model and part number (e.g. 2XA-3B-8L-Part #). *The socket cap screws and nylon lock nuts come with approximately two extra pieces per size. It is normal to have extra when you have properly completed the assembly. Fiberglass colors can vary.*

Boom Assembly Parts

Part #	Description	Quantity
1-2.0	2" Galvanized steel U-Bolt(1) / Saddle Clamp(1) / Nuts(2) Optional 2-1/2" or 3" mast version (1-2.5 or 1-3.0)	2
2-2.0	Boom to Mast plate (6"x 6" x 1/4") Optional 2-1/2" or 3" mast version (2-2.5 or 2-3.0)	1
3	2" x 72" aluminum tube – 2 holes (boom section 1)	1
4	2" x 72" aluminum tube – 4 holes (boom section 2)	1
5	2" x 36" aluminum tube – 2 holes (boom section 3)	1
6	1 7/8" x 12" aluminum tube (boom splice)	2
7	5/16-18 x 2-1/2" S/S hex bolt	8
8	5/16" nylon lock nut	16
9	3/16" x 8.25" x 2-1/2" element plate (10 & 15 Meters)	6
10	1/4" x 9.00" x 3" element plate (20 Meters)	2
11	1/4-20 nylon lock nut	44
12	2" aluminum saddle clamp (half) – 4" x 1/2" x 1-3/16" (10 & 15 Meter element to boom saddle – plate side)	6
13	2" aluminum saddle clamp (half) – 4" x 1/2" 1-1/2" (10 & 15 Meter element to boom saddle)	6
14	2" aluminum saddle clamp (half) – 4" x 5/8" x 1-3/16" (20 Meter element to boom saddle & boom to mast plate – plate side)	4
15	2" aluminum saddle clamp (half) – 4" x 5/8" x 1-1/2" (20 Meter element to boom saddle & boom to mast plate)	4
16	1/4-20 x 3-1/2" S/S hex bolt	12
17	5/16-18 x 3-1/2" S/S hex bolt	8

Element Assembly Parts

Part #	Description	Total Quantity
18	1-1/4" x 72" aluminum tube (20 Meter parasitic element)	1
19	1-1/4" x 36" aluminum tube (20 Meter driven element)	2
20	1-1/8" x 24" aluminum tube (20 Meter elements)	4
21	1" x 18" aluminum tube (20 Meter elements)	4
22	7/8" x 24" aluminum tube (20/15 Meter elements)	8
23	3/4" x 24" aluminum tube (20/15 Meter elements)	8
24	5/8" x 36" aluminum tube (20/15/10 Meter elements)	16
25	1/2" x 36" aluminum tube (20/15/10 Meter elements)	16
26	3/8" x 42" aluminum tube (20 meter reflector element)	2
27	3/8" x 31" aluminum tube (20 meter driven element)	2
28	1" x 18" aluminum tube (15 meter parasitic element)	1
29	1" x 9" aluminum tube (15 Meter driven element)	2
30	3/8" x 27 1/8" aluminum tube (15 meter reflector element)	2
31	3/8" x 20 1/2" aluminum tube (15 meter driven element)	2
32	3/4" x 36" aluminum tube (10 Meter parasitic element)	3
33	3/4" x 18" aluminum tube (10 Meter driven element)	2
34	3/8" x 25 1/4" aluminum tube (10 meter reflector element)	2
35	3/8" x 20 1/4" aluminum tube (10 meter driven element)	2
36	3/8" x 13 1/4" aluminum tube (10 meter director #1 element)	2
37	3/8" x 7" aluminum tube (10 meter director #2 element)	2
38	1-1/4" black nylon element support block (half) (20 meter elements)	8
39	1" black nylon element support block (half) (15 meter elements)	8
40	3/4" black nylon element support block (half) (10 meter elements)	16
41	1/4-20 x 1-3/4" Socket cap screw	24
42	1/4-20 x 2-3/4" Socket cap screw	8
43	10-24 x 1-1/2" Socket cap screw	8
44	#10-24 nylon lock nut	14
45	8-32 x 1-1/4" Socket cap screw	16
46	8-32 x 1"Socket cap screw	16
47	8-32 Nylon lock nut	32
48	6-32 x 3/4" Socket cap screw	32
49	6-32 Nylon lock nut	32
50	#10-24 x 1-1/2" button head screw (10 meter feed point stud)	2
51	#10-24 x 2" button head screw (15/20 meter feed point stud)	4
52	#10-24 Keps® Nut (hex nut with integrated star lock washer)	6
53	#10 flat washer	12
54	Solid fiberglass rod – 9" x 1" (20 meter center insulator)	1
55	Solid fiberglass rod – 9" x 7/8" (15 meter center insulator)	1
56	Solid fiberglass rod – 9" x 5/8" (10 meter center insulator)	1
57	Phasing line, 24" length, flexible two-wire with ring terminals (3kW)	2


6-32 x 0.75"
8-32 x 1.0"
8-32 x 1.25"
1/4-28 x 1.75"
5/16-18 x 2.5"

Tools required

This antenna uses all **SAE standard tool sizes**. Metric fasteners are *not* used on this antenna. Ensure hex keys used are **SAE** sizes to avoid stripping the socket cap screw heads.

Size	Description
5/16”	Nut driver, socket or wrench (for #6-32 nylon lock nuts)
11/32”	Nut driver, socket or wrench (for #8-32 nylon lock nuts)
3/8”	Nut driver, socket or wrench (for #10-24 nylon lock nuts)
1/2”	Nut driver, socket or wrench (for 1/4-20 nylon lock nuts)
9/16”	Nut driver, socket or wrench (for 5/16-18 nylon lock nuts)
7/64”	Allen wrench / Hex Key (for 6-32 socket head screws)
9/64”	Allen wrench / Hex Key (for 8-32 socket head screws)
5/32”	Allen wrench / Hex Key (for 10-24 socket head screws)
3/16”	Allen wrench / Hex Key (for 1/4-20 socket head screws)
9/16"	Socket and ratchet (preferred), or combination wrench, or adjustable wrench (for boom to mast u-bolts)

Recommended Items

- Saw horses to set antenna on during assembly
- Battery powered / cordless drill or screw driver with adapters for sockets and/or Allen® sockets (hex key sockets). Drill / screw driver preferably has an adjustable clutch
- Anti-seize compound for fasteners
- Anti-oxidant for aluminum joints (such as Noalox ® or Penetrox ®)
- Electrical contact enhancer, conditioner & protector (such as DeoxIT® Shield)
- Coax-Seal ® (or equivalent)
- Tape measure (at least 20’ long)
- DC Ohm meter / continuity checker

Assembly Hints & Tips

This antenna uses aluminum tubing and stainless steel fasteners. Although stainless steel resists rust and corrosion which makes it ideal for antenna use**, it is especially prone to "galling" when being tightened or loosened**. When galling occurs a nut can become seized on the bolt requiring the bolt to be cut or drilled to be removed. Galling most often occurs once a nut has been torqued at least once. The proper solution to prevent galling is to coat the thread of the hardware with an "anti-seize" or "anti-galling" compound designed to prevent galling. This antenna uses premium stainless hardware and all the nylon lock nuts have a factory wax coating on the threads to prevent galling during initial installation. It is still advisable to coat the screw threads with an anti-seize compound.

If you are removing a nut that has been installed, especially if it was exposed to the elements, even if the threads were pre-treated with an anti-seize compound, it can help to apply a penetrating lubricant prior to removal of stainless steel nuts to prevent galling. If during the removal or tightening of a nut, you feel the torque required to turn the nut increasing rapidly, the best technique is to stop immediately, liberally apply a liquid penetrating lubricant, work the hardware back in the opposite direction to allow the penetrating lubricant to soak and fully lubricate the threads. If you force a stainless steel nut on or off too far once galling begins, the nut will permanently seize. It is an easy mistake to think the nut will tighten or loosen all the way before the nut permanently seizes, but its best to never force it and liberally apply a lubricant before it's too late. A galling nut will usually squeak as its turns and will feel hot to the touch if it was forced enough. Use slowest speeds on cordless drills or screw drivers when installing to reduce the risk of galling.

The element and boom assemblies use aluminum tubing sections that telescope together. To prevent corrosion between the overlapping joints which increases electrical resistance between sections and can cause the sections to seize together (preventing disassembly), an anti-seize compound should be applied. Two suggested products are "Penetrox A" manufactured by Burndy, or "Noalox Anti-Oxidant Compound" manufactured by Ideal. This will ensure optimal long term electrical and mechanical performance from your 2X Arrays antenna.

On all hardware, resist the urge to over-tighten. Especially hardware that uses a nylon lock nut - extreme force is not required. **Over-torquing will distort mating surfaces and actually *reduce* the holding capability and/or strength of the hardware.** Once hardware begins seat firmly, it only takes a few more turns to properly torque the hardware. The nylon lock nuts do not require higher torque values that would be required to engage a conventional split lock washer. **Over-torquing the screws that use a nylon lock nut can crush the aluminum tubing**. Being consistent in applying torque across fasteners is also important. For instance when applying torque to the two bolts that hold a single clamp on

the boom or to the mast, applying uneven torque between the bolts can reduce the holding power of the clamp. When torquing bolts on a U-Bolt or aluminum saddle clamp, you should alternate between each bolt applying an even amount to turns to each bolt keeping torque on each bolt as close as possible. This keeps the clamp engaging squarely and maximizes clamping force. You can use the exposed threads on the bolts to visually gauge if two bolts have about the same amount of torque. A “torque wrench” would provide absolute insurance of even torque values.

You need a large flat area to assembly this antenna. It is advisable to assemble the antenna over a smooth, flat surface such as a driveway. This way, if parts are dropped, they are easily recovered. If this is not possible, then a tarp or drop cloth should be employed to catch dropped hardware.

Read through each numbered step completely before taking any action on the step, there may be more details or instructions as you read the complete step that might not be obvious if you go sentence by sentence. For instance you maybe be instructed to install a nut, but there maybe further instructions to *not* fully tighten the nut at that point. Steps can span pages, so be aware you may have to flip the page to fully read a step.

Getting Started – Antenna Anatomy

The assembly is grouped into two main assemblies:

1. The **boom**
2. The **elements (8 total)**

Figure 1 shows the two main assemblies areas:

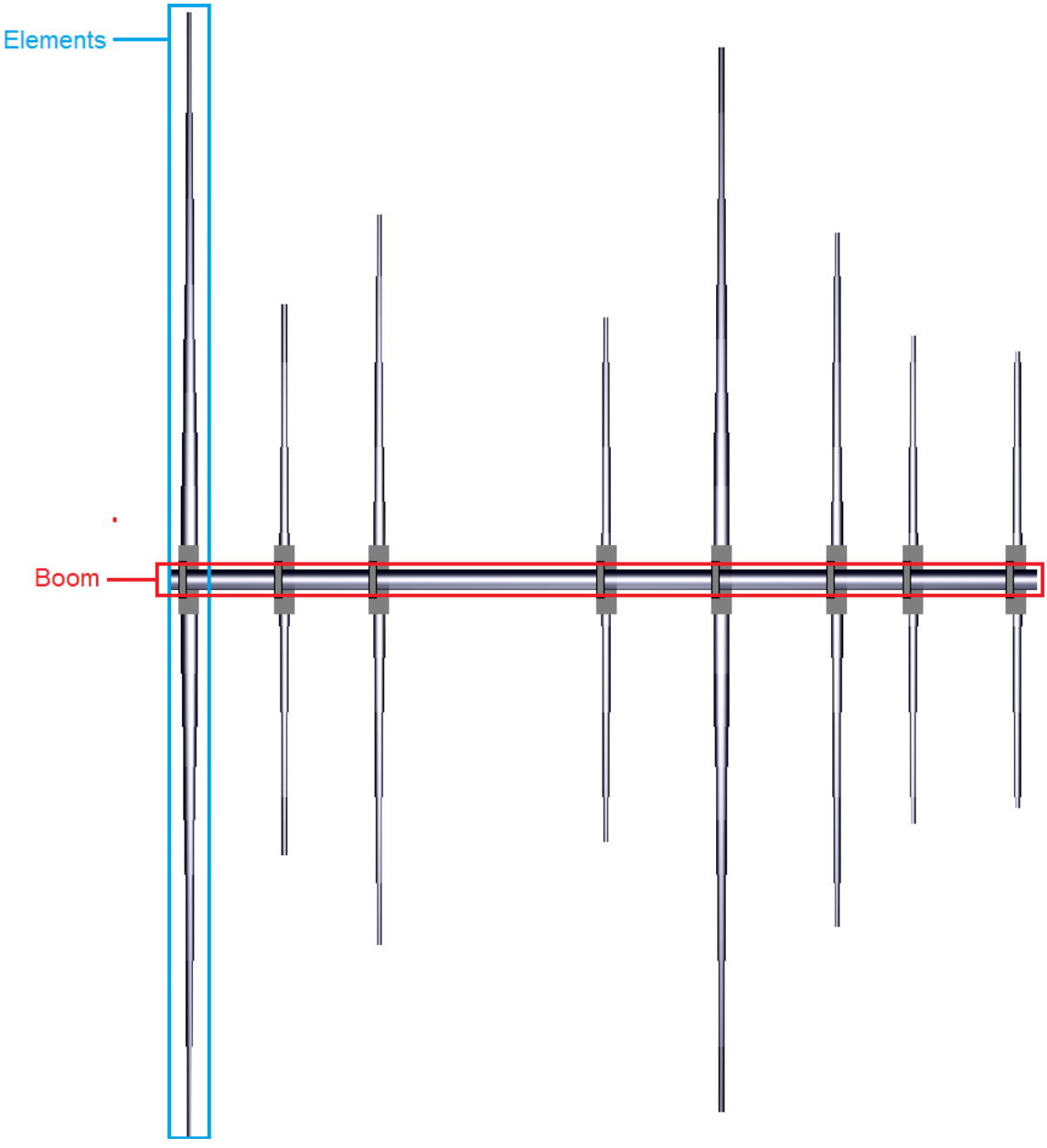


Figure 1 – Two main assembly areas, the "boom" and the "elements"

Boom Assembly

Refer to figure 2 during “Boom Assembly” instructions.

