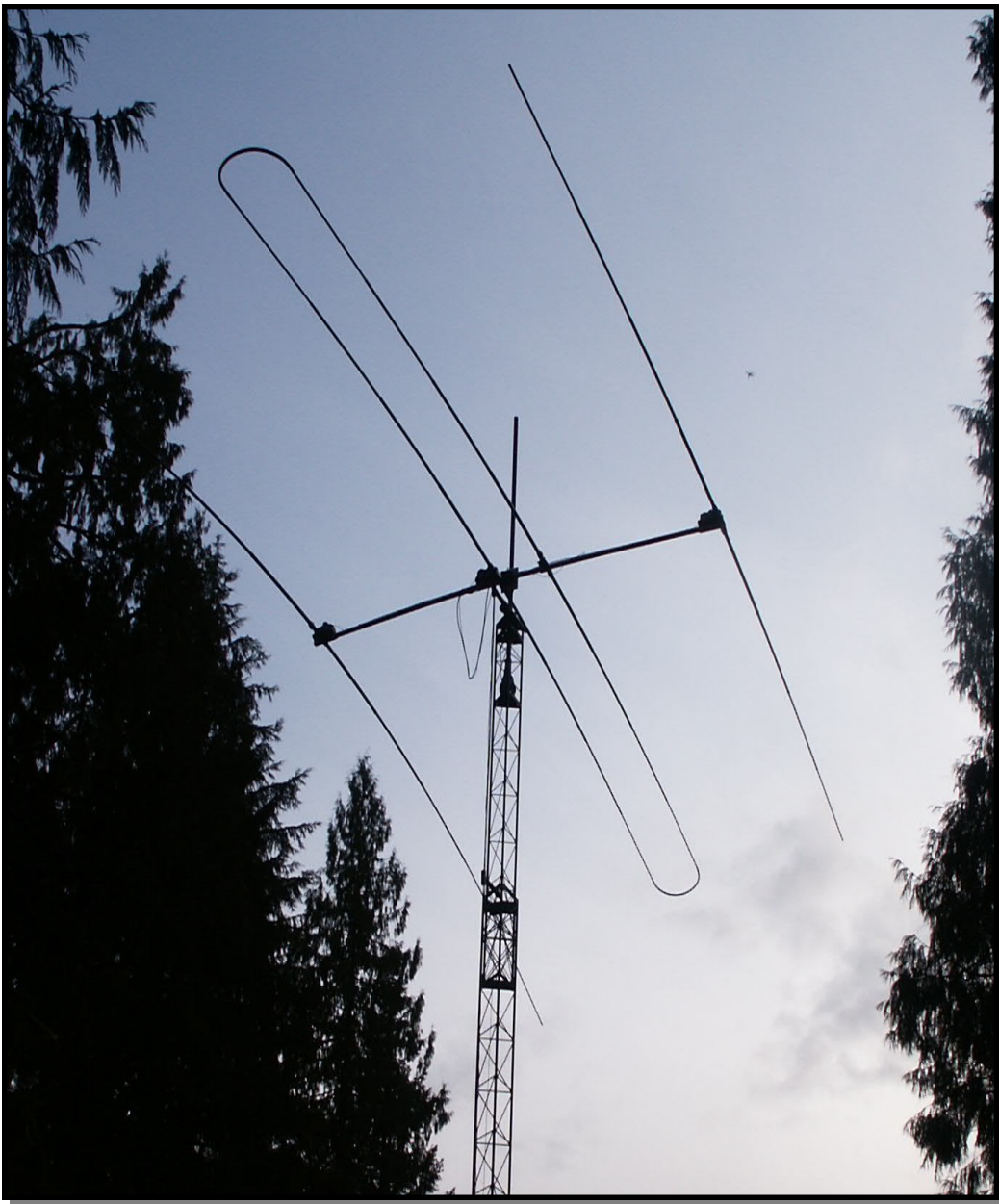


steppIR

40m - 30m Dipole Kit Upgrade

Instruction Manual for the 2, 3 and 4 Element Yagi



40m - 30m Dipole Overview

The 40m - 30m dipole acts as a driven element that functions seamlessly as a dipole from 6.8 MHz to 13.8 MHz and as the driven element for the Yagi array from 13.8 MHz to 54 MHz.

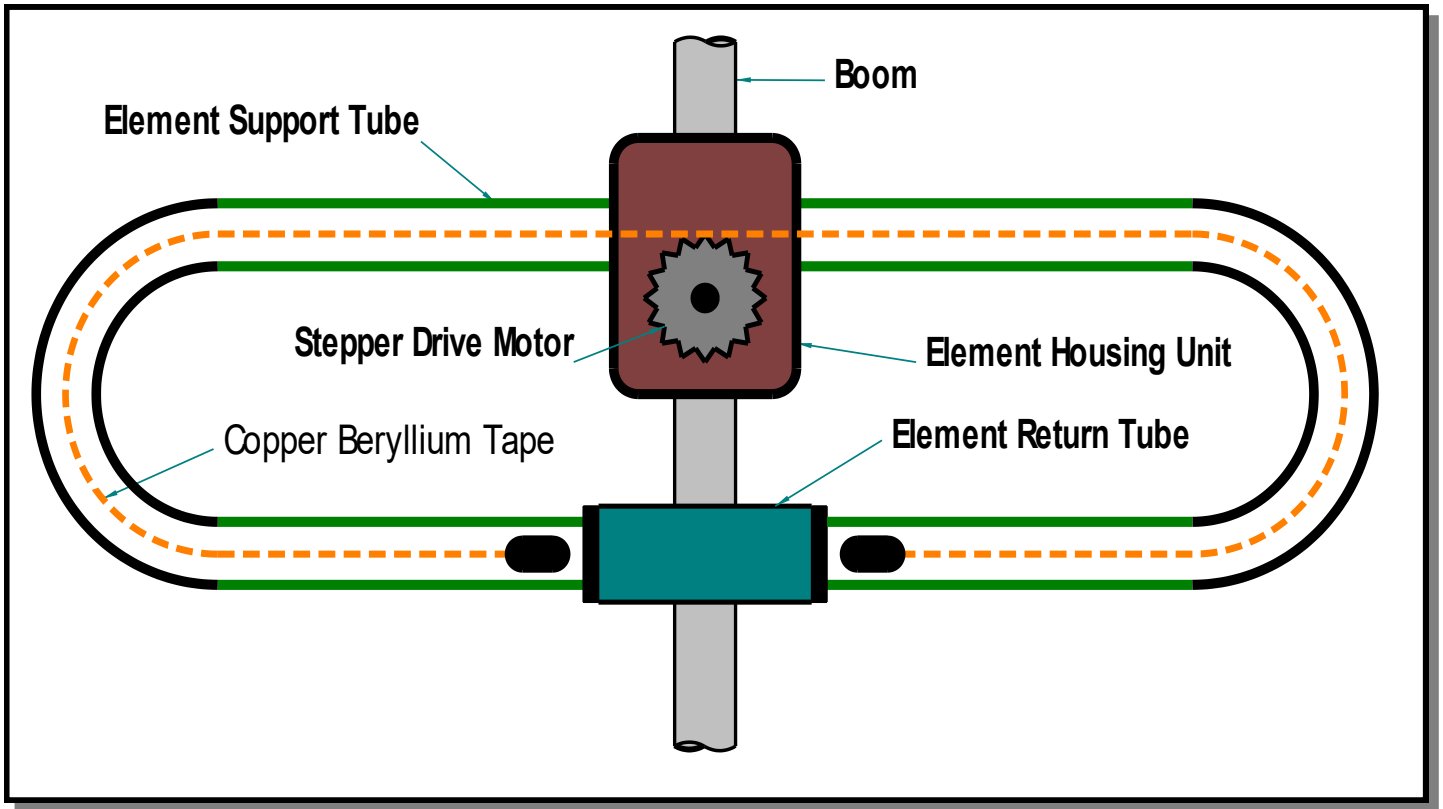
A dipole for 40m would normally be about 64 feet long but we have shortened it to 39 feet by looping the element tip back towards the boom. This patented form of linear loading is very efficient, losing only approximately 0.37 over a full size dipole. On 30m since the copper tape barely turns the corner back toward the boom it essentially performs like a full sized dipole, with higher SWR because of the loop effect, for this band only.

On 40m, folding the element back nearly double (the tape comes within about 3.5 feet of the boom on each side) very conveniently makes the impedance 25 ohms, a 1.0:1 match for our yagi Balun/Unun. On the 30m band however, we have a full sized dipole whose impedance is very much dependent on the height above ground, so there is a varying degree of mismatch. Below 40 feet or so you will find the SWR as high as 2.6:1 but at greater heights it can drop to as low as 1.6:1 SWR.

