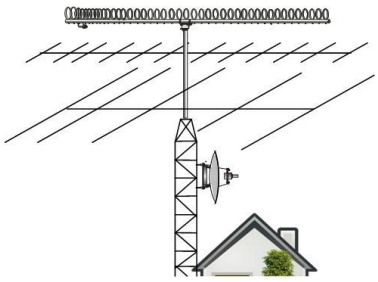

Directive Systems & Engineering

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Haymarket, VA 20169-1628

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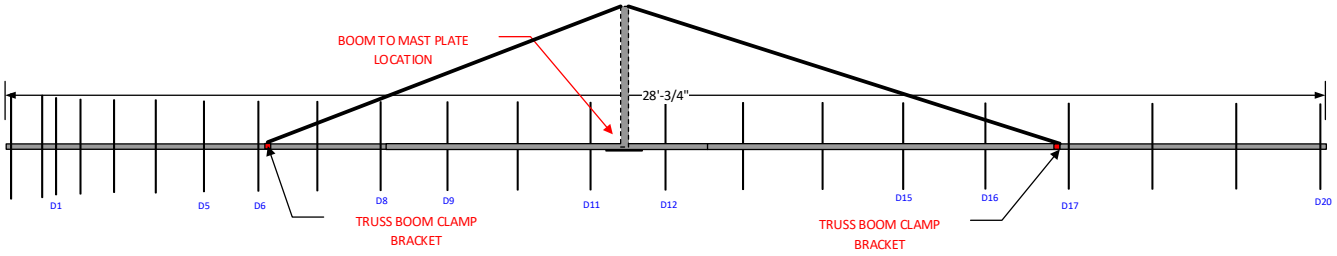
703-754-3876

22 Element 3.9 wl. K1FO Designed Yagi, Model DSEFO222-22 (w/boom sag)



ELECTRICAL SPECIFICATIONS

Frequency range: MHz 222-223
Gain: dBd..... 15.8
Impedance: Ohms..... 50
Connector type..... Type N (F)
Front -to- back ratio: dB..... 22
SWR: Typical at resonance..... 1.12:1
Beamwidth 3dB: degrees
E- Plane 23º
H- Plane 24º
Sidelobe level: decibels
1st E- Plane ..... -17.5
1st H- Plane ..... -15.5
Power rating, Continuous: Watts 1500
Stacking Distance: ft.(m)
E- Plane..... 11’ (3.353)
H- Plane..... 10’4” (3.150)

MECHANICAL SPECIFICATIONS

Boom length: in. (m.)..... 28’ 3/4” (8.553)
Turning radius: in. (m.)..... 17’ (5.182)
Weight Assembled: Lbs (kg.)..... 13 (5.90)
Max mast size: in. (cm.)..... 2” (5.08)
Wind surface area: sqft (m.) ..... 3 (.279)
Wind Survival: Mph (km/hr)..... 90+ (150)

BEFORE INSTALLING YOUR NEW ANTENNA, PLEASE BE SURE TO READ THE ENCLOSED WARNING PAMPHLET.

PARTS LIST

Note: All hardware is Stainless Steel unless otherwise noted.

Boom	
1 1/4" OD x 0.058" x 72" rear (Black on one end) w/ coax/balun assy attached	1
1 3/8" OD x 0.058" x 72" rear mid (Black / Red)	1
1 1/2" OD x 0.058" x 72" center (Red / Blue)	1
1 3/8" OD x 0.058" x 71 1/2" front mid (Blue / Green)	1
1 1/4" OD x 0.058" x 69 1/4" front (Green on one end)	1
Boom Sag	
72" x 3/4" aluminum flattened on one end	2
48" x 5/8" aluminum flattened on one end	1
24" x 5/8" aluminum flattened on one end	1
Element bundle	
3/16" elements	22
Brass T-arms	2
Hardware Bag	
8-32 x 1 3/4" Machine screw	4
#8 Split lock washer	4
#8 Hex nut	4
Brass shorting bars	2
Hex wrench	1
1 1/2" Hose clamp	4
3/16" Element insulators	46
3/16" Keepers	48
1 1/4" Black End Caps	2