The boom consists of three aluminum pieces of tubing with two 6 foot lengths and one 3 foot length, all of which have a 2.0 inch outer diameter.
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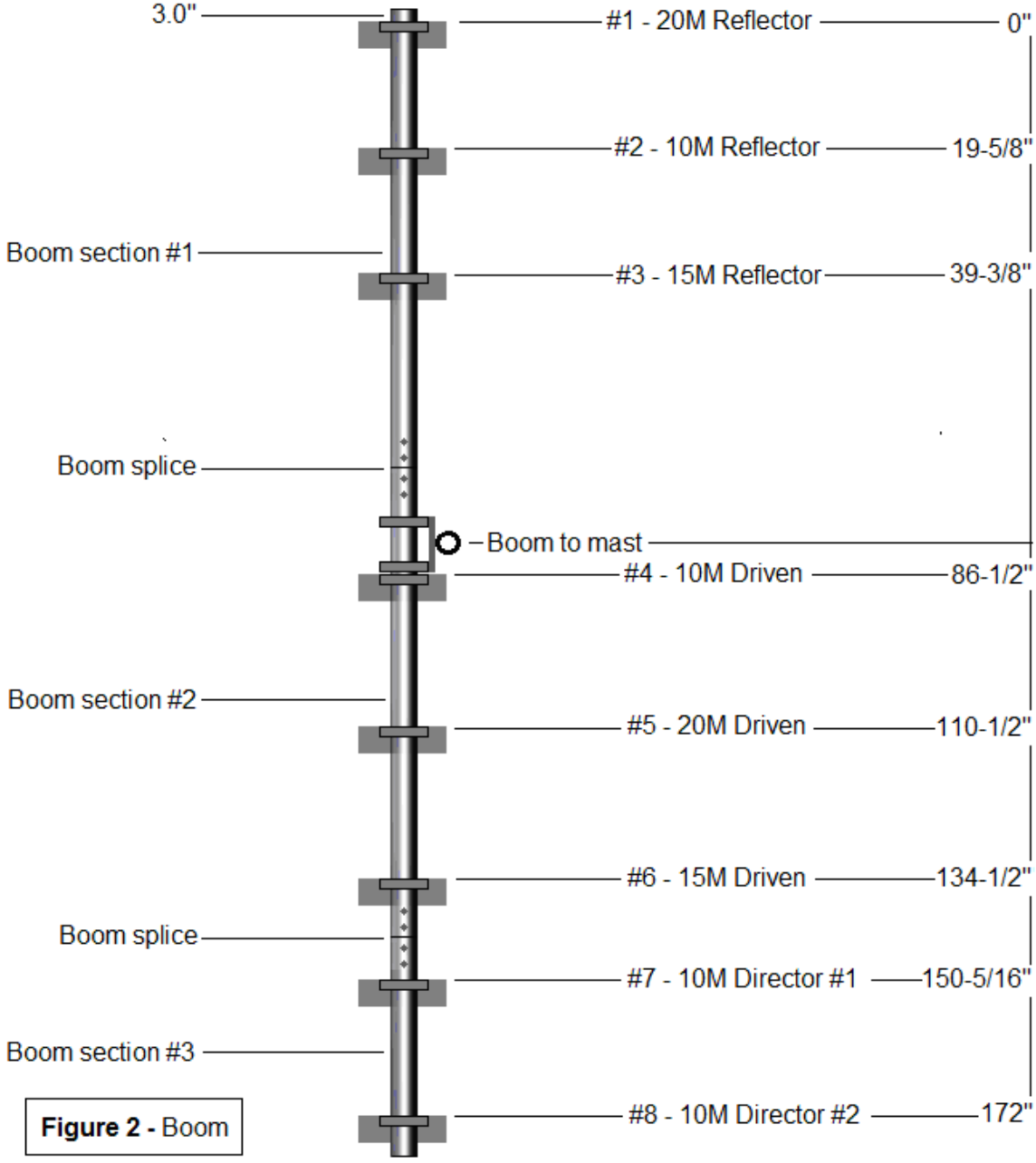

Figure 2 - Boom

Step 1 ☐ Lay the three boom sections **(Part #3, #4 and #5**) in the proper order in a row on saw horses. Boom section 1 (Part #3) is 72” long and only has holes drilled on one end. Boom section 2 (Part #4) is 72” long and has holes drilled on both ends. Boom section3 (Part #5) is 36” long and has holes drilled on one end. See figure 3.

Figure 3 - Lay boom sections out on sturdy saw horses in order.

Step 2 ☐ Take one of the 7/8” x 12” aluminum tube (Part #6) boom splices and insert it 6” inside boom section one and rotate it to align the through holes. Take two 5/16-18 x 2-1/2” hex bolts (Part #7) and insert sent through the aligned holes. The head of the hex bolt should be on the top side of the boom (and remain in this orientation). Place a 5/16-18” nylon lock nut (Part #8) on each installed bolt. Slide boom section #2 over boom sleeve, align and installed two more 5/16-18” bolts and nuts. Do final tightening on these bolts, **BUT DO NOT OVERTIGHTEN**. Once the bolt is seated firmly, make one more turn. Refer to figure 4 for completed view of joint.

Step 3 ☐ Take the remaining 7/8” x 12” aluminum tube (Part #6) boom splice and joint boom section 2 and section 3 as was done in step #2 to complete assembly of the boom tubing.

Figure 4 - Boom splice installed. The hex head should face up and the nylon lock nuts should face down.

Step 4 ☐ Take the boom to mast plate (Part #2), four 2" aluminum saddle clamps (Part #15 (2), Part #14 (2)), four 5/16-18 x 3-1/2" hex bolts (Part #7) and nuts (Part #8), and mount the boom to mast plate approximately 85 inches from the end of the boom (Element #1 end). Place the hex bolts through the boom to mast plate, then slide the saddles over the bolts, place onto boom, then slide other saddle clamp over hex bolts and finally place the nuts onto the bolts.

Note there are two different heights of saddle clamps; place the short saddle against the boom to mast plate. Refer to figure 5.

Figure 6 shows the completed boom to mast plate.

Do not do final torquing at this time, this plate might move and need aligned later.

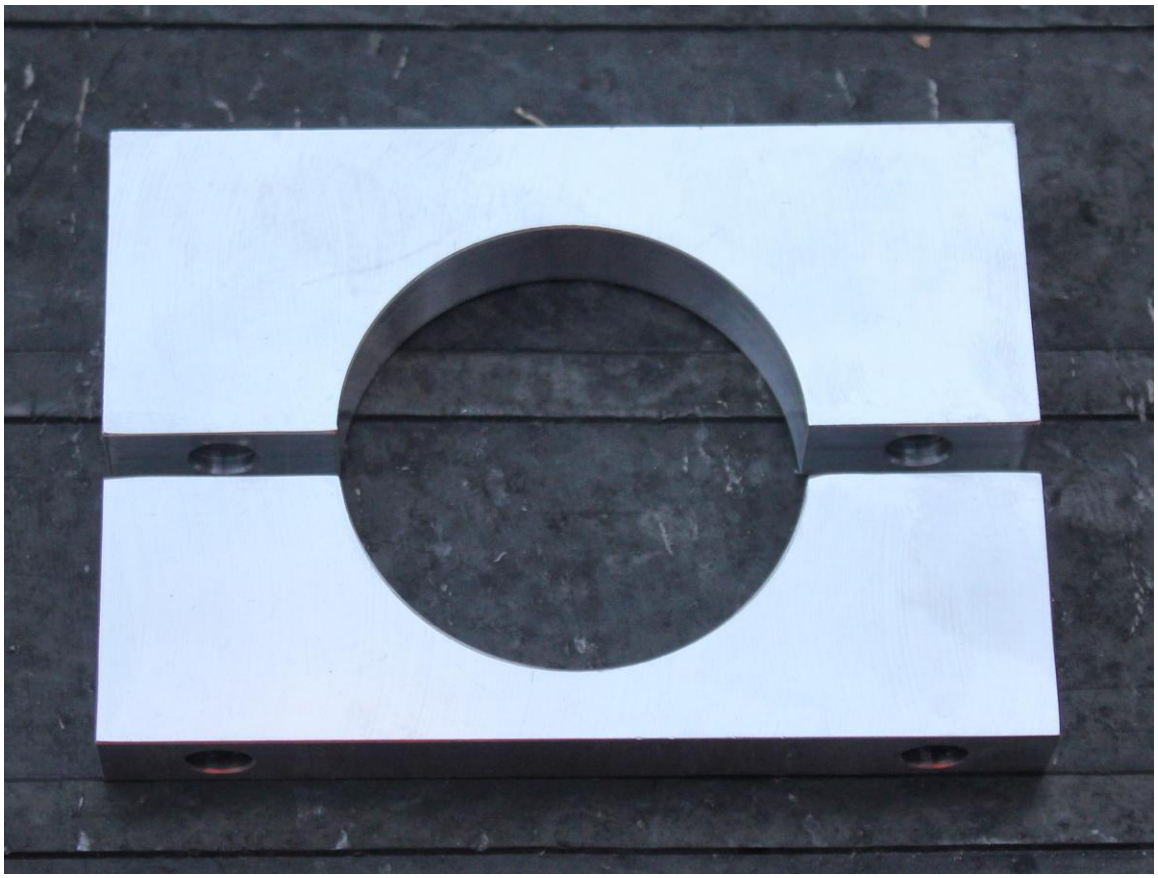

Figure 5 – Aluminum saddle clamps. Note two different saddle clamp sizes that make up one clamp assembly. *The shorter side always goes against the plate to which it is mounted to.*

Figure 6 – Boom to mast plate mounted. This plate should be mounted perpendicular to the ground.

This concludes assembly of the boom.

Element Assembly

The elements are made up of various telescoping sizes of aluminum tubing ranging from 1-1/4" to 3/8". Each of the 8 elements comes bundled together for easy identification and assembly. The elements are designed to be mounted on the *underside* of the boom. This is the preferred way because it helps to keep direct weather and sunlight off the element insulators and electrical connections.

The elements sections are joined together with a single socket cap screw. In all cases where element sections are telescoped together, the head of the socket cap screw will be inserted into the larger diameter counterbored hole through the outer tubing section and exit out the other side of the larger diameter tubing, see figure 7, 8 and 9. This fastening method compresses the two tubes together and creates a mechanically and electrically superior joint. The single bolt can be installed quicker than any other joining method, including multiple rivets, when using a cordless screwdriver. It can also be quickly disassembled and later reassembled reusing the same hardware (unlike rivets which must be drilled out and replaced). This is useful for emergency use or exercises such as field day. Standard hex or wing nuts (not provided) could be used for quicker assembly and disassembly in *temporary installations*.

To give a summary of the element assembly, all of the element center tubing sections will be assembled and then mounted to the element to boom plates. Then, the rest of the element sections will be assembled off the antenna, and then joined to the previously mounted center sections. This is the most efficient way to assemble the elements.

The elements are grouped and shipped in 8 bundles. It is advisable to lay these out in order from #1 through #8. You will open various bundles at different times, so you need to keep the element bundle separated and keep them properly staged.

The bundles are labeled as such:

1. Element # 1 - "**20R**"
2. Element # 2 - "**10R**"
3. Element # 3 - "**15R**"
4. Element # 4 - "**10DRV**"
5. Element # 5 - "**20DRV**"
6. Element # 6 – "**15DRV**"
7. Element # 7 – "**10DIR1**"
8. Element # 8 – "**10DIR2**"

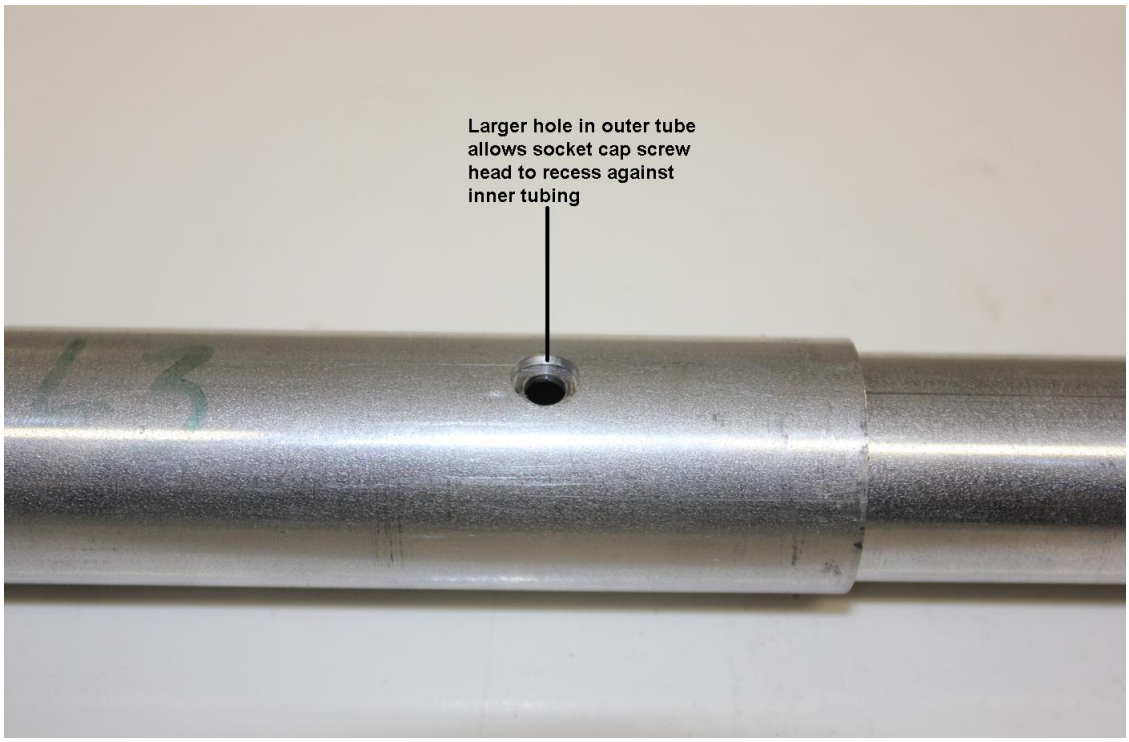

Figure 7 – Telescoped sections of element tubing. Element joint shows counterbored hole in the outer tube.