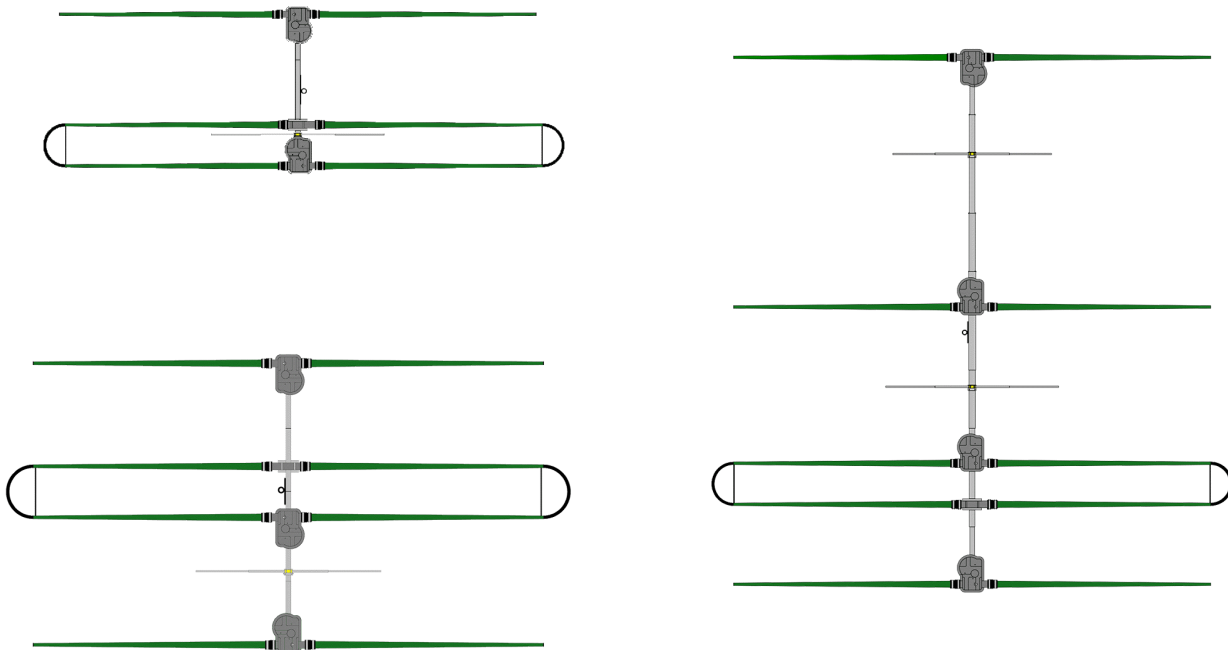
This small amount of mismatch can easily be handled by the internal tuners on most transceivers. At 10 MHz SWR values in this range result in insignificant loss, so the antenna will perform very well on 30m. You will find that on 40m even at heights below 40 feet you will get a very good match with this type of shortened dipole. If the SWR seems to be too high try adjusting the driven element length using the "Create Modify" function.

A Note from Mike Mertel K7IR:

By using the "Create Modify" function to fully extend either the reflector or director 1 (there are two directors on the 4E Yagi) on 30m, a very short director can be created for the dipole, resulting in approximately 0.5 dB gain, also lowering the SWR by about 0.2. The antenna can be saved into memory and it will be permanent (you can always reset factory defaults if it doesn't work out for you). Try saving it both directions (180 and normal), by lengthening the reflector in the 180 direction, and the director 1 in the normal direction, and now have the antenna reversible on 30m. If SWR is the largest concern, try lengthening both the reflector and director 1 to get the lowest SWR



Driven Element Placement—Loop



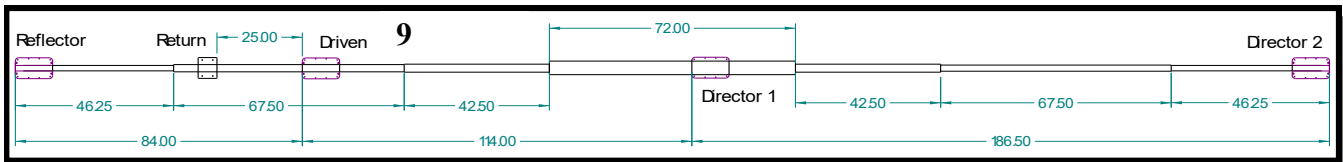
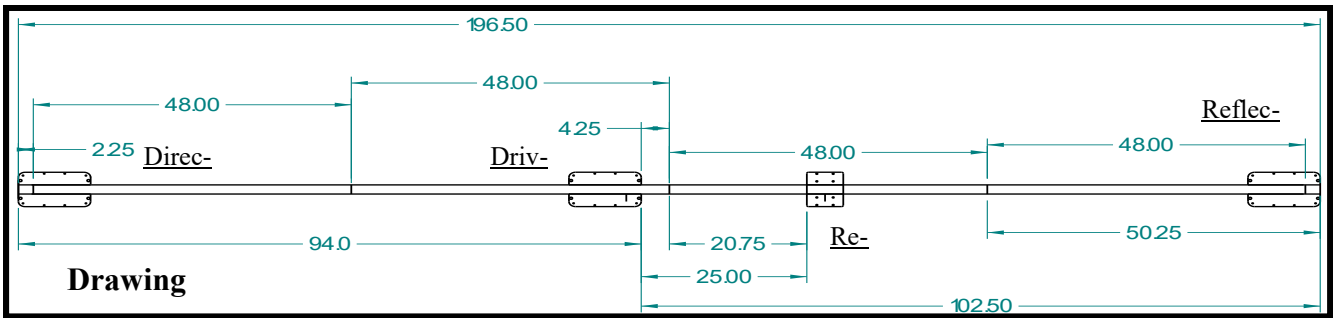
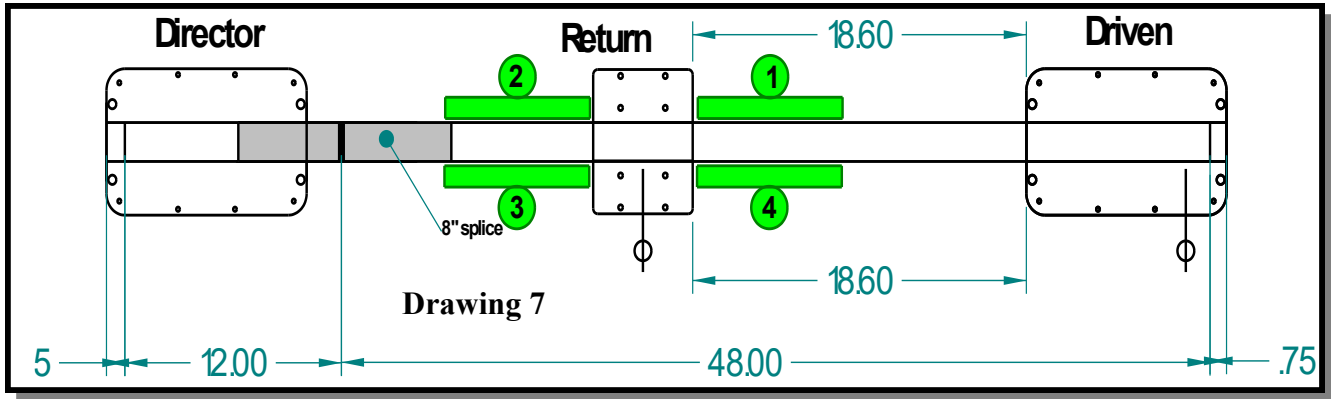
2 and 3 Element Yagi Retrofit Kit Bill of Materials

Item	Description	Qty Per	UOM
09-1022	Coax Seal, 12' x 1/2".	8	IN
10-1501-23	Lid for Black EHU, With countersunk drain hole	1	EA
09-0001	Electrical tape 3/4" PVC MERC0 307	1	EA
10-1028-01	Anti-seize single packets, TMP-1	1	EA
09-1025	conical grinding stone, 3/4", (ENCO)	1	EA
10-1013-02	Telescoping Pole, 18 foot 4 section	4	EA
10-1509-02	Diverter Cone	2	EA
72-0054-01	Kit, EHU Lid Hardware	1	EA
60-1006-22	QUICK DISCONNECT, 1-1/2" to 1-1/4", Fernco	4	EA
72-0009-03	Kit, Glue	1	EA
10-1503-21	Fiberglass rod, 3/8" x 31-3/4" long, black	2	EA
70-1015-21	EST Return Tube, 1-3/4" x 12", Fiberglass	1	EA
70-2025-13	CPVC tube, 49" x 3/4", with coupler	2	EA
70-2025-23	CPVC tube, 39-7/8" x 3/4", w/o coupler	2	EA
72-0030-61	Kit, Sweep Hardware	1	EA
72-0009-11	Kit, 30/40 M Return Hardware, 2E, 3E Adder/Retrofit	1	EA
70-3403-01	EHU, 40m Driven	1	EA
10-1153-01	Poly Sweeps (100 psi)	2	EA
10-1511-01	Sweep Diverter	4	EA
10-1059-21	Polyolefin Heat Shrink	4	EA
10-1059-01	Polyolefin Heat Shrink	12	EA
21-5001-01	Control cable, 4 conductor, 22awg, shielded	20	FT