Boom Sag Hardware Bag	
Boom Sag Bracket	2
2" Long tangent U-bolt	1
2" Saddle	1
Aluminum spacer	2
10-32 Machine screw	2
10-32 NyLock® nut	2
5/16" Split lock washer	2
5/16" Flat washer	6
5/16" Hex nut	2
5/16" NyLock® nut	2
3/4" Hose clamp	2
Boom to Mast Hardware Bag	
5/16" x 2" U-bolt	2
2" Saddle	2
5/16" Nut	4
5/16" Split lock washer	4
5/16" Flat washer	4
1/4" x 1 1/2" U-bolt	2
1 1/2" Saddle	2
1/4" Nut	4
1/4" Split lock washer	4
1/4" Flat washer	4
Boom to Mast plate	1
Anti Seize Compound	1
Element assembly tool	1
Assembly instructions	1

Anti-Seize Compound - Apply a small amount of the supplied Anti-Seize Compound to the aluminum joints and to the threads of the U-Bolts to prevent galling.

CAUTION: ***While we strive to remove all burrs from all machined parts, there is always the possibility of sharp edges. We strongly suggest checking the edges and use a fine file, or 400 grit sandpaper, to remove any burrs that may have been left.***

Tools needed: *#2 Phillips screwdriver*
¼" flat blade screwdriver
soldering gun or large iron
rosin core solder
large needle nosed pliers
keeper installation tool (supplied with kit)
ruler with metric millimeter markings
marking pencil

ASSEMBLY INSTRUCTIONS

1) The antenna components should be removed carefully from the shipping container and the individual parts counted and checked for completeness. Be careful to check all tubing pieces for elements and hardware that may be packed inside.

2) The boom consists of five pieces of tubing. The rear boom section has the driven element connector and balun already preassembled and attached. The larger diameter rear-mid boom section (with black on one end and red on the other is next. This is followed by the center boom section which has a red mark on the rear and a blue mark on the front. The front mid boom section has a blue mark on the rear and a green mark on the front. Last, the front boom section has only a green mark on the rear where it attaches to the front-mid section.

3) Install all of the element insulators by pressing them into the holes in the boom. They will snap in place and should not fall out. We include a couple of extras just in case!

4) The element bundle contains all of the elements needed for assembly. Take time to inventory each one and check off each dimension with Table 1. Some elements vary by 1 or 2mm in overall length, so extreme care in measuring is called for here. Arrange elements in order of descending size and mark each element with a scribe for proper location of the "keeper" (see Table 1 and Figure 1). The reflector is the longest element, and each succeeding director is slightly shorter. DIR # 20 is the shortest. The keeper must be installed as shown in Figure 2. Using the aluminum tubing tool supplied, slide the keeper to within 1/8" or 3 mm. of the scribed line. Final adjustment will be done on the antenna. Note that the keeper is a one-way device only. If you go past the scribed line you must continue to the element end and start the process over. Place the first keeper on all elements.

See pictures below for keeper orientation. The front side, with the tabs going inward, is the side to push onto the element. The rear side, with the tabs going outward, is the side that faces you. It is the side that goes face down into the element tool.

Keeper Front side Keeper Rear side

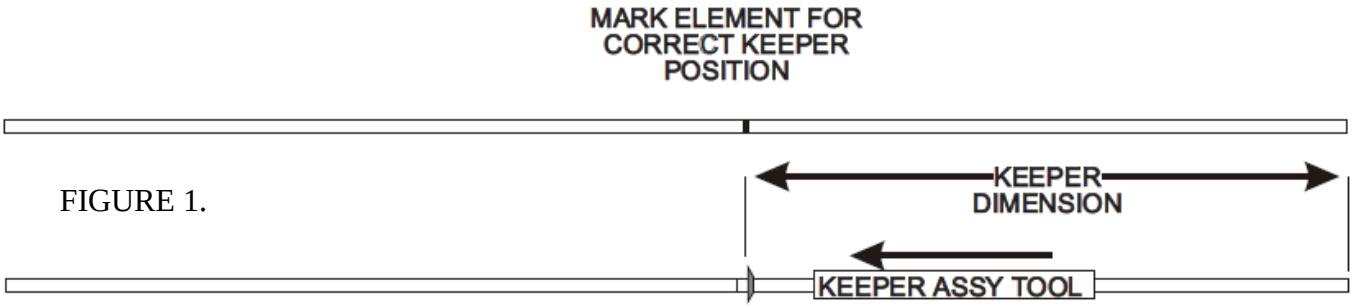


FIGURE 1.

FIGURE 2.