Figure 8 – Socket cap screw head fits in recess

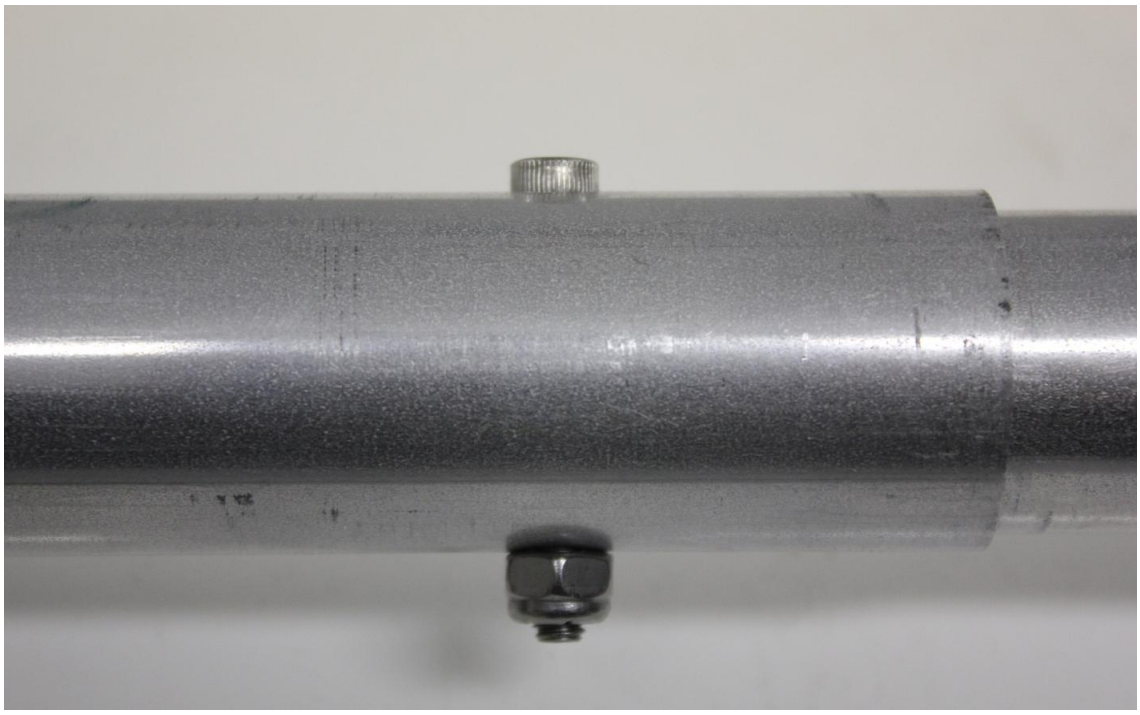

Figure 9 – Nylon lock nut placed on the opposite end. The socket cap head faces upward when installed on the antenna, the nylon nut faces down

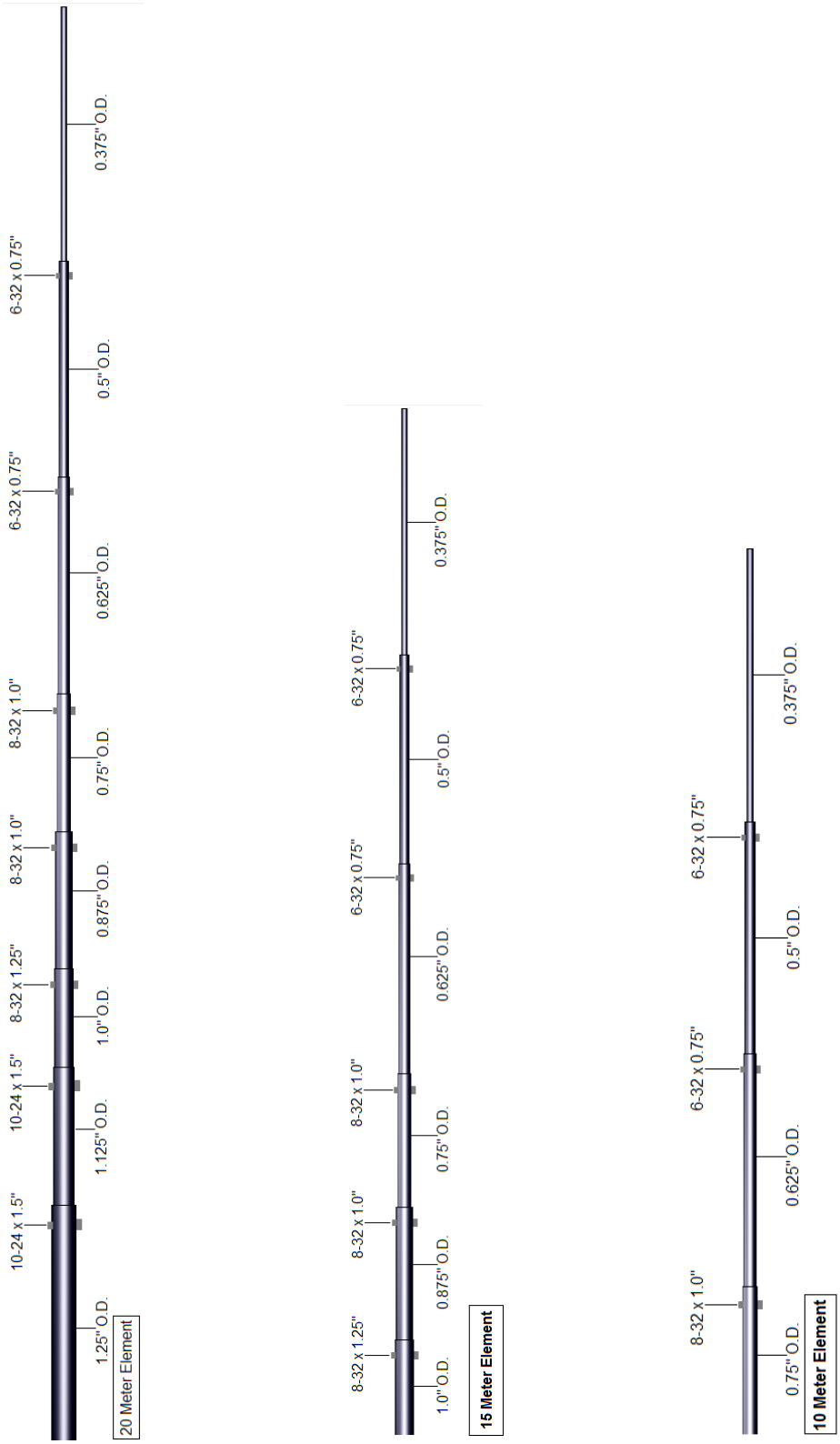

Figure 10 - Socket cap screw sizes shown by band and element section. *Half element shown.*

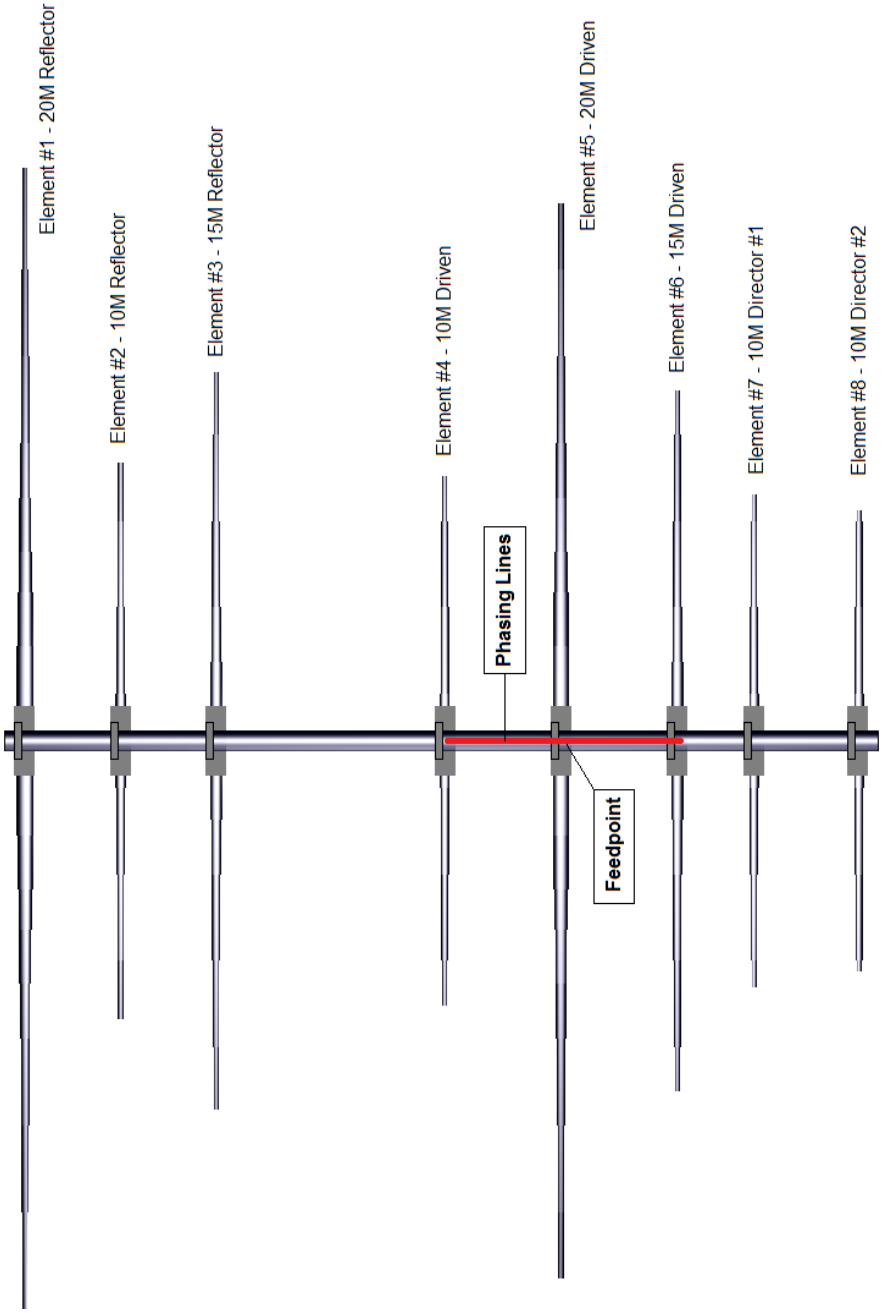

Figure 11 – 2XA-3B-8L element positions and descriptions. The 50 Ohm coax connects to the “Feedpoint”. The “Phasing Lines” connect elements 4, 5 & 6. Top side of boom shown, phasing lines run on the underside of boom.

Element Dimensions

Element Description	Half Length	Total Length	Exposed 3/8" Tip Length
1. 20 Meter Reflector	219"	438"	39"
2. 10 Meter Reflector	106-1/4"	212-1/2"	22-1/4"
3. 15 Meter Reflector	141-1/8"	242-1/8"	24-1/4"
4. 10 Meter Driven	101-1/8"	202-1/4"	17-1/8"
5. 20 Meter Driven	208"	416"	28"
6. 15 Meter Driven	134"	268"	17"
7. 10 Meter Director #1	94-1/4"	188-1/2"	10-1/4"
8. 10 Meter Director #2	88"	176"	4"

Table 1 - Element lengths

Refer to figure 16 for a preview of the parts that will be assembled in step #5 through step # 12.

Step 5 ☐ Locate the element # 1 bundle (labeled “20R”) and the following parts (note the tube is packed with the element bundle):

1. one 1-1/4 x 72” aluminum tube (**Part #18**)
2. one 1/4 x 9” x 3” flat aluminum plate (**Part #10**)
3. four 1/4-20 x 2” socket cap screws (**Part #42)**
4. four 1/4-20 nylon lock nuts (**Part #11**)
5. four 1-1/4” black nylon clamps (**Part #38**)
6. two 5/16-18 x 3-1/2” hex bolts (**Part #17**)

Place the two 5/16-18 bolts (Part #6) through the element plate (Part #1). These bolts will not fit through the plate once the element is mounted to the plate (next paragraph). This only applies to the two 20 meter element plates. The hex head of the bolt will be on the same side as the black nylon clamp mounted next.

Mount the tube to the plate using the black nylon clamps. Place the socket cap screws through the black nylon clamps and through the plate, then install the 1/4-20 nylon lock nuts as shown in figure 13 (nuts not installed yet in photo).

Install the remaining nylon clamp and hardware in the same fashion on the opposite end of the plate.

Before applying final torque to the black nylon clamps, there are **TWO** alignments that have to be completed:

1. Center the mounting plate on the 72” tube. There will be ~32” of tube extending from each side of the plate.
2. There are holes drilled on the each end of the 72” tube. Place the larger counterbored holes (5/16”) face up on the same side as the nuts are on the mounting plate. In other words, the plate will be horizontal when mounted, the nuts will be on topside of the plate and the counterbored holes should be facing straight up.

After you do the previous alignments, you can do final tightening of the 1/4-20 x 2”bolts. Do not apply all the torque to one bolt at a time as this raises the chance of galling occurring when the opposite bolt is tightened. Half tighten one bolt, then torque the other all way, return to the original bolt; torque that one all the way. The proper amount of torque is achieved when the element halves

just start to touch each other. Close the gap between the two halves evenly. See figure 14. There should be an even amount of thread sticking above each nut when they are torqued evenly.

Set this assembly back aside with the element #1 bundle.

Figure 12 – Sample element bundle.

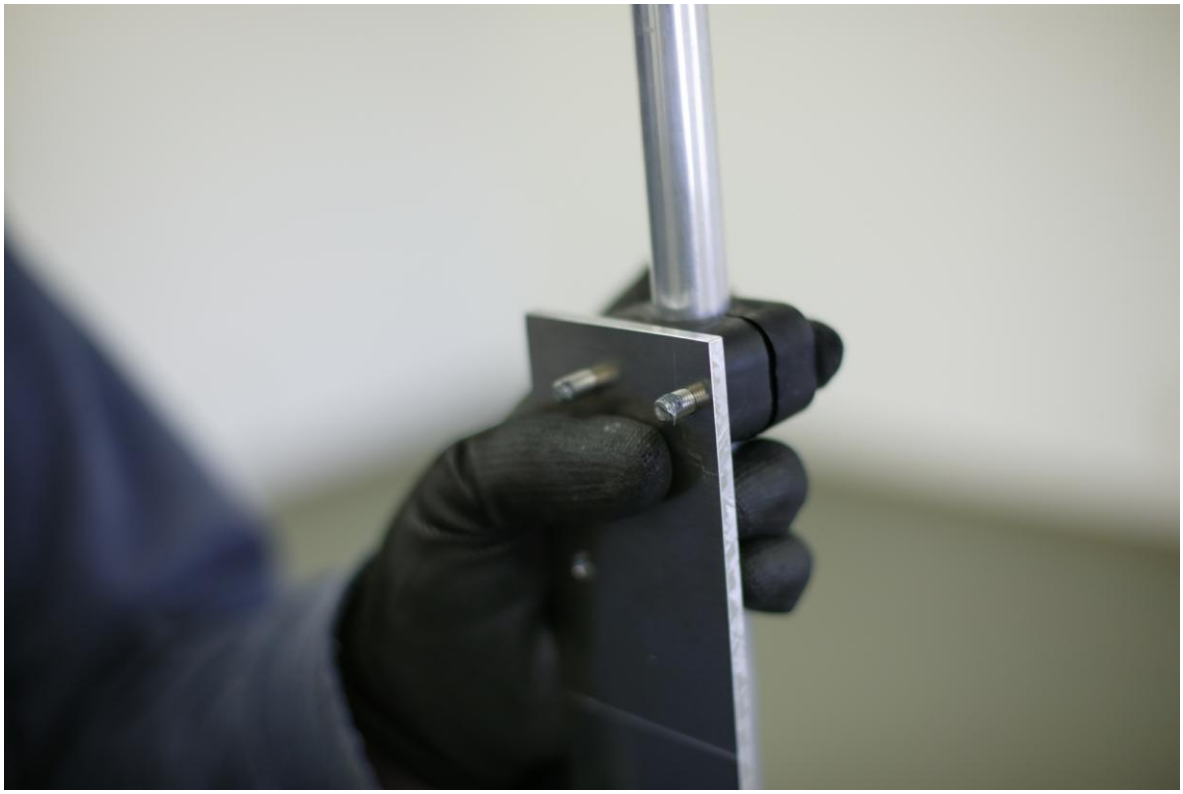

Figure 13 – Assemble center section of element to plate with nylon clamps. Grey colored anti-seize compound installed on the bolt threads. Nuts not yet installed in photo.

