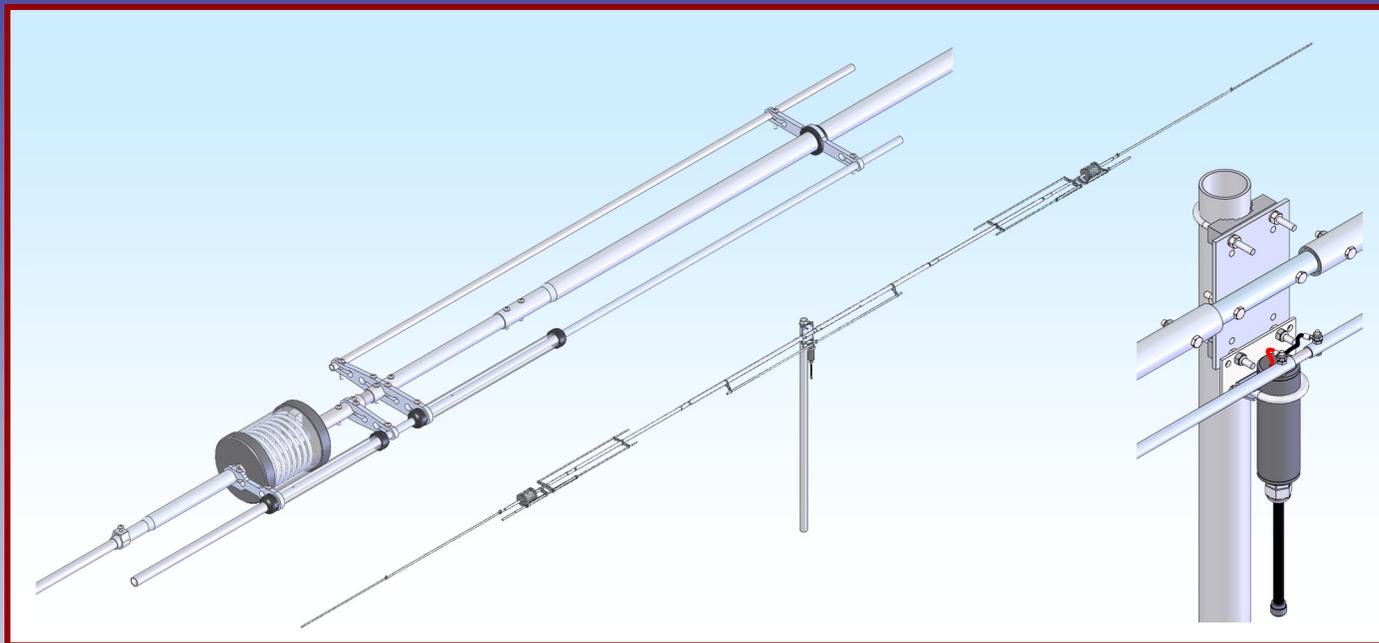




M2 Antenna Systems, Inc.

Model No: KT31WARC



SPECIFICATIONS:

Model	KT31WARC	VSWR	Varies by Band / Adjustable
Frequency Range.....	10.1-10.15 MHz **Selectable	Input Connector	SO-239
Frequency Range.....	14.0-14.35 MHz **Selectable	Power Handling.....	3 kW
.....	(175 KHz / 2:1 VSWR Nominal)	Element Length for 30M.....	35' 2"
Frequency Range.....	18.068-18.168 MHz	Element Length for 20M.....	22' 2"
Frequency Range.....	24.890-24.990 MHz	Turning Radius:.....	11' 1"(20M) 17' 6"(30M)
*Gain in free space.....	1.6 dBi TO 2.1 dBi	Stacking Distance	30' To 43'
Front to side	>20 dB	Mast Size	1-1/2" to 2"
Feed type	Modified T-Match	Wind area / Survival.....	1.6 Sq. Ft. / 100 MPH
Feed Impedance.....	50 Ohms Unbalanced		

***Subtract 2.14 from dBi for dBd**

FEATURES:

The updated KT31WARC offers flexibility in size and frequencies. It is truly unique in many ways. The KT31WARC covers 12,17 and 20 or 30 meters. 20 or 30 meters is user configured during assembly. It spans just 22' 2" for 20 meters and 35' 2" for 30 meters. Parts are supplied to configure the dipole to 20 or 30 meters based upon user requirements. Because It has been designed to be the most efficient, best performing triband dipole on the market, it's efficient design will soon be offered as a compact 2 element and a 3 element Yagi. Here again, it can be a "Killer" three band dipole or a three band Yagi. You can have a traditional 3 band WARC or a unique 12, 17 and 20 meter antenna. The KT31WARC is based off of the KT Series design, proven to be reliable and mechanically efficient for years to come.

KT31WARC ASSEMBLY MANUAL

BEFORE YOU BEGIN: Look over all of the DRAWINGS to get familiar with the various parts and assemblies in the system. Tools handy for assembly process: screwdriver, 11/32", 7/16", 1/2", 9/16" and 5/8" spin-tites, end wrenches and/or sockets, measuring tape.

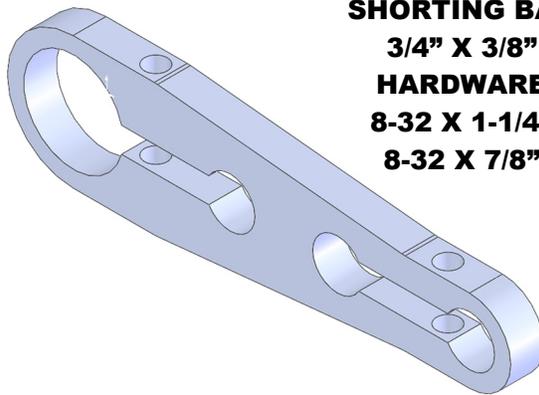
Note:

All installations are unique in some way, which means it's OK to preassemble certain hardware, or rearrange the assembly process to meet specific site requirements. A quick review of the assembly drawings should help firm up the appropriate strategy. Please remember to double-check all hardware for tightness BEFORE it becomes inaccessible.

One container of zinc paste (Penetrox, Noalox, or equiv.) have been provided to enhance and maintain the quality of all mechanical and electrical junctions on this system. Apply a thin coat wherever two pieces of aluminum come in contact or any other electrical connections are made. It is also useful on screws and bolt threads as an ANTI-SEIZE compound.



