ANTENNA SYSTEMS

Dipole (20m-6m) Assembly Manual

Manual Revision 2.03
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www.xorantennas.com

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1 Dipole Antenna Specifications

- Weight ..... 18 lbs. (with junction box)
- Wind load (EIA-222-G) ..... 3.1 sq ft (effective area)
- Longest element ..... 32.7 ft
- Turning radius ..... 16.35 ft
- Power rating (Max) ..... 2.5 kW PEP (continuous)
- Power heating loss (any band) ..... <0.02 dB @ 1.5 kW PEP (continuous)
- Wind rating (Survivability) ..... 100 mph EIA-222-C
- Ice rating (Survivability) ..... 0.9 inches radial ice
- Operating temperature rating ..... -40°C to +85°C
- Frequency bands ..... 20, 17, 15, 12, 10, and 6 m
- Band-Band transition time ..... <20 mS
- SWR @ 40 ft (50 Ω source) [1] ..... <2:1 per band, [1.1 – 1.4]:1 (typical @ resonance)
- Gain (20m – 6m) [2] ..... 2.14 dBi (full size dipole gain)
- Element plate U-bolt clamps [3] ..... for 2" mast
- Controller DC voltage range ..... +12 Vdc to +15 Vdc
- Controller current/power @ 12 Vdc ..... [20 mA to 350 mA] / [0.24 W to 4.2 W]
- Controller cable (400 ft) [4] ..... 8 Wire 22 ga shielded (6-wire option)
- Transport section lengths [5] ..... <6.5 ft

[1] The specified SWR is for an XOR Dipole at 40 ft (50 Ω source). This SWR is less than 2:1 for all bands and bandwidths (except the high end of 6m). Similar specified SWR results will be observed for heights down to 20 ft.

[2] Free Space Gain (dBi) is gain relative to isotropic radiator in free space.

[3] 5/16" U-bolts for 2" mast included. An adapter for 1" to 2" mast is available.

[4] For cable > 400 ft, cable and controller power adapter options are available.

[5] Ideal for primary station antenna, as well as for portable operation. A dipole **Quick Disconnect** feature allows for easy disassembly and hand carry [in a to-go box/bag]. Dipole can be easily transported in most vehicles, and easily reassembled. Operates with any +12 Vdc to +15 Vdc source with 350mA Max current. There are no special power supply requirements. The 0.24 watts to 4.2 watts maximum power requirement @ 12 Vdc is ideal for solar power operation.

2 XOR ANTENNA: WHY CONSIDER XOR ANTENNAS?

XOR Antennas were developed using the latest relay technology on a single element, to achieve mufti-band operation. By eliminating the need for moving elements, traps, or excess elements, a more reliable, radiation efficient and cost-effective multi-band antenna system has been developed.

The XOR Switch-Mode Technology switches multiple element sections for a given element, enabling a significant number of multiple half-wavelengths for a single element. Thus, a state-of-the-art multi-band antenna is achieved, without the need for moving elements, traps, or excess resonant elements.

As an example, XOR's 6-band (20m-6m) dipole antenna is currently the ONLY 6 band antenna on a single rotatable element, without moving elements.

XOR's potted UV resistive switching modules are rated from -40°C to +85°C, resulting in a high reliability function under all adverse weather conditions. The switching lifetime is rated at over two million cycles. These modules are also efficient at Radio Frequencies (RF) with a measured open switch power loss of only 0.02 dB @1500 W PEP on any band. These modules are also robust, with plenty of operating margin at a continuous 2.5 kW PEP antenna input power rating.

A UV resistive CAT control cable is used for electrically controlling the switching modules along the element to a central Junction Box. This CAT cable's twisted control wire pairs ensure excellent RF immunity for all electrical control signals to the switching modules, even when applying this dipole's rated 2.5 kW PEP continuous input power.

Thus, XOR's 20m-6m dipole provides inherently high reliability and low maintenance, yet provides excellent SWR and bandwidth performance (See Dipole Specifications) with high radiation efficiency. Quality is maintained throughout the design, with aircraft grade aluminum and high-grade stainless steel (SS) fasteners (grade 316 is used for all RF paths.) There is no "wait time" when changing bands. The XOR dipole's Quick Disconnect feature allows for easy disassembly, transport and reassembly of the element.

XOR looks forward to serving the Amateur Radio Community with this dipole antenna and future planned Switch-Mode multi-band vertical and Yagi antennas.

Regards, and best 73's

Bill Davis
CEO/President
XOR Antenna Systems LLC

3 PRE-ASSEMBLY ADVICE

GETTING STARTED:

Please read this manual before proceeding with the dipole assembly. First, inventory the parts included using the, "Check Parts List." Please notify XOR staff immediately in case of any discrepancy to ensure there are not any delays in your assembly plans. **DO NOT remove switching modules from their box until needed**. When unpacking the modules, be sure the TOP cover is UP. After unsealing the cover tape, carefully remove top layer module string and place on a flat surface followed by removing bottom layer module string. XOR recommends assembling the dipole in a large cleared flat area. Keep in mind a fully assembled dipole will be 32.3 ft. long, so plan accordingly. Refer to figures **(FIG.) 31 and 52** for further assembly support table suggestions. Once sections A1 and B1 are joined to the element plate, the entire element including modules can be built on the ends of sections A1 and B1, as shown in **FIG. 52.**

PARTS ORGANIZATION:

- **1601 Element Plate Hardware Kit**→ place aside.
- **1603 Module Mount and Wiring Hardware Kit** → place with modules.
- **Pre-fabricated sections A1, A2, A3 and A4** (two A packages)→ place aside.
- **Pre-fabricated sections B1, B2 B3 and B4** (two B packages) → place near A packages. **Note:** The three pieces of aluminum tubing (for A and B) are inside A3/A4 and B3/B4 packages.
- **1602 Element Hardware Kit** → place near the pre-fab sections A and B.
- **Mounted Junction Box**, including three plugs and one contact protector inside.

GALLING (Stainless steel hardware seizing)

Stainless steel (SS) fasteners are prone to seize. Once seized, the coupling is almost impossible to reverse, without destroying the fastener, or even worse; destroying whatever is being fastened. Seizing can be prevented, by applying an anti-seize compound to the thread portion of the bolt (or screw). Please apply the supplied anti-seizing stick (shown on right) on all SS bolts / screws. (Apply to used THREADED AREA ONLY.)

Controller Power Supply:

The controller may be powered by any suitable +12 Vdc to +15 Vdc power source, using a 2.1 mm power jack. XOR includes a low RF noise +12Vdc power adapter (1102) for this purpose, which will limit current and protect controller from any output short circuits to ground. However, if the controller is powered instead by an external source such as a +12 Vdc battery, or a +13.8 Vdc 20-amp supply, a 1 amp fuse is recommended in the controller's power line, for controller protection against output short circuits to ground.

TOOLS NEEDED:

Sockets and/or open-end wrenches

- 5/16" deep (for #6 nuts)
- 11/32" deep (for #8 nuts)
- 3/8" (for #10 nuts)
- 7/16" deep (for 1/4" nuts)
- 1/2" deep (for 5/16" nuts)

- Phillips screw driver # 2
- Wire strip tool for 22-gauge wires
- Small flat blade screw driver (plug connector)
- Isopropyl alcohol / steel wool (tube cleaning)
- Volt-ohm meter (for DC testing)

Support wood/blocks (2) 4"x4"x2" and (1) ½" x 3') may also prove helpful

4 CHECK PARTS LIST

✓	QTY	PART #	DESCRIPTION
	1	1000	XOR 20m-6m Dipole Antenna Assembly Manual
	1	1101	XOR band controller XBC-1
	1	1102	+12 Vdc low RF noise power adapter for XBC-1
	2	1201	5 Switching Modules (string assemblies)
	2	1301	Element pre-fab Sections 1 (A1 & B1) (in A1/A2 & B1/B2 Pkg)
	2	1302	Element pre-fab Sections 2 (A2 & B2) (in A1/A2 & B1/B2 Pkg)
	2	1303	Element pre-fab Sections 3 (A3 & B3) (in A3/A4 & B3/B4 Pkg)
	2	1304	Element pre-fab Sections 4 (A4 & B4) (in A3/A4 & B3/B4 Pkg)
	1	1401	12” x 5” pre-drilled element mounting plate
	2	1501	Aluminum tubing – 3/4” x 11” (in A3/A4 and B3/B4 Pkg)
	2	1502	Aluminum tubing –1/2” x 20-1/4” (in A3/A4 and B3/B4 Pkg)
	2	1503	Aluminum tubing – 3/8” x 36” (in A3/A4 and B3/B4 Pkg)
	1	1601	Element mounting plate and hardware kit
	1	1602	Element hardware kit
	1	1603	Module mount and wiring hardware kit
	1	1701*	Junction box with mounting plate assembly (plus four parts)

***(1) 8-Postion Plug, (2) 6-Position Plug and a package of Contact Protector**

1601 Element Mounting Plate Hardware Kit

✓	QTY	PART #	DESCRIPTION
	8	1801	Polyamide (PA) half clamps for 1” OD tubing
	8	1901	SS plates for PA-clamp for spacer and reinforcements
	8	11001	1/4”–20 x 2-1/2” SS HEX bolts (for PA-clamp)
	3	11002	1/4”–20 x 1” SS HEX bolts (for JBOX & cushion P-clamp)
	11	11003	1/4”–20 SS nylon lock nuts (for PA & P-clamps/JBOX)
	11	11004	1/4” SS washers (for PA & P-clamps / JBOX)
	8	11005	1/4”–20 SS HEX nuts (PA-clamp) – for temporary use
	2	11106*	EPDM UV cushioned SS P-clamp 3/8” for cable management
	1	11107	EPDM UV cushioned SS P-clamp 1/4” for cable management
	1	11201	Two 5/16” 18 SS U-bolt Assemblies with 5/6” hardware
	1	11301	AGS TMK-1 Anti-Seize Compound – stick (see page 4)

***One of Set for 3/8” cable cushion clamp on JBOX mounting plate**

1602 Element Hardware Kit

✓	QTY	PART #	DESCRIPTION
	14	11401	Ferrite Beads 0.250" ID – for CAT3 cable RF suppression
	8	11603	SAE #6 SS element tube clamp 1/2" to 7/8, 1/2" SS band
	4	11701	#8-32 1-1/2" pan head screw (section 1 and 2 fasteners)
	4	11702*	#8-32 lock nut (section 1 and 2 fasteners) (in 1603 KIT)
	8	11703*	#8 washer [3/8" OD] (Section 1 & 2 fasteners) (in 1603 Kit)
	1	11704	One SS grade 316 Input Terminal Assembly including one 1/4" – 20 x 1-3/4" hex bolt, 1 lock nut, 1 hex nut, 3 washers, and 1 high collar lock washer
	1	11800	3/4" x 5" fiberglass rod (part shipped attached to section A1)

*** In 1603 Kit**

1603 Module Mount and Wiring Hardware Kit

✓	QTY	PART #	DESCRIPTION
	20	11801	Module mounting aluminum support plates
8	8	11901	SS P-clamps - 1/2" for 5/8" OD - tubing RF connections
	12	11902	SS P-clamps - 3/4" for 7/8" OD tubing RF connections
	21	12001	#10-24 x1/2" 316 SS pan head screw - RF contact to P-clamp
	21	12002	#10-24 316 SS – lock nut - RF contact to P-clamp
	41	12003	#10 316 SS washer - - RF contact to P-clamp
	20	11700	#8-32 x1/2" SS pan head screw – support plate to module
	36	11702	#8-32 SS lock nut - module support plate (4 used in 1602 Kit)
	60	11703	#8 [3/8" OD] SS washer-module plates (8 used in 1602 kit)
	20	11713	#8 [7/16" OD] SS washer-top of support plate (at ALL posts)
	8	13001	#6-32 SS lock nut – support plate for 15/17 m Post
	8	13002	#6 SS washer – support plate (under) for 15/17 m Post
	2	1702	6-Position JBOX plugs (shipped inside JBOX)
	1	1703	8-position JBOX plug (shipped inside JBOX)
	1	1704	AGS CP-1A connector protector grease (shipped inside JBOX)
	1	11502	3M Super 88 Tape 66 ft for cable management along Element

CAUTION!!!

Avoid making any contact with power lines or any other potential hazards, when constructing, moving and installing this antenna. Serious injury or even death is possible, if any metal portion of mast or antenna comes into contact with any source of high voltage. BE AWARE!

5 DIPOLE ELECTRICAL SYSTEM DIAGRAM/FUNCTION

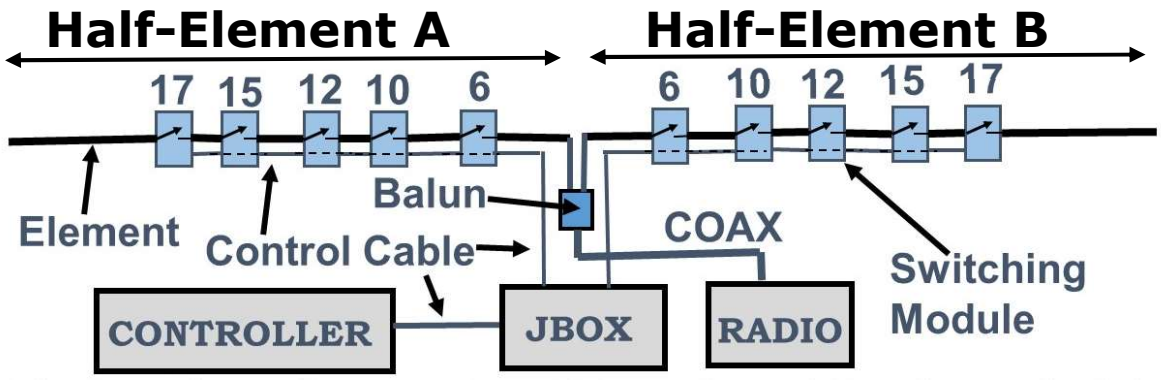


FIGURE 1
XOR (20m – 6m) Dipole Electrical System

DIPOLE ANTENNA SYSTEM OVERVIEW

- The Dipole Antenna System (**FIG. 1**) consists of two half-elements (A and B), having central RF inputs which are connected to a BALUN as shown. There are multiple methods to achieve the BALUN function (See page 48-49.). An RF coaxial cable is connected from the BALUN to a radio. Each half-element consists of 6 element segments, each of which can be switched together (or not) by 5 switching modules. All switching modules are coupled and controlled by UV resistive CAT control cables, which terminate on a central Junction Box (JBOX) (See page 35-37.). A 22-gauge 8 wire shielded UV resistive controller cable connects the XOR Band Controller (page 54) to the JBOX. The controller's source voltage is typically a +12 Vdc supply. The controller's BAND selection activates the appropriate switching modules, to achieve the desired half-wavelength and the resulting operating BAND.
- Functionally, when the controller selects ALL CLOSED switches, the dipole operating band is 20m. When the controller selects ALL OPEN switches, the dipole operating band is 6m. If the controller selects 6m/10m switches CLOSED and 12m/15m/17m switches OPEN, the dipole operating band is 12m.
- The Power-OFF default BAND [with no power applied] is 20m (all switches closed). The Power-ON BAND will be the last Power-ON BAND selected.
- The Controller's voltage source requirement is [+12Vdc → +15Vdc]. Maximum current @ 12Vdc is 0.35A, or 4.2W max Vdc. XOR provides a low RF noise power adapter [+12Vdc @ 1A], which inherently limits current and protects the controller output, from short circuits to ground.

6 ELEMENT ASSEMBLY

IDENTIFY PRE-FABRICATION A/B SECTIONS

There are 8 pre-fabricated element sections: Sections A1, A2, A3, and A4 are used for the "A" half-element assembly, and sections B1, B2, B3 and B4 are used for the "B" half-element assembly, as shown below in **FIG. 2.** All sections are marked at the factory, but may also be identified as shown below. Sections A1/B1 are identical, as are A2/B2, A3/B3, and A4/B4 as shown below. It is important that A and B sections are identified and grouped separately for assembly of the "A" and "B" half-elements.

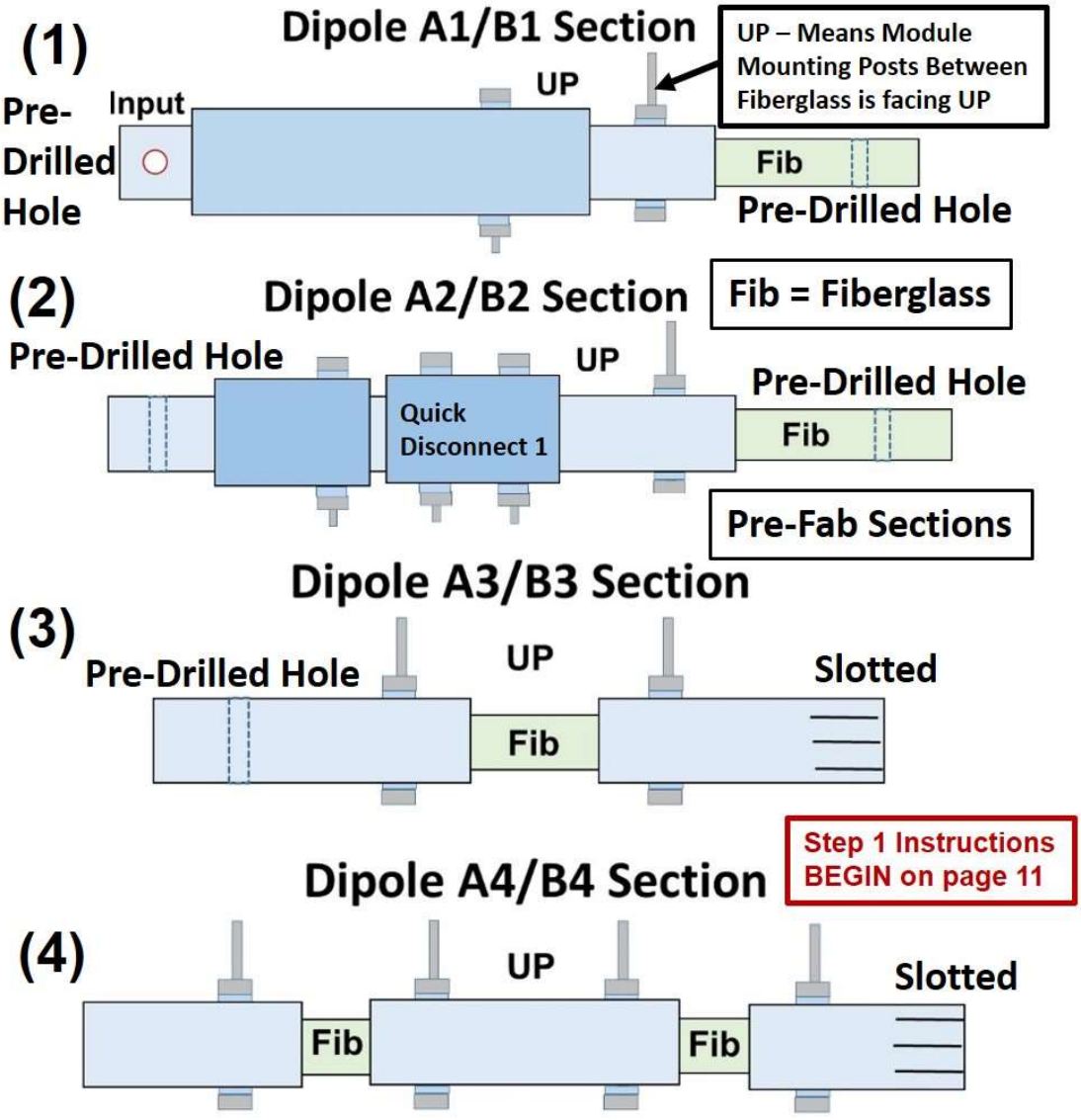


FIGURE 2
Pre-Fabricated Dipole Sections

OVERVIEW OF ASSEMBLY OF HALF-ELEMENTS

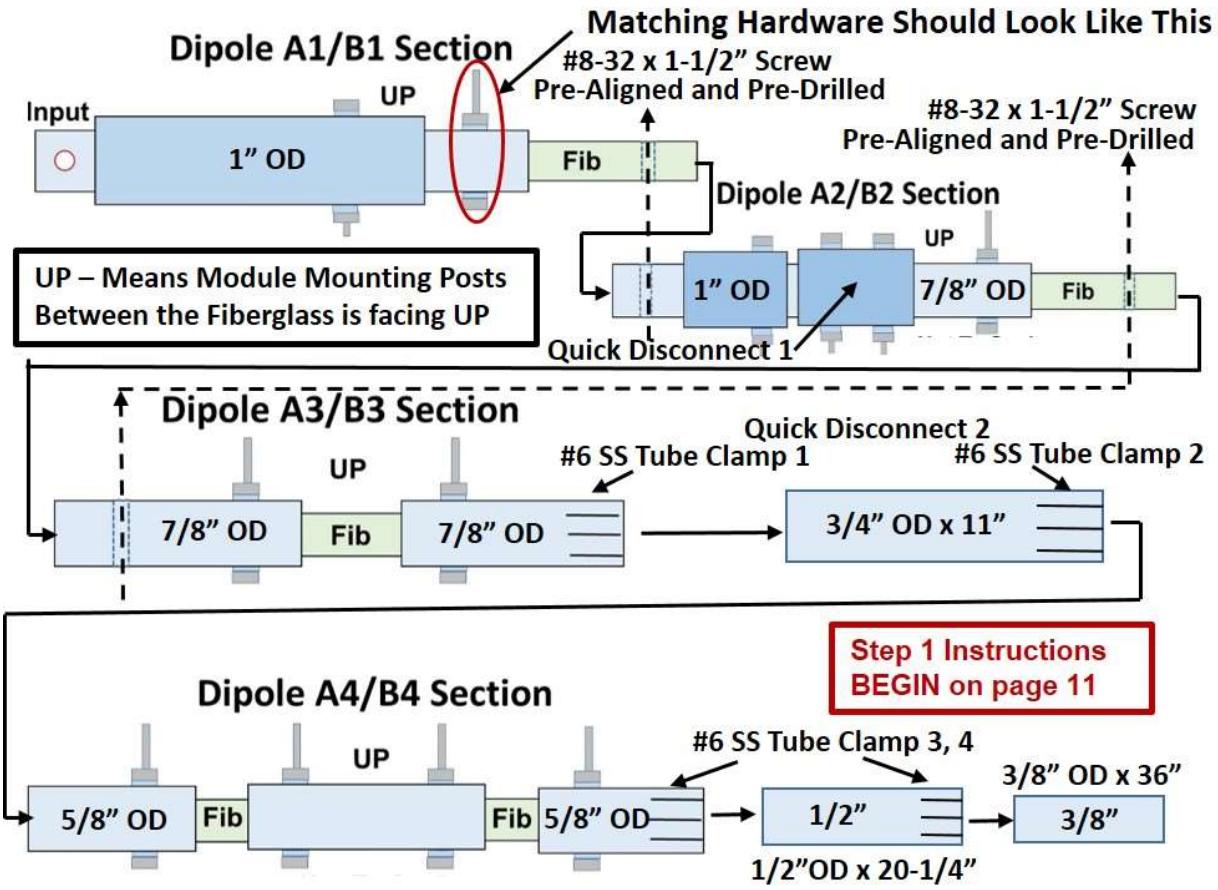


FIGURE 3
Overview of Half-Element Assembly

Figure 3 shows an example of the half-element "A" or "B" assembly.