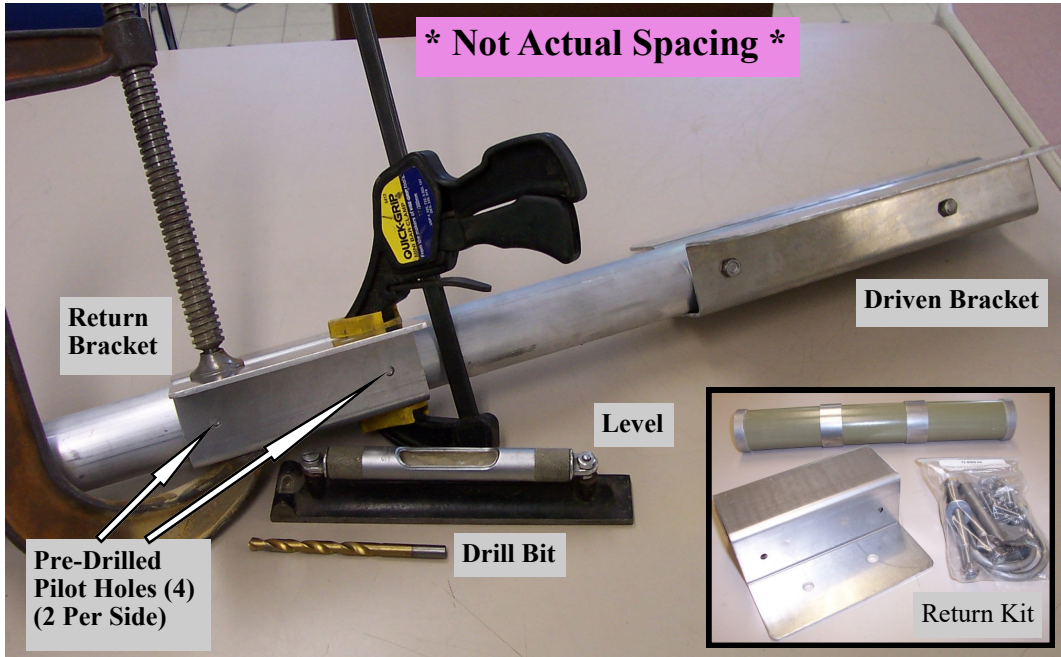
4 Element Yagi Retrofit Kit Bill of Materials

Item	Description	Qty Per	UOM
09-1022	Coax Seal, 12' x 1/2".	8	IN
10-1501-23	Lid for Black EHU, With countersunk drain hole	1	EA
09-0001	Electrical tape 3/4" PVC MERC0 307	1	EA
10-1028-01	Anti-seize single packets, TMP-1	1	EA
09-1025	conical grinding stone, 3/4", (ENCO)	1	EA
10-1013-02	Telescoping Pole, 18 foot 4 section	4	EA
10-1509-02	Diverter Cone	2	EA
72-0054-01	Kit, EHU Lid Hardware	1	EA
60-1006-22	QUICK DISCONNECT, 1-1/2" to 1-1/4", Fernco	4	EA
72-0009-03	Kit, Glue	1	EA
10-1503-21	Fiberglass rod, 3/8" x 31-3/4" long, black	2	EA
70-1015-21	EST Return Tube, 1-3/4" x 12", Fiberglass	1	EA
70-2025-13	CPVC tube, 49" x 3/4", with coupler	2	EA
70-2025-23	CPVC tube, 39-7/8" x 3/4", w/o coupler	2	EA
72-0030-61	Kit, Sweep Hardware	1	EA
72-0009-11	Kit, 30/40 M Return Hardware, 2E, 3E Adder/Retrofit	1	EA
70-3403-01	EHU, 40m Driven	1	EA
10-1153-01	Poly Sweeps (100 psi)	2	EA
10-1511-01	Sweep Diverter	4	EA
10-1059-21	Polyolefin Heat Shrink	4	EA
10-1059-01	Polyolefin Heat Shrink	12	EA
21-5001-01	Control cable, 4 conductor, 22awg, shielded	20	FT

Return Plate Mounting Placement Drawings– 2, 3 and 4 Element Yagi

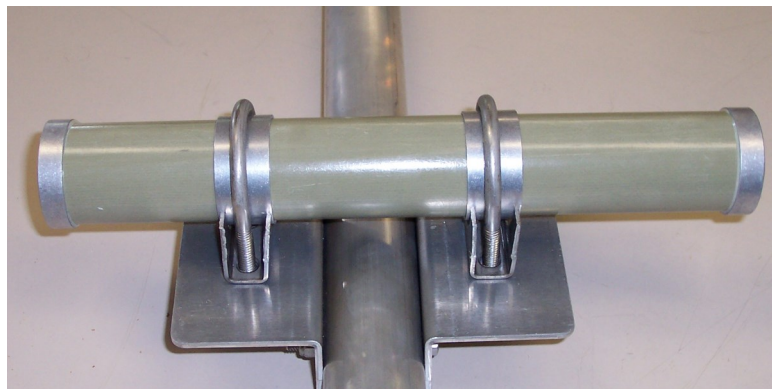
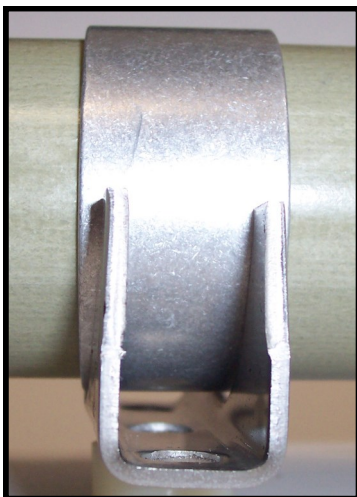


Return Tube Placement and drilling example
 (check your boom, newer models were shipped with this return bracket installed)



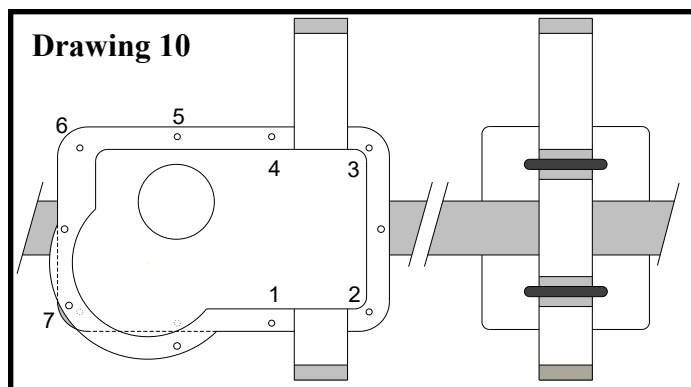
Assemble the Return Mounting Kit

- Install return element cross tube and U-bolts as seen in below picture (center an aluminum sleeve under each U-bolt but do not tighten yet).
- Measure the return tube offset to match the offset of the driven element housing tube (see drawing on prior page)
- Tighten the U-bolts securely.



Install Boom Counter-weights: (4 Element ONLY)

On the 4 element antenna ONLY you will need to install a pair of counter-weights to the side of the **Director 2** element mounting bracket to balance the boom after the installation of the 40m - 30m dipole kit. These are powder coated steel bars weighing approximately a total of 8.2 pounds.