SHORTING BAR INSULATOR



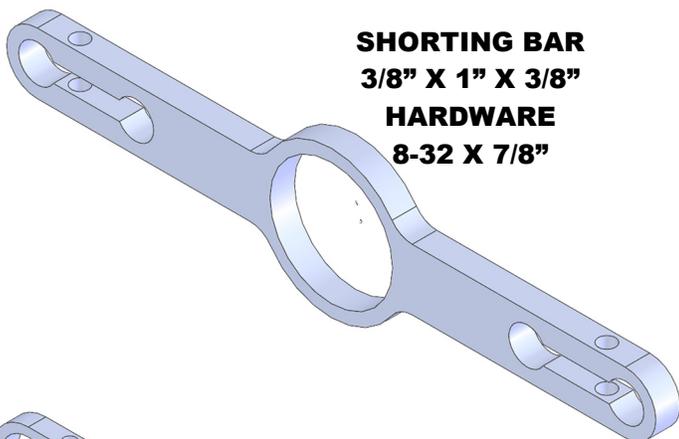
SHORTING BAR

3/4" X 3/8"

HARDWARE

8-32 X 1-1/4"

8-32 X 7/8"

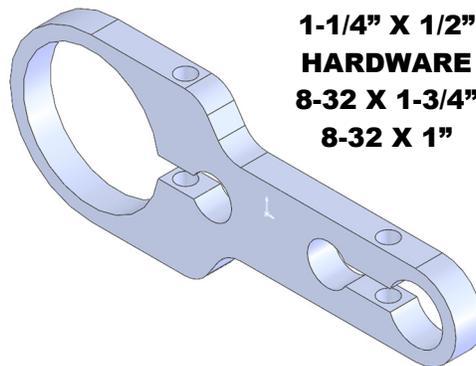


SHORTING BAR

3/8" X 1" X 3/8"

HARDWARE

8-32 X 7/8"



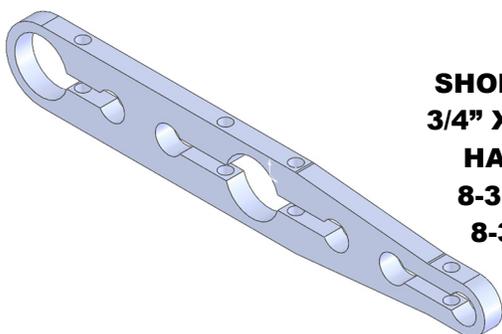
SHORTING BAR

1-1/4" X 1/2"

HARDWARE

8-32 X 1-3/4"

8-32 X 1"



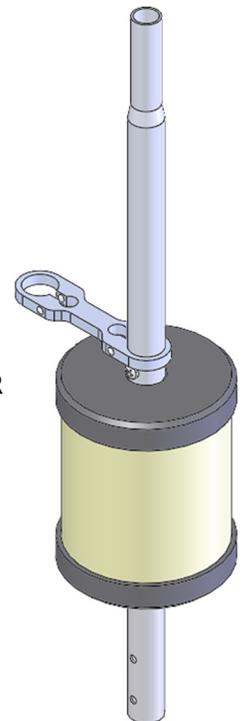
SHORTING BAR

3/4" X 3/4" X 3/8"

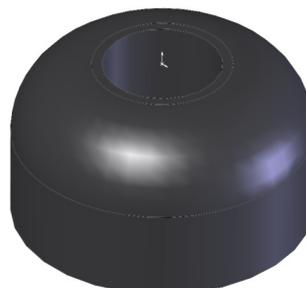
HARDWARE

8-32 X 1-1/4"

8-32 X 7/8"