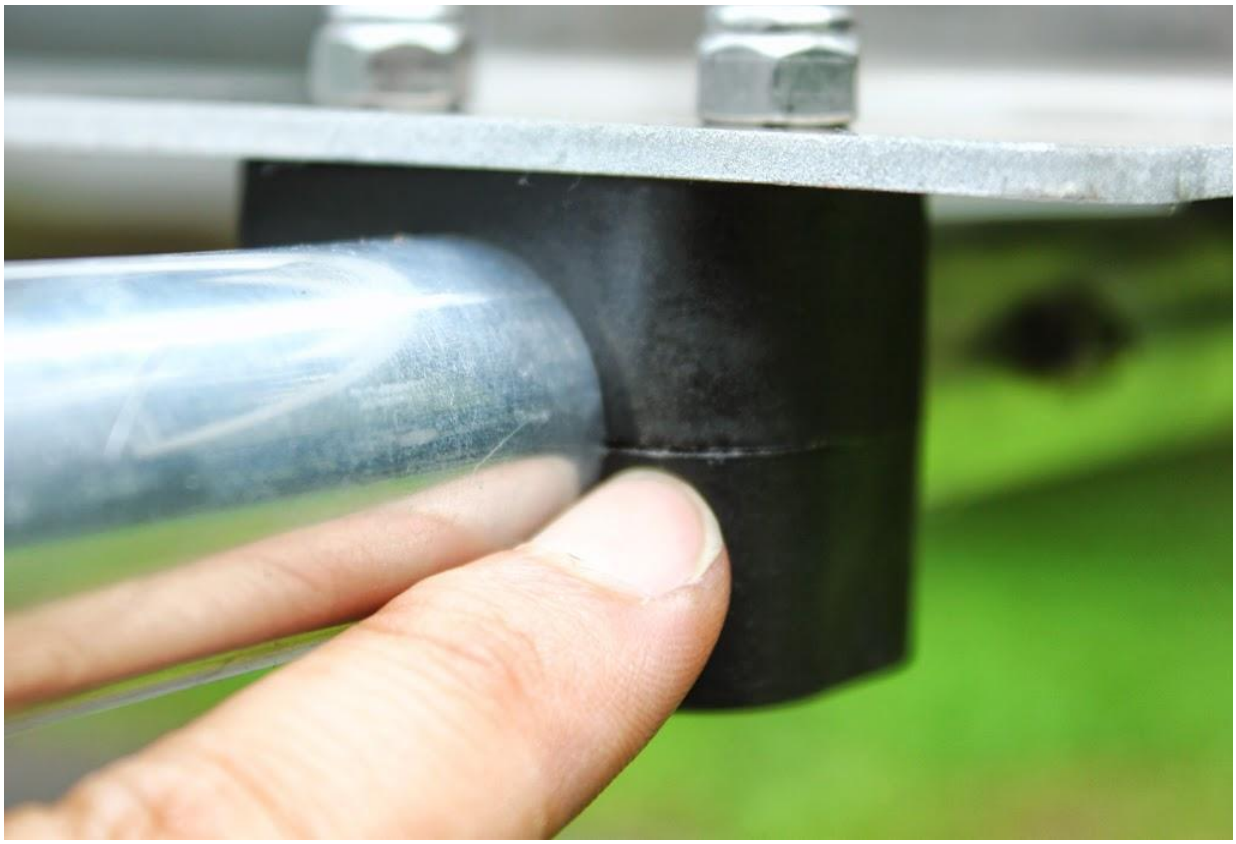

Figure 14 – Tighten the nylon clamp evenly. Alternate between each bolt to avoid galling. The gap between the blocks should just close when the torque is correct. Do not continue to add additional torque after the gap closes.

Step 6 ☐ Locate the element # 5 bundle, labeled “20DRV” and the following parts:

1. two 1-1/4 x 36” aluminum tubes (**Part #19**)
2. one 9” x 1” solid fiberglass rod (**Part #54**)
3. two 10-24 x 2” button head screws (**Part #51**)
4. two 10-24 Keps nuts (**Part #52**)

Refer to figure 15. The 1” fiberglass section is used to splice together the two 1-1/4” tubes. Slide the fiberglass inside the 1-1/4” tube and align the through holes. Place two 10-24 x 2” button head machine screws (Part #51) through and tighten a 10-24 Keps nut (Part #52) on each. The 1”fiberglass splice is centered between the 1-1/4” sections.

NOTE: **The head of the button head screw is to be placed on**

the same side as the 5/16" counterbored hole on the opposite end of the tube.

The button head machine screws form the studs that the balun hooks onto and these need to be pointing down when assembled and all counterbored holes face up. This is why this orientation is necessary.

Do final tightening of these 10-24 screws at this time. These are easy to torque with just a hex key. The Keps nut will bite into the aluminum and not turn once it is seated. This ensures a solid electrical connection to the driven element. You may wish to apply an anti-oxidant (see page 9) to the Keps nuts before installing if the antenna will be installed in a harsh marine environment

Finally, refer back to step # 5 above, mount this newly assembled piece onto a plate as in step # 5, using the exact same steps.

Set this assembly back aside with the element #5 bundle

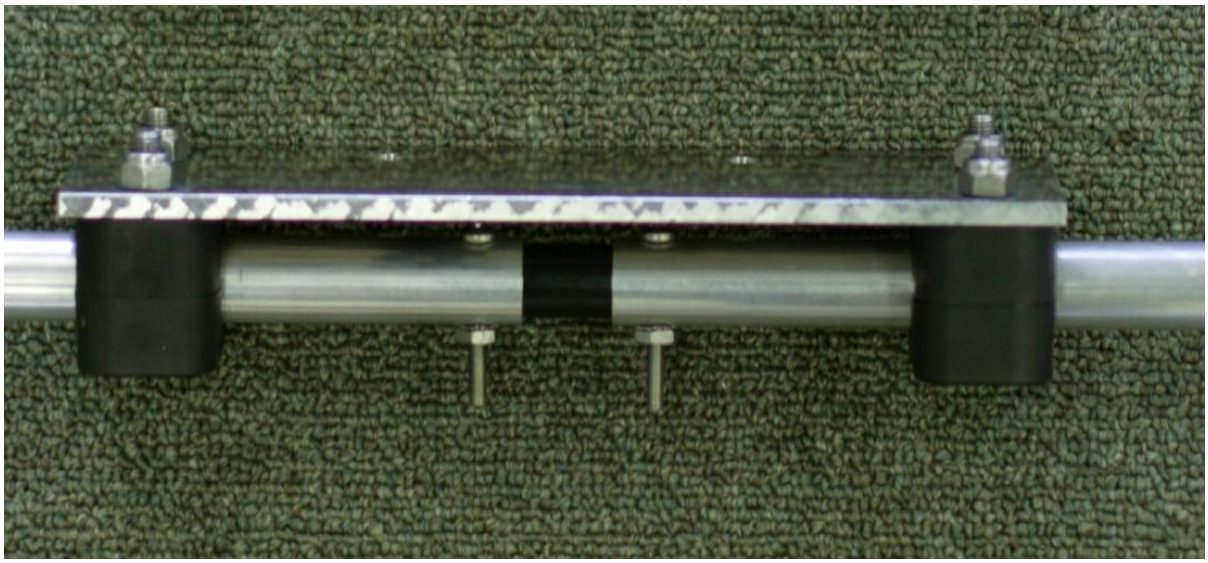

Figure 15 - Driven element assembly showing fiberglass split center section with #10 studs.

Step 7 ☐ Locate the element # 3 bundle (labeled “15R”) and the following parts (note the tube is packed with the element bundle):

1. one 1” x 18” aluminum tube (**Part #28**)
2. one 3/16” x 8.25” x 2-1/2” flat aluminum plate (**Part #9**)
3. four 1/4-20 x 1.75” socket cap screws (**Part #41)**
4. four 1/4-20 nylon lock nuts (**Part #11**)
5. four 1” black nylon clamps (**Part #39**)

Mount the tube to the plate using the black nylon clamps as you did in step # 5 above. The only difference is you will have ~4” of tube extending beyond the plate to have centered. Also note the counterbored hole (9/32”) alignment before final torquing.

Set this assembly back aside with the element #3 bundle.

Step 8 ☐ Locate the element # 6 bundle, labeled “15DRV” and the following parts:

1. two 1.0 x 9” aluminum tubes (**Part #29**)
2. one 9” x 7/8” solid fiberglass rod (**Part #55**)
3. two 10-24 x 2” button head screws (**Part #51**)
4. two 10-24 Keps nuts (**Part #52**)

The 7/8” fiberglass section is used to splice together the two 1” tubes. Slide the fiberglass inside the 1” tube and align the through holes. Place two 10-24 x 2” button head machine screws (Part #51) through and tighten a 10-24 Keps nut (Part #52) on each. The 7/8” fiberglass splice is centered between the 1” sections.

NOTE: **The head of the button head screw is to be placed on the same side as the 9/32” counterbored hole on the opposite end of the tube**. The button head machine screws form the studs that the phasing line hooks onto and these need to be pointing down when assembled and all counterbored holes face up. This is why this orientation is necessary.

Do final tightening of these 10-24 bolts at this time. These are easy to torque with just a hex key. The Keps nut will bite into the aluminum and not turn once it is seated. This ensures a solid electrical connection to the driven element. You may wish to apply an anti-oxidant (see page 9) to the Keps nuts before installing if the antenna will be installed in a harsh marine environment

Finally, refer back to step # 7 above, mount this newly assembled

piece onto a plate as in step # 7, using the same steps – *however**, do not** do final torquing of the 1/4-20 nylon lock nuts at this time, this element maybe need to be rotated in the nylon clamps to properly adjust phasing line tension at a later step.*

Set this assembly back aside with the element #6 bundle

Step 9 ☐ Locate the element **#** 2 bundle (labeled "10R") and the following parts (note the tube is packed with the element bundle):

1. one 3/4" x 36" aluminum tube (**Part #32**)
2. one 3/16" x 8.25" x 2-1/2" flat aluminum plate (**Part #9**)
3. four 1/4-20 x 1.75" socket cap screws (**Part #41)**
4. four 1/4-20 nylon lock nuts (**Part #11**)
5. four 3/4" black nylon clamps (**Part #40**)

Mount the tube to the plate using the black nylon clamps as you did in step **#** 5 above. The only difference is you will have ~14" of tube extending beyond the plate to have centered. Also note the counterbored hole (9/32") alignment before final torquing.

Set this assembly back aside with the element #2 bundle

Step 10 ☐ Locate the element **#** 4 bundle, labeled "10DRV" and the following parts:

1. two 3/4" x 18" aluminum tubes (**Part #33**)
2. one 9" x 5/8" solid fiberglass rod (**Part #56**)
3. two 10-24 x 1-1/2" button head screws (**Part #50**)
4. two 10-24 Keps nuts (**Part #52**)

The 5/8" fiberglass section is used to splice together the two 3/4" tubes. Slide the fiberglass inside the 3/4" tube and align the through holes. Place two 8-32 x 1-1/2" button head machine screws (Part #50) through and tighten a 10-24 Keps nut (Part #52) on each. The 5/8" fiberglass splice is centered between the 3/4" sections.

NOTE: **The head of the button head screw is to be placed on the same side as the 9/32" counterbored hole on the opposite end of the tube**. The button head machine screws form the studs that the phasing line hooks onto and these need to be pointing down when assembled and all counterbored holes face up. This is why this orientation is necessary.

Do final tightening of these 10-24 bolts at this time. These are easy to torque with just a hex key. The Keps nut will bite into the aluminum and not turn once it is seated. This ensures a solid electrical connection to the driven element. You may wish to apply an anti-oxidant (see page 9) to the Keps nuts before installing if the antenna will be installed in a harsh marine environment

Finally, refer back to step # 7 above, mount this newly assembled piece onto a plate as in step # 7, using the same steps – *however**, do not** do final torquing of the 1/4-20 nylon lock nuts at this time, this element maybe need to be rotated in the nylon clamps to properly adjust phasing line tension at a later step.*

Set this assembly back aside with the element #6 bundle

Step 11 ☐ Locate the element **#** 7 bundle (labeled "10DIR1") and the following parts (note the tube is packed with the element bundle):

1. one 3/4" x 36" aluminum tube (**Part #32**)
2. one 3/16" x 8.25" x 2-1/2" flat aluminum plate (**Part #9**)
3. four 1/4-20 x 1.75" socket cap screws (**Part #41)**
4. four 1/4-20 nylon lock nuts (**Part #11**)
5. four 3/4" black nylon clamps (**Part #40**)

Mount the tube to the plate using the black nylon clamps as you did in step **#** 5 above. The only difference is you will have ~14" of tube extending beyond the plate to have centered. Also note the counterbored hole (9/32") alignment before final torquing.

Set this assembly back aside with the element #7 bundle

Step 12 ☐ This step is similar to step11, but for the last remaining element.

Locate the element **#** 8 bundle (labeled "10DIR2") and the following parts (note the tube is packed with the element bundle):

1. one 3/4" x 36" aluminum tube (**Part #32**)
2. one 3/16" x 8.25" x 2-1/2" flat aluminum plate (**Part #9**)
3. four 1/4-20 x 1.75" socket cap screws (**Part #41)**
4. four 1/4-20 nylon lock nuts (**Part #11**)
5. four 3/4" black nylon clamps (**Part #40**)

Mount the tube to the plate using the black nylon clamps as you did

in step # 5 above. The only difference is you will have ~14” of tube extending beyond the plate to have centered. Also note the counterbored hole (9/32”) alignment before final torquing.