5) You are now ready to install the elements on the boom. You must start at one end and work your way, in order, to the far end of the boom. Lay out the elements in ascending or descending order as appropriate. Install a black insulator in each side of the boom piece at the starting end, and slide the correct element through the two insulators. Obtain a second keeper and install that keeper on the opposite end of element #1 from the pre-installed keeper.

(See Figure 3) Check that the element is centered before you snug up both keepers. A positioning error of +/- 1mm. or 0.040" is acceptable. At this point, if you tighten the keepers and the element is not centered, you will have to cut one of the keepers to remove the element and start again. Some extra keepers are supplied, but care is definitely required here. Check your work as you go! Proceed with the next element in similar fashion. Note that the driven element is brass tube, but otherwise is installed same as the other elements. Check off each element on Table 1 to monitor your progress. Double-check element lengths one last time before final installation on the boom.

FIGURE 3.

6) The driven element and T-Match assembly are built as shown in Figures 4 & 5.

7) Locate the two brass T-arms. Both are preformed- one is straight with a flattened end, while the other is bent and flattened on one end. Locate also the brass T- arm shorting bars, and position them on the brass driven element as shown in Figure 4.

8) Referring to photo 1, push the pre-formed T-arm into the hole in the standoff insulator which has the hole rotated up slightly for easier installation.

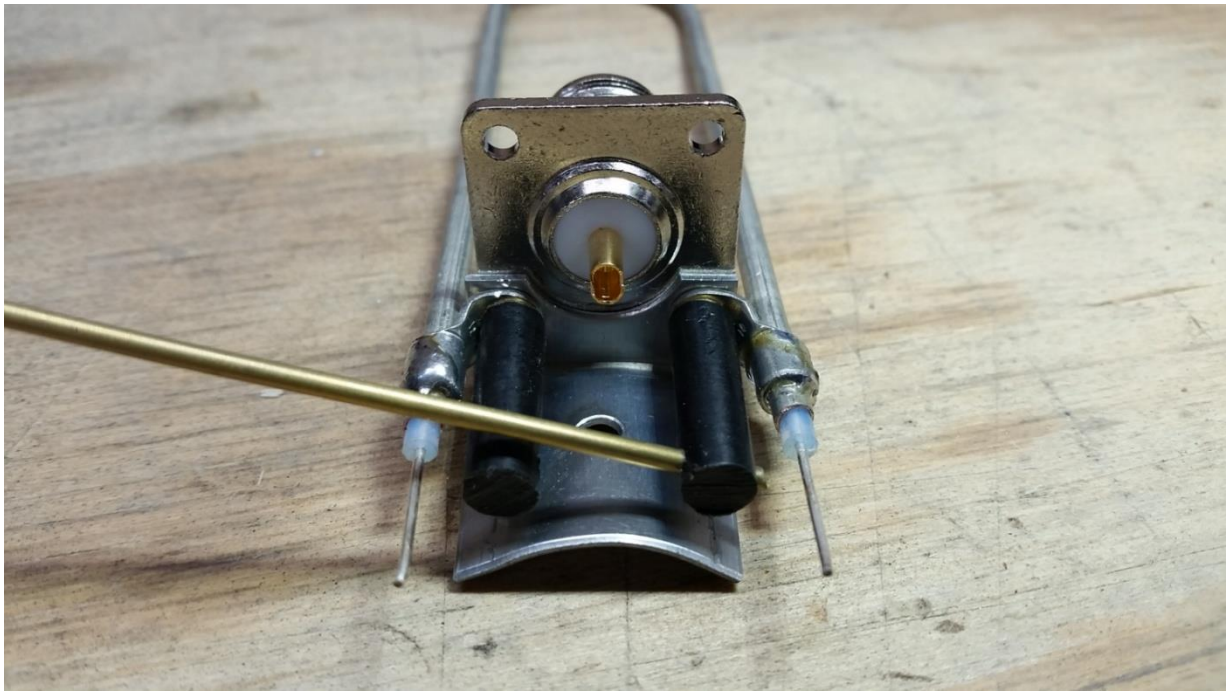


Photo 1

9) Push the T-arm all the way through as shown in photo 2.