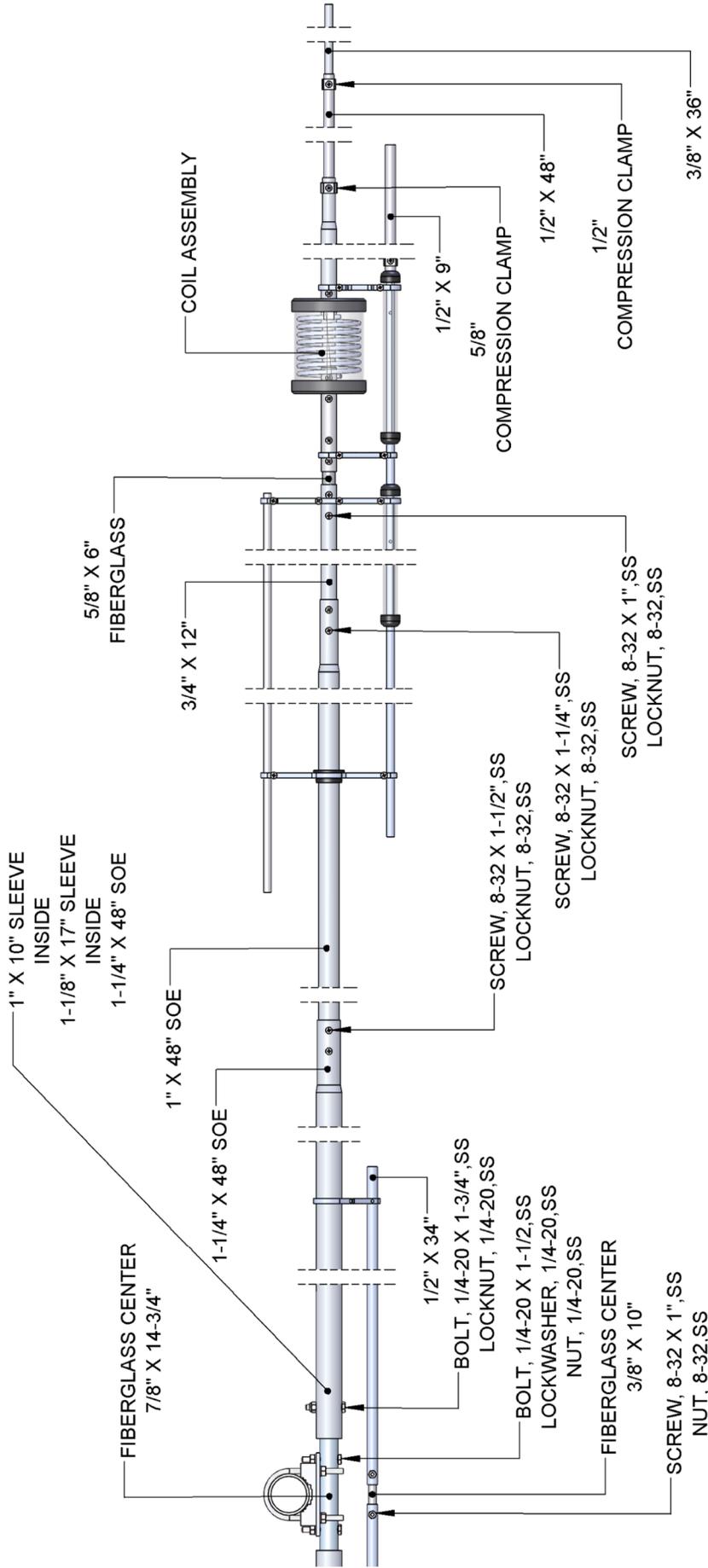


COIL ASSEMBLY



CAPACITOR CAP

KT31WARC GENERAL HARDWARE



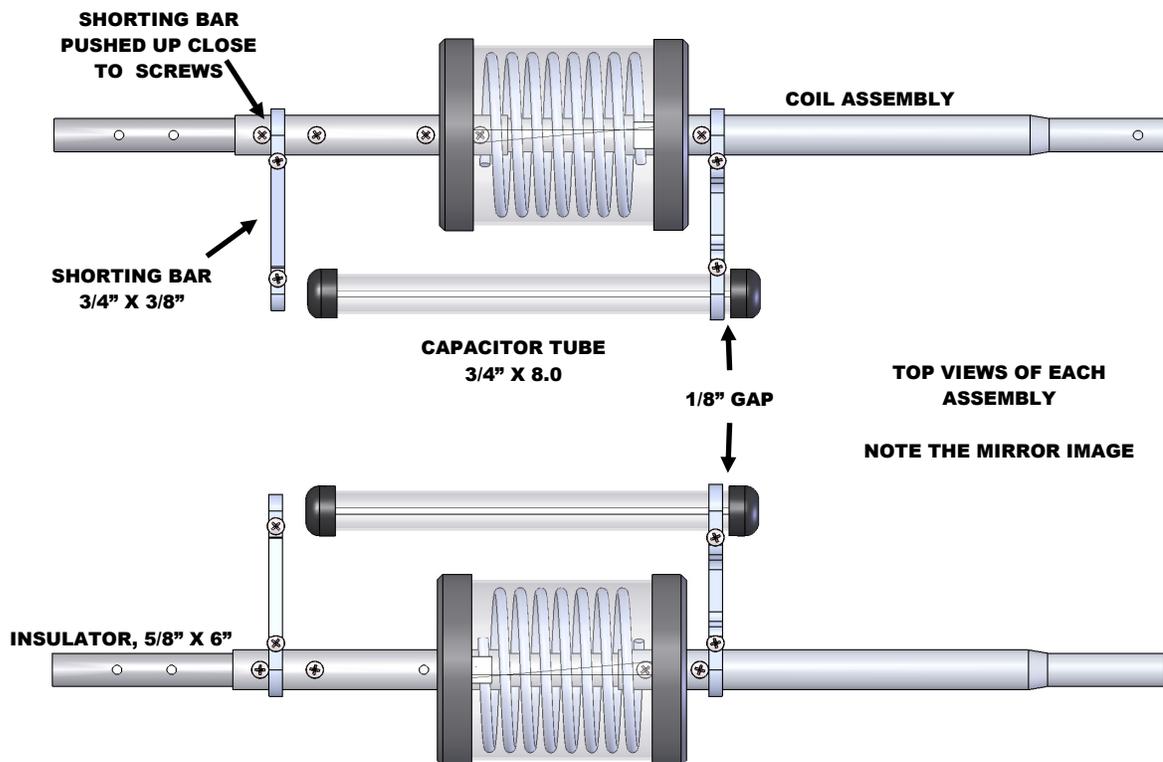
KT31WARC ASSEMBLY MANUAL

1. SHORTING BARS PREPARATION

Included with this kit are five different shorting bars, pictured in Figure 1. First locate the 3/8" X 1" X 3/8" shorting bars and shorting bar insulators (black plastic). For each 3/8" X 1" X 3/8" shorting bar press a single shorting bar insulator into the large hole. This can be done initially with a vise or with a hammer and a block of wood. After the insulator has been partially set into the hole, use a block of wood or similar and center the shorting bar on top of the wood block. Now place another block of wood on top of the insulator and give a final strike. You should hear a snap. This is the indication that the insulator has been secured. Next install the 8-32 hardware listed to the right of each part into each respective shorting bar. Remember to apply a light coating of Penetrox to the threads of each screw. Finger tighten each locknut for now.

2. COIL & CAPACITOR TUBE AND MIRROR IMAGE ASSEMBLY

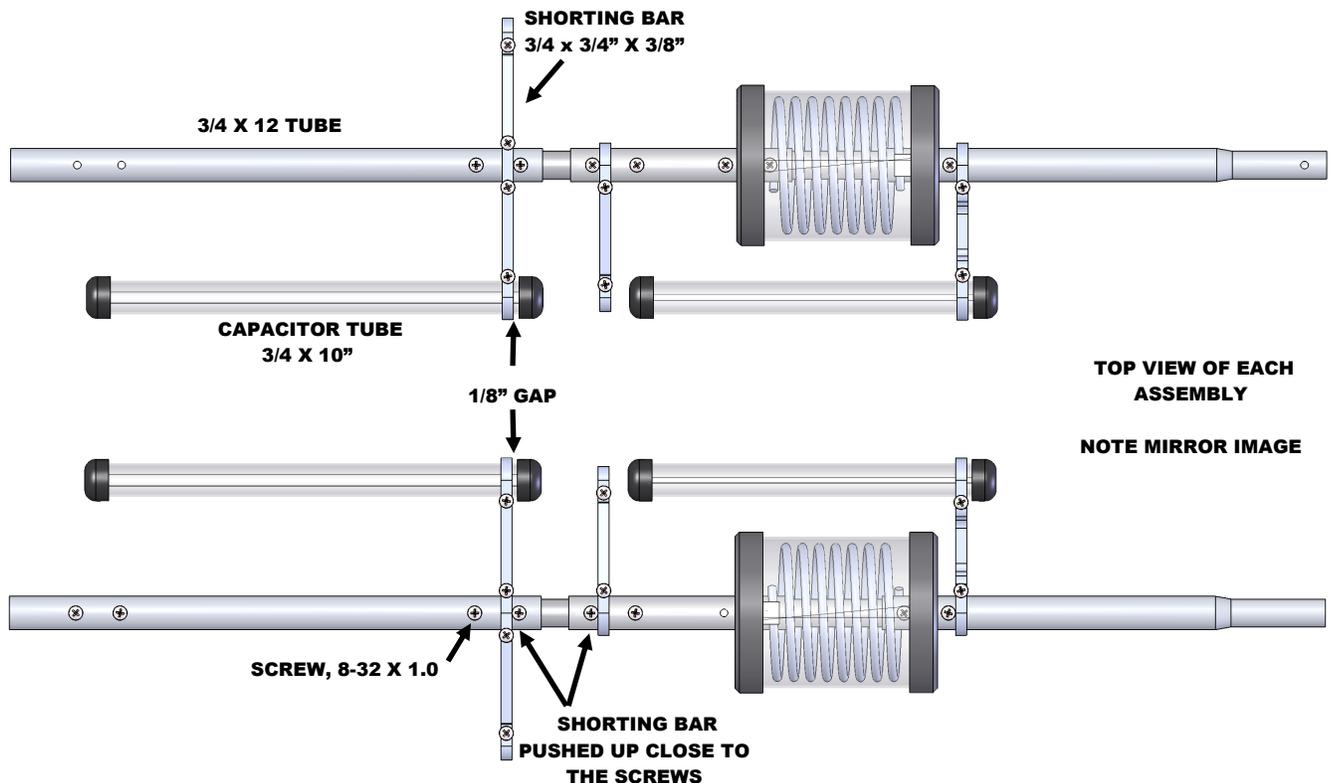
Locate the pre-assembled coil assembly, the two **Capacitor Tubes 3/4" x .049 x 8" and 10"**, **Fiberglass Insulator 5/8" X 6"** and **Shorting Bar 3/4" x 3/8"**. Note about capacitor tubes: THE CAPACITOR TUBE SHOULD BE VERY CLEAN INSIDE. PUSH KLEENEX OR EQUIVALENT THROUGH AS REQUIRED TO REMOVE CHIPS, OIL ETC. Add a capacitor cap to one end of the 8" capacitor tube slide the other end of the 8" capacitor tubes into the shorting bar that was preassembled on the coil assembly then add the other capacitor cap. Each capacitor cap will engage the 3/4" tube 3/8" (.375) so a measurement can be taken to insure complete engagement of the caps to the tube, simply measure between the inside edge of the two installed caps, it should be 5/8" (.625) to 3/4" (.750) shorter than the capacitor tube being measured. Now add the **Shorting Bar 3/4" x 3/8"** and the **Insulator 5/8" X 6"** to the short end of the coil assembly and add the noted hardware. Note the positions of the shorting bars pushed up next to the screws, also note the 1/8" gap between the capacitor cap and the shorting bars. Keep the hardware snug, not completely tight at this point, adjustments maybe needed as you move forward. Now repeat for the other assembly noting the mirror image.