Section A1, for example, is coupled and secured to section A2, as shown, using hardware identical to that highlighted in the RED circle. The hole in section A1 and in section A2 were pre-drilled and are pre-aligned for easy coupling of A1 to A2.

Similarly, section A2 is coupled and secured to section A3 as shown.

Section A3 is coupled and secured to Section A4 with the 3/4" x 11" slotted coupling tube. The 3/4" tube end is inserted into the 7/8" slotted tube end of A3 and clamped. The 5/8" tube end of A4 is inserted into the slotted 3/4" x 11" tube and clamped.

For the two 20m end tubing, the 1/2" diameter tube is coupled and secured to section A4, by inserting the 1/2" tube end into the slotted 5/8" end of section A4 and clamped. The 3/8" diameter tube is coupled and secured to the 1/2" tube, by inserting the 3/8" tube into the slotted 1/2" tube and clamped.

The two **Quick Disconnect** regions are shown for easy disassembly.

Half-element B assembly uses the same procedure.

TWO HALF-ELEMENTS

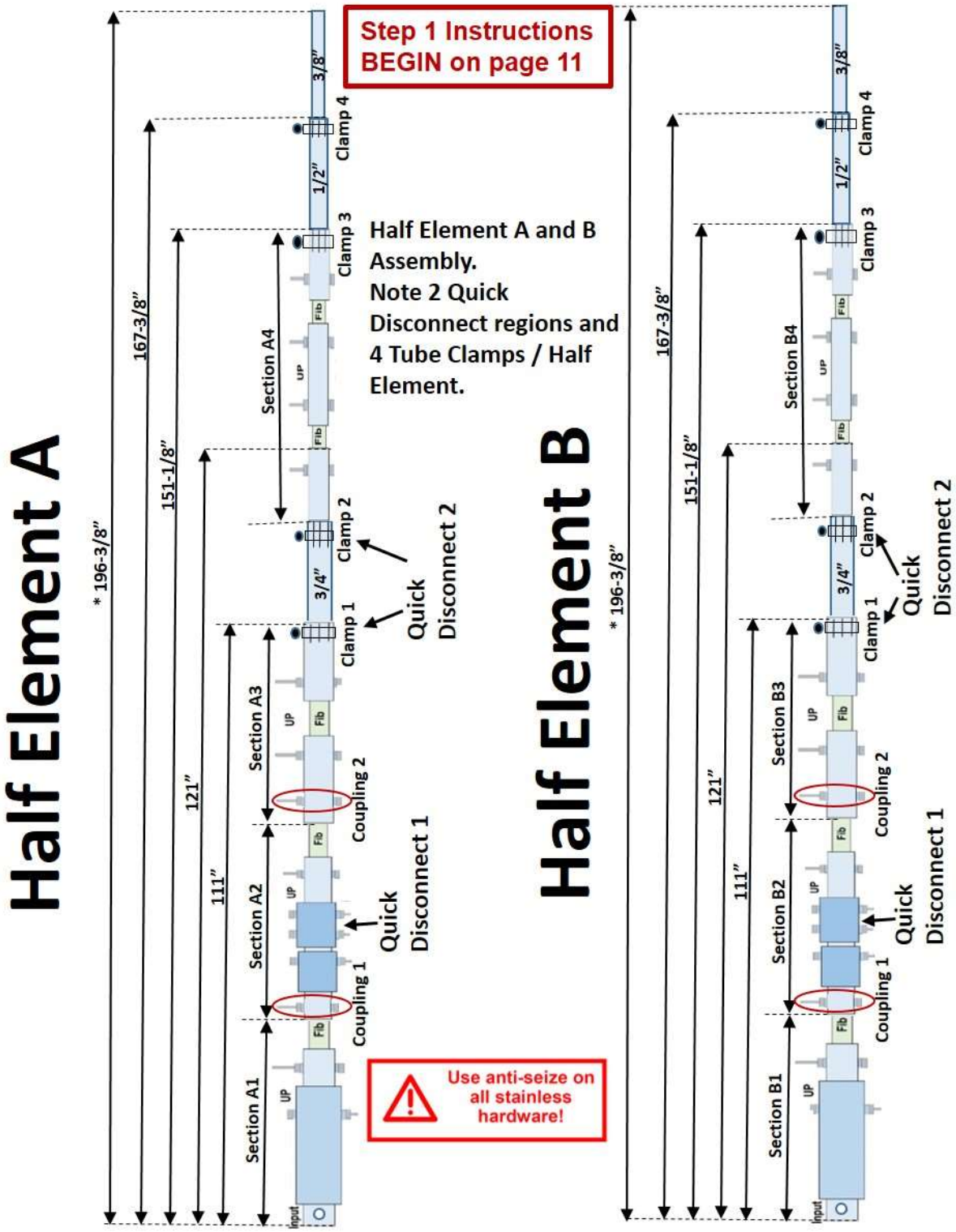


FIGURE 4
Two Half-Elements

COUPLING SECTIONS A1 TO B1

☐ **STEP 6.1** Locate:

- Input terminal assembly (11704), including:
  - (1) 1/4"-20 x 1-3/4" SS HEX Bolt
  - (1) 1/4" –20 SS 20 lock nuts
  - (3) 1/4" SS washers
  - (1) 1/4" SS collar lock washer.

☐ **STEP 6.2** Locate and align:

- Sections A1 and B1 (1301).
- Section A1 has a fiberglass rod (11800) extension pre-assembled at INPUT terminal of section A1. Place and align sections A1 and B1 on a flat surface (4 → 6 ft long table), as shown in **FIGs 5 and 6. Be sure the module mounting posts at each end of each section are facing in same direction (UP), when terminals / holes are horizontal (FIG. 5).**

☐ **STEP 6.3** Slide the 7/8" input of section B1 over the 3/4" rod, until the holes of section B1 input align with the hole in the fiberglass rod (**FIGs 5, 6 and 7**):

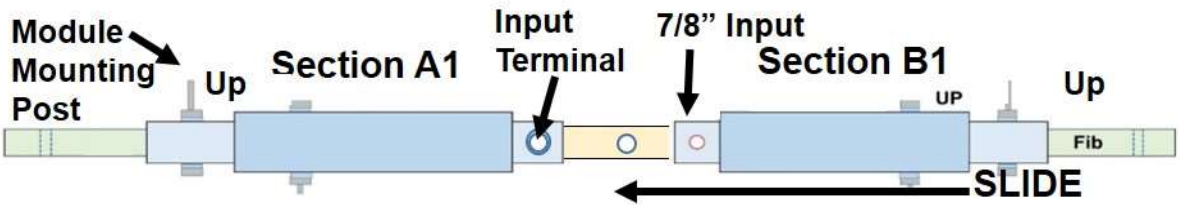


FIGURE 5
Coupling Section A1 to Section A2

Align and slide Section B1 (7/8" pre-drilled input) over ¾" fiberglass rod and align the two input terminal holes.

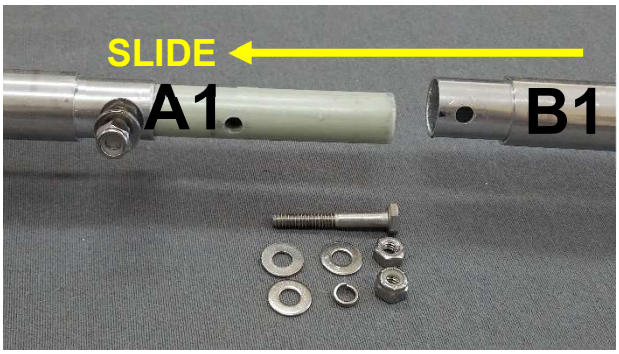


FIGURE 6
Slide section B1 over section A1 fiberglass until holes align. (316 SS hardware shown.)

FIGURE 7
Input Terminals. After alignment, secure with SS hardware as shown in FIG. 8.

☐ **STEP 6.4** After holes are aligned, insert the 1/4" hex bolt through B1 hole for matching the existing A1 terminal, as shown in **FIGs 7 and 8.**

☐ **STEP 6.5** Add a 1/4" washer, collar lock washer and 1/4"–20 HEX nut. Tighten securely. Then add two 1/4" washers, and a **loose** fit 1/4"–20 lock nut (**FIG. 8**). **DO NOT tighten lock nut!**

NOTE: HEX nut secures input terminals. After assembly, input wires with tin plated ring connectors will be sandwiched between two adjacent top washers by lock nut. (FIG. 8).

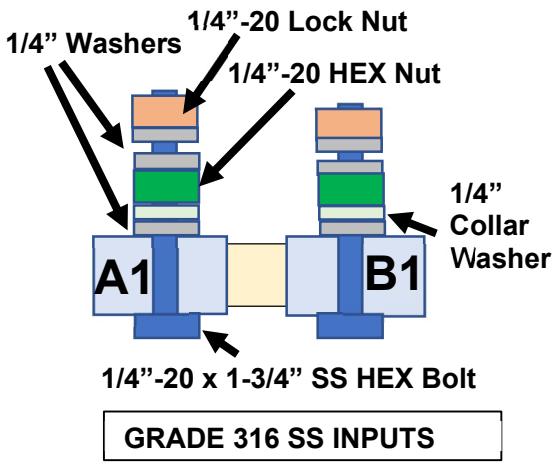
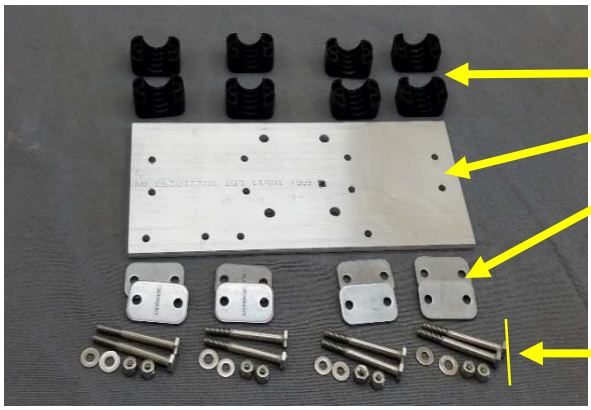


FIGURE 8
Input Terminal hardware.

COUPLING A1/B1 TO ELEMENT PLATE

☐ **STEP 6.6** Locate element plate and parts as shown in **FIG. 9.**



(8) 1" Element PA-Half-Clamps (1801)

(1) 12" x 5" Element Plate (1401)

(8) Element Clamp Reinforcement and Standoff Plates (1901)

(8) 1/4 –20 x 2.5" HEX Bolts (11001)
(8) 1/4"–20 Lock Nuts (11003)
(8) 1/4" Washers (11004)

FIGURE 9
Element plate and parts

☐ **STEP 6.7** Locate (8) 1/4"–20 HEX nuts (11005) **[NOT SHOWN]. NOTE:** HEX nuts are used **ONLY** during assembly. After assembly, HEX nuts are removed and replaced by 1/4"-20 lock nuts for securing the PA clamps to the element plate.

☐ **STEP 6.8** Place element mounting plate on a flat soft smooth 4-5 ft surface, with long side edge holes facing bottom left, as shown in **FIGs 9 and 10.**

☐ **STEP 6.9** Place a standoff plate (1901) aligned to each of the 4 pairs of holes, which are parallel to the short edge of plate. (**FIG. 10**).

☐ **STEP 6.10** Place PA- half- clamps (1801) on top of each standoff plate (1901), with FLAT side down. Align clamp holes to each pairs of holes, as shown in **FIG. 10**.

☐ **STEP 6.11** Place a 1/4”-20 x 2.5” HEX bolt (11001) through one side of each clamp / standoff plate combination and through element plate hole, as shown in **FIG. 10**.

1/4”-20 x 2.5” HEX bolt for aligning each half clamp and standoff plate with element plate hole for each of the 4 pairs.

Half Clamp - Rounded UP

FIGURE 10: Mounting plate with PA-clamps, standoffs and HEX bolts.

☐ **STEP 6.12** Center, place and press joined element sections A1 (Left) and B1 (Right) onto the 4 half clamps, as shown in **FIG.11**. This should auto-align the remaining 4 holes for the remaining HEX bolts used in the following steps.

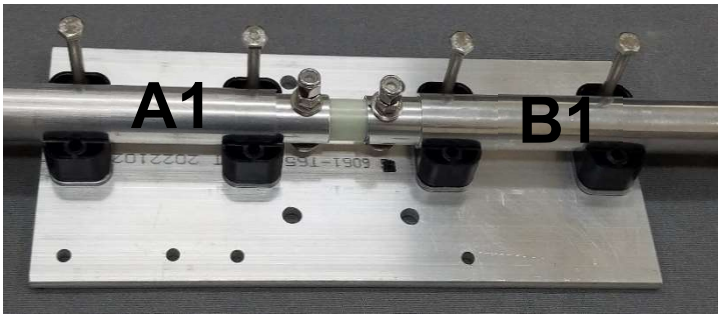


FIGURE 11
Use of A1/B1 sections to align half clamps.

☐ **STEP 6.13** Use the remaining four 1/4”-20 x 2.5” HEX bolts, to ensure alignment and push through of the half clamp/standoff and element plate holes to bottom surface, as shown in **FIG. 12.**

FIGURE 12
All HEX bolts are pushed through to bottom surface to ensure ALL clamp/standoff plates are aligned through bottom element plate.

☐ **STEP 6.14** Carefully remove all HEX bolts, without disturbing alignment. Press down on element as each bolt is being removed, to prevent disturbance, as shown in **FIG. 13.**

FIGURE 13
All HEX bolts removed after pre-alignment procedure of **FIGs 11 and 12**.

☐ **STEP 6.15** Insert two 1/4"-20 x 2-1/2" HEX bolts through a reinforcement plate and a half clamp with FLAT side up, as shown in **FIG. 14**. Slowly and carefully insert the 2 HEX bolts back into the bottom portion of the half clamp / standoff plate and through element plate. Repeat this procedure for the remaining 3 half clamp / reinforcement plates, as shown in **FIG. 15**. Press down on all HEX Bolts, to ensure all bolts are fully inserted through bottom element plate.

FIGURE 14
Insert HEX Bolts through top portion of clamp/plate and then through bottom portion of clamp/plate and element plate.

FIGURE 15
Repeat process of **FIG. 14** for remaining 3 clamp assemblies. Press down on all HEX bolts to insure fully inserted through element plate.

☐ **STEP 6.16** Carefully pick up the element plate, by each long side edges, and place on two 4"x4"x2" support wood blocks. This allows space under the plate for the protruding HEX bolts, as shown in **FIG. 16**. Press down on all HEX bolts, to insure all 4 clamp assemblies are fully nested and seated, with HEX bolts through the element plate.

☐ **STEP 6.17** Carefully pick up one edge of element plate and rotate on other edge, without disturbing the element placement. Rotate until input terminals are resting on one of the support blocks, as shown in **FIG. 17**

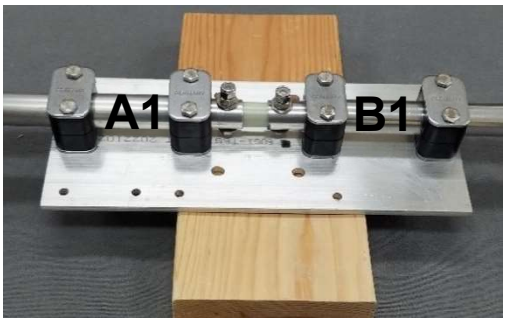


FIGURE 16
Place plate on two wood blocks and press down on all HEX bolts.

FIGURE 17
Rotate plate edge on surface until input terminals rest on support wood block with inserted HEX bolts protruding.

☐ **STEP 6.18** Secure the 1/4"-20 x 2-1/2" HEX bolts with 1/4" washers (11004) and 1/4"-20 standard HEX nuts (11005), as shown in **FIG. 18**. **LOOSELY TIIGHTEN HEX NUTS!**

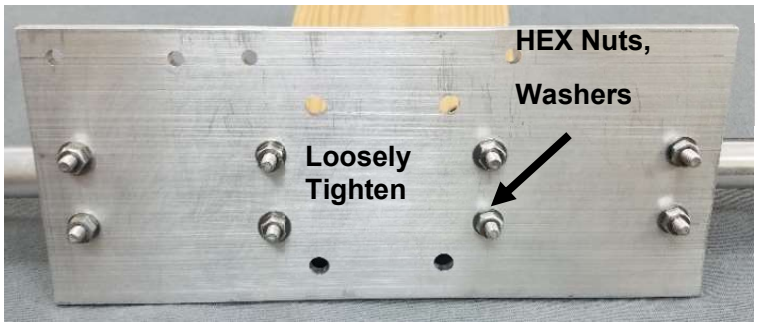


FIGURE 18
Secure 1/4" HEX bolts with HEX nuts & washers.

FIGURE 19
Close-Up view of element clamp with reinforcement and stand-off plates.

☐ **STEP 6.19** Place the element plate flat on surface, then lightly rotate element sections A1/B1 until input terminals are parallel to the element plate, as shown in **FIG. 20**. After rotation, module mounting posts near each end of sections A1 and B1, should both be facing upward - shown in **FIG. 21**. Loosen bottom HEX nuts to rotate terminals, if necessary for rotation. Secure nuts temporarily using anti-seize stick (11301).

FIGURE 20
Rotate element input terminals as shown.

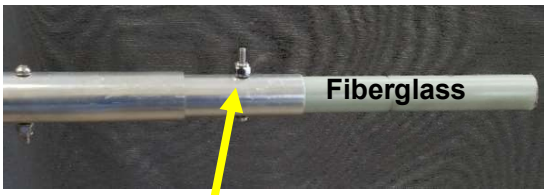


FIGURE 21
Module mounting posts (arrow) A1/B1 module mounting posts face upwards with inputs shown in **FIG. 20.**

COUPLING SECTIONS A1 TO A2

☐ **STEP 6.20** Locate:

- (1) #8-32 x 1-1/2" pan head screw (11701)
- (1) #8-32 lock nut (11702)
- (2) #8 washers (11703)

☐ **STEP 6.21** Locate sections A1 (joined to B1 on element plate) and section A2 (1302), as shown in **FIGs 22, 24 and 25**.

☐ **STEP 6.22** Place sections A1 [and B1 on element plate] on a smooth soft flat surface with section A2, as shown in **FIG. 22**. A 1/2" thick 3' long wood support elevates section A2 to the A1 level. Ideally, this long flat surface can be provided by two 4 → 5 ft long tables placed end-to-end -- each of same height. Any suitable long flat surface area may be used.

☐ **STEP 6.23** Rotate A2 initially to lay FLAT on the 1/2" support wood, with module support post facing same side as the 4 holes on long edge of element plate. See **FIGs 22 and 23**.

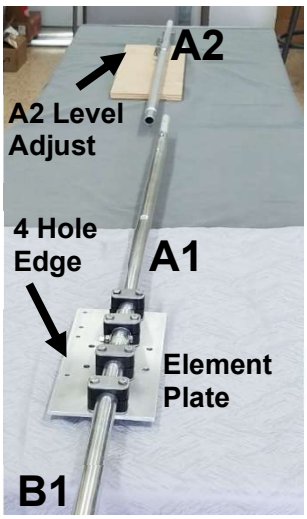


FIGURE 22
Position A1 and A2 on Flat surface**.**

☐ **STEP 6.24** Align and position section A2 relative to section A1, as shown in **FIG. 24**.