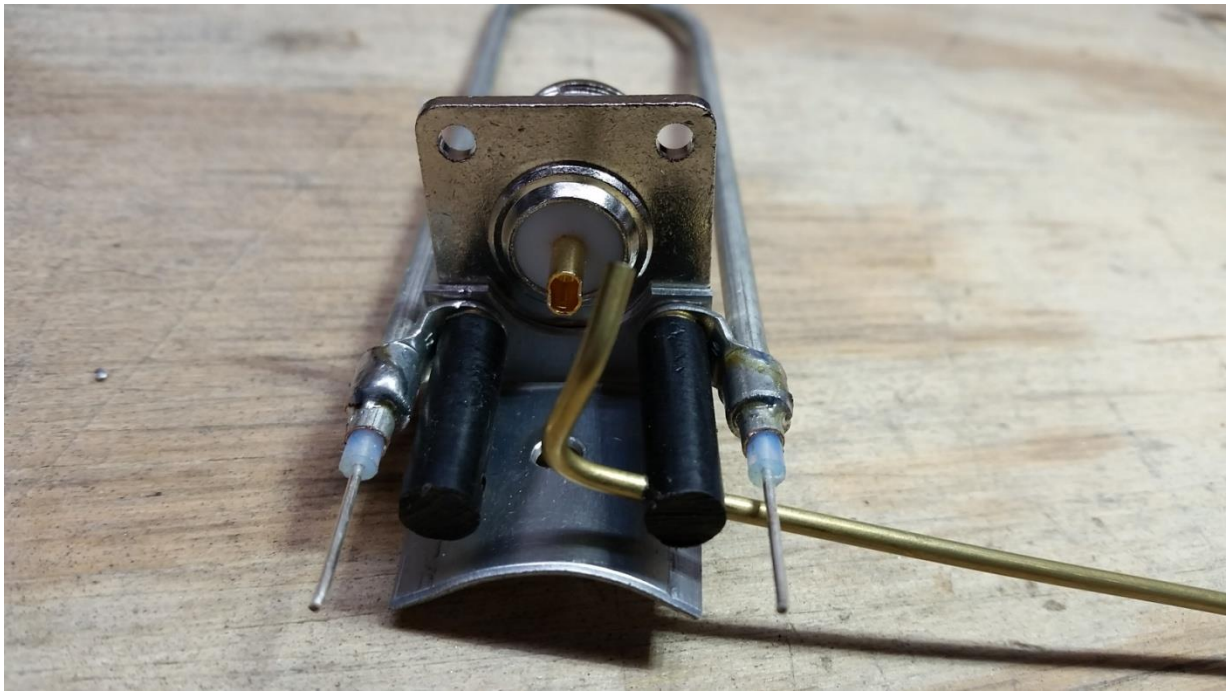


Photo 2

10) Once the T-arm is inserted all the way as in photo 2, slightly loosen the screw holding the insulator using a #1 Phillips screw driver.

11) Rotate the T-arm so the end of the T-arm fits into the solder cup on the N connector (see photo 3) and tighten the Phillips screw.