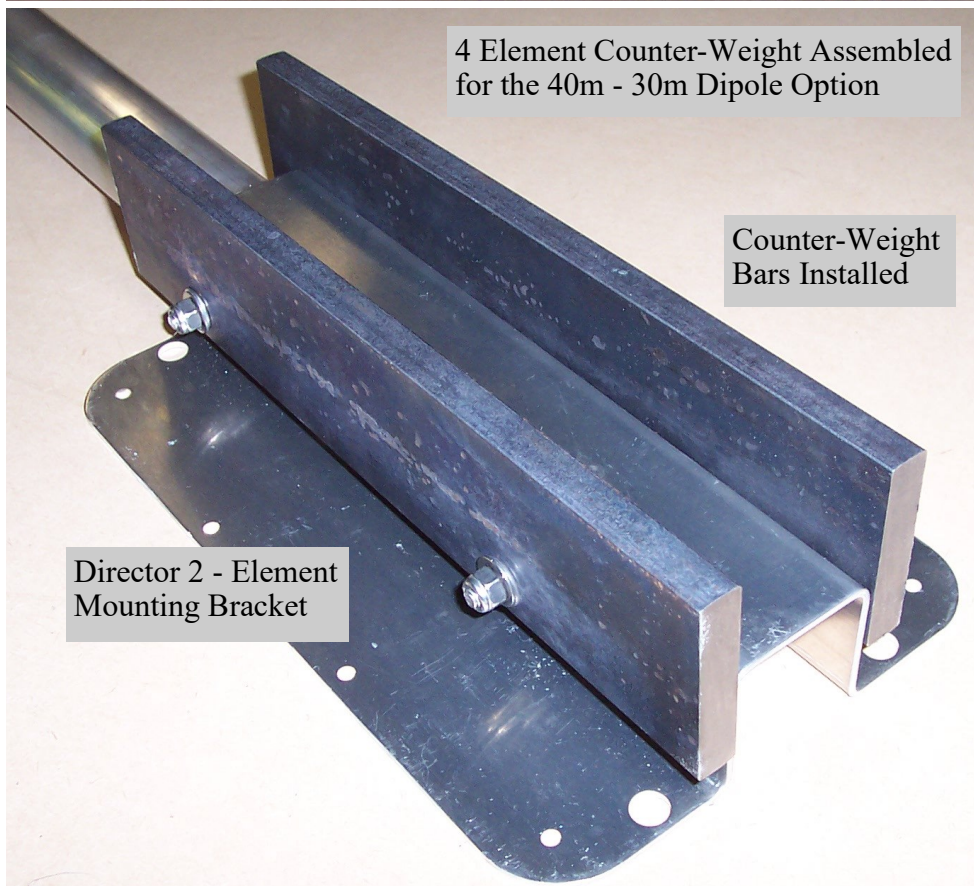
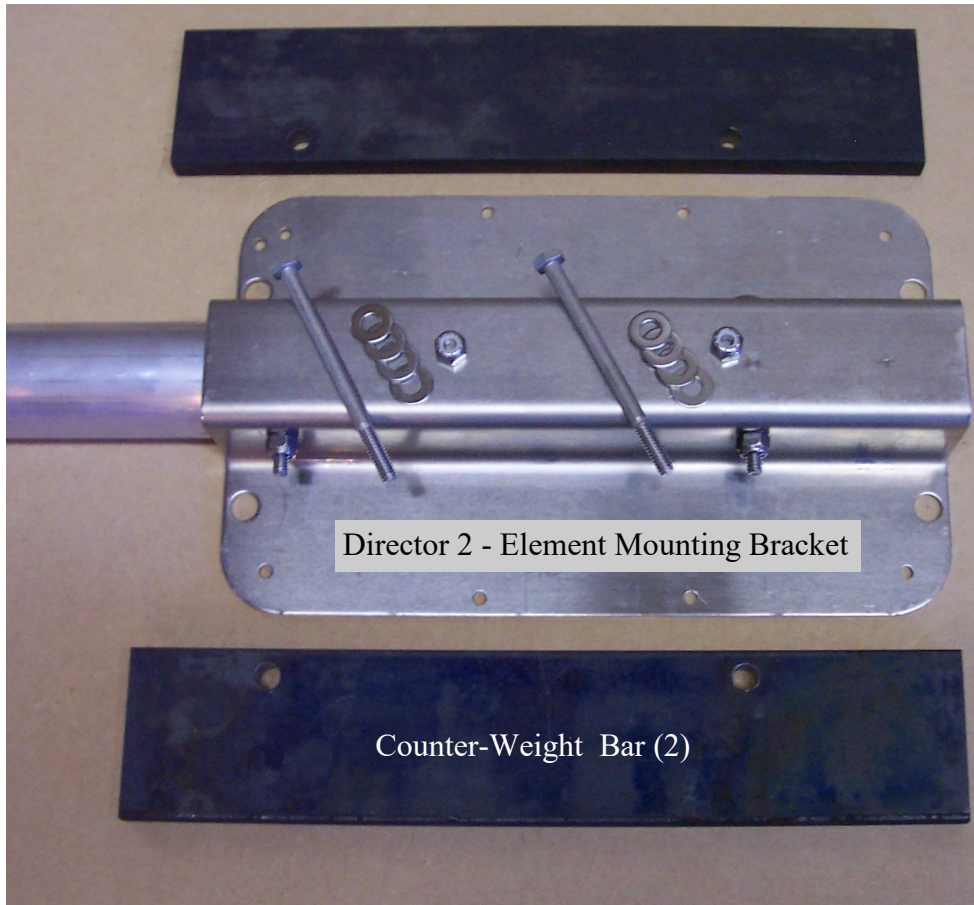
Locate:

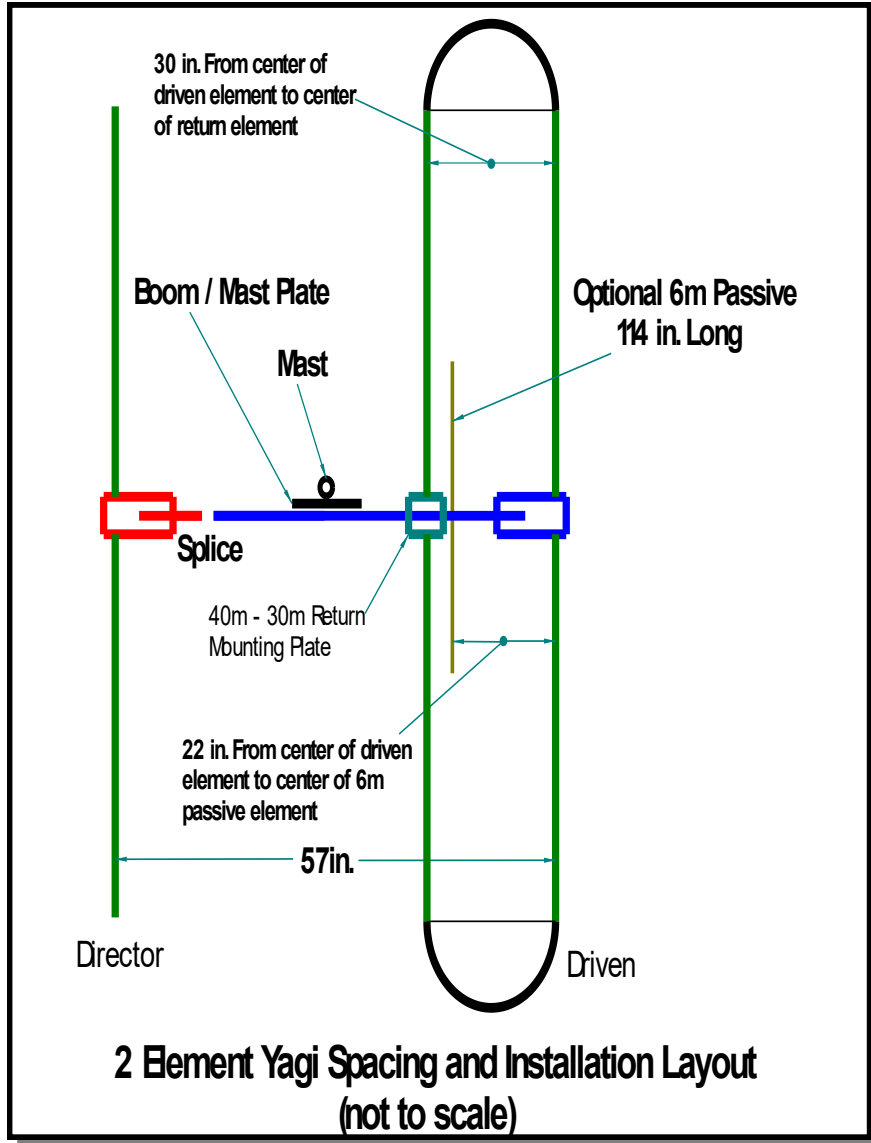
- Two steel bars 2-1/2" x 12" x 1/2" (counter-weights)
- Two 1/4-20 x 3-3/4" bolts
- Two 1/4-20 Nylok nuts
- Eight 1/4" flat washers