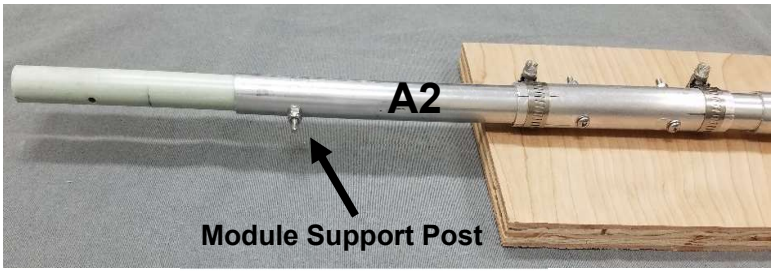


FIGURE 23
Initially, rotate section A2 to lay FLAT on support wood, with module post facing outward on 4-hole edge side of element plate.

FIGURE 24
Align A2 tube end relative to A1 as shown.

☐ **STEP 6.25** Slide section A2 7/8" tube over 3/4" fiberglass rod of section A1, as shown in **FIGs 25, 26 and 27**. Section A2 will slide smoothly over A1, if properly aligned. A slight angular adjustment may be necessary, for a smooth slide. When sliding A2, slowly rotate A2 to align the 2 holes. The STOP line on the fiberglass rod is where the holes should align, **if properly rotated**. **After holes are aligned, check that both module end posts for A1/A2 face UP. (FIGs 25 and 28.)**

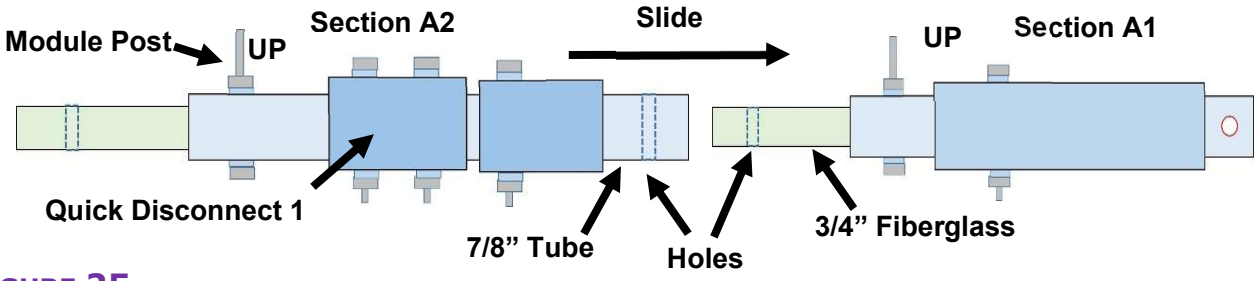


FIGURE 25
Section A2 tube slides over section A1 fiberglass.

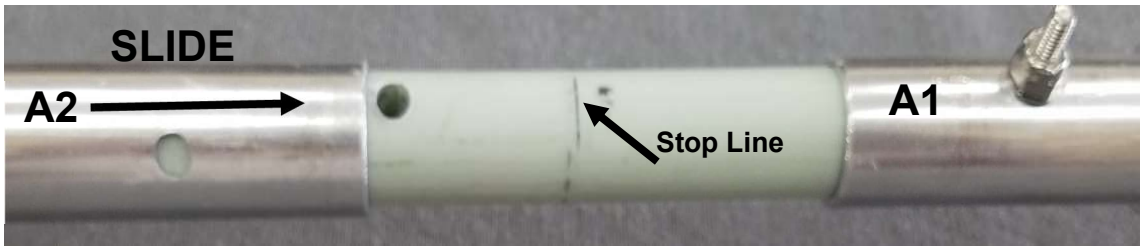


FIGURE 26
Slowly slide A2 tube over the A1 fiberglass rod. Rotate A2 as needed, to align the A2 hole with the A1 hole when the A2 edge reaches the STOP line.

FIGURE 27
A1 and A2 after hole alignment

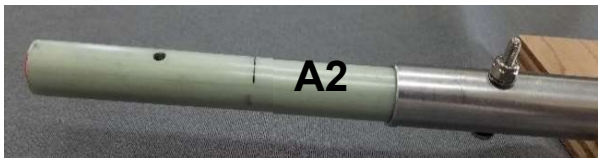


FIGURE 28
End of A2 mounting post UP **after** A1/A2 aligns with holes.

☐ **STEP 6.26** Insert (1) #8-32 x 1-1/2" screw (11701) through a #8 washer (11703) and the A2 hole as shown in **FIG. 29**. Hardware should match the adjacent module mounting post of A1. The supporting hardware is (2) #8 SS washers (11703), and (1) #8-32 lock nut (11702). Tighten hardware securely, as shown in **FIG. 30.**

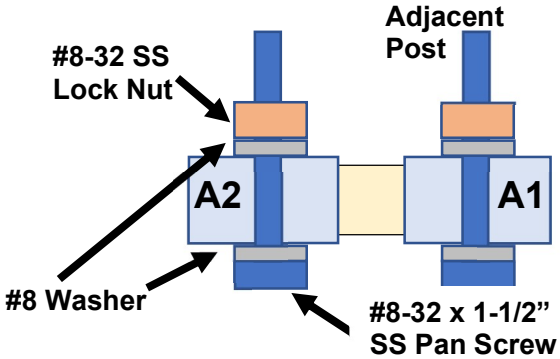


FIGURE 29
Module mounting post hardware.

FIGURE 30
Finished coupling of sections A1 and A2 after tightening of hardware**.**

MOBILE SURFACES

NEXT STEP ELEMENT ASSEMBLY METHODS

The next steps will be adding sections A3 and A4 to section A2 of half-element A. As a result, the half-element length will increase from the (A1+A2) length of about 7 ft, to 13 ft. Long flat surface areas are not practical for most assemblers and are not necessary. If one stationary table is used for element plate support, then a second mobile table can be used for assembly. Thus, there is no need for a long surface area. (**FIG. 31**).

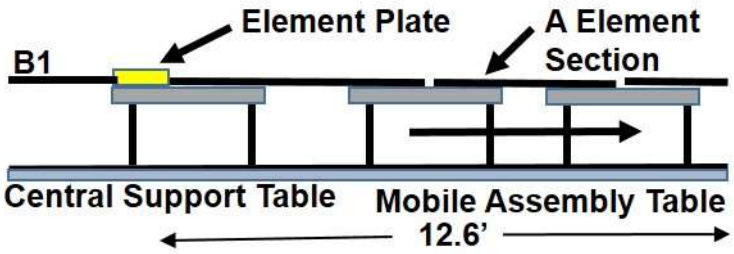


FIGURE 31
A mobile assembly table allows for assembling half-element sections over a 12.6 ft length.

Two flat same height tables can be used to assemble (couple) the dipole sections. The central support table supports the central element plate. The mobile assembly table is used to assemble element sections together. After completing one task, the mobile table is move to next assembly position, to assemble next sections etc. Excluding section B1 and 20m extensions, the total half-element sections length is about 12.6 ft**.**

COUPLING SECTIONS A2 TO A3

☐ **STEP 6.27** Locate:

- (1) #8-32 x 1-1/2" pan head screw (11701)
- (1) #8-32 lock nut (11702)
- (2) #8 washers (11703).

☐ **STEP 6.28** Locate sections A2 and A3, as shown in **FIGs 32 and 34.**

☐ **STEP 6.29** Sections A3 should be placed on a smooth soft flat surface with section A2, as shown in **FIG.32**. A 1/2" X 3' wood support elevates section A3 to the A2 level. Ideally, this long flat surface can be accomplished by two 4 → 5 ft long tables, as shown in **FIG. 31.** Ideally, each table is of same height. Any suitable long flat surface area may be used.

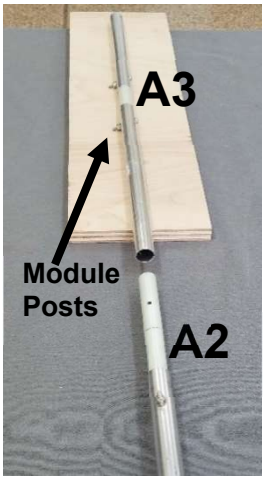


FIGURE 32
Elevate and align A3 relative to A2, with module posts facing same side as 4 holes on element plate edge**.**

☐ **STEP 6.30** Position section A3 such that A3 lays FLAT on the 1/2" support wood, with module support post facing same side as the 4 holes on long edge of element plate. (**FIG. 32**.)

☐ **STEP 6.31** Align and position section A3 on wood support relative to section A2, as shown in **FIG.33.**

Use anti-seize on all stainless hardware!

Align A3 and A2 – ready for coupling.

FIGURE 33

☐ **STEP 6.32** Slide 7/8" tube of section A3 over 3/4" fiberglass rod of section A2, as shown in **FIGs 34, 35 and 36**. Section A3 will slide smoothly, if properly aligned. A slight angular adjustment may be necessary for a smooth slide. When sliding A3, slowly rotate to align the 2 holes. The STOP line on the fiberglass rod is where the holes will align, **if properly rotated. After holes are aligned, check that both module posts for A2 and A3 face UP. (FIGs 34 and 37).**

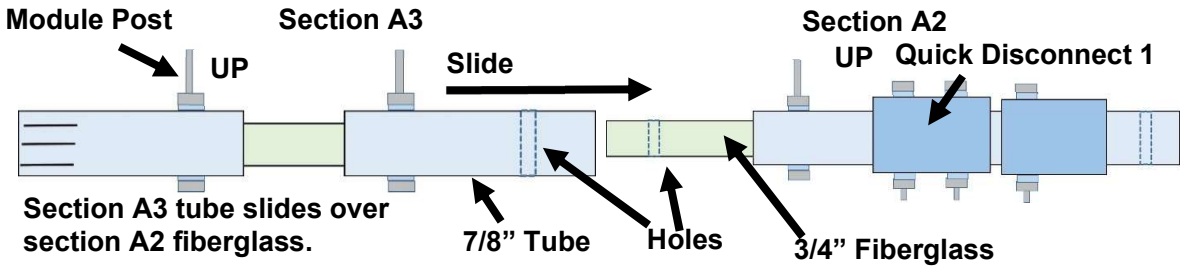


FIGURE 34
Section A3 coupled to A2.

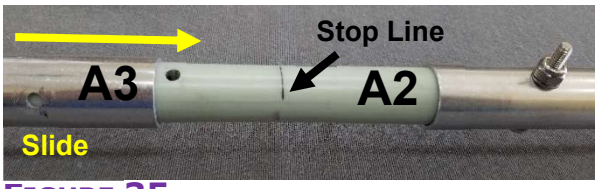


FIGURE 35
Slide and rotate A3 over A2 to stop Line.

FIGURE 36
Slide A3 to stop Line while rotating to align holes.

☐ **STEP 6.33** Insert (1) #8-32 x 1-1/2" screw (11701) through #8 washer (11703) and through the A3 hole, thereby matching the adjacent module mounting post hardware of A2, as shown in **FIG. 29.** Supporting hardware is (2) #8 SS washers (11703), and (1) #8-32 lock nut (11702). Tighten hardware securely, as shown in **FIGs 37 and 38.**

FIGURE 37
Verify A3 posts are UP **after** A2/A3 coupling.

FIGURE 38
Coupling of sections A3 and A2 after tightening of hardware.

NOTE: This Dipole Antenna has 2 Quick Disconnect regions, for easy disassembly and transport. Section 2 has one such region. The second region uses tube clamp 1 and tube clamp 2 to loosen/secure a 3/4" coupling tube from/to sections A3 and A4. Disassembly is quick and easy at these disconnect regions. See FIGs 3 and 4, for overview of disconnect regions and page 55-56 for details.

COUPLING A3 TO 3/4" X 11" TUBE

☐ **STEP 6.34** Locate (1) #6 stainless steel tube clamp 1 (11603).

☐ **STEP 6.35** Locate (1) 3/4" x 11" aluminum tube (1501) and section A3 (1303) as shown in **FIGs 39 and 42.**

☐ **STEP 6.36** The 3/4" tube should be placed on a smooth soft flat surface with section A3, as shown in **FIGs 40 and 41**.

☐ **STEP 6.37** Measure and place a 3" mark on the non-slotted end of the 3/4" tube, as shown in **FIG. 41.**

☐ **STEP 6.38** Slide the 3/4" non-slotted tube into / inside the slotted end of 7/8" tube of section A3 – and up to the 3" mark, as shown in **FIGs 41 and 43.**

FIGURE 39
A 3/4" x 11" Aluminum Tube (1501)

FIGURE 40
Align 3/4" tube with 7/8" tube of section A3 on a FLAT surface.

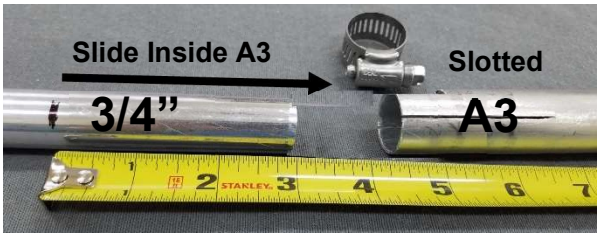


FIGURE 41
Place 3" mark, and slide 3/4 tube into slotted section of A3 – up to 3" mark.

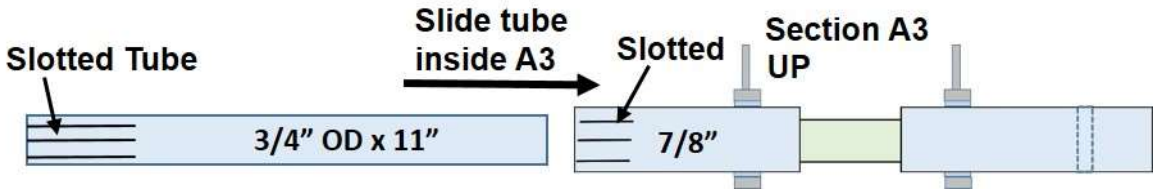


FIGURE 42
A 3/4" tube coupled to section A3.

☐ **STEP 6.39** Slide the #6 tube clamp 1 over the 3/4" tube and the slotted region of A3 tube. Orientate tube clamp 1 with 5/16" hex screw side down, as shown in **FIG. 43.** Then tighten clamp securely.

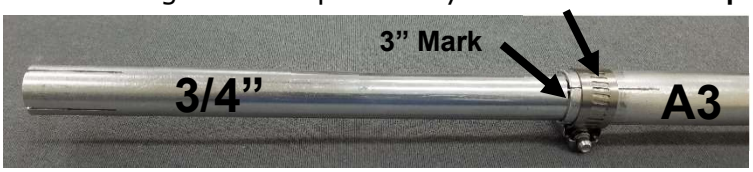


FIGURE 43
#6 tube clamp 1 secures the slotted section of A3 to clamp onto the 3/4" tube.

COUPLING A4 TO 3/4" X 11" TUBE

☐ **STEP 6.38** Locate (1) #6 stainless steel tube clamp 2 (11603)

☐ **STEP 6.39** Locate 3/4"x 11" tube (1501), coupled to section A3 (1303), as shown in **FIGS 43 and 48.**

☐ **STEP 6.40** Locate section A4 (1304), as shown in **FIGs 44, 48.**

☐ **STEP 6.41** Section A4 should be placed on a smooth soft flat surface in-line with 3/4" tube, as shown in **FIG. 44**. A 1/2" X 3' wood support elevates section A4 to the 3/4" tube level. Use table support method described for **FIG. 31**, for this assembly.

☐ **STEP 6.42** Position A4 such that A4 lays FLAT on the 1/2" support wood, with module support post facing same side as the 4 holes on long edge of element plate (**FIG 44**).

☐ **STEP 6.43** Align and position non-slotted section A4 relative to the 3/4" slotted tube, as shown in **FIGs 44 and 45**.

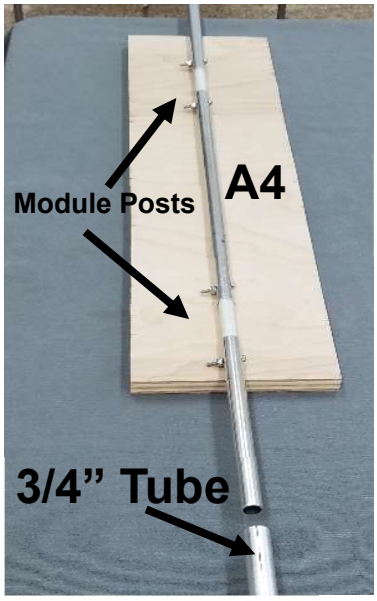


FIGURE 44
Elevate and align A4 relative to 3/4" tube, with module posts facing same side as 4-hole element plate edge.

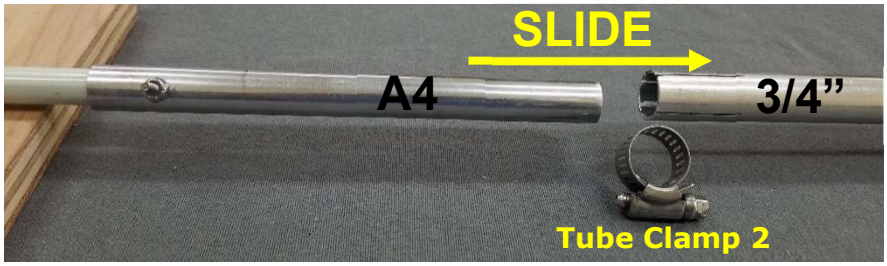


FIGURE 45
Elevate and align non-slotted section A4 relative to 3/4" slotted tube coupler.

☐ **STEP 6.44** Place a 3-1/4" mark on the non-slotted section of A4, as shown in **FIG. 46.**

☐ **STEP 6.45** Place #6 tube clamp 2 over 3/4" slotted tube, with the 5/16" hex screw side down, as shown in **FIG. 47.**

☐ **STEP 6.46** Slide 5/8" section A4 into the 3/4" slotted tube to 3-1/4" mark. Rotate A4 for module posts UP, as shown in **FIG. 47.** Tighten tube clamp 2 securely.

FIGURE 46
Place a 3-1/4" mark on the A4 non-slotted section.

FIGURE 47
Slide A4 into 3/4" tube to 3-1/4" mark. Rotate section A4 for module posts UP.

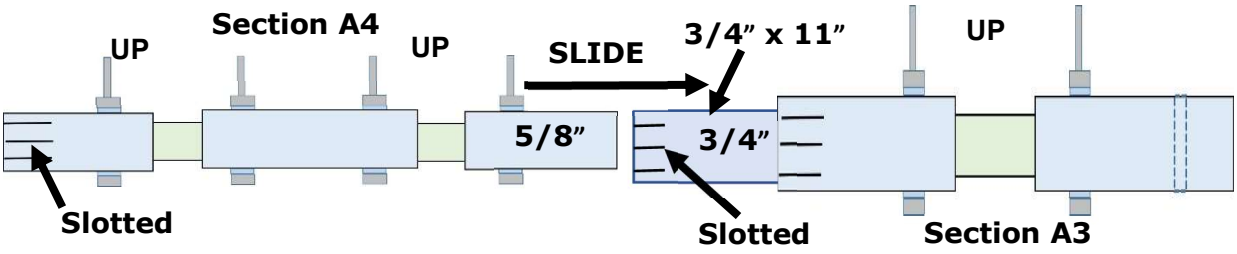


FIGURE 48
Coupling of section A4 to section A3 via 3/4" x 11" tube coupler.

☐ **STEP 6.47** Verify section A4 module posts are UP, as shown in **FIG. 49.**

Verify section A4 mounting posts are UP, matching UP position of all other half-element mounting posts.

FIGURE 49
Module post UP position verification.

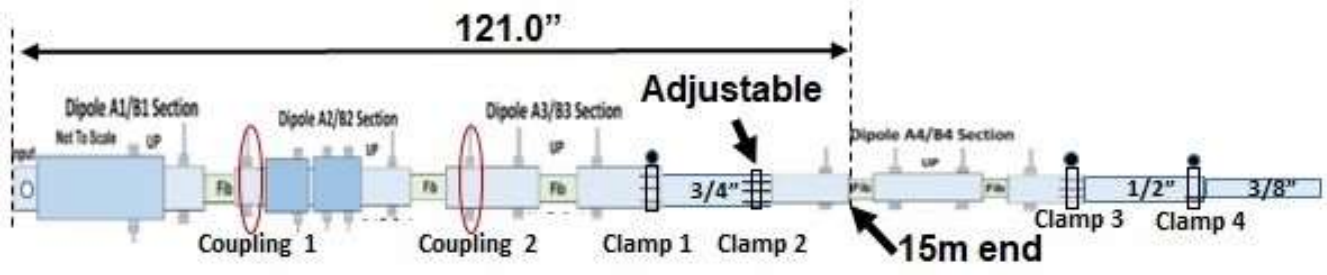


FIGURE 50
Half-element (A or B) distance from INPUT end to 15m tube end is 121". This distance can be adjusted, by sliding section A4 tube into the 3/4" x 11" tube.

NOTE: The distance from the INPUT END of the Half-Element to the END of the 15m tube should be adjusted to 121.0 inches, as shown in FIG. 50.