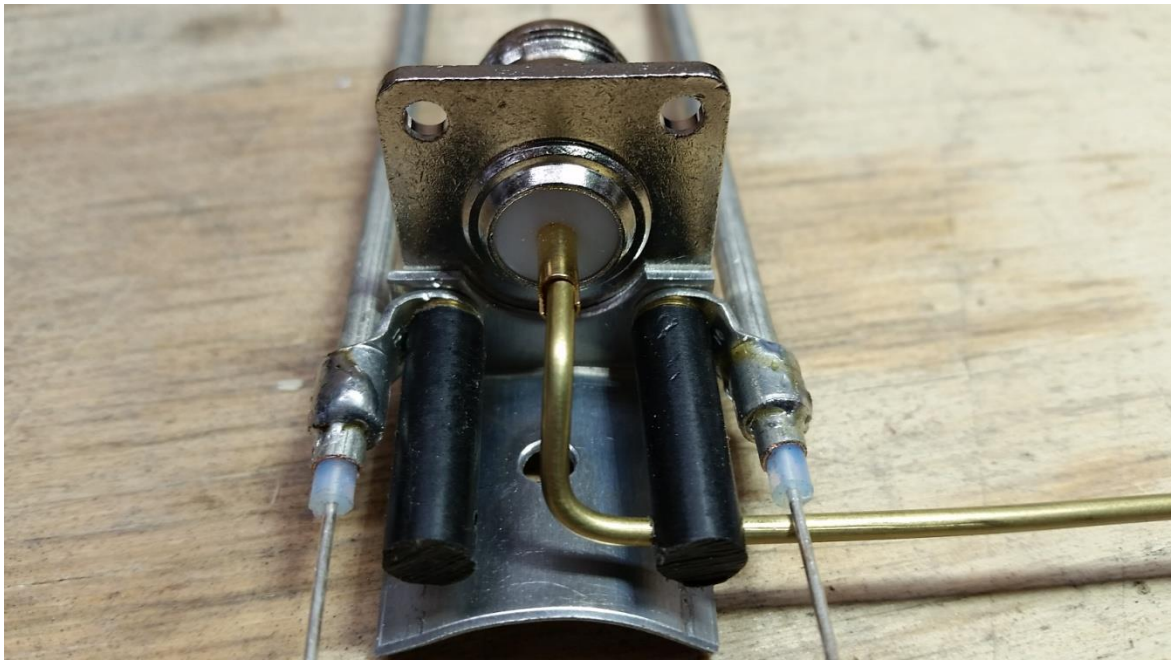


Photo 3

12) Next, insert the straight T-arm into the other standoff insulator until it is flush with the inside edge (see photo 4).

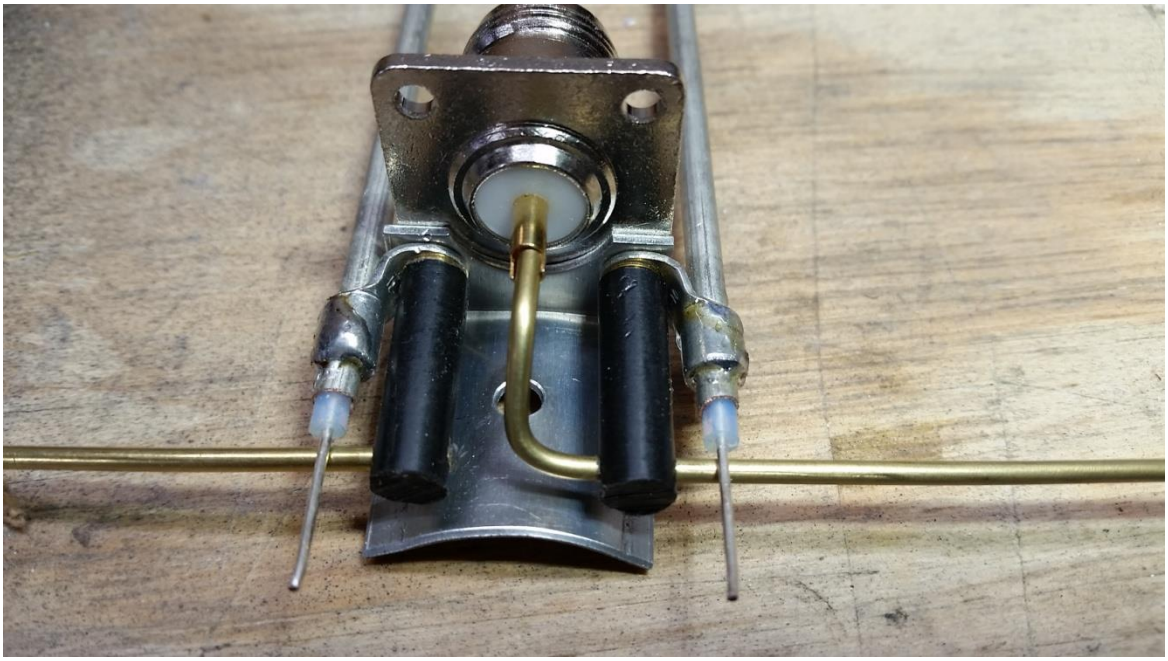


Photo 4

13) Last, wrap the balun center conductor around the T-arms and solder (see photo 5)

Photo 5

14) Slide the T-arm shorting bars over the driven element and T-arms. Measuring from the boom to the inside of the shorting bar, the dimension below is a good starting point; however, to ensure the minimum SWR at your operating frequency, we recommend using an antenna analyzer or SWR bridge to obtain the lowest SWR. Note: The ends of the T-arms that extend past the shorting bars can be bent up toward the driven element, or down away from the driven element to obtain the best SWR.