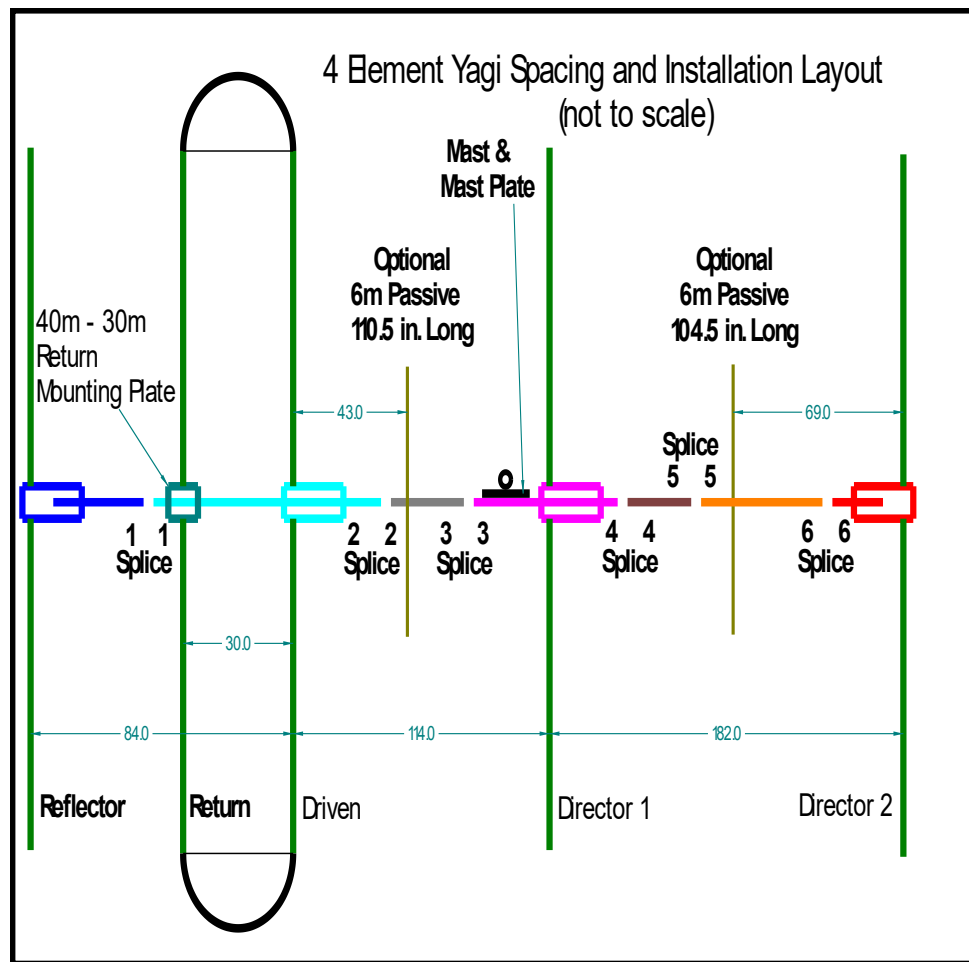
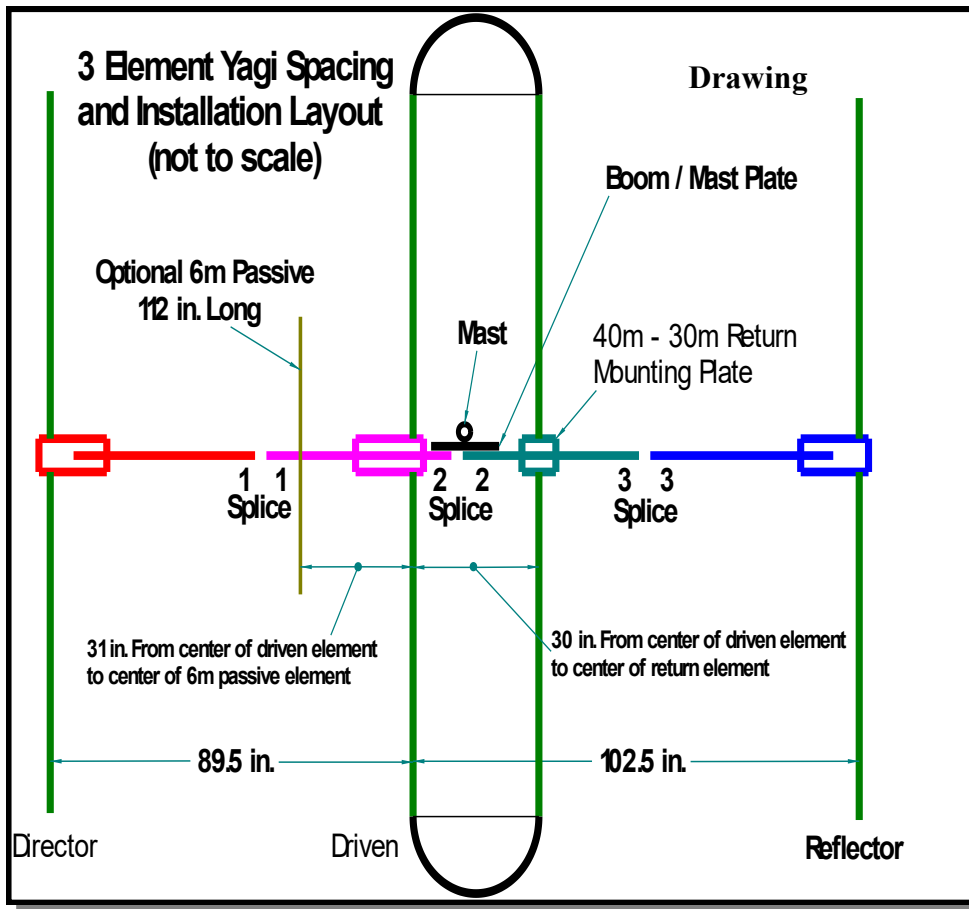
Suggested Installation Steps (retrofit only):

- On a retrofit installation you should not need to remove the element housing unit (EHU) from the element mounting bracket but do be careful with the weight of the EHU and the FTP's attached when you remove the existing bolts.
- Remove the first 1/4" bolt from the **Director 2** element mounting bracket and install it back into its hole from the other side of the bracket. This will support the bracket while you remove the second bolt.
- Remove the second 1/4" bolts from the **Director 2** element mounting bracket.
- Put two 1/4" flat washers on each of the new 1/4-20 x 3-3/4" bolts.
- Position the first counter-weight by lining up the holes so that the end of the weight is even with the end of the element mounting bracket and install a new 1/4-20 x 3-3/4" bolts with the two flat washers through the empty hole.
- Now install the second new 1/4-20 x 3-3/4" bolts with the two flat washers through the second hole pushing out the old bolt that you temporarily installed from the other side.
- Put the second counter-weight over the two new bolts sticking out.
- Install two flat washers on each bolt and then the new Nylok nuts and tighten.
- This completes the installation of the counter-weights.

Install Boom Counter-weights (4 Element cont.)







ATTACH THE ELEMENTS TO THE EHU'S

PREPARE THE CPVC INNER-GUIDE TUBE & DIVERTER CONE

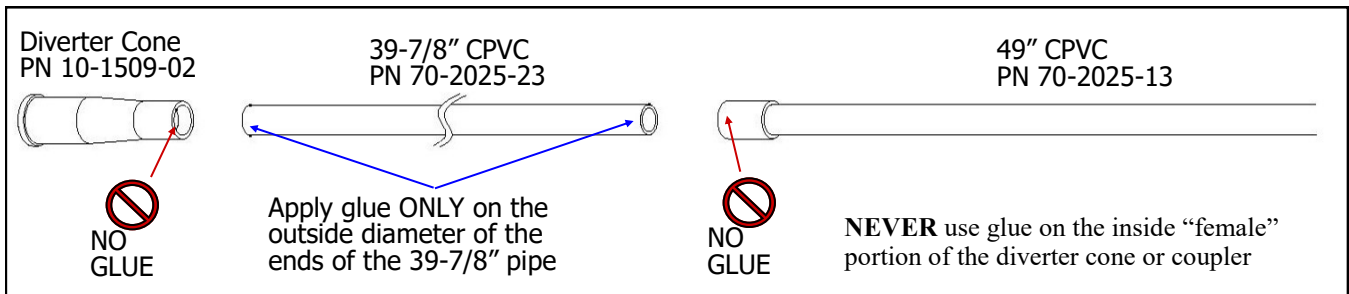
The 40/30 loops on the DB18 Yagi use a plastic tube and a diverter cone located inside the telescoping pole, to guide the copper strip out of the EHU. The plastic tube is off-white and is made of CPVC. There are 3 pieces that make up the guide tube assembly: The diverter cone (PN 10-1509-02), the 39-7/8" section of 3/4" CPVC with no coupler (PN 70-2025-23) and the 49" section of 3/4" CPVC with a coupler attached to one end (PN 70-2025-13). This guide tube is only required for 40/30 loop elements. The guide tube is not needed on the return side of the loop.

The smaller diameter end of the diverter cone is glued to one end of the 39-7/8" CPVC tube. Use the supplied glue and applicator. Apply the glue evenly around the outside diameter of the tube. Be sure you get even coverage all the way around the tube. Cover about 3/4" of an inch deep. Firmly push the 39-7/8" CPVC tube into the diverter cone end as shown in. Let the glue dry at least 20 minutes before moving it.

Apply glue evenly around the outside diameter of the 39-7/8" CPVC tube. Apply approximately 3/4" deep as per prior step. Locate the 49" CPVC tube (PN 70-2025-13) with coupler. Push the 39-7/8" tube firmly into the coupler.

Repeat above instructions for remaining guide tube assembly's (two per EHU, four total).

WARNING: Do not apply glue to the inner "female" portion of either the diverter cone or coupler. The glue applied to the outside of the tube is sufficient to bond the two pieces, and will prevent potential for damaging obstructions being formed by dried glue.



ATTACH THE ELEMENTS TO THE EHU's (continued)

SECURING THE ELEMENT SUPPORT TUBE (EST) TO THE EHU

When the CPVC inner guide tubes are completed, they will need to be inserted into the telescoping poles and secured to each EHU. The drawing below shows placement for a reflector element, but the procedure is the same for driven elements.