KT31WARC ASSEMBLY MANUAL

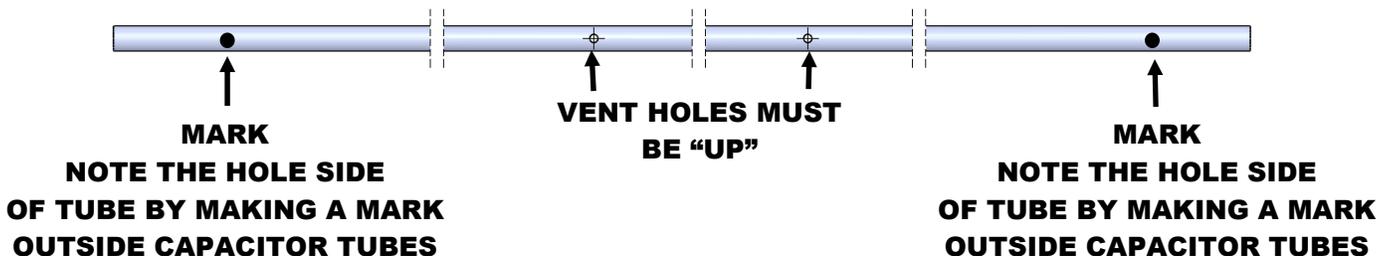
3. COIL & CAPACITOR TUBE AND MIRROR IMAGE ASSEMBLY CONTINUED

Add the capacitor cap to one end of the 3/4 x 10" capacitor tube. Slide the other end of the capacitor tube into the outer hole of the **Shorting Bar 3/4" x 3/4" x 3/8"** and add the other capacitor cap to the 10" capacitor tube. Locate the 3/4" x 12" tube with holes on both ends, slide the end of the 3/4" x 12" tube with the holes closest to the end into the center 3/4" hole of **Shorting Bar 3/4" x 3/4" x 3/8"** just past the first hole. Now slide the same tube onto the exposed end of the insulator 5/8" x 6". Add the hardware, align the capacitor tubes and shorting bars as shown below. Be sure to note the 1/8" gap at the shorting bar to capacitor caps and that the shorting bar is pushed up close to the screws. Now repeat for the other assembly noting the mirror image.



4. LL TUBE, PREPARATION

Locate the 3/8" X 48" diameter tubes. Upon inspecting the tubes, you'll notice there are two holes drilled on one side only. These holes equalize the atmospheric pressure in the capacitors and prevent moisture build up inside the capacitor tubes. Note the hole side of the tube by making a identifying mark NEAR the tube end, with a pen or marker. This will help you later to confirm the correct assembly of the element halves. It is very important to be sure these vent hole are facing upward in the final assembly.

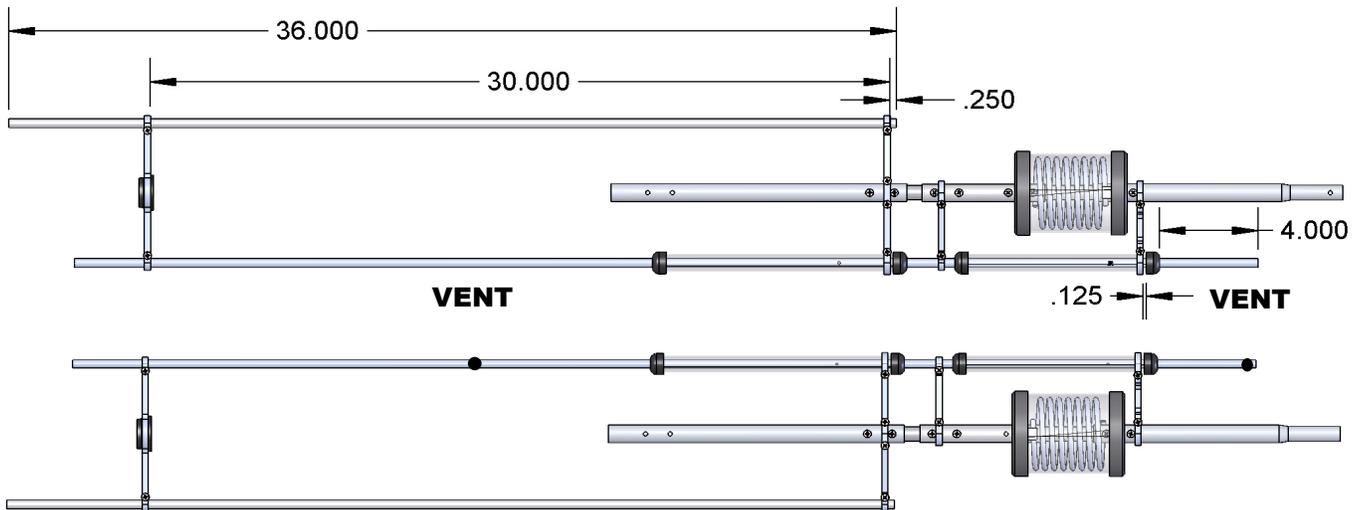


KT31WARC ASSEMBLY MANUAL

5. COIL & CAPACITOR TUBE AND MIRROR IMAGE ASSEMBLY CONTINUED

Insert the 3/8" x 48" tube into the end of the 3/4" x 10" capacitor cap. Please note that one end of the 3/8" tube has a small hole located 6" from the end. That end needs to be inserted first, so that it will be inside the 3/4" x 8" tube when the assembly is complete. Carefully push the tube through the first end of the capacitor cap, continue through second capacitor cap then through the shorting bar, being sure all components are aligned. Because the tube must push through tight tolerance plastic capacitor cap this process will require a consistent amount of pressure to move the tube. **Do not force this assembly, when all the parts are aligned the 3/8" tube will slide through.** Continue through the last capacitor caps and 3/4" x 8" tube, finally exposing 4" of the 3/8" x 48" tube. Rotate and point the vent hole up using the marks on the ends of 3/8" x 48" tube.