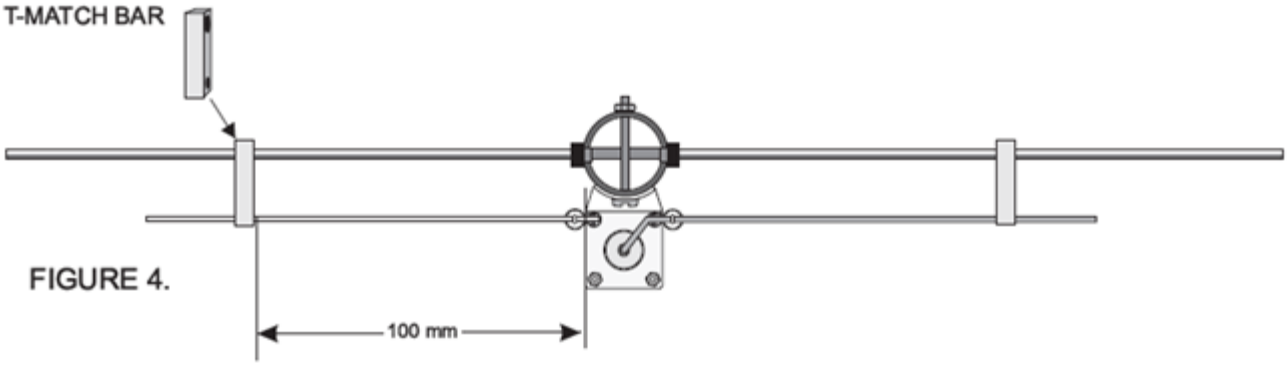


FIGURE 4.

BOOM SAG SUPPORT ASSEMBLY INSTRUCTIONS

15) Last is the boom sag brace assembly. We recommend attaching the antenna to a temporary support to get the adjustments done before erecting on your tower.

16) The boom to mast plate mounts between D11 and D12, using ¼" X 1 ½" U-bolts, saddles, lock washers, flat washers and nuts. The exact position should be determined by balance with your feed line in place. If unsure, just center it between D11 and D12.

17) Mount the antenna to a mast and assemble the boom sag long tangent U-bolt by placing the saddle on the legs of the U-bolt. Next slide on the ½" spacers, then a 5/16" flat washer, lock washer and nut. This assembly should be about 24" above the antenna.

18) Next, locate the two ¾" X 72" long boom sag struts and place a ¾" hose clamp over the slits. Then place a flat washer on each leg of the long tangent U-bolt you just installed and place the flattened end of one of the boom sag struts on each leg, followed by another flat washer and a nylon lock nut. DO NOT TIGHTEN THE NUTS TO A POINT WHERE THE BOOM SAG STRUTS CAN'T MOVE.

Mast Boom Sag Support

19) Install a boom sag support bracket on the front of the rear boom section (marked in black), placing the bracket so that it is against the next boom section.

20) Locate the shorter 5/8" X 24" boom sag strut and slide the strut into the ¾" strut coming from the mast going to the rear. Attach the end of the boom sag to the boom sag bracket using a 10-32 X 1" screw and nylon lock nut. Do not over tighten. Snug the hose clamp slightly over the slits to hold it in place.

21) Locate the 5/8" X 48" boom sag strut and slide the strut into the ¾" strut coming from the mast going to the front. Attach the end of the boom sag to the boom sag bracket using a 10-32 X 1" screw and nylon lock nut. Do not over tighten. Snug the hose clamp slightly over the slits to hold it in place.

22) Assemble the front boom sag by placing the boom sag support bracket over the rear of the front boom section (marked with green), placing the bracket so that it is against the next boom section. Complete the assembly as you did for the rear. Once the boom is adjusted for no sag, tighten the ¾" hose clamps securely.

23) If you are installing multiple antennas, mark each boom sag so it stays with the antenna it came off of.

If you are installing multiple antennas, please be sure that you build each antenna with the same T-match wire orientation. In the above drawing, the center pin goes to the right hand side of the antenna as viewed from the back of the connector. Make sure both antennas do the same! Proper phase relationship is very important here!

If you wish to check your work, now is the time to apply power to the antenna. Any workaround RF energy should be done carefully. We do not recommend standing next to an antenna with many watts of 222 MHz energy radiating around it. The best method involves using a low power return loss bridge and SWR indicator along with a signal generator. A power level of 1milliwatt is all that is required. The T-arm shorting bars may be adjusted with power applied and the point of best match can be found quickly, easily and more accurately than that with an amateur transmitter and wattmeter connected. Generally, good watt meters can reliably indicate SWR down to about 1.2:1. A high directivity bridge or coupler can increase accuracy, but 1.2:1 is more than adequate for any installation.