☐ **STEP 6.48** Loosen tube clamp 2 and adjust distance [from INPUT END of half-element A to the END of the 15m tube] to 121", as shown in **FIGs 49, 50, and 51.** After 121" measurement, tighten tube clamp 2, while ensuring the module mounting posts of A4 are UP, as shown in **FIGs 49, 50, and 51**.

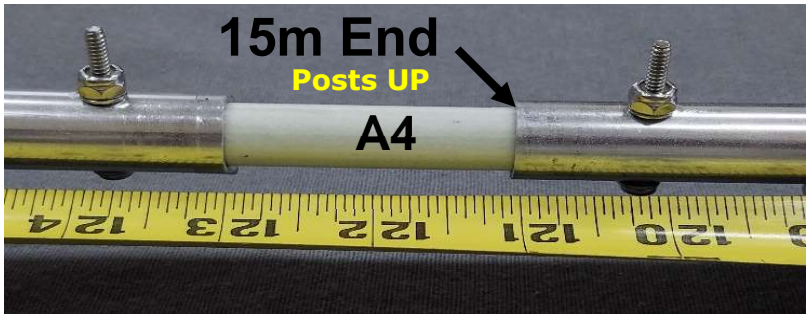


FIGURE 51
Loosen tube clamp 2 and adjust 15m End to 121.0 inches from the INPUT END of the half-element A.

Then tighten tube clamp 2 securely with posts UP.

NEXT ACTIVITIES: This concludes the mechanical assembly of sections A1/A2/A3/A4 for half-element A, as shown in **FIGs 3 and 4.** It is highly recommended **NOT to complete the 20m end tubing assembly of element A at this time** [**Do not add** the 20m end sections of 1/2" x 20-1/4" tube and the 3/8" x 36" tube, as shown in **FIGs 3 and 4.**]. This will allow assembling the entire A and B mechanical pre-fabricated sections, as well as assembling all electrical modules and wiring, in a total end-end length of about 26 ft. **(Otherwise total assembly length would be about 32.7 ft.)** This may facilitate an indoor or under cover assembly and test area. In all cases, a level assembly area is highly recommended.

HALF-ELEMENT B ASSEMBLY

- The mechanical assembly of half-element B Pre-Fab sections follows exactly the same 0s as for half-element A Pre-Fabricated sections assembly.
- Half-element B Pre-Fabricated sections assembly thus starts as **STEP 6.20** on page 16 of this Manual, and concludes with **STEP 6.48** on page 23 of this Manual.
- Substitute B1 for A1, B2 for A2, B3 for A3 and B4 for A4 during assembly.
- For element B assembly – XOR suggests mobile assembly surfaces, as shown in **FIG. 52**, and as well as for all other subsequent assemblies.

MOBILE ASSEMBLY SURFACES

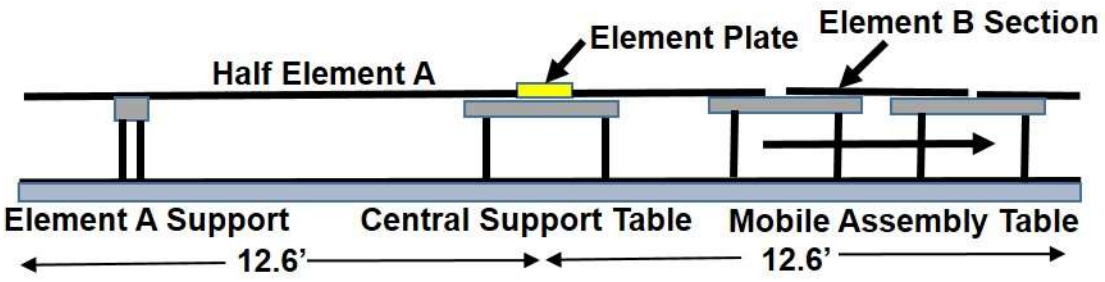


FIGURE 52

Two flat same height tables may be used to assemble element B sections. The central support table supports the central element plate, while half-element A has a separate support. The mobile assembly table assembles element B sections. After completing a B task, the mobile table is move to the next B assembly position, etc. Ignoring half-element A and 20m extensions, the total half-element B sections length is about 12.6 ft. Thus, the total end-end length of this structure is about 25.2 ft. After element sections assembly, this assembly structure can be used to complete all other assembly tasks, such as module attachment, wiring and DC testing.

7 MODULE ASSEMBLY

MOUNTING SUPPORT PLATES

☐ **STEP 7.1** Locate & carefully remove (2) strings of switching modules (1201) **FIG. 53**.

☐ **STEP 7.2** Locate:

- 6m module
- (2) #8-32 x 1/2" screws (11700)
- (2) #8-32 lock nuts (11702)
- (4) #8 3/8" OD washers (11703)
- (2) Module support plates (11801) shown in **FIGs 54, 55 and 56.**

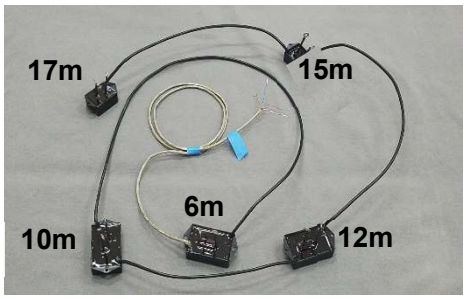


FIGURE 53
20m-6m switching module string

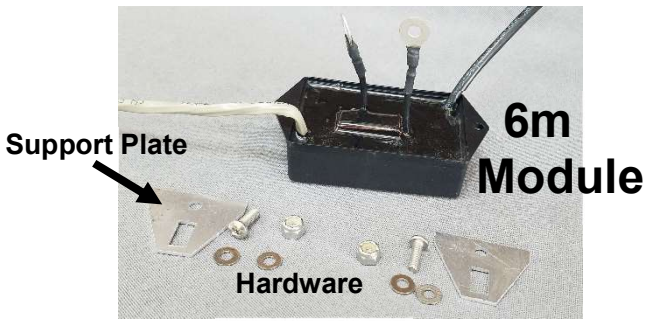


FIGURE 54
6m module support plates and hardware

NOTE: Module Strings may be labeled "A" and "B" with pre-spliced pre-cut ends.

☐ **STEP 7.3** Review **FIG. 55** method of attaching module support plate to the 10 total switching modules. Each module requires two (2) module support plates (one at each end). The final result will be as shown in **FIGs 56 and 59.**

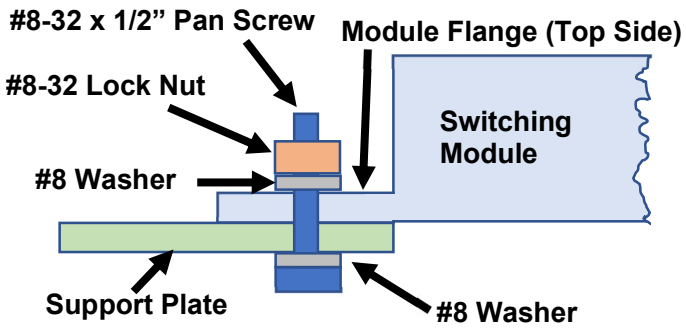


FIGURE 55
Module support plate assembly

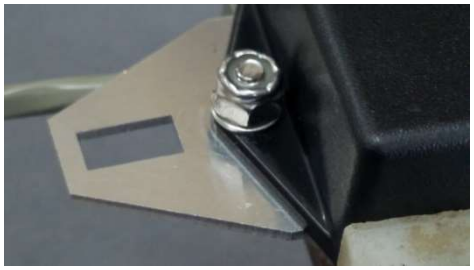
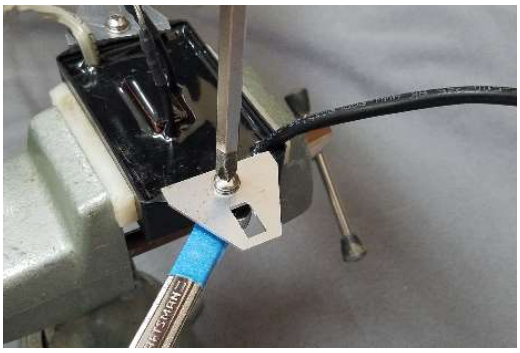


FIGURE 56
Module support plate attached to module, using method of **FIG. 55.** Note NUT is on top side of flange.

☐ **STEP 7.4** With module upside down on flat surface, loosely attached hardware per **FIG. 55** at each end of module (**FIG. 57**). The #8-32 x 1/2" screw with a #8 washer is inserted through hole of the support plate and then through the module bottom side flange. The screw is then terminated with a #8 washer and #8 lock nut (top side), as shown in **FIGs 55, 56, and 59.**

☐ **STEP 7.5** Place module in a secure setting as shown in **FIG. 58.** Position support plate on module, as shown in **FIGs 57 and 58**. Use a #2 Phillips screw driver **to hold** the #8 screw. **Do Not Turn Screwdriver.** Tighten #8 lock nut securely with an 11/32" open end wrench. After tightening, ensure support plate is in the position of **FIGs 57-59.** Repeat for the 2nd module support plate. Finished module support plates are shown in **FIG. 59.**

FIGURE 57
Module support plate attached to module, using method of **FIG. 55.**



Use anti-seize on all stainless hardware!

FIGURE 58
Phillips screw driver holds the #8 screw, as the #8 lock nut is tightened with open end 11/32" wrench.

FIGURE 59
Finished attached module support plates to module.

☐ **STEP 7.6** Repeat **STEPS 7.2** through **7.5** for the remaining 4 switching modules.

☐ **STEP 7.7** Repeat **STEPS 7.1** through **7.6** for the 2nd string of 5 switching modules.

MOUNTING P-CLAMPS TO HALF-ELEMENT

OVERVIEW: The mounting of switching modules to a half-element consists of two basic activities.

- Placing the stainless-steel P-clamps around the appropriate element tube,
- Attaching the modules to their respective mounting posts (between the fiberglass rods) and managing the module control cables on the element.

PLACING THE P-CLAMPS

NOTE: The 1/2" wide grade 304 stainless steel P-clamps are designed to be 1/8" undersized of tubes being clamped. This ensures a very tight and reliable electrical RF clamp connection to the aluminum tube.

☐ **STEP 7.8** Locate (12) 3/4" P-clamps (11902), and (8) 1/2" P-clamps (11901). Note each clamp has a sharp bend leg, as shown in **FIG. 60.**

FIGURE 60
3/4" P-clamp

☐ **STEP 7.9** Review **FIGs 61 and 62** regarding P-clamp placement. → **FIG. 61** shows the locations of the 3/4" P-clamps for 7/8" tube and of the 1/2" P-clamps for 5/8" tube. The 3/4" P-clamps are placed at the 6m, 10m and 12m module locations. The 1/2" P-clamps are placed at the 15m and 17m module locations.

→ **FIG. 62** shows **TOP VIEW** locations of P-clamps contact points, along each half-element relative to the element plate holes, for the 3/4" and the 1/2" P-clamps.

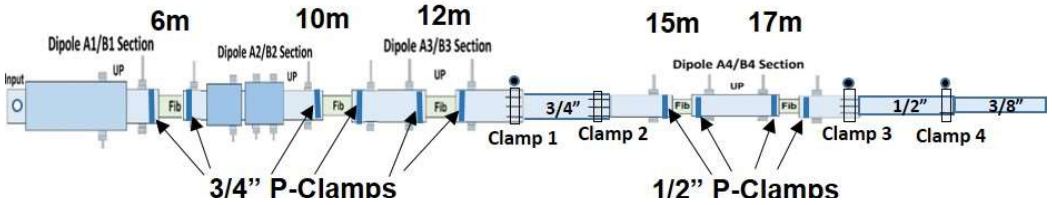


FIGURE 61
Location of the 3/4" P-clamps and the 1/2" P-clamps along the half element.

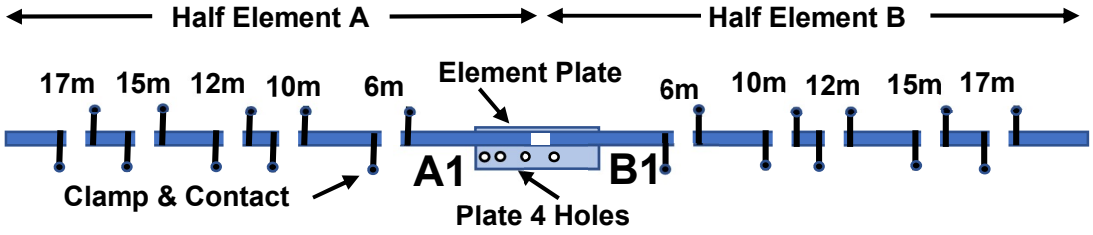


FIGURE 62
TOP VIEW -- P-camp locations and contact positions relative to 4-hole plate edge, for half element A and B. **Note clamp electrical contacts side for element A is opposite that of clamp contacts side for element B.**

CLEANING: Use 50/50 isopropyl alcohol, or the like, for cleaning surfaces of affected aluminum tubing, before P-clamp placement or cable management taping.

NOTE: The procedure for placing the P-clamps is to 1st slide the clamps over the fiberglass rod, with the sharp bend contact leg facing UP and on the appropriate side (FIG. 62 and 63). After pinching the clamp/contacts together, slide clamp over the appropriate tube, as shown in FIG. 63. Clamps should fit snuggly, but can be rotated into position, as shown in FIGs 63, 64.

☐ **STEP 7.10** Locate the 6m position of half-element A and place the 3/4" P-clamps per **FIG. 62,** as shown in **FIG. 63, 64.** For **FIG. 64**, element plate is to the right.

FIGURE 63
Proper placement of P-clamp with sharp bend contact leg UP.

FIGURE 64
Proper placement of 3/4" P-clamp for 6m position of element A.

☐ **STEP 7.11** Locate the 12m and 10m positions of half-element A and place the 3/4" P-clamps per **FIG. 62**, as shown in **FIG. 65**. For **FIG. 65**, element plate is right.

☐ **STEP 7.12** Locate the 17m and 15m positions of half-element A and place the 1/2" P-clamps per **FIG. 62** and as shown in **FIG 66.** For **FIG. 66**, element plate is right.

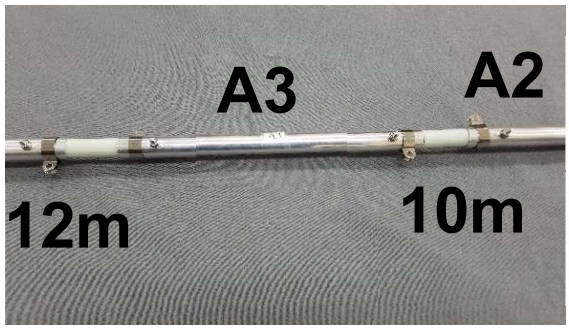


FIGURE 65
Proper placement of 3/4" P-clamp for 12m and 10m position of element A.

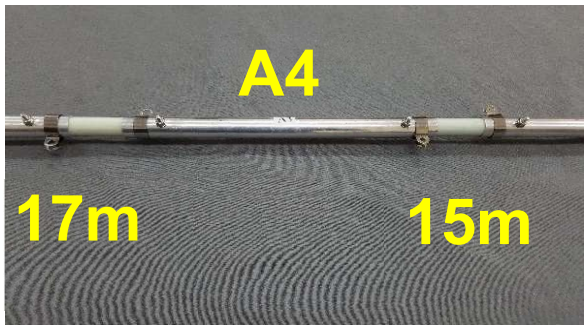


FIGURE 66
Proper placement of 1/2" P-clamp for 17m and 15m position of element A.

☐ **STEP 7.13** Repeat **STEPS 7.9** through **7.12** for half-element B.

NOTE: Placement of P-clamps for half-element B is opposite the placement for half-element A. Refer to FIG. 62 during clamp placement.

MOUNTING MODULES TO HALF-ELEMENT

OVERVIEW: The attaching of switching modules to the half-element consists of two basic activities.

1) Attaching the BAND modules on their respective BAND mounting posts,
2) Managing the module control cables.

Module strings labeled "A" and "B" must be placed on their corresponding half-element.

ATTACHING THE MODULE

PROCEEDURE: Procedure for attaching the modules to the half-element is to initially place each BAND module (**FIG 53**) at their respective BAND position (**FIG. 61, 62**) and on their respective element mounting posts. It is recommended that supporting surfaces such as tables (**FIG 52**) be used to help align and support the module string beneath the half-element band positions, during the module attachments. Refer to **FIGs 67, 68 and 69** before proceeding. **FIG. 69** is important for cable management between modules, when placing modules on their respective posts.

☐ **STEP 7.14** Review **FIG.67** method of attaching module support plate to the module Post (on both side of module). Basically, a small #8 3/8" OD washer is initially placed over the post. The support plate is then lowered over the post which passes though the long slot in the support plate, resting on the bottom washer. **Be sure the module's two switching wires [with ring connectors-as shown in FIG. 57] straddle the fiberglass rod on each side, bending towards their respective P-clamp contacts as shown in FIG. 71.** A #8 7/16" OD washer followed by a lock nut is then place over the post to secure the support plate, as shown in **FIGs 67 and 68.**

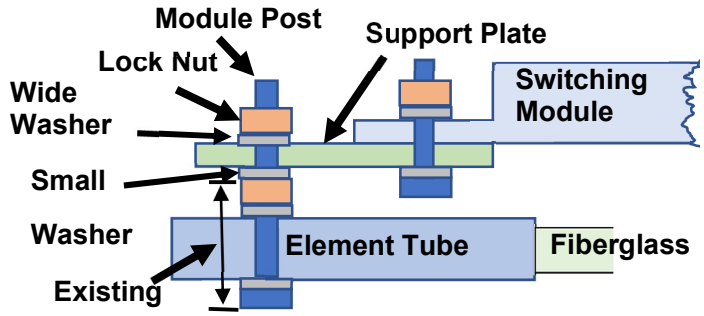


FIGURE 67
Method of attachment of support plate to module Post

.

FIGURE 68
View of module plate to post attachment per **FIG. 67**.

CABLE MANAGEMENT: The control cable length between modules is longer than the distance between modules, to ensure a fit. All cables **between and from** modules should twist **UNDER** the element in **EITHER** direction, as shown in **FIG. 69** example. See **FIGs 70-76** and **89 - 92** for additional cable management examples.

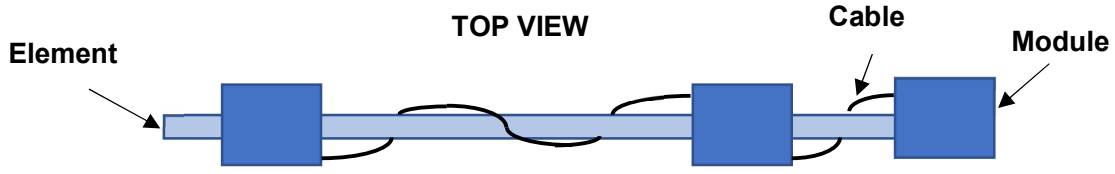


FIGURE 69
Cable between modules is always routed UNDER element from each module.

☐ **STEP 7.15** Locate:

- (12) #8-32 lock nuts (11702)
- (12) #8 3/8" washers (11703)
- (20) #8 7/16" washers (11713)
- (8) #6-32 lock nuts (13001)
- (8) #6 washers (13002)

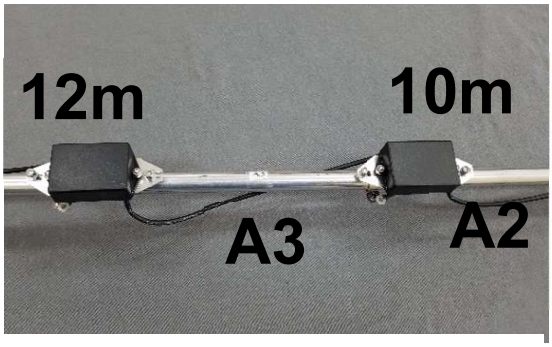


FIGURE 70
12m and 10m Module mounting on element, **after** routing the cable UNDER the Element. Modules are centered and then secured.

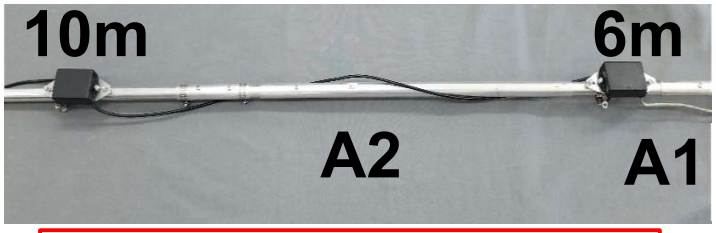
☐ **STEP 7.16** Locate one of the module strings of **FIG. 53** and arrange / place them on supporting structures beneath half-element A. The 6m module, with the longest control cable with cut end, should be placed nearest the element plate, as shown in **FIG. 62.**

☐ **STEP 7.17** Locate the 12m and 10m modules **(FIG. 53).** Initially place (not secure) on their respective mounting posts per **FIG. 61, 62 and 70**, using cable management methods of **FIGs 69 & 70.**

☐ **STEP 7.18** Ensure that both module's 2 RF wires (with ring connectors) straddle each side of fiberglass rod, bending towards the P-clamp as shown in **FIG. 71.**

☐ **STEP 7.19** Center and then secure the 12m and 10m modules to their respective mounting Posts, using the attachment method shown in **FIG. 67** and as shown in **FIGs 70 and 71** for all 4 posts. [Small #8 washer under plate / 7/16" OD washer on top of plate.]