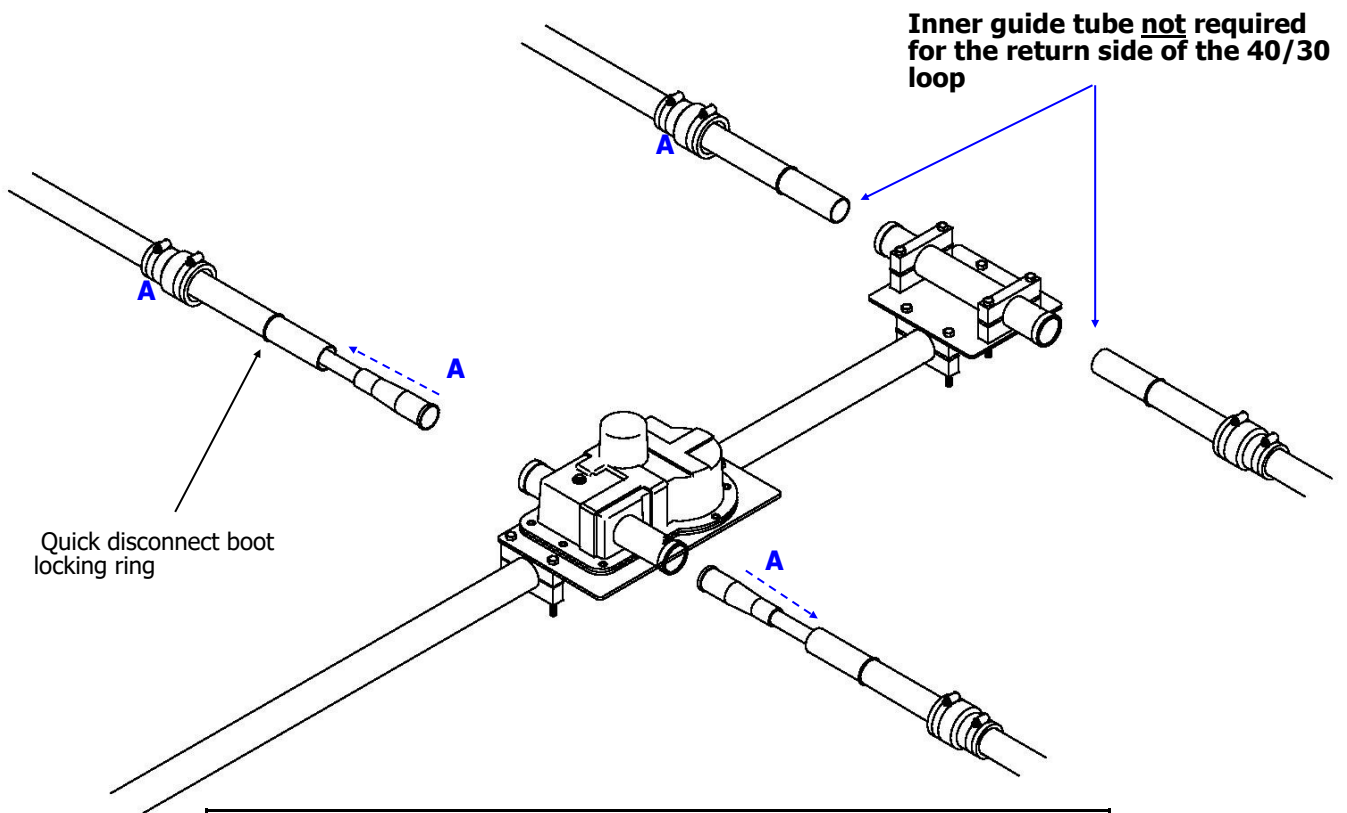


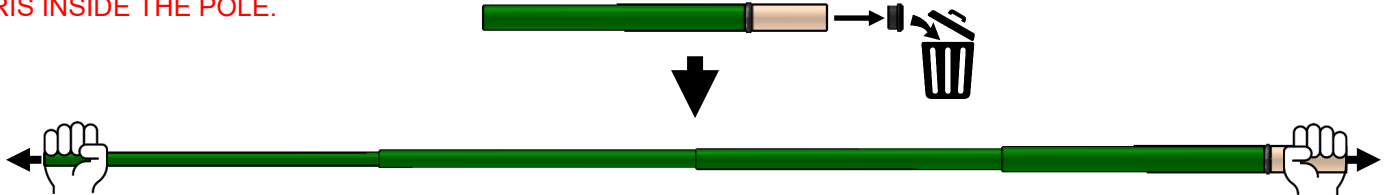
Figure A:

Inner guide tube assembly consisting of diverter cone , 39-7/8" and 49" CPVC Plastic tube, glued together. They are only used on the EHU side of the 40/30 loop

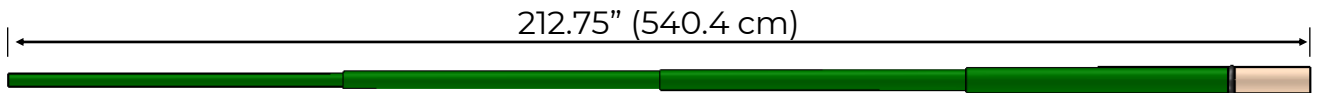
NOTE: THIS IS A DRAWING OF A DB SERIES ANTENNA—THE ONLY DIFFERENCE FOR THE 2, 3 AND 4 ELEMENT YAGI WOULD BE U-BOLTS BEING USED INSTEAD OF SADDLES AS SHOWN IN THIS DRAWING. THIS DRAWING IS BEING UPDATED TO MATCH THIS DOCUMENT

PREPARING THE TELESCOPING POLES

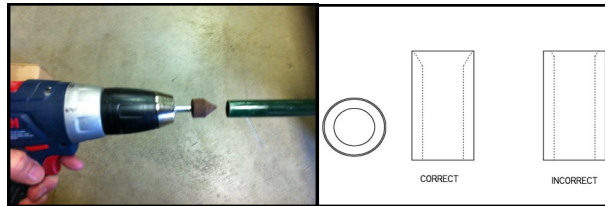
1. Extend the telescoping poles (PN 10-1013-02) to full length by firmly locking each section of the pole in place. A good methodology is to position each half of the joint so that they are several inches apart (while still within each other), and then pull quickly and firmly. Do this for each pole. There are rubber plugs inside the base section of each telescoping pole. These make it easier for handling, but they **MUST BE REMOVED BEFORE ASSEMBLY. VERIFY THE FOAM INSERT IN THE PLUG HAS NOT MADE ITS WAY DOWN THE POLE AND THAT THERE IS NO OTHER FOREIGN DEBRIS INSIDE THE POLE.**



2. With the poles fully extended, trim the end of the tip element of each pole so that the pole is 212.75 inches (540.4 cm) from the tip of the pole to the butt end, as shown below. **ONLY trim the poles used for the 40/30 loops**—if your antenna has 20m-6m straight elements, those should not be trimmed (must have a length of at least 213.1”). Use a hack saw, pipe cutter, or similar cutting blade that is suitable for fiberglass. Be sure that you cut the pole perpendicular to the length of the pole so that it is as “square” as possible.



3. Using the conical drill bit, chamfer the tips of the 40/30 poles as shown below. The image below shows the proper angle to chamfer to. Clean out the interior of the fiberglass poles after chamfering it.



LOOK INSIDE OF THE TELESCOPING POLE TO VERIFY NOTHING IS BLOCKING IT. YOU SHOULD BE ABLE TO SEE LIGHT AT THE OTHER END IF THE POLE IS KEPT STRAIGHT. DEBRIS INSIDE THE TELESCOPING POLES CAN LEAD TO FAILURE OF THE EHU.



4. Each telescoping pole uses 3 polyolefin heat shrink pieces 1.5” x 3” (PN 10-1059-01), one covering each joint after it has been pulled tight. Once finished, the seal is secure and waterproof. This product requires a heat gun for activation of the adhesive.

5. When positioning the heat shrink, place it so that the joint of the telescoping pole is centered in the middle of the heat shrink.

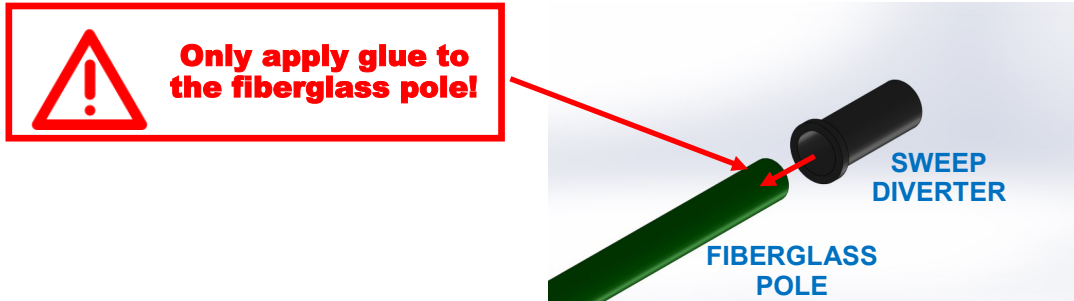
6. Using a heat gun (hair dryers will NOT work), apply heat evenly around the entire area of heat shrink. Note: there are 4 blue colored lines imprinted on the tubing. The joint is considered done being heated and waterproof when the lines change color to a yellowish green. Each line needs to change color to ensure even adhesion temperatures.