Set this assembly back aside with the element #8 bundle

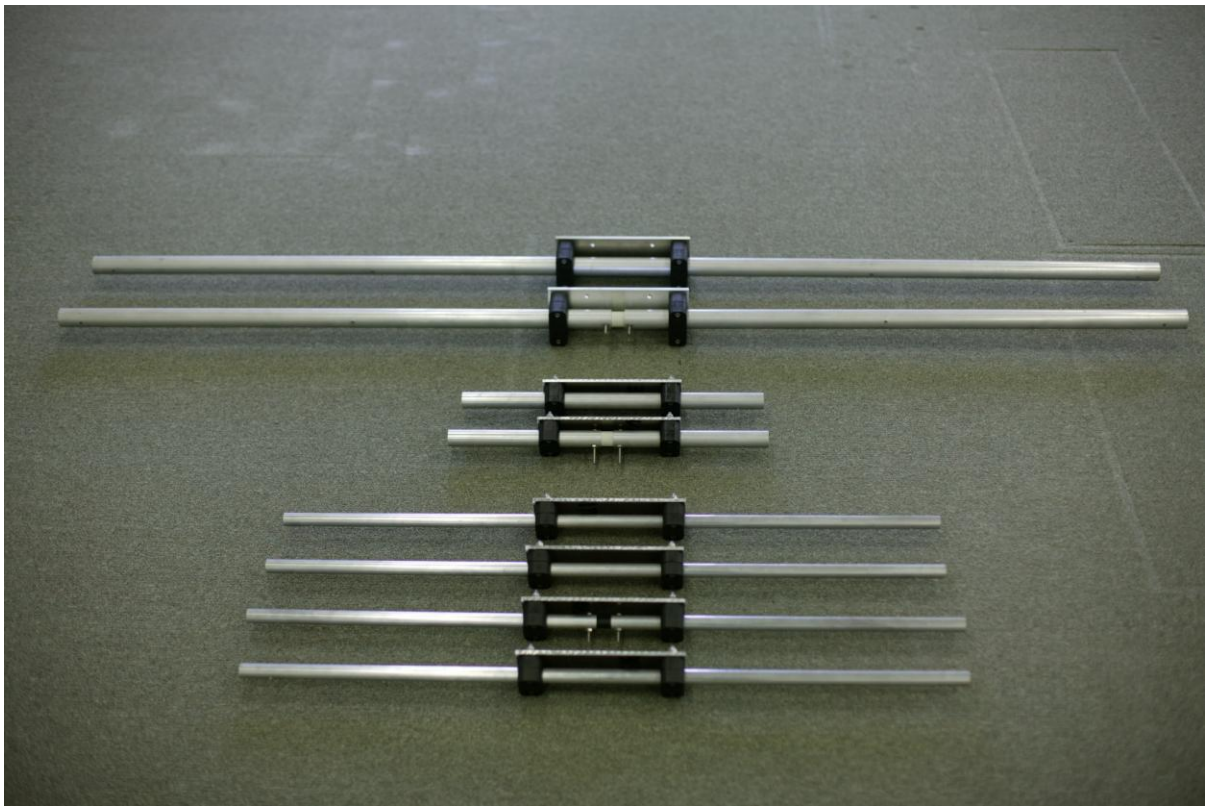

Figure 16 – All of the assembled center sections mounted to the element boom plates completed in step # 5 through step # 12. *Note, 5/16-18 x 3-1/2” hex bolts not shown on the two 20 meter elements.*

The next steps will be mounting the eight previously assembled center sections to the boom as shown in figure 17.

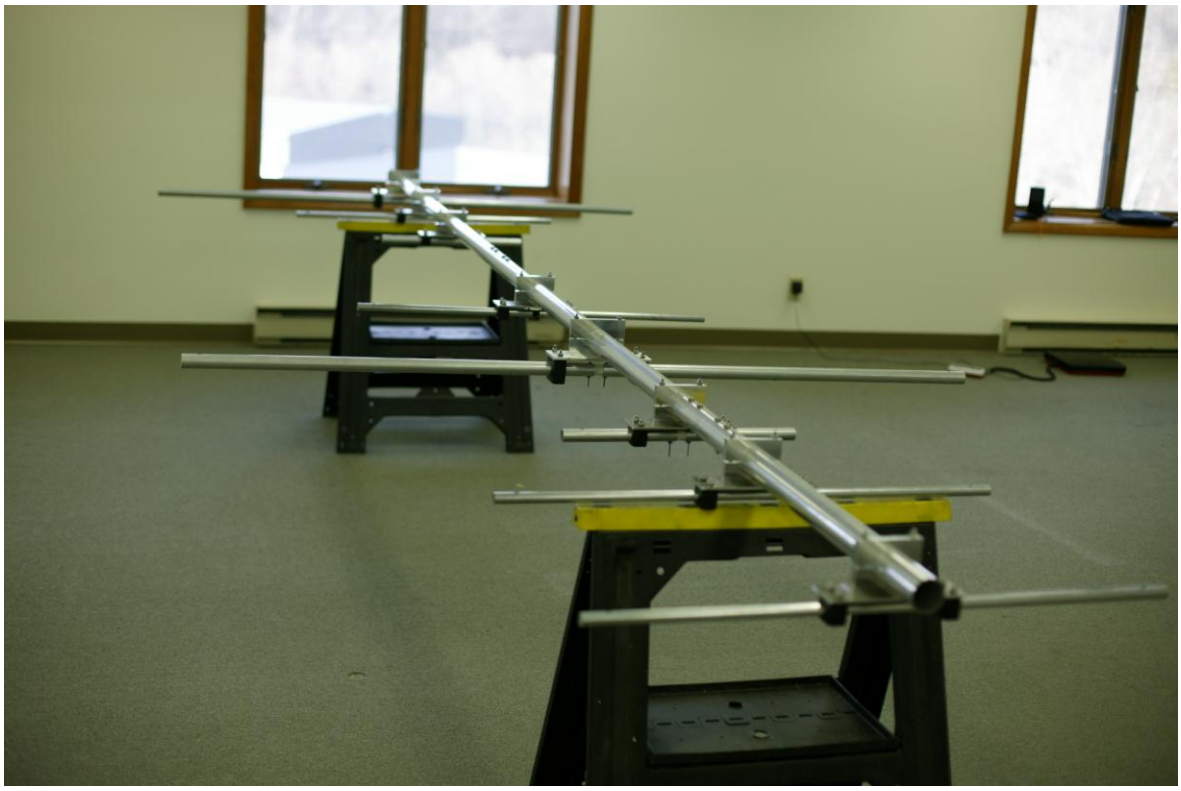

Figure 17 – Preview of mounting the eight previously assembled center sections to the boom

Refer to figure 2 on page 13. At this point, its time to mount the element center sections on the boom. The element center-to-center spacing is shown in figure 2. It may be helpful to mark the boom in the approximate position that each element is mounted, so that when you are initially mounting element plates that you can quickly place them onto the boom. Refer to figure 18 for an example of a suggested way to mark the boom.

Figure 18 – You may wish to mark the boom with the approximate position of each element plate, so that when you are initially mounting element plates that you can quickly place them onto the boom

It is advisable to have a good tape measure that can measure down to a 1/16th of an inch. Placing the element plates on the boom accurately will ensure the antenna is performing in-specification. Unlike monobanders that have only a small number of elements on the boom, a multibander like the TX38 has a greater number of elements active at all time. Performance and bandwidth are likely to be affected by imprecise element plate setup.

Step 13 ☐ Refer to figure 19 for this step.

Locate the following parts:

1. Element # 1 section assembled in step # 5
2. 2” aluminum saddle clamp 4” x 5/8” x 1-3/16” (**Part #14**)
3. 2” aluminum saddle clamp 4” x 5/8” x 1-1/2” (**Part #15**)
4. 5/16-18 nylon lock nut (**Part #7**)

The boom is referenced from the start of “boom section 1” as

shown in figure 2. There will be a mark approximately 3" from the end of the boom. Take the element plate, with the two 5/16-18 x 3-1/2" hex bolts previously installed and slide the **shorter** of the two element saddle clamps (Part #14) over the two 5/16-18 bolts, placing the flat side of the saddle clamp against the plate. Refer to figure 5 on page 14, which shows the short / tall saddle clamps mating together.

Bring this assembly up from the bottom side of the boom placing the aluminum saddle against the boom, Place the remaining saddle clamp (Part #15) over the 5/16-18 bolts, over the boom. Thread two 5/16-18 nylon lock nuts (Part #7) onto the hex bolts.

If the bolts are too short for the nuts to start, this means you grabbed two of the taller saddles clamps, instead of the correct, short / tall pair. The saddle clamp is thinner on the plate side.

The edge of the saddle clamp towards the edge of the boom should be exactly 3" from the edge of the boom. ***This will be the reference point for all other plates that are mounted.*** Refer to figure 20. Take all measurements from element #1 to the plate you are mounting. All spacing dimensions are given from element #1.

The saddle clamp is mounted off-center on the element mounting plate. Place all saddle clamps towards the "reference" side of the antenna, i.e. the side towards the element #1, the 20 Meter reflector as shown in figure 21.

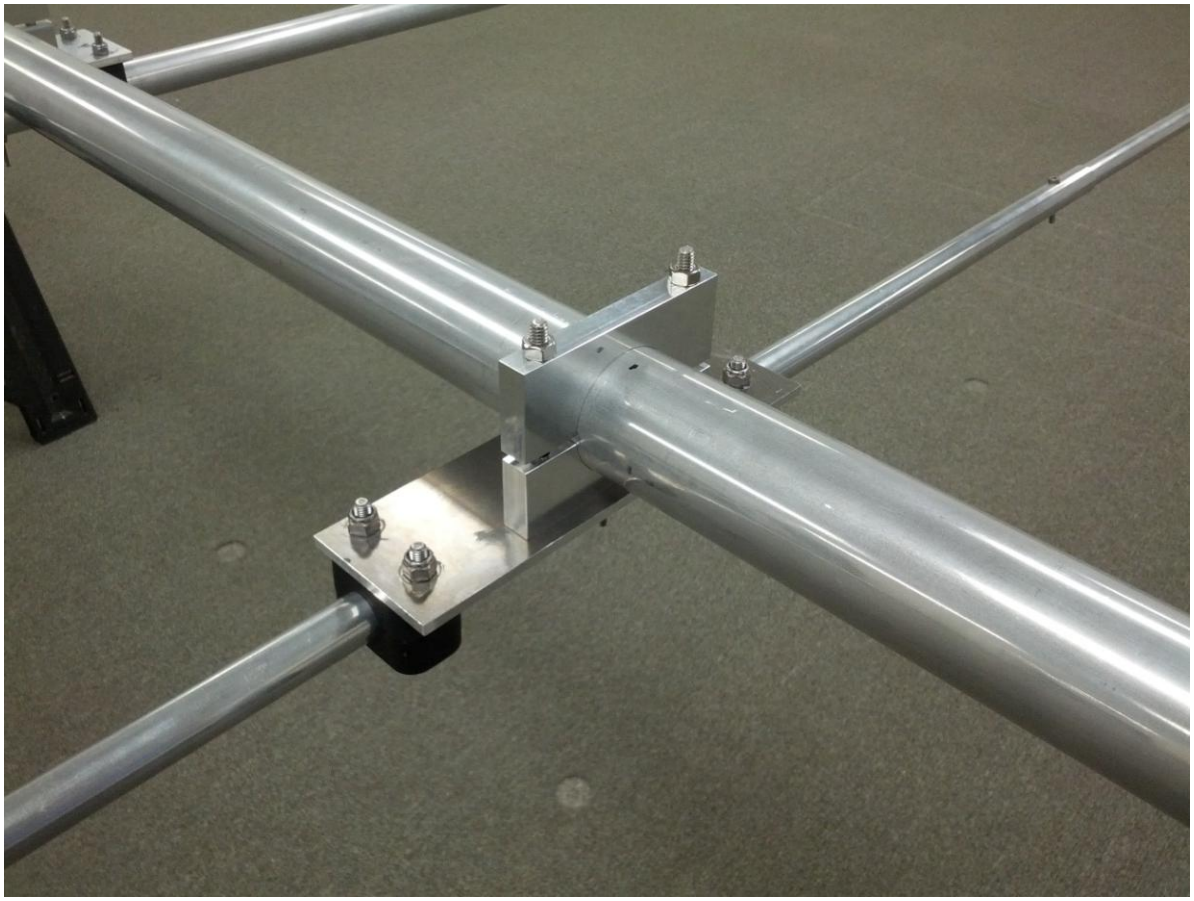

Figure 19 – Element to boom mounting arrangement (10 Meters shown). A pair of billet aluminum saddle clamps is placed around the boom and a pair of hex bolts passes through the plate and saddle clamps to firmly clamp the plate to the boom. The precision CNC made clamps provide a larger, even clamping surface.