6. Add the 3/8" x 36" tube to the open hole in the **Shorting Bar 3/4" x 3/4" x 3/8"**. Add the last **Shorting Bar 3/8" x 1" x 3/8"** with the insulator and set the shorting bar dimension to 30.00". Be sure to tighten all the hardware and double check all dimensions. This completes coil and capacitor tube half element assemblies. Repeat steps 5 & 6 for mirror image.



FINAL ELEMENT HALF ASSEMBLY

Refer to the Element layout page that shows the configuration for 30M or 20M. Add the 1/2" x 9.00" tube with compression clamp to the exposed 4.00" tip section of the 3/8" x 48" preassembled tube. Because 17M is affected by setting the element for 20M or 30M there is slight difference for the 17M tip dimension when used on either 20M or 30M. Set 17m tip dimension (1/2" x 9.00") tube to the appropriate dimension for either 20M or 30M. Add the 20m or 30M the tips, referring to the element layout page. This completes the Half element Layout.

KT31WARC ASSEMBLY MANUAL

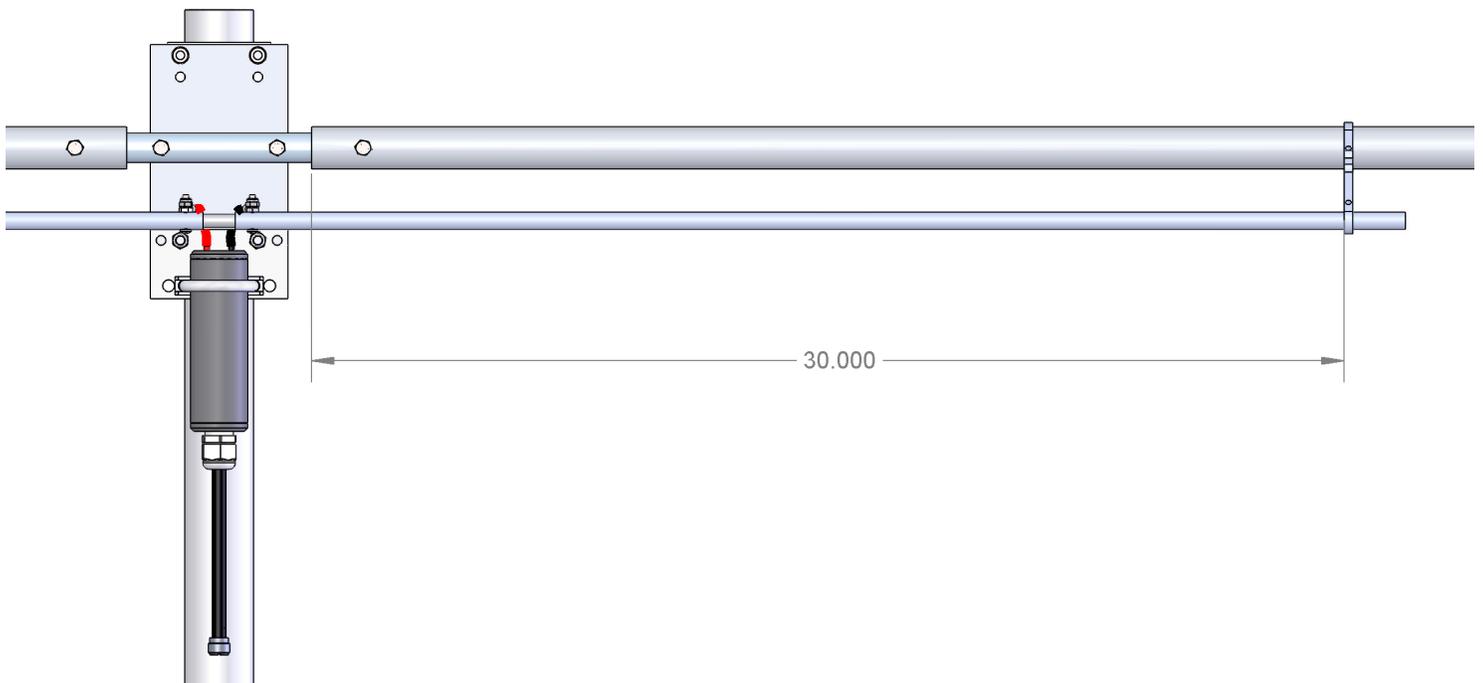
FINAL ELEMENT ASSEMBLY

During this final assembly process it helps to simulate the actual mounting of the dipole antenna on a short stub mast at chest level. Refer to the General Hardware Page and the Mounting Plate Detail page and assemble the **Fiberglass Rod 7/8" x 14-3/4"** to the boom to mast plate and mount the boom to mast plate to a short mast using 2" U-bolt and uni-cradles. Slide the 1-1/4" x 1/2" shorting bars onto the 1-1/4" x 48" SOE tube. Position them around 30" from the butt of the tube, do not tighten at this time. Now assemble the 1-1/4" x 48" tube and sleeves over the fiberglass and secure with 1/4-20 hardware. Add the 1" x 48" SOE tube and secure with 8-32 hardware. Finally add the pre assembled half element assemblies, be sure to assemble with the vent holes skyward or in the up position.