FIGURE 71
Module's 2 RF connector wires straddle the fiberglass rod and bend towards the P-clamp.



Some module cables may not need a twist!

FIGURE 72
6m module placement, **after** routing the cables from both modules shown UNDER the element.

☐ **STEP 7.20** Next, locate the 6m module **(FIG. 53).** Use the cable management of **FIG. 69** to place the 6m module per **FIG. 61 and 62**, as shown in **FIG. 72.**

☐ **STEP 7.21** Ensure that the 6m module's 2 RF wires (with ring connectors) straddle each side of fiberglass rod, bending towards the P-clamp as shown in **FIG. 73.**

Use anti-seize on all stainless hardware!

☐ **STEP 7.22** Center and then secure the 6m module to the respective mounting posts, using the method shown in **FIG. 67** and as shown in **FIG. 73.** Do not forget #8 small OD washers under and larger 7/16" OD on top of these support plates per **FIG. 67.**

☐ **STEP 7.23** Locate the 15m module **(FIG. 53).** Use the cable management of **FIG. 69** to position the 15m module on their respective mounting posts (**FIG. 60, 61, and 74**).

☐ **STEP 7.24** Ensure that the 15m module's 2 RF wires (with ring connectors) straddle each side of fiberglass rod, bending towards the P-clamp, as shown in **FIG. 75.**

☐ **STEP 7.25** Center and then secure the 15m module to their respective mounting posts (**FIG. 67**), as shown in **FIG. 75.** Do not forget #6 smaller OD washers under and larger #8 7/16" OD above the support plates.

☐ **STEP 7.26** Locate the 17m module **(FIG. 53)** and use the cable management of **FIG. 69** to position 17m module, as shown in **FIG. 76.**

☐ **STEP 7.28** Ensure that the 17m module's two RF wires (with ring connectors) straddle each side of fiberglass rod, bending towards the P-clamp, as shown in **FIG. 77.**

☐ **STEP 7.29** Center - then secure the 17m module to respective mounting posts, using the method shown in **FIG. 67** and as shown in **FIG. 77.** Be sure #6 smaller OD washers under / larger #8 7/16" OD above support plates.

Some module cables may not need a twist!

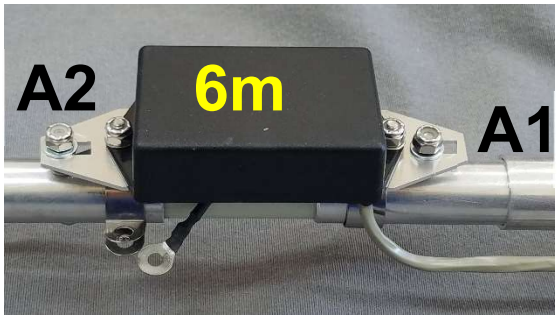


FIGURE 73
6m module **after** support plates loosely secured on each side using method of **FIG. 67**.

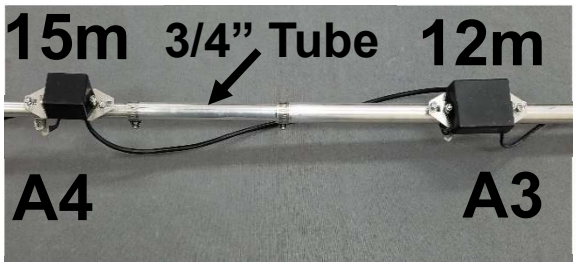


FIGURE 74
15m module **after** routing the cable from both modules shown UNDER the element.

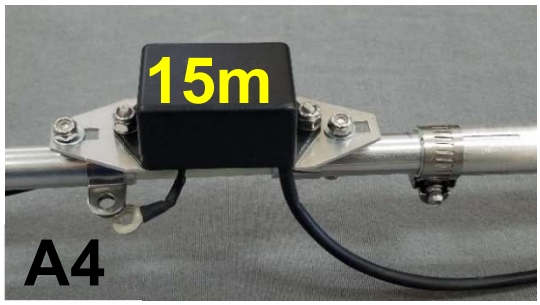


FIGURE 75
15m module **after** support plates loosely secured on each side, using method of **FIG. 67**.

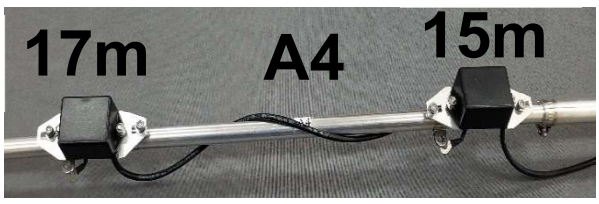


FIGURE 76
17m module **after** routing the cable from both modules -- UNDER the element.

☐ **STEP 7.30** Locate the 2nd module string shown in **FIG. 53** and repeat **STEP 7.16** through **STEP 7.29** for half-element B.

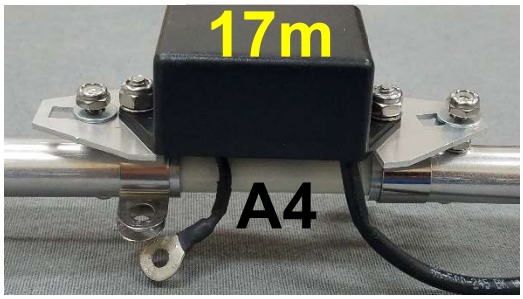


FIGURE 77
17m module with support plates positioned on each side, using method of **FIG. 67**.

MODULE ELECTRICAL CONNECTIONS

OVERVIEW: The switching module's #14 RF UV resistive (PE jacket) wires are connected to adjacent aluminum sections, for the purpose of electrically coupling or uncoupling these sections. These wires are terminated on tin-plated ring connectors. The tin connectors are sandwiched between SS grade 316 washer and SS grade 304 1/2" wide P-clamp, having a low contact resistance around aluminum tube Sections. This combination with all SS grade 316 fasteners, provides for a very robust corrosion resistance RF electrical connection to the Al tube, further providing optimized reliability.

☐ **STEP 7.31** Review **FIG 78** and associated **PROCEDURE** for method of attaching the RF wire's ring connector to the P-clamp**.**

PROCEDURE: Procedure for attaching ring connector to P-clamp is shown in **FIGs 78 and 79**. A #10 washer and the ring connector is placed near the #10-24 screw head as shown. Screw is inserted though top/bottom portions of P-clamp, through a #10 washer and secure with a #10-24 lock nut on the #10 screw.

☐ **STEP 7.32** Locate:

- (20) #10-24 x 1/2" pan head screws (12001)
- (20) #10-24 lock nuts (12002)
- (40) #10 washers (12003)

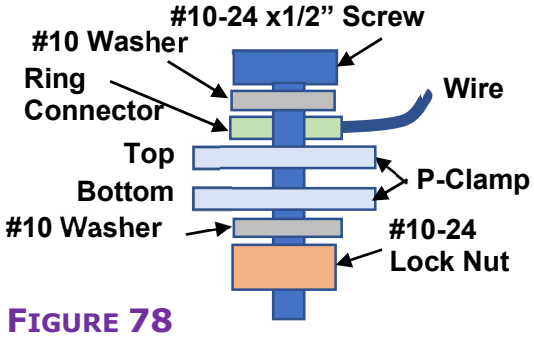


FIGURE 78
Grade 316 SS hardware plan to attach tin-plated ring connector to the P-clamp. Photo view shown in **FIG. 79**

DETAILS: On A1 side, slide P-clamp if necessary, to align to connector ring. Also align hardware at a slight angle, as shown in **FIG. 80**, to allow for a Phillips screw driver to be place on head of screw. Make sure the position of hardware will NOT pull-on wire when tightening.

☐ **STEP 7.33** Locate 6m module for half-element A, as shown in **FIG. 73**. On A1 side, attach RF wire's ring connector to P-clamp per **FIGs 78, 79, and 80.**

☐ **STEP 7.34** Place a 3/8" socket wrench on the #10-24 lock nut, and a #2 Phillips screw driver on the screw head, as shown in **FIG. 81.** Tighten with wrench until P-clamp is fully compressed, as shown in **FIGs 82 and 83. [See details below.]**

DETAILS: To prevent pulling on the module wire, it is recommended for socket wrench to push upwards and turn while holding the screw driver steady. **DO NOT TURN THE SCREW DRIVER**. A fully compressed P-clamp occurs when it becomes more difficult to turn wrench. At this time, the P-clamp should be unable to be moved with reasonable force.

FIGURE 79
Loose connection view of **FIG. 78** [ring connector to P-clamp contact].

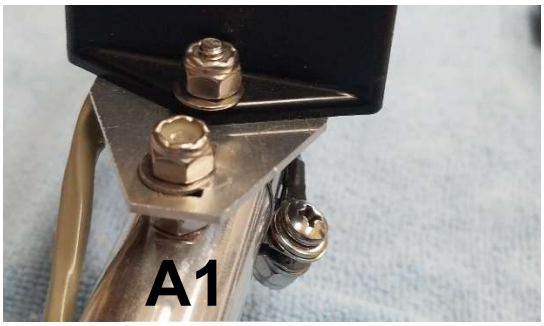


FIGURE 80
Ring connector attached to P-clamp at an angle for screw driver access.

FIGURE 81
A socket wrench and a screw driver is used to tighten hardware connection.

☐ **STEP 7.35** Repeat **STEPS 7.33 and 7.34** for the ring connector on the opposite side of 6m module at A2 side, as shown in **FIG. 84.**

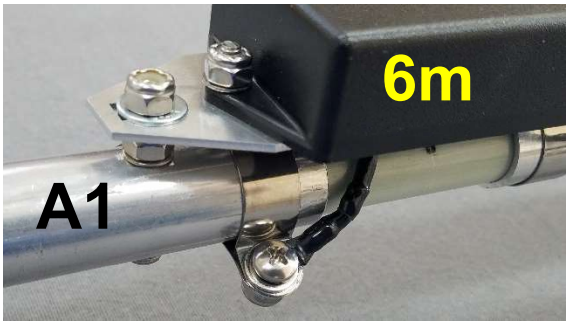


FIGURE 82
Finished P-clamp to ring connector (wire) connection for A1 end tube.

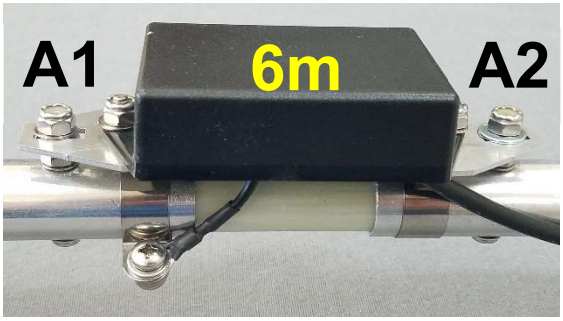


FIGURE 83
Finished 6m P-clamp to ring connector (wire) connection for A1 end tube.

☐ **STEP 7.36** Repeat **STEPS 7.33 through 7.35** for remaining modules on half-elements A and B.

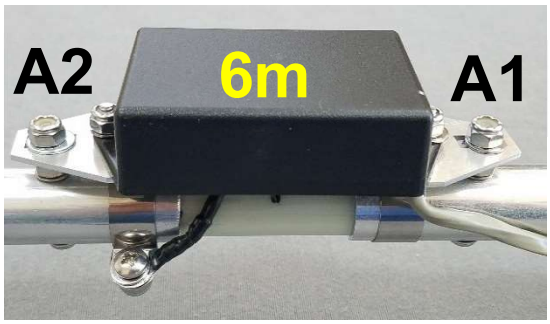


FIGURE 84
Finished 6m ring connector (wire) to P-clamp connection - A2 side tube.

8 CONTROL CABLE

ELEMENT MANAGEMENT

☐ **STEP 8.1** Locate the long CAT3 module control cable cut end exiting from the A1 side of the attached 6m module for half-element A.

☐ **STEP 8.2** Locate (1) Super 88 tape roll (11502) and (14) Ferrite Beads (11401).

TAPING CABLES / BEADS TO ELEMENT: The following steps require taping the control cables [and Ferrite Beads] to element A with 3 wraps of UV resistive 3M Super 88 tape. Below are basic 3M (and XOR) guidelines for a secure wrap:

- Gently rough up the element's tape area [i.e. steel wool] and wipe area clean.
- Begin taping on the element surface near the bottom of the element, then continue taping, until ending the tape wrap **on the tape surface.**
- During the first two wraps, stretch the tape about **50% of tape WIDTH** and also apply pressure to the tape against the element when wrapping.
- For the 3rd wrap, stretch tape substantially less, but maintain pressure to the tape onto the element during this last wrap.

☐ **STEP 8.3** Route the CAT3 cable **UNDER** the A1 element section to the element plate and tape cable initially in two locations as shown in **FIG. 85.** The center tape is about 12 inches from the element plate, as shown in **FIG.85**.

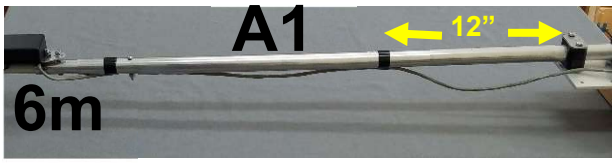


FIGURE 85
Route and tape the CAT3 cable UNDER the A1 section as shown.

☐ **STEP 8.4** Feed the CUT end of the CAT3 cable through 7 in-line Ferrite Beads, as shown in **FIG. 86. Although not necessary, as an option, you may consider placing 3/4" shrink wrap (not supplied) over these beads for bead gathering at this time.**

FIGURE 86
Feed the cut end of the CAT3 cable though 7 in-line Ferrite Beads.

☐ **STEP 8.5** Tape the 7 Ferrite Bead assembly under the A1 section using at least 3 tape wrap locations (one wrap at each end and one at central), as shown in **FIG. 87**. **Leave at least 2 inches from the beads to the element plate**, for routing and taping the CAT3 cable to the A1 section as shown in **FIGs 87 and 88**.

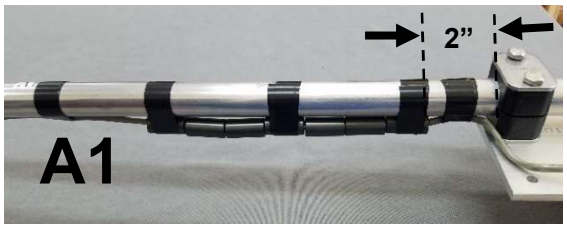


FIGURE 87
Seven Ferrite Beads tape wrapped to A1 section and CAT3 cable routing.

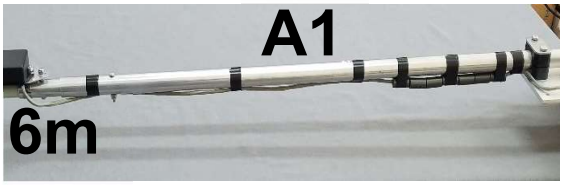


FIGURE 88
Final taped cable / beads for section A1 (6m module to element plate).

CAUTION: Although the Inter-module UV cables (Black) are very robust, allow for smooth curvature [without sharp bending]. Cable curvature radius should always be greater than 1.5”. [**See FIGs 90, 91 and 92.**]

☐ **STEP 8.6** Per **FIG. 69,** the CAT cable [between the 10m and 6m modules] should be **UNDER** the A2 section from each module with 1 full twist and then tape as shown in **FIG. 72 and 89**. The cable remains straight under the element near the **Quick Disconnect** 1 coupler as shown. **The cable distance between modules will vary – some cables may not require a twist.**

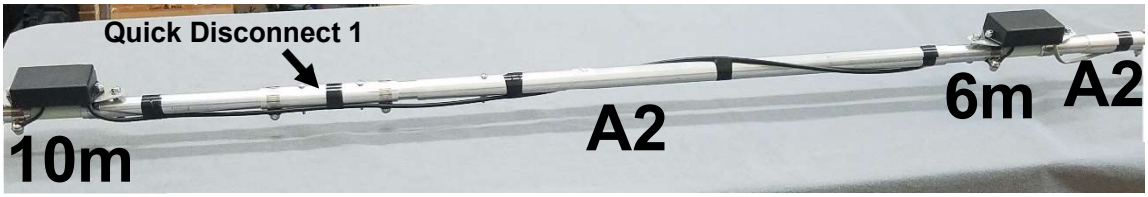


FIGURE 89
Final taped cable plan for section A2, from 10m to 6m module. Cable routed under the element from each module with one twist.

☐ **STEP 8.7** Per **FIG. 69,** the CAT cable [between the 12m and 10m modules] should be routed **UNDER** the A3 section from each module and then tape. See **FIG. 70 and 90.**

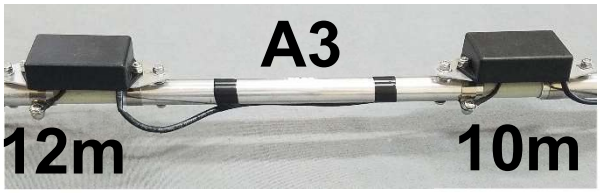


FIGURE 90
Final taped cable under section A3 from 12m to 10m module.

☐ **STEP 8.8** Per **FIG. 69**, the CAT cable [between the 15m and 12m modules] should be routed UNDER the A3 and A4 sections from each module and then tape. See **FIG. 74 and 91**.

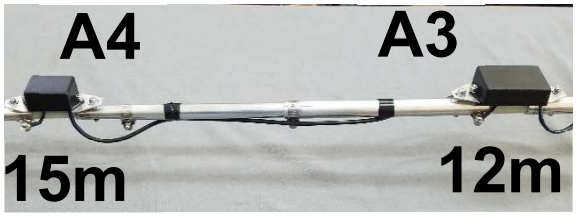


FIGURE 91
Final taped cable under sections A3 and A4 from 15m to 12m module.

☐ **STEP 8.9** Per **FIG. 69,** the CAT cable [between the 17m and 15m Modules] should be routed **UNDER** the A4 section with 1 twist from each module and then tape. See **FIG. 76 and 92.**

NOTE:
Some cables may not require a twist.

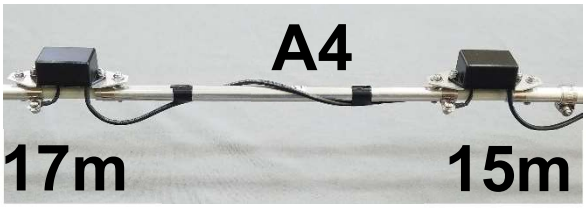


FIGURE 92
Final taped cable under section A4 from 17m to 15m module, with 1 twist.

☐ **STEP 8.10** Repeat **STEPS 8.1** through **8.9** for remaining cable management tasks between modules for half-element B.

PLATE MANAGEMENT

☐ **STEP 8.11** Locate (1) 3/8" cushioned P-clamps (11106) and (1) 1/4" cushioned P-clamp (11107) and the two cut ends of the two CAT3 cables.

☐ **STEP 8.12** For the half-element B cable, slide B cut end first through a 1/4" P-clamp followed by sliding though a 3/8" (**FIG. 93**)

☐ **STEP 8.13** Slide the A cut end from half-element A through the same 3/8" P-clamp with CAT3 cable B, as shown in **FIG. 93.**

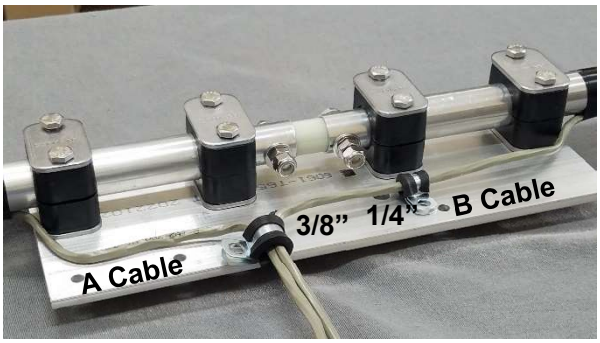


FIGURE 93
Temporary routing of cut ends of A and B element CAT3 cables through 3/8" and 1/4" cushioned P-clamps.

9 JUNCTION BOX

ATTACHMENT TO ELEMENT PLATE

☐ **STEP 9.1** Locate:

- The junction box (JBOX) with mounting plate (1701) and 3 connector plugs and one contact protector inside.
- (3) 1/4"-20 x 1" SS HEX bolt (11002)
- (3) 1/4"-20 SS lock nuts (11003)
- (3) 1/4" SS washers (11004)

☐ **STEP 9.2** Place the JBOX mounting plate over the element plate (A side) and align the two JBOX mounting plate holes with two element plate edge holes. (**FIG. 94**).

☐ **STEP 9.3** Insert **one** 1/4”-20 x 1” HEX bolt through corner hole of both plates. Terminate the HEX bolt with a 1/4” washer and a 1/4”-20 lock nut, as similarly shown in **FIG. 18**. (**FIG. 94.**) **DO NOT TIGHTEN.**

☐ **STEP 9.4** Rearrange the cabling, to allow for the placement of a 2nd 1/4”-20 x 1” HEX bolt through the 3/8” P-clamp mounting bracket and through the JBOX and adjacent element plate holes, as shown in **FIG. 95.** Terminate the HEX bolt with a 1/4” washer and a 1/4”-20 lock nut. **Tighten both lock nuts for HEX bolts for these two plates.**

☐ **STEP 9.5** Use the 3rd 1/4”-20 x 1” HEX bolt through the 1/4” P-clamp mounting bracket and B side element plate hole. Terminate bolt with same hardware as above and tighten. Follow cable arrangement on plate and avoiding U-Bolt holes shown in **FIG. 95**.