7. The heat shrink will want to slide as it is heated so wear gloves and reposition the heat shrink to keep it centered on the joint as needed. **Caution: The heat shrink will be HOT, wear insulated gloves!**



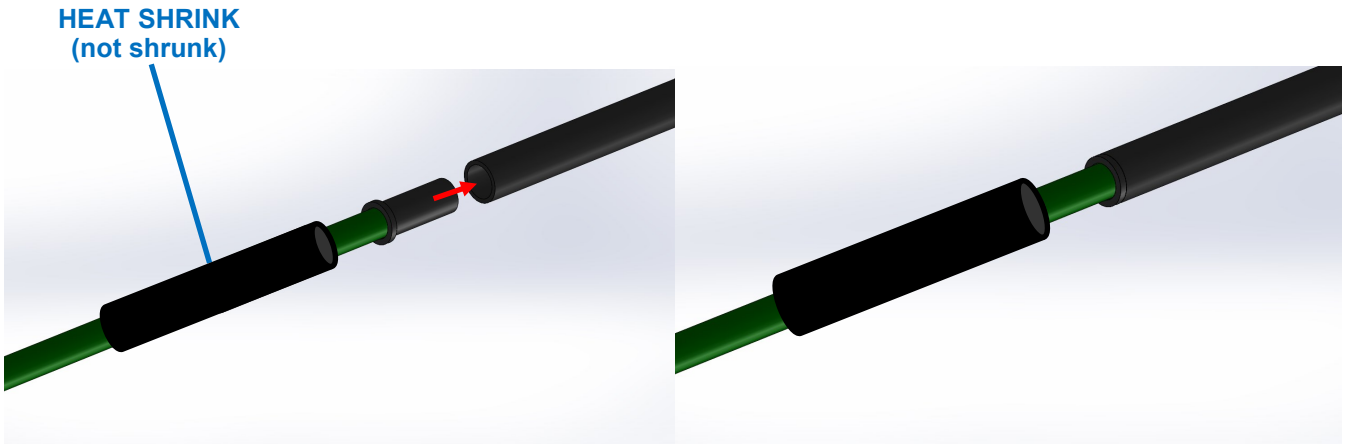
ATTACHING SWEEPS AND DIVERTERS TO FIBERGLASS

8. Use the glue kit (PN 72-0009-03) from the glue/tape kit to attach the sweep diverters (PN 10-1511-01) to the tips of the fiberglass telescoping poles. **ONLY APPLY GLUE TO THE FIBERGLASS.** Slowly rotate the sweep diverter as you slide it onto the pole to let the glue cover the most surface area possible. **MAKE SURE THE SWEEP DIVERTER IS PUSHED AS FAR DOWN ONTO THE FIBERGLASS POLES AS POSSIBLE.** The sweep diverter should be oriented in the same way as shown in the figure below, with the flanged edge towards the rest of the pole. Be sure the glue has dried completely before moving onto the next steps.



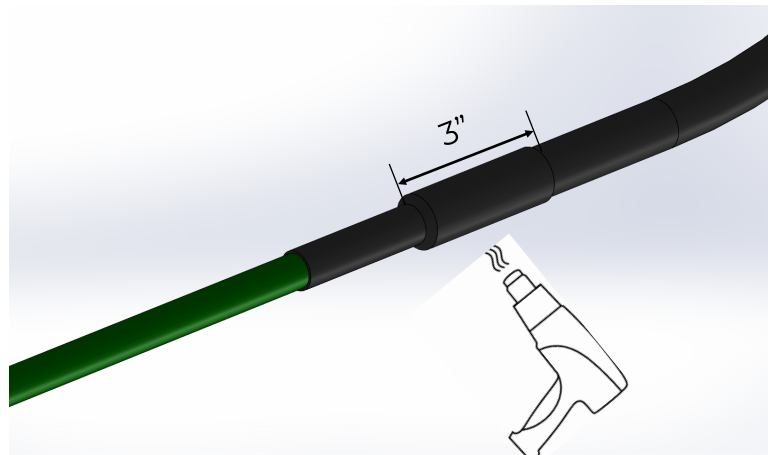
9. Put a piece of polyolefin heat shrink 1.1" x 6" (PN 10-1059-21) onto the telescoping pole, leaving the diverter clear. It should be down on the pole far enough that it doesn't interfere with fitting the diverter into the sweep.

10. Insert the fiberglass pole, with the sweep diverter on it, into the sweep as far as possible. **DO NOT GLUE THE SWEEP DIVERTER INTO THE SWEEP.** Reposition the heat shrink to cover the joint.



11. Shrink the polyolefin sleeve over the joint as described on step 6 on the previous page; **LEAVE AT LEAST 3" OF HEAT SHRINK ON THE SWEEP SIDE OF THE JOINT.** Be **EXTREMELY careful not to overheat the poly sweep, you will deform or kink the material if too much heat is applied** (if this occurs you will need to undo your work and replace the poly sweep).

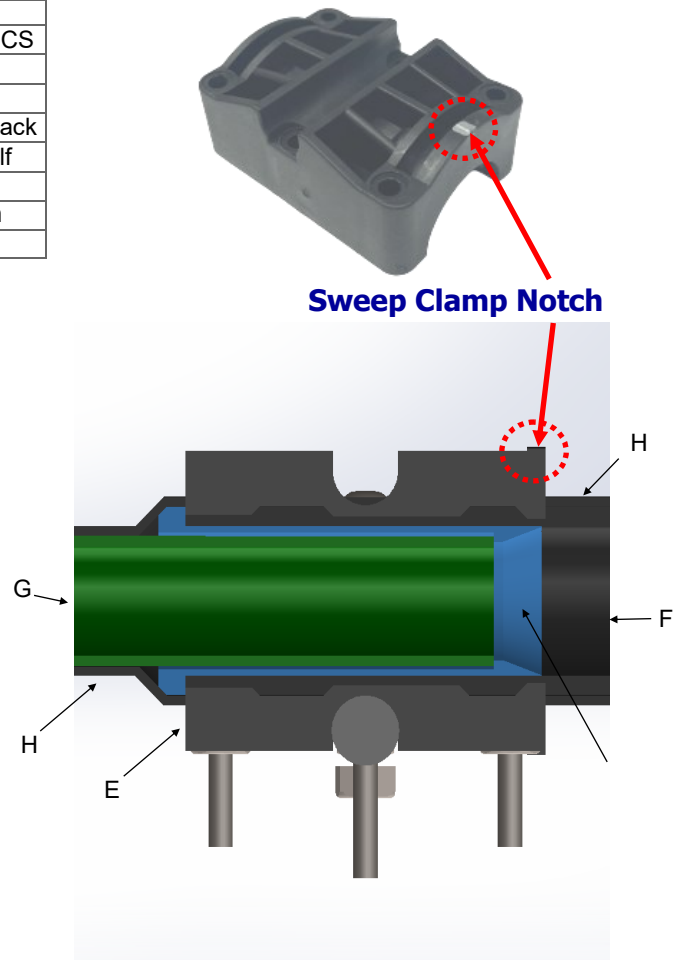
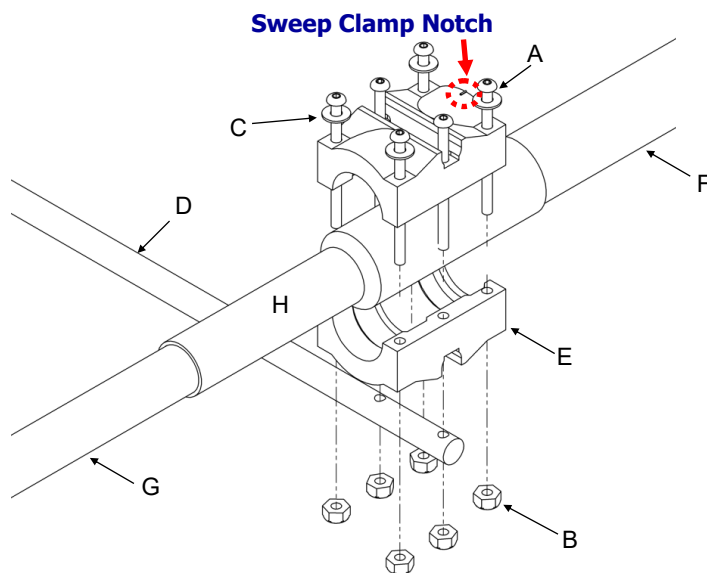
12. Remember, the heat shrink will want to slide as it's heated. Reposition it as it cools to make sure the joint is fully covered. **The heat shrink will be hot; wear insulated gloves.**



ATTACHING SWEEP COUPLERS TO SWEEP TUBES

- Refer to the drawing below during the following steps for an overview of the assembly process.
 - Each of the sweep coupler halves (PN 10-1155-01) will have a notch in the mold on one side marked with silver sharpie. **IT IS CRITICAL THAT THESE NOTCHES ARE POINTING TOWARDS THE SWEEPS OR THEY WILL NOT WORK PROPERLY.** Be certain that each half of the coupler has the mark facing the sweep tube!
- 13.** Place the coupler halves over the heat shrink on the sweep side of the joint. The flange on the diverter should still be visible through the heat shrink, as well as the edge of the sweep material. The non-marked side of the coupler should be placed as close to the edge of the sweep material as possible, without overhanging, as shown in the cutaway where the sweep diverter is highlighted in blue.
- 14.** Insert four of the 6-32 x 2" socket head screw (PN 60-0186) with washer (PN 60-0016). Place the screws so that the threaded portion of the screw is facing downward. **BE SURE THAT THE DRAIN HOLES FOR THE PLASTIC SWEEP TUBE ARE POINTING DOWNWARD BEFORE INSTALLING THE COUPLERS.**
- 15.** Apply anti-seize to the threads and screw the Nylock nuts on. Tighten using a 5/16" wrench/socket to **turn the nut** and the provided 5/64" Allen Key to hold the screw. Tighten enough so that the clamp is held in place on the sweep/heat shrink. Final tightening will happen once the fiberglass spreader is installed.
- 16.** Repeat the previous steps on the other side of sweep tube.