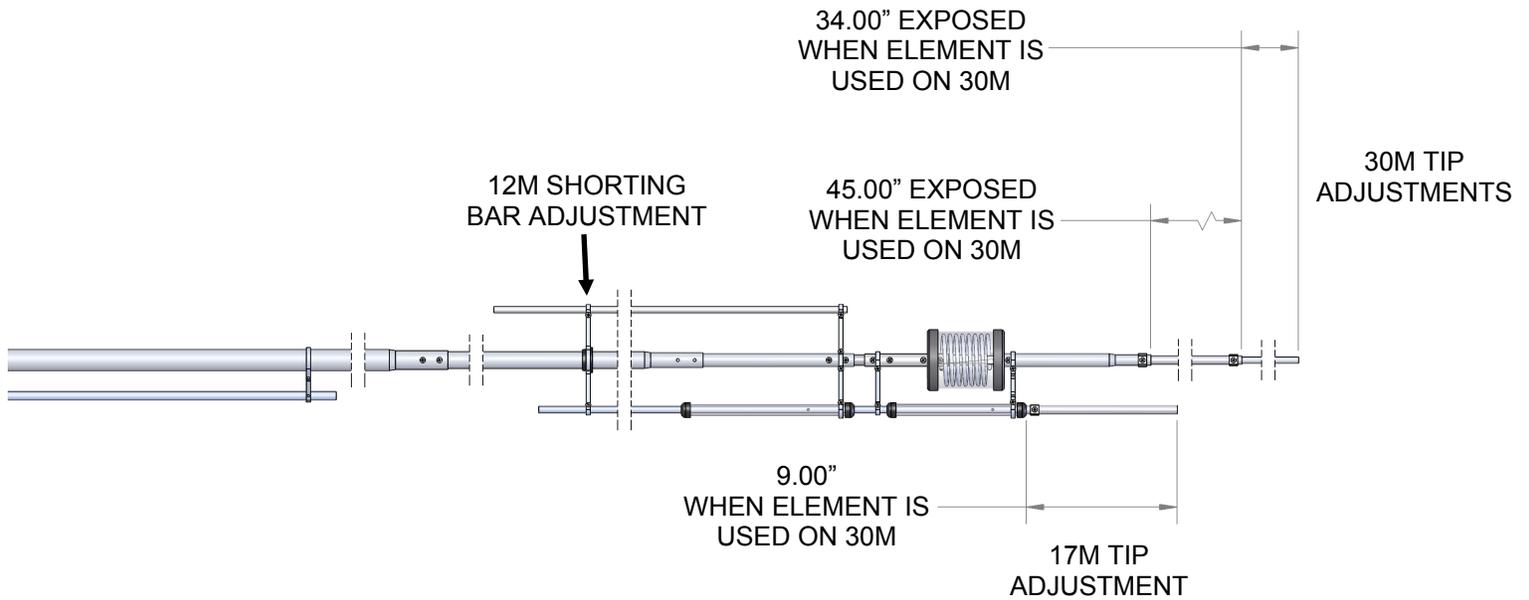
FINAL BALUN AND T-MATCH FEED ASSEMBLY

Assemble the 3/8" x 10" fiberglass tube to both 1/2" x 32" tubes secure with 8-32 screws and create a stud for the balun leads. Slide the T-match assembly into the shorting bars and position the shorting bars at 30" from the butts of the 1-1/4" x 48" SOE tubes and center the T-match tubes. Add the hardware to the shorting bars and lightly tighten. Assemble the balun with the plate and 1-1/2 U-bolt as shown in mounting plate detail page. Mount the balun assembly to the studs of the 2" U-bolt, adjust the angle of the T-match assembly as to keep the balun leads as short as possible and tighten. Add the lugs to the balun leads and assemble to the studs at the center of the T-match.

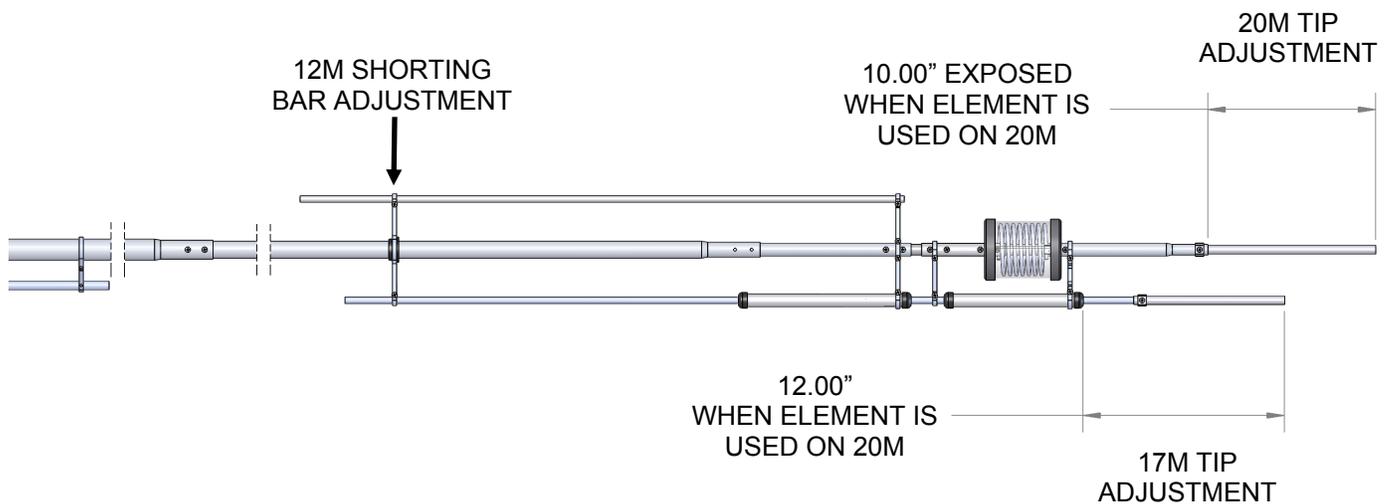
This completes the assembly of the antenna. Always double check and tighten all hardware during final installation. Be sure to use quality coax and water proof as needed.