The aperture of this antenna is large enough, so that you must elevate the antenna a minimum of about 8 feet or 2.5 m above the ground. Point the antenna so that there are no "reflectors" or obstructions for 100 feet directly in front of the beam. A better method would be to point the antenna straight up toward the sky. Support the antenna on a wooden or metal pole or tube, and tie or guy the antenna boom with very light string or line. Now the driven element will be at arm level, and ground effects are removed. Most locations are pretty clear straight overhead as well!

Install a short length of coax (1/2 wave is ideal ...The antenna impedance will repeat each half wave from the antenna regardless of coax imperfections) between the coax connector and your bridge or wattmeter. If you utilize your 222 MHz transmitter as an RF source, apply power and observe the reflected power. Turn off the power and adjust the T-Match bars equally in small increments - 1/8" or 3 mm. is a good starting point. Apply power again and observe results. If it got better, keep going. If it degraded, change the direction of your T-Match movement program and recheck your SWR. At some point, you will observe a null in reflected power. When you have found it, tighten the set screws on both the driven element and the T-arms with the supplied hex wrench.

Brass, copper and tin lead solder will oxidize in the weather and over the year's performance can degrade. It is a good idea to spray your handiwork with a good grade of clear paint sealant. As a general rule, the slower drying sprays tend to be more enduring. Rustoleum "Clear Seal" or Krylon clear sprays are recommended. A few light coats work better than one big one. Be sure to cover the connector before spraying.

DO NOT, UNDER ANY CIRCUMSTANCES, APPLY ANY TYPE OF SEALANT OR COATING TO THE DRIVEN ELEMENT, T-ARMS OR CONNECTOR ASSEMBLY, OTHER THAN KRYLON® CLEAR COAT. ANY OTHER COATING WILL ADVERSELY AFFECT THE SWR AND VOID YOUR WARRANTY.

You are now ready to install your new antenna. Be careful when you dress the coax down the boom. Keep the coax away from any elements. Tape the cable tightly and securely to the boom. The Boom-to Mast plate has V shaped grooves to fit mast sizes up to 2" maximum. The 1/4" U-bolts, flat washers, lock washers and nuts are used to attach the boom to the mounting plate and the 5/16” U-bolts, flat washers, lock washers and nuts are used to attach the antenna to your mast. It is a good idea to apply a small amount the supplied anti-seize compound to the stainless steel threads under the hex nuts to prevent galling of stainless steel.

This will complete the assembly of your DSEFO222-22. The construction of this antenna will provide many years of consistent performance with no degradation of performance due to corrosion and weathering.

Table 1

Element Description	***Element Length mm. +/- 1mm***	***Keeper Half Length mm.***
Reflector	684	324
Driven Element	650	308
Director #1	631	298
Director #2	616	291
Director #3	602	284
Director #4	595	280
Director #5	589	277
Director #6	584	275
Director #7	581	271
Director #8	577	270
Director #9	574	268
Director #10	571	266
Director #11	568	264
Director #12	566	263
Director #13	564	262
Director #14	563	262
Director #15	562	262
Director #16	558	262
Director #17	557	262
Director #18	556	261
Director #19	555	260
Director #20	554	260

Directive Systems Warranty Policy

All Directive Systems antennas are built with the finest materials available. We take great pride in building a quality product that will give years of good service and performance. If there is a defect in materials or workmanship within 90 days of purchase, Directive Systems will repair or replace the defective part, free of charge, to the original purchaser. **DO NOT RETURN ANYTHING WITHOUT PRIOR AUTHORIZATION FROM DIRECTIVE SYSTEMS**. Please contact us either by phone or email describing the problem and we will work to resolve it.

If, after examining a new antenna you received, you are not satisfied, contact us immediately for return authorization and refund. **ANY ANTENNA THAT HAS BEEN MODIFIED WILL BE SUBJECT TO A RESTOCKING CHARGE. IF AN ANTENNA IS SO MODIFIED AS TO MAKE IT UNUSABLE, DIRECTIVE SYSTEMS RESERVES THE RIGHT TO REFUSE TO ACCEPT THE ANTENNA FOR RETURN.**