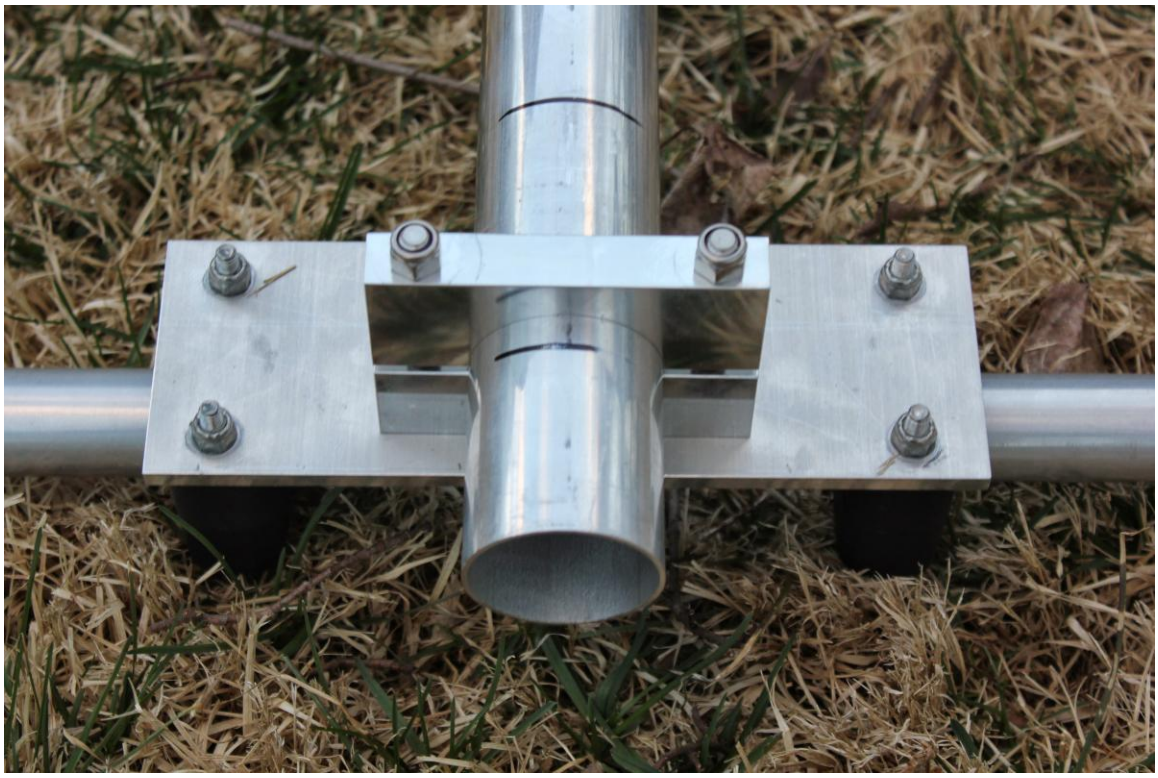

Figure 20 – Element #1, the 20 meter reflector is mounted 3” from the end of the boom.

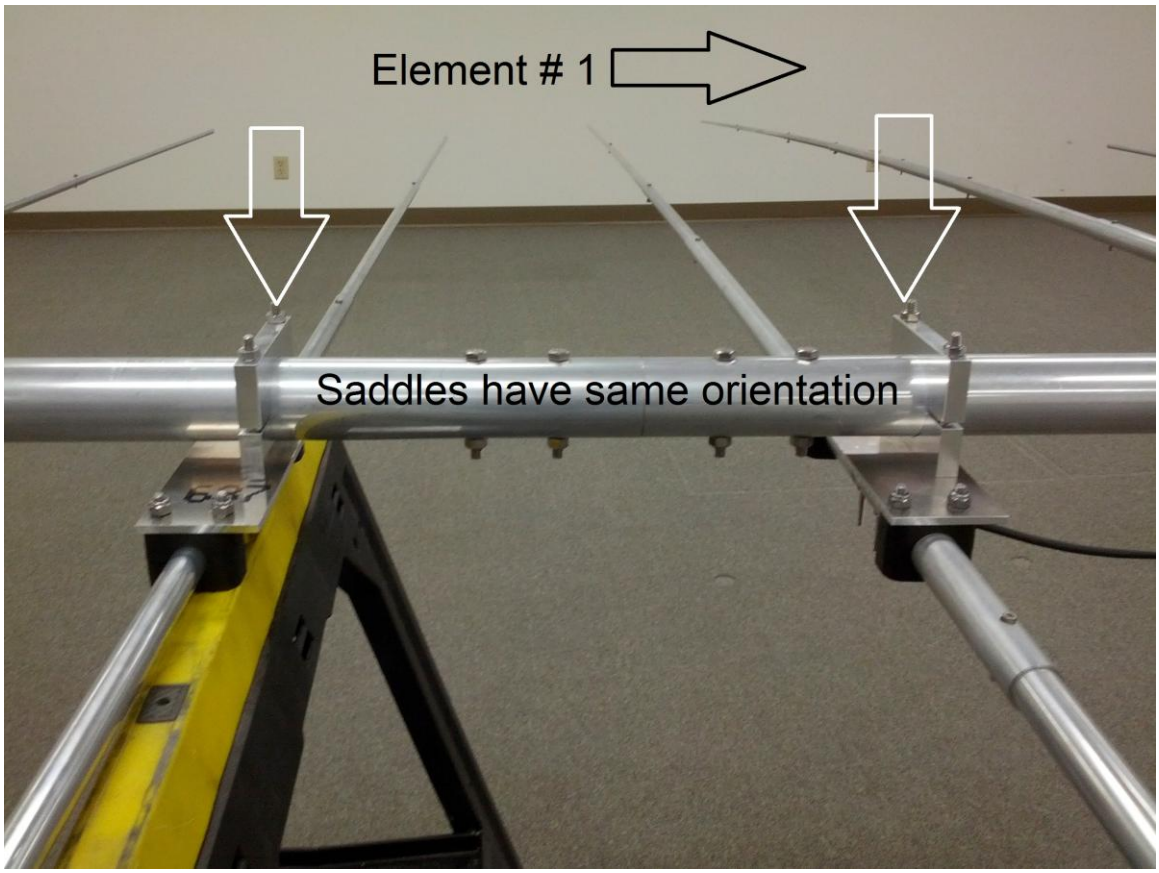

Figure 21 – The aluminum saddles are offset on the mounting plates, when mounting, position all the saddle clamps in the same orientation – on the side towards element # 1 (the 20 Meter reflector)

Step 14 ☐ Locate the following parts:

1. Element # 5 section assembled in step # 6
2. 2” aluminum saddle clamp 4” x 5/8” x 1-3/16” (**Part #14**)
3. 2” aluminum saddle clamp 4” x 5/8” x 1-1/2” (**Part #15**)
4. 5/16-18 x 3-1/2” hex bolt (**Part #17**)
5. 5/16-18 nylon lock nut (**Part #7**)

Assemble the parts as in step # 13 above. There is a mark on the boom for the position of element #5. Place the leading edge of this saddle clamp *exactly* 110 ½” from the leading edge of the element # 1 saddle clamp.

Refer to figure 22 for the proper way to measure plate positions.

Before pre-torquing, check spacing and horizontal alignment with respect to element #1 At this point, it is advisable to apply enough

torque to hold this element from spinning, but not applying final torque, so that it can be later adjusted.

Figure 22 – Most effective way to measure element spacing. Always measure from the edge of the plate element #1 (20 Meter Reflector) to the element you are positioning on the boom. Use the leading edge of both plates. Do not measure the spacing element to element, as this accumulates inaccuracies

Step 15 ☐ Locate following parts:

1. Element #2 section assembled in step # 9
2. 2” aluminum saddle clamp 4” x 1/2” x 1-3/16” (**Part #12**)
3. 2” aluminum saddle clamp 4” x 1/2” x 1-1/2” (**Part #13**)
4. 1/4-20 x 3-1/2” hex bolt (**Part #16**)
5. 1/4-20 nylon lock nut (**Part #11**)

Assemble the parts as in step # 14 above. There is a mark on the boom for the position of element #2. Place the leading edge of this saddle clamp exactly 19 ½” from the leading edge of the element # 1 saddle clamp.

The difference in this assembly vs. the one done in step # 14 is that thinner saddle clamps are used. There is still a short/tall pair

that is to be used. The assembly procedure is exactly the same.

Before final torquing, check spacing and horizontal alignment with respect to element #1

At this point, it is advisable to apply enough torque to hold this element from spinning, but not applying final torque, so that it can be later adjusted.

The remaining element plate assemblies (5) use the same saddle and hardware as in step # 15. *Step 16 through 20* are similar to step # 15, the only difference to note is the spacing of each element from reference element #1

Step 16 ☐ Locate the following parts:

1. Element # 3 section assembled in step # 7
2. 2” aluminum saddle clamp 4” x 1/2” x 1-3/16” (**Part #12**)
3. 2” aluminum saddle clamp 4” x 1/2” x 1-1/2” (**Part #13**)
4. 1/4-20 x 3-1/2” hex bolt (**Part #16**)
5. 1/4-20 nylon lock nut (**Part #11**)

Assemble the parts as in step # 15 above. There is a mark on the boom for the position of element #3. Place the leading edge of this saddle clamp exactly 39-**3/8**” from the leading edge of the element # 1 saddle clamp.

The difference in this assembly vs. the one done in step # 15 is that thinner saddle clamps are used. There is still a short/tall pair that is to be used. The assembly procedure is exactly the same.

Before final torquing, check spacing and horizontal alignment with respect to element #1

At this point, it is advisable to apply enough torque to hold this element from spinning, but not applying final torque, so that it can be later adjusted.

Step 17 ☐ Locate the following parts:

1. Element # 4 section assembled in step # 10
2. 2” aluminum saddle clamp 4” x 1/2” x 1-3/16” (**Part #12**)
3. 2” aluminum saddle clamp 4” x 1/2” x 1-1/2” (**Part #13**)
4. 1/4-20 x 3-1/2” hex bolt (**Part #16**)

5. 1/4-20 nylon lock nut (**Part #11**)

Assemble the parts as in step # 15 above. There is a mark on the boom for the position of element #4. Place the leading edge of this saddle clamp exactly 86 **1/2**" from the leading edge of the element # 1 saddle clamp.

Step 18 ☐ Locate the following parts:

1. Element # 6 section assembled in step # 8
2. 2" aluminum saddle clamp 4" x 1/2" x 1-3/16" (**Part #12**)
3. 2" aluminum saddle clamp 4" x 1/2" x 1-1/2" (**Part #13**)
4. 1/4-20 x 3-1/2" hex bolt (**Part #16**)
5. 1/4-20 nylon lock nut (**Part #11**)

Assemble the parts as in step # 15 above. There is a mark on the boom for the position of element #6. Place the leading edge of this saddle clamp exactly 134 **1/2**" from the leading edge of the element # 1 saddle clamp.

Step 19 ☐ Locate the following parts:

1. Element # 7 section assembled in step # 11
2. 2" aluminum saddle clamp 4" x 1/2" x 1-3/16" (**Part #12**)
3. 2" aluminum saddle clamp 4" x 1/2" x 1-1/2" (**Part #13**)
4. 1/4-20 x 3-1/2" hex bolt (**Part #16**)
5. 1/4-20 nylon lock nut (**Part #11**)

Assemble the parts as in step # 15 above. There is a mark on the boom for the position of element #7. Place the leading edge of this saddle clamp exactly 150 **5/16**" from the leading edge of the element # 1 saddle clamp.

Step 20 ☐ Locate the following parts:

1. Element # 8 section assembled in step # 12
2. 2" aluminum saddle clamp 4" x 1/2" x 1-3/16" (**Part #12**)
3. 2" aluminum saddle clamp 4" x 1/2" x 1-1/2" (**Part #13**)
4. 1/4-20 x 3-1/2" hex bolt (**Part #16**)
5. 1/4-20 nylon lock nut (**Part #11**)

Assemble the parts as in step # 15 above. There is a mark on the boom for the position of element #8. Place the leading edge of this saddle clamp exactly 172" from the leading edge of the element **#** 1

saddle clamp.

All of the element center sections are now mounted on the antenna and it is time to assemble the element end sections.

Step 21 ☐ Locate the bundle for element #1, the 20 Meter reflector. The center 1-1/4" section is already mounted, leaving 14 tubing pieces remaining. There are two of each of the following tubes that makes up one-half of the 20 Meter reflector :

1. 1-1/2" x 24" (Part #20)
2. 1" x 18" (Part #21)
3. 7/8" x 24" (Part #22)
4. 3/4" x 24" (Part #23)
5. 5/8" x 36" (Part #24)
6. 1/2" x 36" (Part #25)
7. 3/8" x 42" (Part #26)

Figure 10 shows the fasteners sized used to join each section together. Take the 1-1/2" x 24" piece and the 1.0 x 18" piece. Each tube has one larger counterbored hole drilled on one end, on one side. On the 1" tube, insert the end opposite the counterbored hole into the 1-1/8" tube on the side with the counterbored hole. The tube should be inserted 3" to align the through holes. Place a 10-24 x 1-1/2" socket cap screw through the aligned holes and then install an 10-24 nylon lock nut. Before you join these two pieces and all further element sections, you may wish to coat the joints with an anti-oxidant (see page 9) if the antenna is to be installed in a harsh marine environment

Always be aware of the orientation of the larger countersunk hole, you should keep them on all on the same side as you insert the next tubing section. This way all the socket cap heads remain on the same side of the element tubing.

Next insert the 3/4" x 21" tube into the 1" tube, this time using an 8-32 x 1-1/4" socket cap screw and #8 nylon lock nut. The socket cap screws get shorter and smaller the further out the element goes because the tubing tapers down in size.

Next insert the 5/8" x 36" tube into the 3/4" tube, this time using an 8-32 x 1" socket cap screw and #8 nylon lock nut.

Next insert the 0.5 x 36” tube into the 5/8” tube, this time using an 6-32 x 3/4” socket cap screw and #6 nylon lock nut.

Next insert the 3/8” x 42” tube into the 1/2” tube, using an 6-32 x 3/4” socket cap screw and #6 nylon lock nut.

Take the remaining 7 pieces from the element #1 bundle and repeat the steps above. You will then have two halves ready to insert into the previously installed element #1 center section. Set these two pieces back aside.

Regarding assembling the remainder of the elements, you can continue to install the socket cap screws and nuts and tighten them as you go, using hand tools for tightening. *For quicker overall assembly*, we have found that its best to install all of the socket cap bolts and hand install the nuts as tight as possible only by hand (usually to the point the nylon starts to engage which is just a few turns). We do this for all the elements, not doing any final tightening beyond hand starting the nuts. Once all the element sections are together, we then use a cordless / battery powered screwdriver or (cordless) drill fitted with an Allen / hex key head driver or a hex socket to drive the nut side. In other words you can hold the nut stationary with a wrench and drive the screw together from the Allen head, or hold the Allen head stationary with an Allen wrench and drive the nut on. There is minimal excess thread sticking beyond the nut, so the bolts don’t take long to tighten. However, the nylon locking mechanism does take some torque to overcome. Running the cordless drill with the clutch (if available) set to **lowest torque** and running it at the **slowest speed** possible is most ideal. ***These nylon lock nuts used on the element sections should not be torqued so much that they crush the tubing. The nylon lock nut only needs to seat firmly, just a turn beyond seating. The nylon insert will keep it from loosening.***

There are only three size screws used on the elements; #10, #8 and #6. The most efficient way is to set your cordless screwdriver or drill up for #10 first, to do final tightening on all the #10 sizes. Then setup for #8 and then #6 and run through tightening the sizes.

Step 22 ☐ Locate the bundle for element #5, the 20 Meter driven element. You will assemble the two element halves like you did for element #1 in step 21.

The only difference from step 21 is the end / tip tubes are 3/8” x 31” (Part #27)

Step 23 ☐ Locate the bundle for element #2, the 10 Meter reflector element.