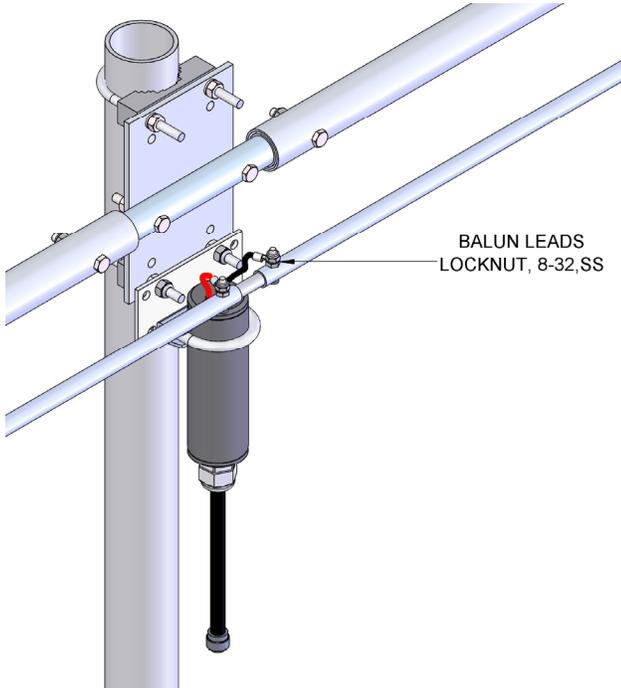
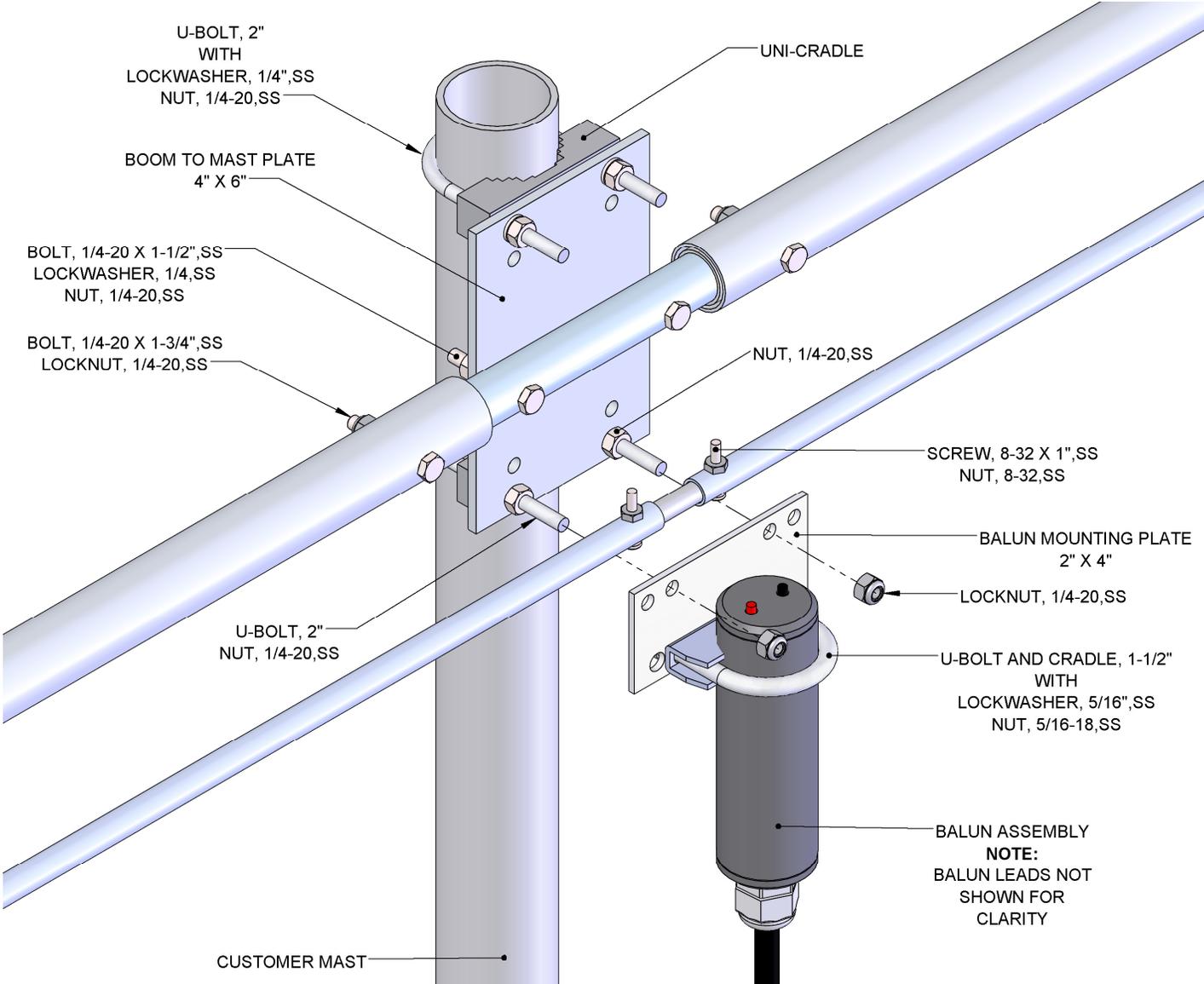
KT31WARC 30M, 17M, 12M ELEMENT