FIGURE 94
Align 2 holes of the junction box mounting plate with element plate holes and insert one (1) 1/4”-20 bolt and hardware at the corner.
DO NOT TIGHTEN!

FIGURE 95
Mounting junction box plate and P-clamps to element plate and input cable management.

A/B CABLE ROUTING

☐ **STEP 9.6** Locate:

- (1) 3/8” cushioned P-clamp (11106)
- (1) #10-24 x 1/2” Screw (12001)
- (1) #10-24 lock nut (12002)
- (1) #10 washer (12003).

☐ **STEP 9.7** Route both cut ends of CAT3 cables A and B through this 3/8” P-clamp and place a #10-24 x1/2” screw through the P-clamp mounting bracket and the JBOX plate as shown in **FIG. 96.** Secure hardware with #10 washer and #10-24 lock nut.

☐ **STEP 9.8** Route both CAT3 cables A and B through the JBOX opening and around the 8-position connector header, as shown in **FIG. 97.** Extend each cable length at least to that shown in **FIG. 97,** before trimming the A and B cables. **Cable ends A and B may be already prepared at factory.** The large cable loop outside JBOX opening, allows flexibility in adjusting the final desired cable lengths to headers.

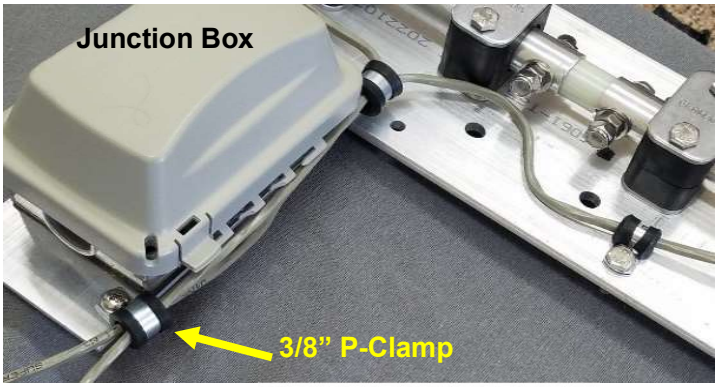


FIGURE 96
Route A and B cables through 3/8" P-clamp and secure to junction box plate.

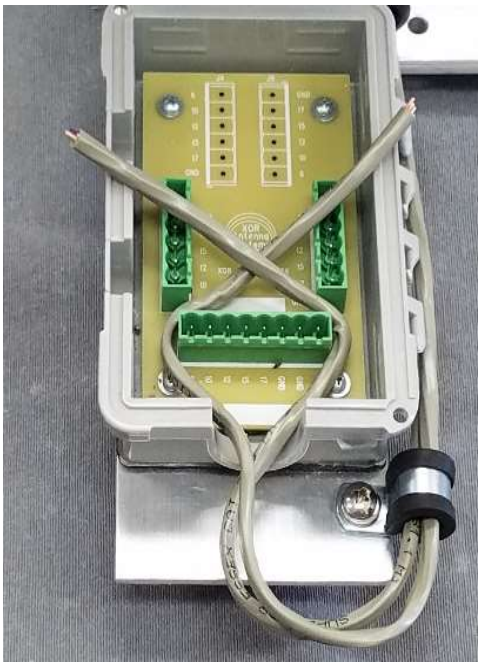


FIGURE 97
Route A and B cables through junction box opening and box to determine the final cut length.

A/B CONNECTOR PLUGS

Skip to **STEP 9.12**, if following 3 steps performed at factory.

☐ **STEP 9.9** Trim about 1-3/4" outer jacket off ends of CAT3 control cables A and B, as shown in **FIG. 98.** Cut the white strain relief cord at jacket for each cable. **The NEXT STEPS apply to both cables.**

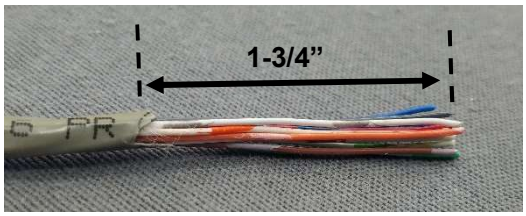


FIGURE 98
Unwrapped cable wires and cut jacket as shown.

☐ **STEP 9.10** Unwrap the 6 pairs of wires (12 wires), then separate and arrange wires, as shown in **FIG. 99.** The 5 wires on the RIGHT are BAND control wires. The 7 wires on the LEFT are unused wires and a ground wire.

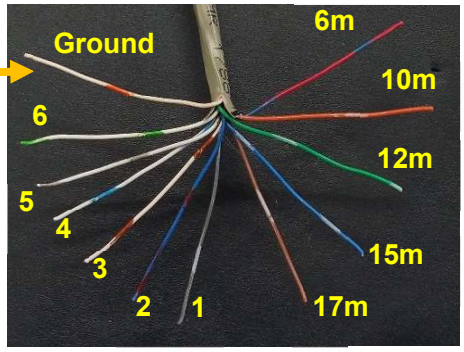


FIGURE 99
Unwrapped cable wires.
COLORS: Dominant/non-dominant

☐ **STEP 9.11** Cut wires #1 to #6 on **LEFT** at jacket (**FIG. 99**). **DO NOT CUT the WHITE/ORANGE wire [GROUND WIRE], as highlighted in FIGs 99 and 100.**

Cut wires:

1) GRAY/WHITE
2) BLUE/RED
3) WHITE/BROWN
4) WHITE/BLUE
5) WHITE/GRAY
6) WHITE/GREEN

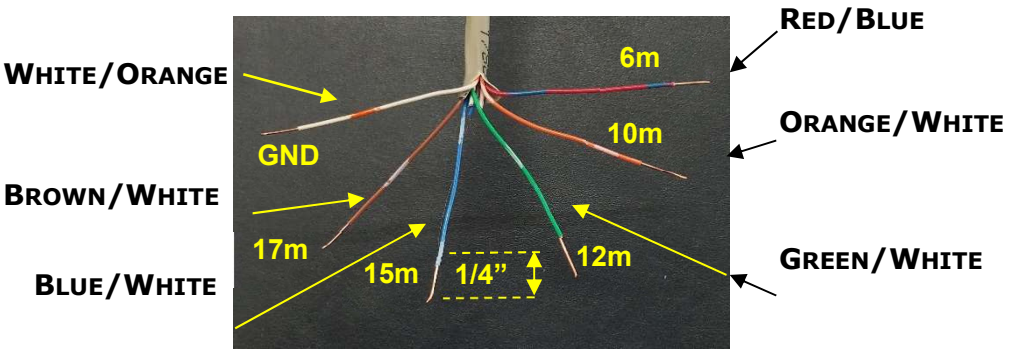


FIGURE 100
Remaining 6-BAND connector wires with 1/4" insulation stripped at each wire end.

DO NOT CUT WHITE/ORANGE. **FIG. 100** shows final 6 A/B cable wires, after cutting # 1-6 unused wires.

☐ **STEP 9.12** Strip about 1/4" of insulation off each end of the remaining 22-gauge wires, leaving 1/4" bare copper wire as shown in **FIG. 100.**

☐ **STEP 9.13** Group wires of **FIG. 100** and wind electrical tape at the end of the control cable jacket, as shown in **FIG. 101**. This prevents the cut wires from possible electrical contact. **This step may have been already performed at factory.**

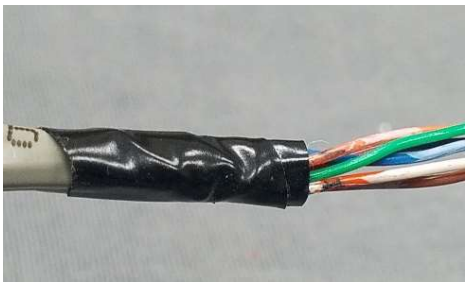


FIGURE 101
Tape CAT Cable's cut jacket end.

☐ **STEP 9.14** Locate the two 6-position plug connectors (1702) and one 8-position plug connector (1703) which were shipped inside the JBOX. Insert each plug loosely into their respective connector header (HDR). Mark a 6 on TOP END of each of 3 plugs that aligns with the 6-meter position of the PCB header. (**FIG. 102)**

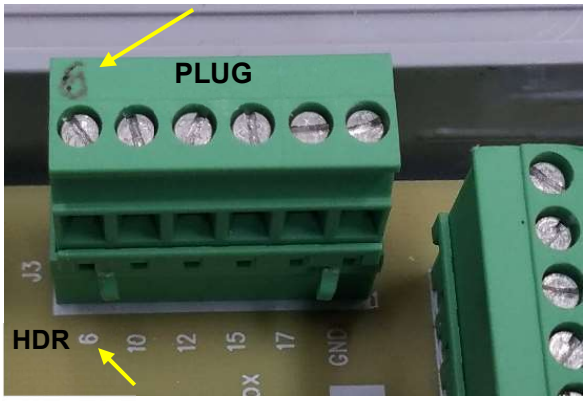


FIGURE 102
Place 6 mark on plug that aligns with 6 on header. 6 defines the 6m circuit.

WIRING PLUG OVERVIEW:

1. In next steps, bare wires are inserted into plug ports, as shown in **FIG. 104**.
2. It is recommended that the plug be held by a clamping device during wiring, as also shown in **FIG. 104**.
3. Then dip each of the end bare copper wires into the connector protector (1704) supplied (**FIG. 103**), before inserting bare wire into the connector plug ports of **FIG. 104**.

4. Use a small flat blade screw driver for TOP PLUG metal screws, to clamp the inserted bare copper wire. Be sure the clamp is on bare wire and NOT on the insulation.
5. After clamping the bare wire at a port, pull on wire with sufficient force to convince yourself that the wire is secure.
6. A 6-position wired plug should resemble that of **FIG. 105**.
7. See **BAND WIRE COLOR CHART** (**FIG. 106**) for wire color corresponding to plug position.

FIGURE 103
Connector Protector

☐ **STEP 9.15** Study "**Overview**" and **FIGs 104, 105 and 106,** before wiring of 6-position plugs. Note that each wire has a dominant color, with a strip or "/" of a 2nd color, defining the BAND control wire color. These BAND control wire colors are defined by the **BAND WIRE COLOR CHART,** associated with **FIG. 106.**

☐ **STEP 9.16** Select the 6m wire (**RED/BLUE**) (dominant RED), and dip bare wire into the connector protector. Insert bare wire into OPEN wire port for marked 6m position. Using small flat blade screw driver, turn screw clockwise to clamp down on the bare 6m wire, with results as shown in **FIGs 104, 105, and 106**. Be sure port clamp is on bare wire and NOT on the insulation. Pull on wire to insure it is clamped securely.

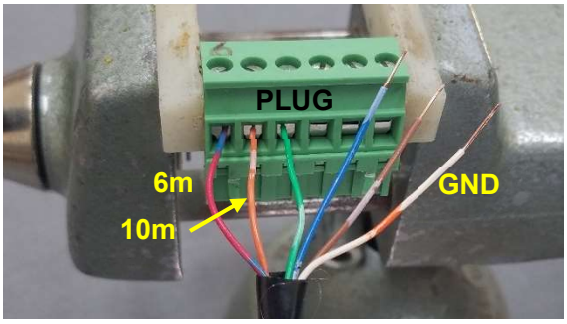


FIGURE 104
Vise holding plug during wiring per **Band Wire Color Chart** [**FIG. 106**].

☐ **STEP 9.17** Repeat **STEP 9.16** for the 10m position and BAND color (**ORANGE/WHITE**), as shown in **FIGs 104, 105, and 106.**

☐ **STEP 9.18** Repeat **STEP 9.16** for 12m, 15m, 17m and GND positions, using the **BAND COLOR WIRE CHART** and as shown in **FIGs 104, 105 and 106.**

NOTE: Both finished 6-position PLUGS should look similar to FIGs 105 and 106.

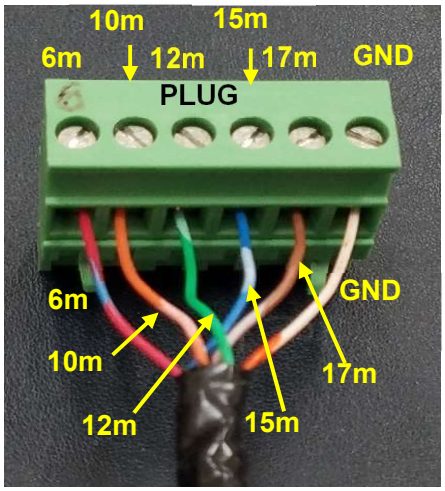


FIGURE 105
Wired connection to 6-position plug.

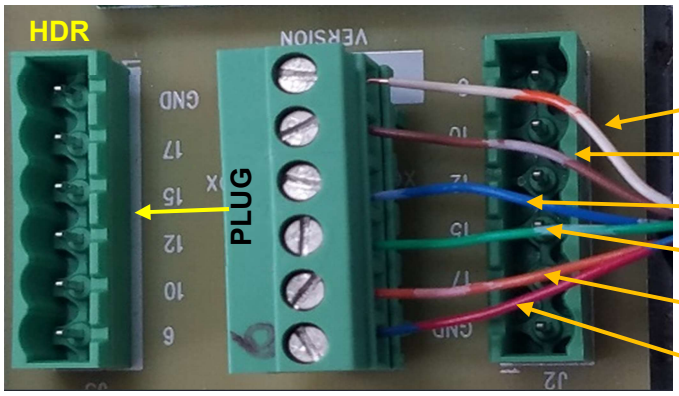


FIGURE 106
6-position plug wire colors aligned with marked 6 plug which is aligned with 6-mark header.

BAND	COLOR
GND	WHITE/ORANGE
17M	BROWN/WHITE
15M	BLUE/WHITE
12M	GREEN/WHITE
10M	ORANGE/WHITE
6M	RED/BLUE

Band Wire Color Chart

WIRING: INSTALLING CONNECTOR PLUGS

☐ **STEP 9.19** Route CAT3 control cables A and B through the JBOX opening and around the sides of the 8-position controller cable header, to their respective 6-postion A and B headers, as shown in **FIG. 107.**

The A/B JBOX sides should match the A/B half-element sides, to avoid any confusion.

☐ **STEP 9.20** Then press A and B cable plugs into their respective headers as shown.

☐ **STEP 9.21** Manage all cables as shown in **FIG. 107.**

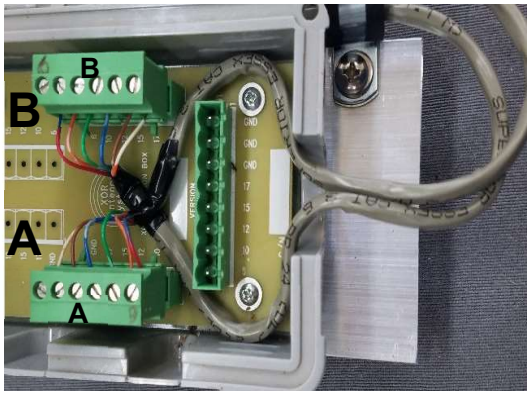


FIGURE 107
A/B cable routing and 6 position plugs to corresponding headers for JBOX.

10 CONTROL CABLE WIRING

JBOX PLUG CONNECTIONS

☐ **STEP 10.1** Locate the shielded 8-conductor controller cable, with 22-gauge (colored) wires. This cable is offered by XOR as an accessory. Locate the 8-positon plug (1703) supplied inside the XOR junction box.

☐ **STEP 10.2** Trim about 1-1/2” of outer jacket off one end of the shielded controller cable,

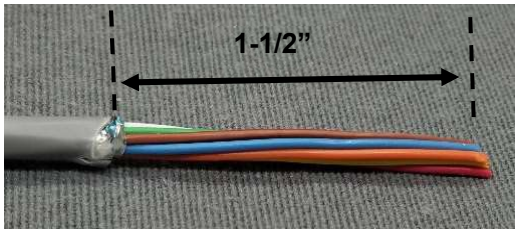


FIGURE 108
Cut jacket 1-1/2” off one end of controller cable leaving colored wires. Cut shield, cord, and GND wire at jacket.

as shown in **FIG. 108.** Also cut the shield, strain relief cord, and ground wire at the cut jacket, as shown in **FIG. 108.**

☐ **STEP 10.3** Unwrap the 8 colored wires and wrap electrical tape at the end of the cut jacket, as described for **FIG. 101,** and as shown in **FIG. 109.**

☐ **STEP 10.4** Strip about 1/4" of insulation off each end of the 22-gauge wires, leaving bare copper wire as shown in **FIG. 109.**

NOTE: FIG. 109 also shows controller cable's BAND colors for each BAND wire with 3 ground wire colors. [See also FIG. 111.]

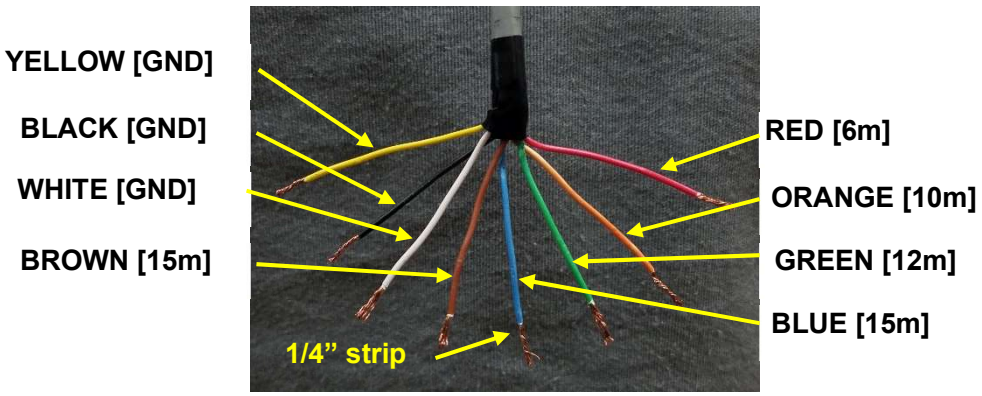


FIGURE 109
Taped jacket end for controller cable with 1/4" insulation strip to bare copper on each colored wire end.

☐ **STEP 10.5** Review the **Wiring Plug Overview**, associated with **FIG. 104.**

☐ **STEP 10.6** Study **FIGs 109, 110 and 111**, before wiring of the 8-position plug. Be sure a 6 is marked on the 8-position plug, to align with 6-meter position of the 8-position header as shown in **FIG. 110.**

Note that each controller wire has one color, defining the controller's BAND control wire color. These BAND control wire colors are defined by the BAND CONTROLLER WIRE COLOR CHART, associated with FIG. 111

☐ **STEP 10.7** Select the 6m wire (**RED**) and dip bare wire into connector protector. Insert bare wire into OPEN wire plug port for the marked 6m position. Using small flat blade screw driver, turn screw CW to clamp down on the bare 6m wire, with results as shown in **FIGs 110 and 111.** Be sure port clamp is on bare wire and **NOT** on the insulation. Pull on wire to ensure it is clamped securely.

☐ **STEP 10.8** Repeat **STEP 10.7** for the next 10m Position and BAND color (**Orange**), as shown in **FIGs 110 and 111.**

☐ **STEP 10.9** Repeat **STEP 10.7** for 12m, 15m and 17m positions and the 3 GND positions. Use the **BAND CONTROLLER COLOR WIRE CHAT** and wire as shown in **FIGs 110 and 111.**

NOTE: Finished 8-position PLUG should look similar as shown in FIGs 110 and 111.

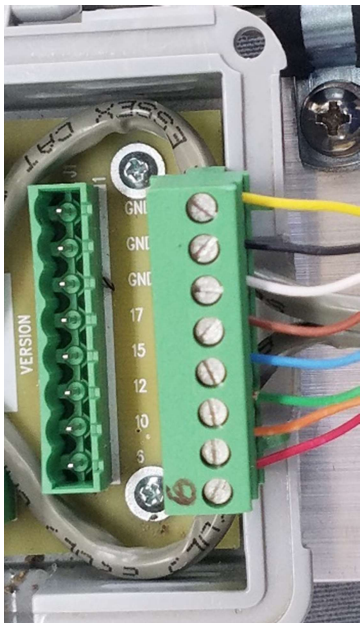


FIGURE 110
8-position wire plug colors aligned with header 6 and marked 6 on the plug.

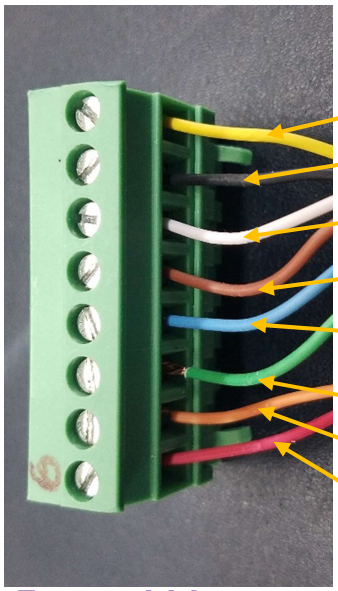


FIGURE 111
8-position wired controller plug.