Key	QTY	Part Number	Description
A	6	60-0186	Screw, 6-32 x 2", 18-8 Button Socket CS
B	6	60-0014	Nut, 6-32 Nylock
C	4	60-0016	Washer, 6-32, Flat
D	1	10-1503-21	Fiberglass Rod, 3/8" x 31-3/4" long, black
E	2	10-1155-01	Sweep Clamp, SCH-160 Clamp Half
F	1	10-1153-01	Poly Sweeps (100psi)
G	1	10-1013-02	Telescoping Pole, 18 foot 4 section
H	1	10-1059-21	1.1" x 6" polyolefin heat shrink



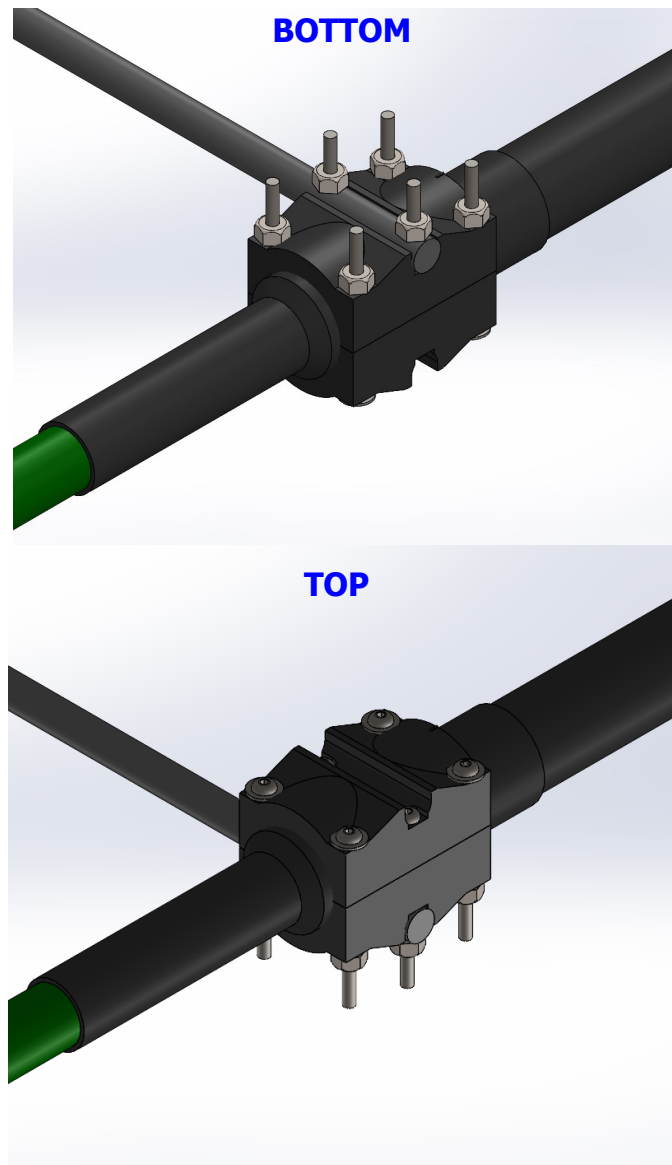
MOUNTING FIBERGLASS SPREADERS

17. Mount the black fiberglass sweep spreaders (PN 10-1503-21) to the sweep couplers. There is a concave mounting area on each side of the plastic couplers. Position the fiberglass spreader so that the holes align with the clam shell couplers. When installing the fiberglass spreader, you will want the spreader to be underneath the plastic coupler. The spreaders will be longer than the couplers on each side of the loop. This is done on purpose to ensure plenty of fiberglass material is on each side of the screw.

18. Insert 2qty 6-32 x 2" socket head screw (PN 60-0186) through each of the coupler halves and the fiberglass rod. This screw must be placed so that the Nylock nut (PN 60-0014) is resting on the fiberglass material and the screw head are resting inside the concave groove on the top of the sweep coupler. The screws are longer than necessary so that you can get the nut on in the initial stages.

19. Tighten the Nylock nuts firmly. Be sure to use anti-seize on these screws or they will likely gall and have to be replaced.

20. Repeat the previous steps on the other side of sweep tube.



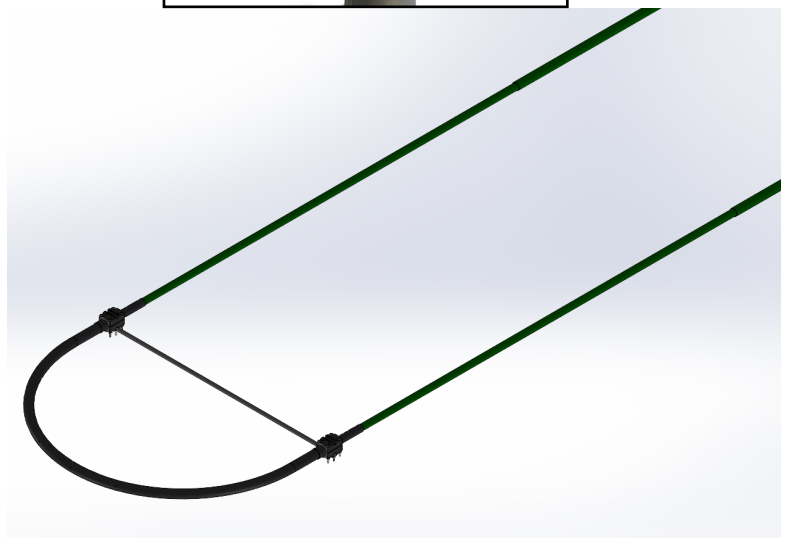
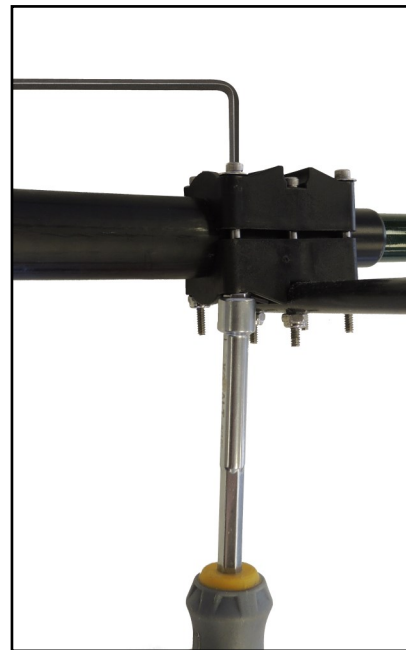
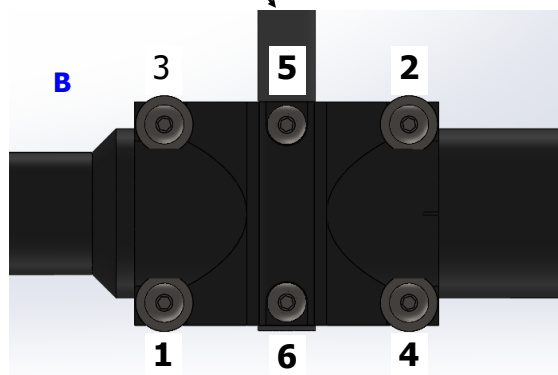
FINAL TIGHTENING

21. Finish tightening the four screws on the outside corners of the plastic coupler. Tighten evenly, in an automobile X type pattern. If you do not tighten evenly, you may break the fastener. Once the outsides are firmly tight, tighten the two screws that hold the fiberglass spreader in place. **Figure B** shows the suggested method for tightening the screws.

22. When completely tightened, **THE SWEEP COUPLER HALVES SHOULD HAVE GAP OF ABOUT 5/16" – 3/8"**, as shown in **Figure C**. This gap is not critical as the coupler is mostly to keep the spreader in place properly. **IT IS BEST TO LET THE SCREWS SIT FOR A WHILE (15-30MIN) AND TIGHTEN IN INTERVALS IN ORDER TO ALLOW THE PLASTIC CLAMP MATERIAL TO RE-FORM.** This also will reduce the chance of snapping a screw.

23. Completed sweep shown below.—repeat the process for each sweep.

Fiberglass spreader rod



Limited Warranty

STEPPIR ANTENNAS LIMITED PRODUCT WARRANTY

Our products have a limited warranty against manufacturers defects in materials or construction for two (2) years from date of shipment. Do not modify this product or change physical construction without the written consent of Fluidmotion Inc, dba SteppIR Antennas.

This limited warranty is automatically void if the following occurs: improper installation, unauthorized modification and physical abuse, or damage from severe weather that is beyond the product design specifications.

SteppIR Antenna's responsibility is strictly limited to repair or replacement of defective components, at SteppIR Antennas discretion. SteppIR Antennas will not be held responsible for any installation or removal costs, costs of any ancillary equipment damage or any other costs incurred as a result of the failure of our products.

In the event of a product failure, a return authorization is required for warranty repairs. This can be obtained at www.steppir.com. Shipping instructions will be issued to the buyer for defective components, and shipping charges to the factory will be paid for by the buyer. SteppIR will pay for standard shipping back to the buyer. The manufacturer assumes no further liability beyond repair or replacement of the product.

SteppIR Contact Information

Email:

New orders or questions about your current order: sales@steppir.com

Existing customers requiring technical or product support services:
support@steppir.com

Information and questions about our products:
sales@steppir.com

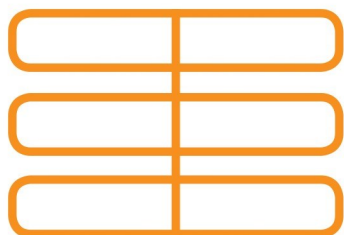
Phone / Fax:

Phone: 425-453-1910 (M-F 9:30am to 5:00 pm PDT)

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