You will assemble the two element halves like you did for element #1 in step 21. The sections:

1. 5/8” x 36” (Part #24)
2. 1/2” x 36” (Part #25)
3. 3/8” x 25-1/4” (Part #34)

Refer back to figure 10 for the socket cap schedule for the 10 meter elements. **For a given diameter of tubing, the same size and length of socket cap screw is always used, regardless the band the element is for.**

Step 24 ☐ Locate the bundle for element #4, the 10 Meter driven element. You will assemble the two element halves like you did for element #2 in step 23.

The only difference from step 24 is the end / tip tubes are 3/8” x 20-1/4” (Part #35)

Complete all remaining elements halves for the 10 Meter elements, which are elements 7 & 8 (Part 36 & 37 are the 3/8” tip sections, respectively)

Step 25 ☐ Locate the bundle for element #3, the 15 Meter reflector element. You will assemble the two element halves like you did for element #1 in step 21. The sections:

1. 7/8” x 24” (Part #22)
2. 3/4” x 24” (Part #23)
3. 5/8” x 36” (Part #24)
4. 1/2” x 36” (Part #25)
5. 3/8” x 27-1/8” (Part #30)

Refer back to figure 10 for the socket cap schedule for the 10 meter elements. **For a given diameter of tubing, the same size and length of socket cap screw is always used, regardless the band the element is for.**

Step 26 ☐ Locate the bundle for element #6, the 15 Meter driven element. You will assemble the two element halves like you did for element #3 in step 25.

The only difference from step 25 is the end / tip tubes are 3/8” x 20-1/2” (Part #31)

All of the element end sections are now assembled and ready to mount on element center sections.

Step 27 ☐ Locate the two element halves assembled in step 21. This is for element #1, the 20 Meter reflector. If needed, apply an anti-oxidant to the end of the 1-1/8" sections. Go to element #1 on boom assembly and install one of these element halves into the previous installed 1-1/4" section. Place a 10-32 x 1-1/2" socket cap screw and nylon lock nut to join these sections. Install the remaining half in the same fashion. Do final tightening of the installed 10-24 x 1-1/2" bolts. Element #1, the 20 meter reflector is now completely finished.

The head of the socket head cap screws should all be facing directly upwards and the nylon lock nut should be facing down for all the fasteners joining the element tubing together.

Step 28 ☐ Locate and install all of the remaining elements halves #2 through #8. The 20 Meter elements (1 & 5) halves are all joined with a 10-24 x 1-1/2" socket cap screw as in step 27.

All of the 15 Meter elements are joined with an 8-32 x 1-1/4" socket cap screw and #8 nylon lock nut.

All of the 10 Meter elements are joined with an 8-32 x 1" socket cap screw and #8 nylon lock nut.

Step 29☐ Now that all the elements are installed. It is time to do final horizontal of alignment of all the elements on the boom. Sight down the boom and align any elements that need it.

Make any alignments needed to the boom to mast plate at this time.

Do final checking and torquing of the 1/4-20 x 3-1/2"and 5/16-18 x 3-1/2"bolts on the element to boom aluminum saddle clamps at this time on all eight elements.

All of the elements are installed. It is time to install the phasing lines and balun and complete final tightening of the driven elements. You can coat all of the phasing and balun electrical connection with a contact cleaner, enhancer and protector if you wish (see page 9).

Balun Guidelines

This antenna is delivered without a balun. It most circumstances, a 1:1 current balun should be used since the antenna is designed to be fed with a 50 Ohm balanced source. A W2DU "bead balun" type can be used and is ideal for being physically installed next to the provided phasing lines. See figure 23.

Figure 23 – Phasing lines flank element #5, the 20 Meter element, which is where the 1:1 balun attaches. This photo shows a thick, black W2DU style bead balun installed via tie-wraps to the boom above the phasing lines. Coaxial choke baluns can hang below the feedpoint.

The provided phasing lines (Part #57) are *unshielded* balanced lines. These rules must be followed:

1. Do not tape the phasing lines to the boom
2. Do not tape the balun to the phasing lines
3. Leave at least ½" around the phasing lines
4. You can use tie-wraps to support the phasing lines if desired
5. Do not tape the coax to the phasing lines, run it up to the boom

The coaxial choke balun described in later version of the ARRL Antenna book can be also be used. The amount of choking resistance the balun must provide depends on the environment the antenna is installed in. If the antenna is placed into a asymmetrically conductive environment, such as mounted on the side of a wide tower face (ex. Rohn 55G), then a balun using #31 2-1/2" OD ferrite toroid cores should be used to ensure no pattern distortion occurs.

Step 30 ☐

Locate these items:

1. two phasing lines (**Part #57**)
2. four #10 washers (**Part #53**)
3. two 10-24 nylon lock nuts (**Part #44**)
4. Your balun

Install your selected balun (following the guidelines above) onto the #10 studs on element #5. It is recommended that you install ring terminals that properly fit #10 studs onto the leads of your balun.

The leads on the balun should be as short as practical. Leads longer than 1" may cause SWR tuning issues.

Place these items over the each of the #10 studs in this order

1. #10 washer (**Part #53**) (Over previously installed 10-24 Keps nut)
2. Your balun ring terminal
3. One ring terminal from one phasing line (**Part #57**)
4. Another ring terminal from the remaining phasing line, use the same colored lead connection on this stud.
5. #10 washer (**Part #53**)
6. One 10-24 nylon lock nut (**Part #44**)

When you prepare each connection and install the phasing lines, you should keep the same colored wire on each stud for each phasing line.

Do final tightening of the 10-24 nylon lock nuts.

Figure 24 shows the phasing lines under the boom.

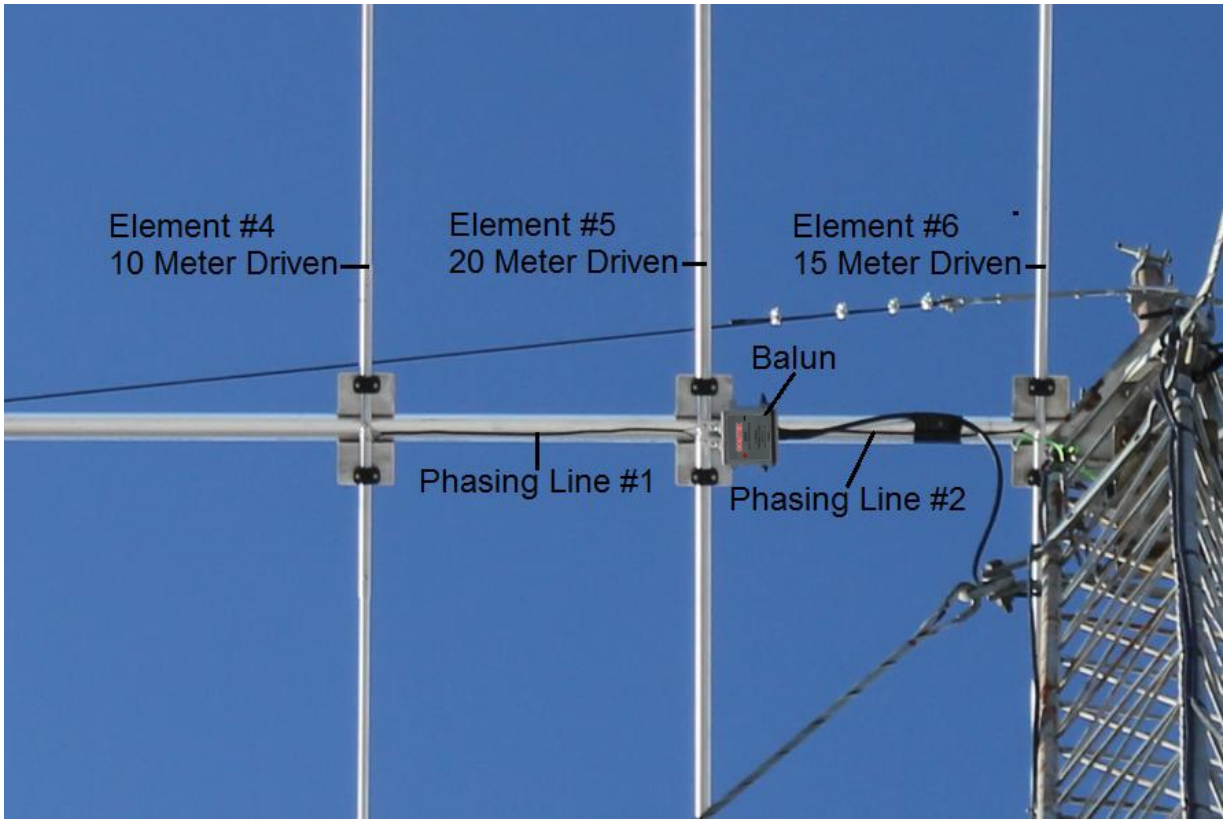

Figure 24 –Phasing line and balun location on underside of boom. Model 2XA-3B-12L shown, but the arrangement is the same on the 3B-8L. Phasing line #1 connects from the element 5 to element 4. Phasing line #2 connects from element 5 to element 6.

Step 31 ☐ Take the free end of phasing line #1 installed in step #33. Attach it to the studs on element # 4.

(These go over the previously installed 8-32 Keps nut)

1. #10 washer
2. Phasing line terminal ring
3. #10 washer
4. 10-24 nylon lock nut

Keep the same colored wire on the same element side as was connected to the 20 meter driven element. **This is NOT a log periodic type feed system and NO PHASE REVERSAL is used.**

Step 32 ☐ Take the free end of phasing line #2 installed in step #33. Attach it to the studs on element # 6.

(These go over the previously installed 8-32 Keps nut)

5. #10 washer
6. Phasing line terminal ring
7. #10 washer
8. 10-24 nylon lock nut

Keep the same colored wire on the same element side as was connected to the 20 meter driven element. **This is NOT a log periodic type feed system and NO PHASE REVERSAL is used.**

Step 33 ☐ The black nylon clamps on element #4 and element #6 were left untightened so that the element could be rotated in the nylon clamps to adjust the phasing line tension. The tension should be adjusted such that the line has a slight amount of tension on it, but not so much that it is pulling on the ring terminals (Figure 25). The line should deflect about 1" when pushed in the middle. Once the tension is set, do final tightening of the 1/4-20 nuts holding the elements to the plate. **DO NOT tape phasing lines directly against the boom.** They are unshielded balanced lines, which must be spaced away from metallic objects. If desired, you can use cable ties to provide a strain relief.

If additional UV protection is desired, it is ok to wrap the phasing lines with a layer of electrical tape, such as 3M Super 33+. This will not affect electrical performance.

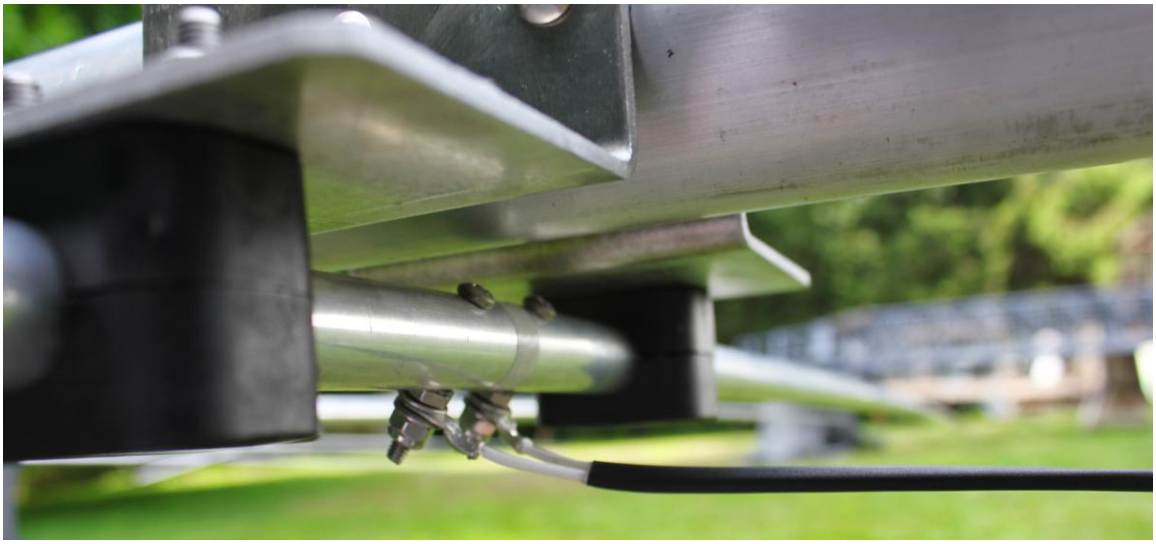

Figure 25 – Rotate the element in the black nylon clamps to put light tension on the phasing line. **Do not tape phasing lines directly against the boom**.

Step 34 ☐ This check assumes a current type balun is used. Do not use a voltage type balun on this antenna.

You should verify the polarity is wired correctly between the three elements using a DC ohm meter or continuity checker. From the center pin of the balun, you should have continuity from the center pin to the three element halves on the same side of the boom. From the shield of the coax, you should have continuity to the opposite three element halves. There should be an open circuit between the balun connections and the boom. And there should also be an open circuit between the center pin and shield on the balun

.

This concludes antenna assembly.

Antenna Final Check and Test – prior to installation

Dimensions:

Although the element lengths are set from the factory, it is highly recommended that you take the time to document and check *all* the dimensions of your assembled antenna with factory dimensions. Mistakes can be made by anyone, anywhere, at anytime. There is so much time involved in installing the smallest of antennas that is not worth skipping the dimension documentation. We recommend that make a note of all your element spacings and lengths down to a ¼". Figure 2 on page 13 shows the element spacings and Table 1 shows the element lengths. You should record your actual values and compare them to the values in this manual. It is difficult to get a perfectly accurate measure of the element length once it is installed on the antenna – be consistent in how you measure the elements and you will get a consistent reading that will track with actual measurement. If you find a variance greater than ½" anywhere, recheck your measurement and the work.

To provide support in the event the antenna is not performing correctly, we will require your recordings of the dimensions after assembly. We cannot provide efficient support and service without your accurate documentation. This is why we highly recommend you document your antenna BEFORE you install it.

Hardware Installation:

Verify that all the hardware has been tightened and there are no loose fasteners.

SWR Test

You may connect a SWR analyzer with the antenna only a few feet off the ground to make sure you do not have a short or open circuit anywhere. You can do this by verifying that you do not have an extremely high SWR on every band. Do not be concerned unless the SWR is high on all bands. The antenna will not have the specified SWR curves unless it is installed at a height of at least 30 feet. With the antenna at least 8 feet from the ground, you will start to see the SWR "dip" below 2:1 somewhere in or near each of the three supported frequency ranges. As long as you start to see a dip somewhere around (above or below) each of the three bands, you may proceed with installation.