Band	Color
GND	YELLOW
GND	BLACK
GND	WHITE
17m	BROWN
15m	BLUE
12m	GREEN
10m	ORANGE
6m	RED

Band Controller Wire Color Chart

☐ **STEP 10.10** Insert the wired 8-position plug into the 8-position header, as shown in **FIG. 112.**

☐ **STEP 10.11** Tape the controller cable to the A/B input cables in order to minimize any pulling on the 8-positon connector, by the controller cable.

NOTE: In an actual application, the controller cable should also be secured on/by the Dipole antenna support mast to prevent pulling on the controller connector.

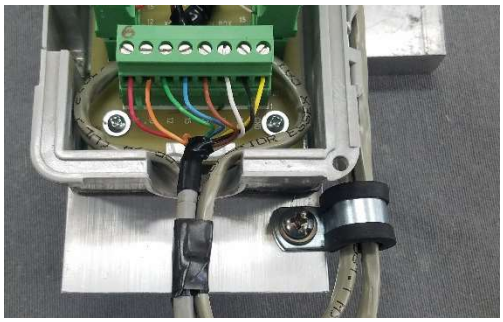


FIGURE 112
Controller plug inserted into header, using cable management.

CONTROLLER CONNECTIONS

☐ **STEP 10.12** Locate the unused end of the shielded 8-conductor controller cable and the XBC-1 XOR Band Controller (1101).

☐ **STEP 10.13** Trim about 3" off the outer jacket of the unused end of the shielded controller cable, as shown in **FIG. 113.** Also cut the shield, strain relief cord, and ground wire at the cut jacket, as shown in **FIG. 113.**

☐ **STEP 10.14** Trim about 3/4" of insulation off each wire end shown in **FIG. 114.**

☐ **STEP 10.15** Twist 3 GND wires together (**YELLOW/BLACK/WHITE**) as in **FIG. 114.**

☐ **STEP 10.16** Tape Wrap wires at cut jacket end, similar shown in **FIGs 101 and 109.**

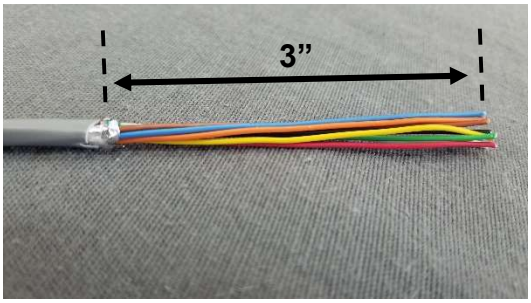


FIGURE 113
Cut 3" off outer jacket of controller cable. Cut shield / cord / GND wire.

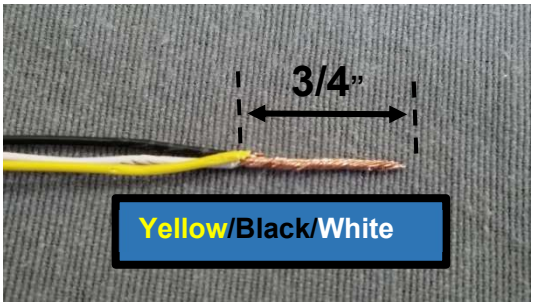


FIGURE 114
Twist 3 ground wires together, leaving 3/4" bare copper twisted region.

NOTE: In following steps, no solder or wire connectors are required. However, tinning twisted wires with solder, or adding a crimped or soldered blade connector can also be implemented, if desired.

☐ **STEP 10.17** On controller back (**FIG. 118**), loosen GND screw "**G**" sufficiently to allow the 3 twisted GND wires **insulation** to pass between GND screw and body as shown in **FIG. 115.** Curl a U loop on end of GND wire as shown. Pull wire back down towards and between the GND screw and connector body as shown in **FIG. 116.** Tighten wire to body securely using Phillips screw driver on GND screw.

☐ **STEP 10.18** Repeat **STEP 10.17** for remaining wires. **FIG. 117** shows an example for the 10m twisted wire, poised to be pulled down towards "**10**" screw and tightened.

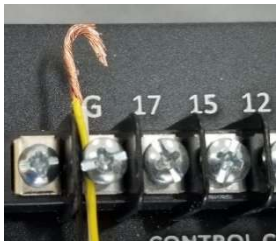


FIGURE 115
GND wires twisted and curled towards GND screw.

FIGURE 116
GND wires tightened at the GND screw.

FIGURE 117
10m wire curled for placing under 10m screw head.

FIGURE 118
BAND CONTROLLER WIRED

FIG. 118 shows a rear view of the XOR BAND CONTROLLER with proper controller cable wiring.

Controller can also accommodate a 6 wire lower gauge cable and/or power adapter up to +15 Vdc for distances greater than 400 ft. (See XOR Website)

11 ANTENNA TESTING: DC METHODS

TESTING OVERVIEW: This Dipole antenna band switching system can be easily DC tested functionally at ground level. This provides the user with a high degree of confidence in this antenna system's functional performance, before placing antenna on a mast. This DC method tests for correct band module switching for each half element, using the Band Controller for band selection and an ohm-meter for testing module Open/Short switching status.

☐ **STEP 11.1** Be sure the Band Controller's control cable is connected to the antenna junction box using the 8-postion plug, as previously described. (**FIGs 110 and 112**)

☐ **STEP 11.2** Locate the +12Vdc power adapter (1102) and plug into wall outlet and into the 2.1 mm jack at the back of the Band Controller. The band Indicator will light, indicating power ON and selected band. Place controller on 20m Band with **SELECT**.

Band Switching Module

Band	6m	10m	12m	15m	17m
20m	S	S	S	S	S
17m	S	S	S	S	O
15m	S	S	S	O	O
12m	S	S	O	O	O
10m	S	O	O	O	O
6m	O	O	O	O	O

S = Across Module Resistive SHORT
O = Across Module Resistive OPEN

BAND SWITCHING TRUTH TABLE

☐ **STEP 11.3** Review the **Band Switching Truth Table** above.

TRUTH TABLE EXAMPLES: With 20m selected, the metallic resistance across all modules is a SHORT. With 6m selected, the metallic resistance across all modules is an OPEN. With 12m selected, the metallic resistance across 6m and 10m modules is a SHORT, while resistance across 12m, 15m and 17m modules is an OPEN. [SHORT < 1 Ω, OPEN >> 10 MΩ]

☐ **STEP 11.4** Locate a suitable volt-ohm or ohm meter capable of measuring shorts and opens across each module.

☐ **STEP 11.5** With Band Controller selected to 20m, measure metallic resistance across all 10 modules, as shown in **FIG. 119.** Each module should measure a low and near 0 Ω resistance (**SHORT**) across all modules. The measurement can either be across the module support plates as shown, or across the element tubular sections on each side of module.

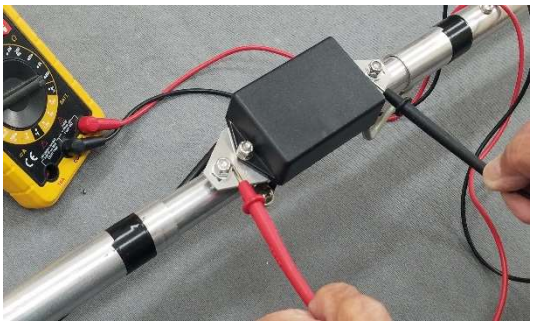


FIGURE 119
Module resistance measurement across the support plates (or across the element sections).

☐ **STEP 11.6** With Band Controller selected to 6m, measure resistance across all 10 modules, as shown in **FIG. 119.** Each measurement should be a resistive **OPEN** across all modules. An **OPEN** is unmeasurable value on a 10-20 Meg ohm scale.

☐ **STEP 11.7** With Band Controller selected to 17m, measure resistance across all 10 modules, as shown in **FIG. 119.** Both A and B 17m module measurements should be an **OPEN** across these modules, while all remaining module pairs (15m, 12m, 10m and 6m) should all measure a **SHORT** across these modules.

☐ **STEP 11.8** With Band Controller selected to 15m, measure resistance across all 10 modules, as shown in **FIG. 119.** Both 17m and both 15m module measurements should be an **OPEN** across these modules, while all remaining module pairs (12m, 10m and 6m) should all measure a **SHORT** across these modules.

☐ **STEP 11.9** With Band Controller selected to 12m, measure resistance across all 10 modules, as shown in **FIG. 119.** The 17m, 15m and 12m pairs of module measurements should be an **OPEN** across these modules, while all remaining module pairs (10m and 6m) should all measure a **SHORT** across these modules.

☐ **STEP 11.10** With Band Controller selected to 10m, measure resistance across all 10 modules, as shown in **FIG. 119.** The 17m, 15m, 12m and 10m pairs of module measurements should be an **OPEN** across these modules, while the remaining pair of 6m nodules should both measure a **SHORT** across these nodules.

PASSED OPEN / SHORTS TEST If using the previous **STEPS 11.5 through 11.10** the antenna switched according to the **Band Switching Truth Table**, then move on to the following Final Assembly of end element tube on page 46.

TROUBLE? If while testing the previous **STEPS 11.5 through 11.10**, an unexpected result occurred [that is not consistent with the **Band Switching Truth Table**], then refer to Trouble Shooting Section (page 50) of this Assembly Manual. **ALL errors must be resolved before proceeding to Final Assembly.**

☐ **STEP 11.11** Upon passing all DC switching module tests, disconnect the controller wires from the back of controller, in preparation for feeding this cable end into your Ham-shack.

12 FINAL ASSEMBLY

20M END ELEMENT TUBING

☐ **STEP 12.1** Locate:

- (2) 1/2" x 20-1/4" tube (1502)
- (2) 3/8" x 36" tube (1503)
- (4) #6 SS tube clamp (11603)

☐ **STEP 12.2** For element A, align the non-slotted end of a 1/2" x 20-1/4" tube with the slotted end of the 5/8" tube of section A4, as shown in **FIG. 120.**

☐ **STEP 12.3** Place a mark 4" from end of non-slotted 1/2" tube. (**FIG. 120**)

☐ **STEP 12.4** Slide the non-slotted 1/2" tube into the slotted 5/8" tube of section A4, up to the 4" mark on the 1/2" tube, as shown in **FIG. 121.** (11603)

☐ **STEP 12.5** Slide the #6 SS tube clamp 3 over this assembly, align with the slotted area of the 5/8" A4 tube. Tighten securely with screw side down, as shown in **FIG. 121.**

☐ **STEP 12.6** Align the end of a 3/8" x 36" tube with the slotted end of the 1/2" slotted tube, as shown in **FIG. 122.**

☐ **STEP 12.7** Place a mark 7" from the end of this 3/8" tube (**FIG. 122).**

☐ **STEP 12.8** Slide the 3/8" tube into the slotted 1/2" tube, up to the 7" mark on the 3/8" tube, as shown in **FIG. 123. (This allows tube adjustment of about +/- 6".)**

☐ **STEP 12.9** Slide the #6 SS tube clamp 4 over this assembly, then align with the slotted area of the 1/2" tube. Tighten securely with screw side down, as shown in **FIG. 123.**

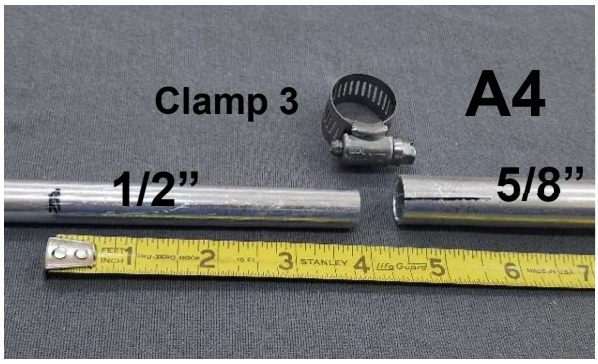


FIGURE 120
Mark 4" on non-slotted 1/2" tube aligned to slotted 5/8" tube of section A4.

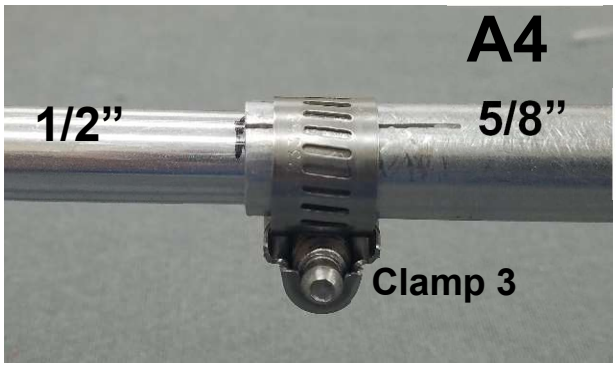


FIGURE 121
Place #6 SS tube clamp 3 over slotted 5/8" A4 tube -- clamping to 1/2" tube.

FIGURE 122
Mark 7" on 3/8" tube aligned to slotted 1/2" tube.

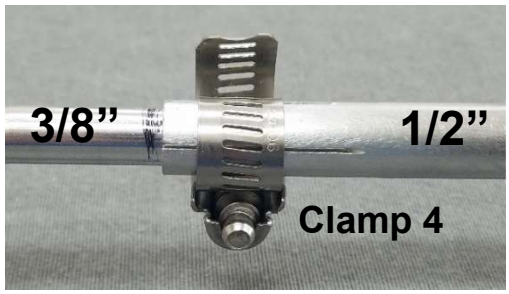


FIGURE 123
Place #6 SS tube clamp 4 over slotted 1/2” tube -- clamping the 3/8” tube at the 7” mark.

FIGURE 124
Assembled element rotated 90 degrees for Dipole Input Terminals facing the UP operating position. This ensures modules are UP when dipole is mounted to a vertical mast.

20M ELEMENT ADJUSTMENT

ELEMENT ADJUSTMENT FOR 20m Per **FIG. 4**, the 20m half element length is 196-3/8”. This length provides resonance at 40 ft in the 20m phone band. The 20m element length can be adjusted +/- 6” for a half element, or +/- 12” for a full element. This is +/- 3% [or +/- 450 kHz] for 20m. Clamp 4 is used for this adjustment, as shown in **FIGs 4 and 123**. If resonance is desired in the 20m CW Band at 40 ft for example, the half element length can be increased to about 198-7/8”. **NOTE:** Resonance is a function of ground conditions and height. Thus, some experimenting may be required for the desired 20m resonant frequency. See Application Note on Dipole Antenna Ground Effects (page 57).

☐ **STEP 12.10** Using clamp 4, adjust the 20m half-element A length for 196-3/8”, or to the desired length for a specific 20m band portion. Loosen clamp 4 and slide the 3/8” tube (+/- 6”) to the desired length, then tighten clamp 4 securely.

☐ **STEP 12.11** Repeat **STEPS 12.2 through 12.10** for half-element B.

13 MODULE ROTATION

INPUT TERMINALS OPERATING POSITION

☐ **STEP 13.1** To ensure modules are UP when dipole is mounted on a vertical mast, lightly rotate element [sections A1 and B1 on element plate], until the input terminals are UP and vertical to the element plate, as shown in **FIG. 124**. If element will not rotate, loosen the HEX Nuts on back of element plate, as shown in **FIG. 18.**

☐ **STEP 13.2** Remove all HEX nuts of **FIG. 18,** and replace with 1/4”-20 HEX lock nuts. Tighten lock nuts securely, after always ensuring the input terminals are upright, as shown in **FIG. 124. Be sure to use anti-seize lubricant on these 1/4" threads.**

NOTE: When mounted on a mast, this rotation ensures top of all modules is facing UP!

14 MAST ATTACHMENT

The element plate is designed for a 2-inch OD mast, with 4 symmetrical U-bolt holes on each side of the element, as shown in **FIG. 126.** These holes can accommodate two 1/4" to 5/16" diameter 2" (between legs) U-bolts, for ~ 1.5" to 2" OD mast. XOR supplies (2) 5/16" diameter 2" U-bolt assembly (11201) with this antenna. Be sure to use the U-bolt reinforcement plates (bolt top side of plate) supplied with both U-bolts. XOR also offers an optional 2" U-bolt assembly adapter, as shown in **FIG. 127.** This adapter allows this element plate to accommodate a 1" to 2" OD mast**.**

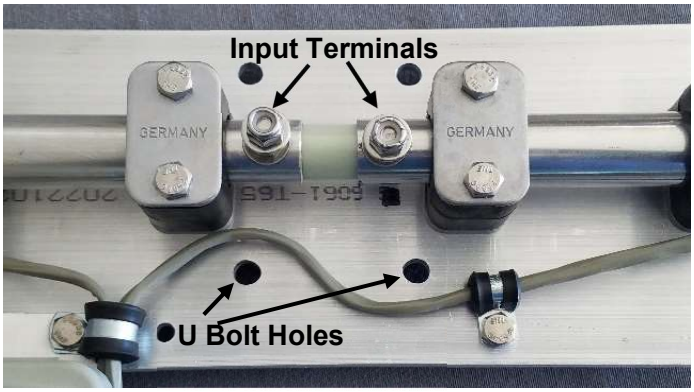


FIGURE 126
Element plate's 4 mast mounting holes using U-bolts for 2" mast.

FIGURE 127
Alternative 2" mast clamp for smaller mast from 1" to 2".

15 BALUNS

- A Dipole element antenna is a **BAL**anced system. Each half-element is symmetrically and electrically balanced and insulated from ground. A coaxial cable is an **UN**balanced system, with one of two conductors being grounded. If the coax cable conductors are **directly** connected to respective dipole half-elements, **unwante**d RF currents **will** flow in the outside GND shield of the coax cable, creating many undesirable effects. A device can be inserted between the **BAL**anced antenna and the **UN**balanced coax, to prevent these unwanted shield currents. This device is called a BAL-UN, or BALUN. The BALUN function can be achieved by many different methods, forms, shapes and impedance transformation ratios. The BALUN is ideally placed as close to antenna feed point as possible, for optimum unwanted currents performance.
- A BALUN's performance is rated by the impedance BALUN presents to the unwanted RF shield currents, at a given frequency. The performance is defined in terms of ohms of shield impedance, or in dB referenced to 50 Ω. While 500 Ω is considered the minimum acceptable impedance [i.e. Common Mode Rejection Ratio (CMRR= 20 LOG (50/500)) = -20dB], many BALUNs perform much better. **Multi-band antennas require multi-band BALUN performance**.
- XOR offers Multi-Band BALUNs from the acceptable BALUN, up to the top-of-the-line multi-band performance for all XOR multi-band antennas. An optional BALUN plate is also offered for 3nd party BALUN use with all XOR Antennas.

INPUT CONNECTIONS / BALUNS

This XOR Dipole has similar Input terminals (**FIGs 124 and 126**) as other popular antennas such as Mosley, Hy-Gain, Cushcraft and Force-12. A coaxial cable feedline with a split pigtail end [with ring connectors] can be directly connected to these input terminals. For this case, XOR offers clamp-on MIX 31 Ferrite Beads (10 advised), to achieve an acceptable BALUN performance.

Listed below are other possible options, offered by XOR Antenna Systems.

- XOR offers a SO239 to pigtail coax adapter (**FIG. 128**) for connecting a COAX cable with PL259 connector to the XOR antenna. It is highly recommended that 10 MIX 31 clamp-on Ferrite Beads be added onto your coax near the adapter for acceptable CMRR on all Bands.
- XOR also offers a SO239 to pigtail coax/Ferrite Bead assembly (**FIG.129**) having 10 Ferrite Beads with -23dB of CMRR on all Bands.
- XOR further offers a pigtail coax/toroid BALUN as shown in **FIG. 130.** This BALUN has a typical CMRR of at least -33 dB on all Bands.
- XOR further offers a 4-hole BALUN plate accessory– to support a toroid BALUN, a DIY BALUN, or a third-party BALUN, as shown in **FIG. 131.**

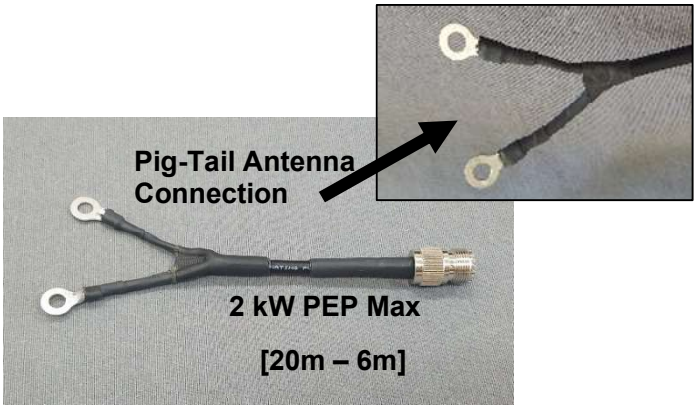


FIGURE 128
SO239 to pigtail coax adapter for coax PL259 interface to antenna.

FIGURE 130
SO239 to pigtail coax / toroid BALUN assembly, for coax PL259 interface.

All power ratings are

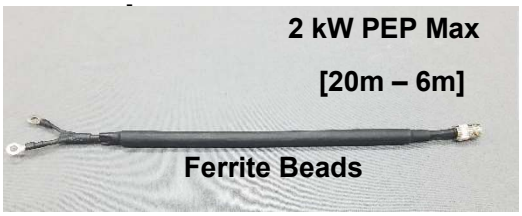


FIGURE 129
SO239 to pigtail coax / Ferrite Bead BALUN assembly for coax PL259 interface.