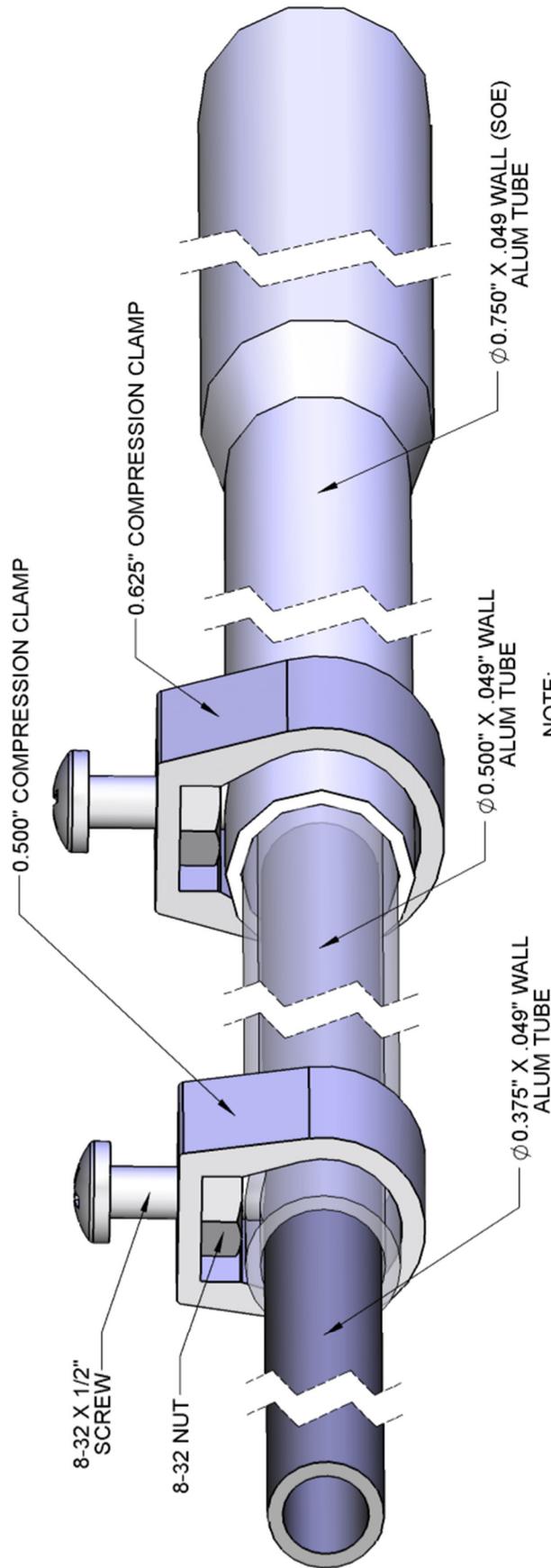
KT31WARC 20M, 17M, 12M ELEMENT



KT31WARC MOUNTING PLATE DETAIL



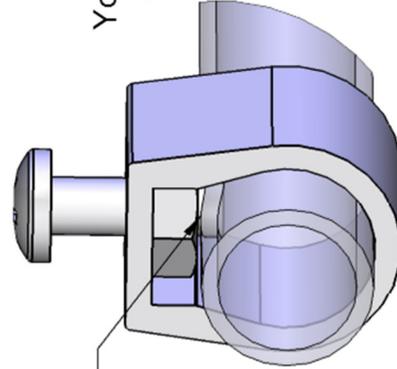
GENERIC COMPRESSION CLAMP DETAIL



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

KT31WARC TUNING NOTES

Tuning

The antenna concept is fairly straight forward. The 8" capacitor tube and the coil create a trap for 12M and passes the lower frequencies, the 10 capacitor tube along with the linear loading tunes 17M. 30M and 20M runs through all the linear loading to final longest tip. This antenna when close to the ground will have an effect of lowering all the bands in frequency. As the antenna is raised the frequency on all bands will raise slightly as the antenna reaches around 30 ft, as the antenna is raised higher any changes will be minor.

You may find that the lowest SWR point for each band may vary. Several factors affect tuning, including height above ground, adjacent structures, and other nearby antennas. **All tip measurements given are based on a height of 30 FT. If tuning is needed; start by tuning from the highest band and work your way down in frequency. Refer to the element layout option page to see the differences of the antenna dimensions for 30M or 20M.**

The **12M** band is tuned by the position of the 3/8 x 1 x 3/8 shorting bar, the 30" dimension is given as a starting point. All the bands run through this shorting bar, so the other bands will be affected by the position of this shorting bar, so do not be alarmed if the others bands change as you change this shorting bar position for 12M. If you want the antenna to work lower in frequency, increase the 30" dimension in 1/2 inch increments, testing at least 30' above ground or optimally in final position. After the antenna is tuned where you want it in the 12M band then move on to the 17M band.

The **17M** band is tuned by the 1/2" x 9" tip that slides over the 3/8" x 48" tube that is exposed 4". Standard tuning concepts applies, shortening the tip raises this band in frequency, lengthening the tip lowers the band in frequency. Finally tune the chosen low band 20M or 30M.

The **30M and 20M** bands are tuned by the amount of the longest tips. **Refer to the element layout option page to see the differences of the antenna dimensions for 30M or 20M.**

Remember it is always a good idea to make small changes, 1/2" increments, then test at least 30 ft. above ground or optimally in final position.

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KT31WARC PARTS & HARDWARE

DESCRIPTION	QTY
ELEMENT SEC, 1 1/4X .058 X 48.00 SOE	2
SLEEVE SEC, 1 1/8X .058 X 17.00.....	2
SLEEVE SEC, 1.0X .058 X 10.00.....	2
ELEMENT SEC, 1" X .058 X 48.00 SOE	2
ELEMENT, 3/4" X .049 X 12.00	2
WARC COIL ASSEMBLY	2
CAPACITOR TUBE, 3/4"X 10.00.....	2
CAPACITOR TUBE, 3/4"X 8.00.....	2
ELEMENT, 1/2" X .049 X 48.00	2
T MATCH TUBE, 1/2 X .049 X 32.00	2
ELEMENT TIP, 17M, 1/2 X .049 X 9.00	2
LL ELEMENT, 3/8" X .049 X 48.00 W VENT HOLES	2
ELEMENT TIP, 3/8" X .049 X 36	2
FIBERGLASS INSULATOR, 7/8" X 14-3/4" (M2AFG0030)	1
FIBERGLASS INSULATOR, 5/8 X 6" (M2AFG0029)	2
FIBERGLASS INSULATOR, 3/8 X 10.00 (M2AFG0010).....	1
CAPACITOR CAPS, 3/8 TO 3/4 (M2APL0019).....	8
SB INSULATOR, (M2ASB0053).....	2
SHORT BAR, 3/8 X 1.0 X 3/8 (M2ASB0052).....	2
SHORT BAR, 3/4 X 1.0 X 3/4 (M2ASB0050).....	2
SHORT BAR, 3/4 X 3/8 (M2ASB0057).....	2
T MATCH SHORT BAR, 1 1/4 X 1/2 (M2ASB0059)	2
BALUN, 1:1 3-60 MHZ, 3 KW (FGBL0700)	1
BALUN MOUNT PLATE, 2" X 4" X 1/8" (M2APT0018).....	1
BOOM TO MAST PLATE, 4 X 6 X 3/16" (M2APT0225)	1
UNICRADLE (M2AMC0076).....	2
COMPRESSION CLAMP, 5/8"	2
COMPRESSION CLAMP, 1/2"	4
2" U-BOLT, STAINLESS STEEL	2
1-1/2" U-BOLT & CRADLE	1
ZINC PASTE, SMALL.....	1
ASSEMBLY MANUAL	1

HARDWARE:

WASHER, 5/16" SPLIT RING, SS	2
NUT, 5/16-18, SS	2
BOLT, 1/4-20 X 1-3/4, SS.....	2
BOLT, 1/4-20 X 1-1/2, SS.....	2
WASHER, 1/4" SPLIT RING, SS	6
NUT, 1/4-20, SS	8
LOCKNUT, 1/4-20, SS	4
SCREW, 8-32 X 1-3/4 PAN HEAD PHL, SS	2
SCREW, 8-32 X 1-1/2 PAN HEAD PHL, SS	4
SCREW, 8-32 X 1-1/4" PAN HEAD PHL, SS	16
SCREW, 8-32 X 1.0 PAN HEAD PHL, SS.....	12
SCREW, 8-32 X 7/8 PAN HEAD PHL, SS.....	8
SCREW, 8-32 X 1/2 PAN HEAD PHL, SS.....	6
NUT, 8-32, SS	8
LOCKNUT, 8-32, SS	42
RING LUG, #8 HOLE #10 WIRE	2

COIL ASSEMBLIES (2) (PRE-ASSEMBLED)

ELEMENT SECTION, 3/4" X .049 X 10" SOE	2
ELEMENT SECTION, 3/4" X .049 X 5"	2
COIL, 7.5 TURN	2
COIL INSULATOR (M2AFG0028).....	2
COIL POST (M2ACP000).....	4
COIL COVER, UHMW 3.420X 4.312.....	2
CAP, COVER,3/4" HOLE	4
SHORT BAR, (M2ASB0051)	2
SCREW, 8-32 X 1" SS.....	8
LOCK NUT, 8-32 SS	4
SET SCREW, 1/4-20 X 1/4 SS.....	4