Installation

The antenna should be installed by a professional in a safe manner on a support structure that is rated to handle the weight and wind load of this antenna, in all expected weather conditions. The boom to mast plate is supplied with saddle clamps (Part # 1-2.0) to mount to a 2" outer diameter mast (user supplied). The

antenna is designed to be fed with 50 Ohm coaxial cable such as RG-8 or RG-213. Pretest the entire run of coax cable with a 50 Ohm “dummy load” to ensure there are no problems with either the coax or the coax connectors. Most SWR issues are due to coax or connector issues and not related to the antenna itself. Even if the coax was previously being used for another antenna, repositioning of the cable can cause new connector faults to occur. You should also test the cable at the full power you intend to run, if possible.

Surrounding metallic objects (other antennas, guy wires, etc.) can affect the performance of the antenna. If the antenna is not interacting with anything, you can expect the specified SWR curve, gain and front to rear performance. There are no user adjustments necessary for this antenna - any SWR issues indicate a coax and/or connector fault, or interaction of this antenna with another metallic object and those situations must be corrected.

Figure 26 – Completed TX38-100 installed on a US Tower 40 foot mast.

Detailed Performance Specifications

Note: Gain is in freespace dBi. Gain over ground (from ground reflections) is not given because it varies by antenna height, ground conductivity and local terrain and is not reliable for comparisons. Subtract 2.14 dB from the dBi figure for the gain over a dipole (dBd) value.

Freq (MHz)	R at Src1	X at Src1	SWR(50)	Max Gain	@ Az °	Fr / Back	Fr / Rear
14.000	31.92	-2.44	1.572	6.73	180	9.97	9.97
14.0125	32.84	-1.64	1.525	6.71	180	10.08	10.08
14.025	33.80	-0.85	1.480	6.69	180	10.18	10.18
14.0375	34.77	-0.06	1.438	6.67	180	10.28	10.28
14.050	35.73	0.71	1.400	6.64	180	10.35	10.35
14.0625	36.73	1.47	1.364	6.62	180	10.43	10.43
14.075	37.73	2.22	1.331	6.60	180	10.51	10.51
14.0875	38.77	2.98	1.301	6.57	180	10.56	10.56
14.100	39.81	3.71	1.274	6.55	180	10.62	10.62
14.1125	40.88	4.44	1.251	6.53	180	10.68	10.68
14.125	41.96	5.16	1.232	6.51	180	10.72	10.72
14.1375	43.07	5.88	1.216	6.48	180	10.76	10.76
14.150	44.19	6.58	1.205	6.46	180	10.79	10.79
14.1625	45.31	7.27	1.199	6.44	180	10.82	10.82
14.175	46.47	7.95	1.197	6.42	180	10.84	10.84
14.1875	47.65	8.62	1.201	6.39	180	10.85	10.85
14.200	48.84	9.28	1.208	6.37	180	10.86	10.86
14.2125	50.03	9.93	1.219	6.35	180	10.87	10.87
14.225	51.27	10.56	1.233	6.33	180	10.87	10.87
14.2375	52.53	11.19	1.250	6.30	180	10.86	10.86
14.250	53.78	11.80	1.269	6.28	180	10.85	10.85
14.2625	55.05	12.40	1.290	6.26	180	10.84	10.84
14.275	56.36	12.99	1.312	6.24	180	10.82	10.82
14.2875	57.67	13.56	1.335	6.22	180	10.80	10.80
14.300	59.02	14.13	1.360	6.20	180	10.78	10.78
14.3125	60.37	14.67	1.385	6.18	180	10.75	10.75
14.325	61.74	15.20	1.411	6.16	180	10.72	10.72
14.3375	63.14	15.73	1.437	6.14	180	10.69	10.69
14.350	64.57	16.24	1.465	6.12	180	10.65	10.65
Average	47.10	7.58	1.323	6.42		10.65	10.65

Freq (MHz)	R at Src1	X at Src1	SWR(50)	Max Gain	@ Az °	Fr / Back	Fr / Rear
21”	34.64	-10.67	1.562	6.93	180	9.02	9.02
21.0125	35.63	-10.28	1.515	6.92	180	9.12	9.12
21.025	36.61	-9.93	1.473	6.90	180	9.21	9.21
21.0375	37.59	-9.59	1.433	6.89	180	9.31	9.31
21.050	38.61	-9.27	1.395	6.88	180	9.40	9.40
21.0625	39.63	-8.96	1.359	6.87	180	9.49	9.49
21.075	40.69	-8.67	1.324	6.86	180	9.58	9.58
21.0875	41.75	-8.40	1.293	6.84	180	9.66	9.66
21.100	42.83	-8.17	1.264	6.83	180	9.74	9.74
21.1125	43.90	-7.95	1.238	6.82	180	9.83	9.83
21-1/2”	45.00	-7.75	1.214	6.80	180	9.90	9.90
21.1375	46.12	-7.56	1.193	6.79	180	9.97	9.97
21.150	47.22	-7.41	1.177	6.78	180	10.05	10.05
21.1625	48.32	-7.29	1.164	6.77	180	10.12	10.12
21.175	49.45	-7.18	1.156	6.75	180	10.18	10.18
21.1875	50.59	-7.10	1.152	6.74	180	10.24	10.24
21.200	51.75	-7.04	1.153	6.73	180	10.31	10.31
21.2125	52.90	-7.01	1.159	6.72	180	10.37	10.37
21.225	54.07	-7.01	1.168	6.70	180	10.42	10.42
21.2375	55.22	-7.03	1.181	6.69	180	10.47	10.47
21.250	56.40	-7.07	1.196	6.68	180	10.53	10.53
21.2625	57.56	-7.14	1.213	6.67	180	10.58	10.58
21.275	58.74	-7.24	1.232	6.66	180	10.63	10.63
21.2875	59.91	-7.37	1.253	6.64	180	10.66	10.66
21.300	61.11	-7.52	1.274	6.63	180	10.71	10.71
21.3125	62.29	-7.71	1.296	6.62	180	10.75	10.75
21.325	63.49	-7.92	1.319	6.61	180	10.79	10.79
21.3375	64.68	-8.15	1.342	6.60	180	10.83	10.83
21.350	65.86	-8.42	1.366	6.59	180	10.86	10.86
21.3625	67.05	-8.72	1.390	6.57	180	10.89	10.89
21.375	68.24	-9.05	1.415	6.56	180	10.92	10.92
21.3875	69.42	-9.40	1.439	6.55	180	10.94	10.94
21.400	70.60	-9.79	1.464	6.54	180	10.97	10.97
21.4125	71.76	-10.21	1.490	6.53	180	11.00	11.00
21.425	72.93	-10.65	1.515	6.52	180	11.02	11.02
21.4375	74.07	-11.13	1.541	6.51	180	11.04	11.04
21.450	75.20	-11.63	1.567	6.50	180	11.06	11.06
Average	54.37	-8.47	1.321	6.71	180	10.29	10.29

Freq (MHz)	R at Src1	X at Src1	SWR(50)	Max Gain	@ Az °	Fr / Back	Fr / Rear
28.000	34.90	7.21	1.489	7.79	180	20.00	20.00
28.0125	35.38	7.22	1.470	7.79	180	20.30	20.30
28.025	35.85	7.22	1.452	7.78	180	20.58	20.58
28.0375	36.30	7.22	1.436	7.77	180	20.85	20.85
28.050	36.74	7.23	1.420	7.77	180	21.12	21.12
28.0625	37.19	7.23	1.404	7.76	180	21.38	21.38
28.075	37.63	7.23	1.389	7.76	180	21.65	21.65
28.0875	38.04	7.23	1.376	7.75	180	21.90	21.90
28.100	38.45	7.23	1.363	7.75	180	22.14	22.14
28.1125	38.86	7.23	1.350	7.74	180	22.38	22.38
28.125	39.25	7.23	1.338	7.74	180	22.61	22.61
28.1375	39.63	7.23	1.327	7.73	180	22.83	22.83
28.150	40.01	7.24	1.317	7.73	180	23.06	23.06
28.1625	40.38	7.25	1.306	7.72	180	23.26	23.26
28.175	40.74	7.25	1.297	7.72	180	23.47	23.47
28.1875	41.10	7.26	1.288	7.72	180	23.67	23.67
28.200	41.45	7.27	1.279	7.71	180	23.86	23.86
28.2125	41.79	7.29	1.271	7.71	180	24.05	24.05
28.225	42.13	7.30	1.263	7.71	180	24.23	24.23
28.2375	42.46	7.32	1.255	7.71	180	24.41	24.41
28.250	42.79	7.34	1.249	7.70	180	24.57	24.57
28.2625	43.11	7.36	1.242	7.70	180	24.73	24.73
28.275	43.43	7.39	1.236	7.70	180	24.88	24.88
28.2875	43.74	7.42	1.230	7.70	180	25.03	25.03
28.300	44.05	7.45	1.225	7.69	180	25.16	25.16
28.3125	44.35	7.48	1.220	7.69	180	25.29	25.29
28.325	44.65	7.52	1.215	7.69	180	25.42	25.42
28.3375	44.95	7.56	1.211	7.69	180	25.53	25.53
28.350	45.23	7.60	1.207	7.69	180	25.64	25.64
28.3625	45.52	7.65	1.204	7.69	180	25.75	25.75
28.375	45.80	7.70	1.201	7.69	180	25.84	25.84
28.3875	46.08	7.75	1.198	7.69	180	25.93	25.93
28.400	46.36	7.81	1.196	7.69	180	26.01	26.01
28.4125	46.63	7.87	1.194	7.69	180	26.08	26.08
28.425	46.90	7.94	1.192	7.68	180	26.14	26.14
28.4375	47.18	8.01	1.191	7.68	180	26.20	26.20
28.450	47.45	8.08	1.190	7.68	180	26.25	26.25
28.4625	47.71	8.15	1.189	7.68	180	26.30	26.30
28.475	47.97	8.23	1.189	7.69	180	26.35	26.35
28.4875	48.23	8.32	1.189	7.69	180	26.38	26.38
28.500	48.49	8.40	1.189	7.69	180	26.40	26.40
28.5125	48.74	8.50	1.190	7.69	180	26.42	26.42
28.525	48.99	8.59	1.191	7.69	180	26.43	26.43
28.5375	49.24	8.69	1.192	7.69	180	26.44	26.44
28.550	49.50	8.80	1.193	7.69	180	26.43	26.43
28.5625	49.75	8.90	1.195	7.69	180	26.43	26.43
28.575	50.01	9.01	1.197	7.69	180	26.42	26.42
28.5875	50.26	9.13	1.199	7.69	180	26.40	26.40
28.600	50.50	9.25	1.202	7.70	180	26.38	26.38
28.6125	50.75	9.37	1.205	7.70	180	26.36	26.36
28.625	51.00	9.50	1.208	7.70	180	26.32	26.32
28.6375	51.25	9.63	1.211	7.70	180	26.28	26.28
28.650	51.49	9.77	1.215	7.70	180	26.24	26.24

28.6625		51.73	9.91	1.218	7.70	180	26.19	26.19
28.675		51.97	10.06	1.222	7.71	180	26.14	26.14
28.6875		52.21	10.21	1.226	7.71	180	26.08	26.08
28.700		52.46	10.36	1.231	7.71	180	26.02	26.02
28.7125		52.70	10.52	1.235	7.71	180	25.95	25.95
28.725		52.95	10.68	1.240	7.72	180	25.89	25.89
28.7375		53.22	10.84	1.245	7.72	180	25.82	25.82
28.750		53.47	11.02	1.250	7.72	180	25.74	25.74
28.7625		53.72	11.19	1.255	7.72	180	25.66	25.66
28.775		53.97	11.38	1.260	7.73	180	25.58	25.58
28.7875		54.21	11.56	1.266	7.73	180	25.49	25.49
28.800		54.46	11.75	1.272	7.73	180	25.40	25.40
28.8125		54.71	11.95	1.278	7.74	180	25.31	25.31
28.825		54.97	12.15	1.284	7.74	180	25.22	25.22
28.8375		55.22	12.35	1.290	7.74	180	25.12	25.12
28.850		55.47	12.56	1.296	7.75	180	25.02	25.02
28.8625		55.73	12.78	1.303	7.75	180	24.92	24.92
28.875		55.99	13.00	1.310	7.75	180	24.81	24.81
28.8875		56.24	13.22	1.316	7.76	180	24.71	24.71
28.900		56.51	13.45	1.323	7.76	180	24.60	24.60
28.9125		56.77	13.69	1.331	7.77	180	24.50	24.50
28.925		57.04	13.93	1.338	7.77	180	24.38	24.38
28.9375		57.30	14.17	1.345	7.77	180	24.27	24.27
28.950		57.58	14.42	1.353	7.78	180	24.16	24.16
28.9625		57.85	14.68	1.361	7.78	180	24.04	24.04
28.975		58.13	14.93	1.369	7.79	180	23.93	23.93
28.9875		58.41	15.20	1.377	7.79	180	23.81	23.81
29.000		58.69	15.47	1.386	7.79	180	23.69	23.69
Averages		47.95	9.44	1.272	7.72	180	24.77	24.77

Specifications (Continued)

Frequency coverage	14.0 – 14.350 Mhz (20 Meters) 21.0 – 21.450 Mhz (15 Meters) 28.0 – 30.000 Mhz (10 Meters)	
Number of elements	8 Total	
20 Meters	2 Active	
15 Meters	2 Active	
10 Meters	4 Active	
Gain (Freespace dBi)	**Average**	**Peak**
20 Meters	6.42 dBi	6.73 dBi
15 Meters	6.71 dBi	6.93 dBi
10 Meters (28-29 Mhz)	7.72 dBi	7.79 dBi
Front-to-Rear (Freespace dB)	**Average**	**Peak**
20 Meters	10.65 dB	10.87 dB
15 Meters	10.29 dB	11.00 dB
10 Meters (28-29 Mhz)	24.77 dB	26.01 dB
SWR	Less than 1.6:1	
20 Meters	14.000 – 14.350	
15 Meters	21.000 – 21.450	
10 Meters	28.000 – 29.000	
Boom length	15 Feet	
Weight	45 Pounds	
Longest Element	36 feet 6 inches	
Turning Radius	19 Feet 5 Inches	
Wind Load	6.7 square feet	
Maximum wind survival	100 MPH (EIA-222C)	
Power Handling	3kW	