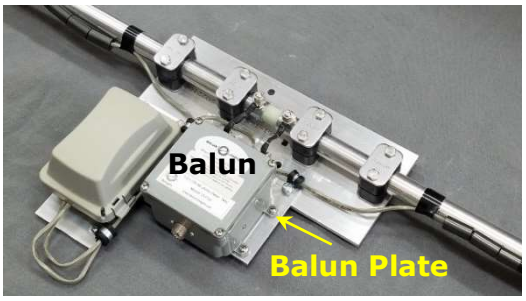


FIGURE 131
XOR BALUN plate accessory offered for use of 3rd party BOX BALUN for XOR dipole.

COAX FEEDLINE SUPPORT: It is important that the coax feedline be supported near the input of the Dipole antenna, typically by the mast. This prevents unnecessary stress on the BALUN and Dipole input terminals.

16 READY TO OPERATE

CONNECTING ANTENNA TO YOUR HAM-SHACK

First connect coax to the BALUN/input Terminals. Attached element plate to mast. Feed both coax and control cables into your Ham shack. Connect coax to your transceiver. Re-connect control cable to back of XOR controller per **STEPS 10.17 and 10.18**. Connect controller AC power supply per **STEP 11.2.** Once mast is raised, you're ready to operate.

OPERATING CONTROLLER

Turn the Controller's knob to corresponding frequency BAND, as noted by LED indicator.

- 6m (50 MHz) 50.000 - 54.000 MHz
- 10m (28 MHz) 28.000 - 29.700 MHz
- 12m (24 MHz) 24.890 - 24.990 MHz
- 15m (21 MHz) 21.000 - 21.450 MHz
- 17m (18 MHz) 18.068 - 18.186 MHz
- 20m (14 MHz) 14.000 - 14.350 MHz

(See Application Notes for more Controller info.)

17 TROUBLE SHOOTING:

The following steps assume the switching modules are not properly switching, in response to the Band Controller's Band selection. The switching module strings and Band Controller, as a system, were all tested at the factory prior to shipping. Thus, it is most likely that any switching issues observed, may be due to a wiring error.

MODULE BAND SWITCHING ISSUES

☐ **STEP 17.1** Review the **Band Switching Truth Table** on **Page 44**. Note for example that with 20m selected, the resistance across all modules is a **SHORT**, and for 6m selected, resistance across all modules is an **OPEN**.

☐ **STEP 17.2** Unplug the 8-position controller cable at the JBOX. Then study the colored wires for each 6-position Plug. The color for each wire (and wire resistances) should be as follows: (Also see **FIGs 105 and 106**).

Band	Wire Color	R[Ω] (2 Plugs)	R[Ω] (1 PLUG)
6m (6 mark)	**Red/Blue**	172	346
10m	**Orange/White**	173	345
12m	**Green/White**	174	348
15m	**Blue/White**	178	358
17m	**Brown/White**	184	369
GND	**White/Orange**		

- **If color wiring error(s) is noted**, correct color wire error(s) before **STEP 17.3**

☐ **STEP 17.3** Measure the resistance for each wire relative to the GND wire (GND is at opposite end of PLUG from 6m). The resistances should be similar to values stated in preceding table for each wire. Resistance is for **one** 6-position plug **ONLY -- or** for when **two** plugs are inserted. The resistance can be measured, using the screw metallic heads on the plugs.

- **If all wire colors are correct for each 6-positon plug and each wire resistance is similar to that stated with wire colors (but module switching is not yet matching the Switching Truth Table),** then move on to **STEP 17.4.**
- **If the resistance of any connector wire is much higher than stated in table,** then unhook high resistance wire from plug, and reinsert to ensure the plug is NOT clamping down on the wire insulation. In some cases, it may be necessary to measure wire resistance of ONLY ONE 6 position plug installed. (Remove the other 6-position plug) in order to determine which plug wire is at fault.
- **If reinsertion of a high resistance connector wire into plug does not correct the issue,** then remove all wires from plug and directly measure all wire resistance again vs GND, measuring directly between the module string wires.
- **If ANY input band wire tested is OPEN (or SHORT) relative to the GND wire**, (based on resistance data above), then an issue exists with the string of modules. A failed module string is highly unusual, since the string is measured just prior to shipping. Module strings would be covered under the 3-year Warranty.

☐ **STEP 17.4** Reconnect the 8-position controller plug onto the 8-position header in the JBOX. (This assumes all 6 Band wire resistances and colors are correct.)

☐ **STEP 17.5** Study the colored wires for 8-position plug. The color for each wire should be as follows: (**FIGs 109, 111 and 118.**)

Band	Wire
6m (6 mark)	**Red**
10m	**Orange**
12m	**Green**
15m	**Blue**
17m	**Brown**
GND	**White, Yellow, Black**

☐ **STEP 17.6** Verify the colors on the 8-position controller plug. (**FIG. 111**).

☐ **STEP 17.7** Verify the colors **on the 6-position screw terminals on the back of the controller.** (**FIG. 118**)

- **If any color wiring error(s) is noted**, correct the color wire error(s) before **STEP 17.8**.

☐ **STEP 17.8** With the Band Controller wired to the JBOX and powered ON, select the 20m Band as designated by the lighted LED position.

☐ **STEP 17.9** Measure the DC voltage on each Band wire, relative to GROUND. This DC voltage reading should be near 0 Vdc (< 0.1 Vdc) on each Band Wire. (See **Band Voltage Truth Table** on page 52.)

- If 20m band DC voltage is near 0 Vdc on **ALL band wires** [**with controller on 20m],** then move on to **STEP 17.12**.
- If 20m band DC voltage is NOT near 0 Vdc **on ANY Band wire,** then double check controller selection is for 20m.
- If 20m band DC voltage is NOT near 0 Vdc **on ANY Band wire, and wiring is correct**, then there is likely an issue with controller. (This is VERY UNLIKELY, since controller was tested just prior to leaving factory) (Covered under Warranty).

MODULE FAILS OPEN: Normally, when Band Controller selects 20m and a near 0 Vdc is on all controller plug terminals, the resistance across ALL MODULES should be a resistive SHORT (<< 1 Ω). If any module is instead a resistive OPEN, then either there is an OPEN connection at a P-clamp, or the module's normally closed switch has failed OPEN. A switch OPEN failure is highly unlikely, since all string modules were tested at factory. If a module fails OPEN, then the following steps will address which of these two cases is the root cause of "OPEN" failure.

☐ **STEP 17.10** If the 20m band resistance across any module is an OPEN, then verify the module's wire to P-clamp resistance is not a short. (Measure ring connector to tube on each module side)

☐ **STEP 17.11** If the module resistance (on 20m) remains OPEN after verifying both Wire to P-clamp/tube resistance is ~ 0 ohms, then open one P-clamp wire connection. Verify resistance between module switch wires is OPEN with NO power applied to controller. If OPEN, module failed – very unlikely.

Band Controller Voltages

Assumes a +12.0 Vdc Supply

Wires →	Red	Org	Grn	Blu	Brn
Band	6m	10m	12m	15m	17m
20m	0	0	0	0	0
17m	0	0	0	0	12
15m	0	0	0	12	11.3
12m	0	0	12	11.3	11.3
10m	0	12	11.3	11.3	11.3
6m	12	11.3	11.3	11.3	11.3

All Voltages Subject to Supply Value

BAND VOLTAGE TRUTH TABLE

☐ **STEP 17.12** With Band Controller wired to the JBOX and powered ON, select 6m band as indicated by lighted LED position. (This assumes passing 20m voltage test.)

☐ **STEP 17.13** Measure the DC voltage on each band wire relative to GROUND. This DC voltage should be ~12 Vdc on 6m wire, and ~11.3 Vdc on remaining wires. (The **Band Voltage Truth Table** is based on a +12.0 Vdc supply voltage.)

- If 6m band DC voltages are near [12 Vdc/11.3] Vdc per Truth Table **on ALL band wires [controller select on 6m],** then move on to **STEP 17.16**.
- If 6m band DC voltage is near 0 Vdc **on ANY band wire,** then double check controller selection is for 6m.
- If 6m band DC voltage is ~ 0 Vdc **on ANY band wire [controller Selected 6m and wiring correct]**, then there is likely an issue with controller. (Note – This is UNLIKELY, since controller was tested just prior to leaving factory)

When the Band Controller is on 6m and near [12 Vdc / 11.3] Vdc on all controller properly wired terminals, the **resistance across all modules** should be a resistive OPEN. If any module is a resistive SHORT, then the module's switch has failed CLOSED, or the modules control wire is open. Double check related PLUG wire connections. A switch failure is highly unlikely, since all module strings were tested at the factory.

☐ **STEP 17.14** With the Band Controller wired to the JBOX and powered ON, **select the 17m band** as designated by the lighted LED position.

☐ **STEP 17.15** Measure the DC voltage on each band wire relative to GROUND. This DC voltage should be near 0 Vdc on each band Wire, except near 12 Vdc on 17m band wire. (See **Band Voltage Truth Table** for 17m.)

- If 17m band DC voltage is near 0 Vdc **on ALL band wires [except near 12 Vdc on 17m wire with controller on 17m],**, then move on to **STEP 17.16**.
- If 17m band DC voltage is near 12 Vdc **on ANY band wire [except the 17m wire],** then double check controller selection is for 17m.
- If 17m band DC voltage is near 12 Vdc **on ANY band wire [except the 17m wire], and wiring is correct**, then there is likely an issue with the controller. (Note – This is UNLIKELY since controller was tested just prior to leaving factory)

☐ **STEP 17.16** With the Band Controller wired to the JBOX and powered ON, **select the 15m band** as designated by the lighted LED position.

☐ **STEP 17.17** Measure the DC voltage on each band wire relative to GROUND. This DC voltage should be near 0 Vdc on each band wire, except near12 Vdc on 15m and 11.3 Vdc on 17m band wire. (See **Band Voltage Truth Table** for 15m.)

- If 15m band DC voltage is near 0 Vdc on **ALL band wires [except near 12 Vdc for 15m and 11.3 Vdc for 17m]**, then move on to **STEP 17.18.**
- If 15m band DC voltage is ~12 Vdc on **ANY band wire, [except 12 Vdc (15m) and 11.3 Vdc (17m) wires]**, then double check 15m controller selection.
- If 15m band DC voltage is near 12 Vdc on **ANY band wire [except 12 Vdc (15m) and 11.3 Vdc (17m) wires]** and band selection and wiring is correct, then there is likely an issue with the controller. (*Note – This is VERY UNLIKELY since controller was tested just before leaving factory*.)

☐ **STEP 17.18** Repeat **STEPS 17.16 and 17.17 for band selections of 12m, and then 10m.** (See **Band Voltage Truth Table** for 12m & 10m expected voltages.)

It is highly likely that any testing issues with this Dipole antenna will be a result of wiring errors. If the **Trouble Shooting STEPS 17.1-17.18** are followed, most testing issues should be resolved. However, if after performing all of these steps there are still issues, please contact the XOR Factory Support Team for further assistance.

WARNING!! → It is very important that the modules perform per the Band Switching and Band Voltage Truth Tables in response to the BAND CONTROLLER, before applying ANY RF power to the input of this elevated antenna.

ONCE DIPOLE IS UP ON THE MAST – Verify Dipole antenna is in-band resonant on all selected bands. Verify the expected SWR occurs across all bands, before applying ANY SIGNIFICANT RF power to the input of this antenna.

18 APPLICATION NOTES

i. XBC-1 BAND CONTROLLER BASICS

FIGURE 132
XBC-1 BAND Controller, used for selecting frequency BANDS on XOR's Multi-Band Antennas.

BAND	20	17	15	12	10	6
FREQ (MHz)	14	18	21	24	28	50

POWER and PROTECTION

- The XBC-1 is powered through a 2.1 mm standard plug on the back panel. The power requirement is from [+12 Vdc to +15 Vdc] at a maximum current of 350 mA, or maximum power is 4.2 W @ 12Vdc. The controller current is a function of BAND selection. On 20m (20 mA), 17m (85 mA), 15m (150 mA), 12m (220 mA), 10m (285 mA) and 6m(350 mA). This 4.2 W Max power requirement makes this antenna ideal for solar power/emergency operation. The LED BAND indicator signifies Power On and selected band. XOR includes a Low RF Noise 12 Vdc @ 1A wall plug adapter for the XBC-1 to power this antenna.
- As noted on page 4, this +12 Vdc adapter will current limit for any controller output shorts to ground, protecting the controller. As also noted, if any voltage source, such as a 12 Vdc Deep Cycle Battery or 13.8 Vdc 20 A supply, is used for a power source, an in-line 1 Amp fuse is required on the power input line, to protect controller from output short circuits to ground.
- For controller cable lengths greater than 400 feet, optional XOR power adapters are available up to +15 Vdc as well as 8 or 6 conductor lower gauge cables. See XOR's web site or contact the XOR factory regarding longer cable length questions.

USE

- By turning the SELECT knob clockwise, the controller selects antenna frequency BANDs from 20m to 6m as indicated by the LED BAND indicator. (See **FIG. 125 and above** as a 12m selected example)
- The BAND change time is almost instantaneous – about 20 mS.
- The Power-OFF BAND will always be 20m. This is an Emergency Use provision. This XOR Dipole antenna is NEVER stuck on an inactive BAND [6m for example], due to lack of controller power.
- The Power-ON BAND will always be the last BAND Selected.
- **Never transmit on a frequency that is NOT the SELECTED antenna BAND.**

ii. Dipole Disassembly and Assembly For Transport

The XOR 20m-6m Dipole antenna has a **Quick Disconnect** feature, which allows the entire antenna to be disassembled into less than 6.5 ft sections. With a weight of about 18 lbs., this antenna can be for easily transported and quickly reassembled. This may be of value for holiday travelers, RV enthusiasts, campers, and remote emergency operations. **[When collapsing and transporting, be sure the black control cable's bending radius is greater than 1.5".]** Power mains or expensive non-standard power supplies are not required for operation. The XOR Dipole can function on all bands, using only [12 -15] Vdc and drawing less than 0.35 A. The controller power is only 4.2 W max (Ideal for solar power operation). **NOTE: Emergency Default BAND is 20m, with NO POWER at all.**

The two **Quick Disconnect** regions are as shown in **FIGs 2, 3 and 4.** Disconnect 1 is at Section 2, and Disconnect 2 is at sections 3 and 4, using clamps 1 and 2**.** An assembled close up of the two **Quick Disconnect** regions are shown in **FIGs 133 and 134** respectively.

Figure 133
Remove bolts, loosen clamps and slide the slotted top region, to expose a tube end opening.

Figure 134
Loosen both clamps and slide the 3/4" tube to the right (towards clamp 1). A tube end opening will be exposed.

ALLIGNMENT In the following steps, it is important that the sections and/or pieces that are being disassembled [or reassembled] – are aligned. Thus, each of these sections or pieces being connected or disconnected should be placed on a level surface, to prevent angular binding.

Disassembly Procedure (For Both A and B Half-Elements)

☐ **Step 18.1** Remove the two joined 20m end tubes from end of each half-element, by loosening section 4 clamp 3, shown in **FIG. 4.** First, place a mark on the 1/2" tube at the end of the 5/8" slotted tube of section 4 clamp 3, as shown in **FIG. 121.** This mark will aid in reassembling. Then loosen the clamp 3 and slide the 1/2" tube, to remove the entire 2-piece end assembly. Put both end assemblies aside for transport.

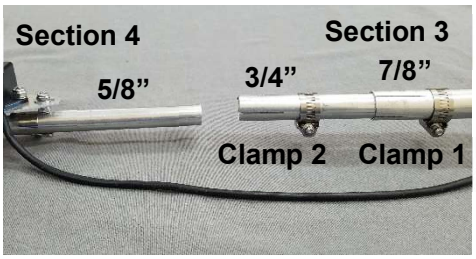


Figure 135
Section 4 gap opening after sliding 3/4" tube into section 3.

☐ **STEP 18.2** Disconnect section 4 from the 3/4" tube extension [attached to section 3], by 1st loosening section 3 clamp 1 and section 4 clamp 2, as shown in **FIGs 4 and 134.** Place a mark on the 5/8" tube at the end of the 3/4" slotted tube of section 4 clamp 2 and a mark on the 3/4" tube at the end of the 7/8" slotted tube of section 3 clamp 1, as shown in **FIG. 134.** This Mark will aid in reassembling for transport.

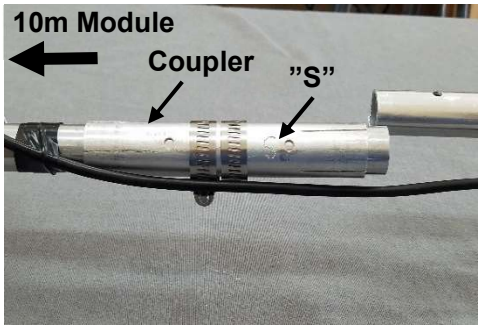


FIGURE 136
Section 2 end gap opening results after sliding 1" coupler towards 10m module.

☐ **STEP 18.3** Remove tape from control cable on the 3/4" tube. Loosen clamp 1 at end of section 3 and also clamps 2 at end of section 4. Slide the 3/4" tube into the 7/8" tube end of section 3, until tube stops. There should then be a gap end opening between the 3/4" tube and section 4 5/8" tube, as shown in **FIG. 135.** Place section 4 near section 3 and avoid excess bending of the black connecting control cable. **When transporting, the bending radius of black control cable should be greater than 1.5".**

☐ **STEP 18.4** Activate the 1" coupler of the section 2 **Quick Disconnect** 1, shown in **FIGs 4 and 133,** to create a gap opening in section 2**.** Be sure both ends of section 2 are on a flat surface, to avoid angular binding. First, place a Mark on the 7/8" tube at the S engraved end of the 1" slotted coupler tube. This coupler end also faces the 1" sleeve of section 2. Remove tape from the control cable on coupler, remove the two #8 screws, and loosen #6 SS clamps at each end of coupler. Then slide the coupler towards the 10m module, until the end gap opening in the 7/8" tube is exposed, as shown in **FIG. 136.** Place uncoupled section 2 aside. When re-assembling, the engraved "S" on 1" coupler must be UP.

UNCOUPLILNG SECTION A1 FROM B1 In following **STEPS**, Section A1/ B1 are uncoupled from each other and also from the element plate. The reverse order of assembly **STEPS 6.7 through 6.19** is followed. Sections A1/B1 must be level.

☐ **STEP 18.5** Unplug the 8-position and the two 6-position plugs from the junction box. Remove all three P-cushioned clamps from their plates. Keep hardware with clamp mountings and keep clamps attached to their respective cables for reassembly.

☐ **STEP 18.6** Remove the four Polyamide (PA) clamps and all hardware associated with these clamps. See **FIGs 9 through 21** and associated steps or reference.

☐ **STEP 18.7** With sections A1 and B1 carefully aligned, remove section B1 terminal post. Then slide section B1 from section A1. See **FIGs 5 through 8** for reference. Reinsert B1 Terminal post for safe keeping.

REASSEMBLY

Reassemble antenna by reversing Disassembly STEP 18.1 through STEP 18.7. Other manual assembly portions may also have value for these tasks.

iii. Dipole Antenna Ground Effect

- A Free Space Dipole resistance at resonant is about 73 Ω.
- The impedance of RF radio systems is 50 Ω, including 50 Ω coax.
- When using an inexpensive1:1 BALUN between the 50 Ω coax and the 73 Ω Dipole, an SWR of 73/50 = 1.46:1 will occur in Free Space. XOR offers several inexpensive choices for these types of 1:1 BALUNs.
- As the Dipole height is reduced down to ~ 0.3 wavelengths above ground, RF ground reflection will alter this 73 Ω value + / -. However, an SWR < 2:1 across all bands and bandwidths can still be achieved with a 1:1 BALUN. (Typically, from [1.2 –> 1.4] :1 @ 40 ft for mid-band resonance.)
- An improvement in SWR can occur by using a typically expensive 1.5:1 BALUN that transforms the 73 Ω Free Space Dipole resistance to about 50 Ω, to match the 50-Ω coax. In reality, ground effects will alter this expectation.
- Thus the 1.5:1 BALUN will slightly improve SWR due to ground reflections over the 1:1 BALUN, for heights down to about 0.3 Wavelengths above ground.

XOR's 20m-6m Dipole antenna was designed for use with a 1:1 BALUN, exhibiting less than 2:1 SWR performance on all 6 bands, for heights above 20 ft and across all bandwidths (except very high end of 6m). This performance can be slightly improved with a 1.5:1 BALUN ratio (75/50).

iv. Dipole Antenna Uses

- Due to this 6-band antenna's light weight (18 lbs.) and small foot print (single element), it can easily be placed on a 20 ft ground mounted side support mast. This allows for easy Armstrong methods of rotation.
- The portability of this antenna and a simple power requirement, makes this Dipole ideal for recreational use, as well as for emergency use.
- This antenna can also be placed on a lightweight tripod on an elevated roof surface with a small lightweight rotator.
- This antenna may be ideal for a 6-band low stealth antenna low on a flat roof or inside an attic. For attic use, the two 3.75-foot 20m end sections may be replaced with a wire, being arranged to accommodate the attic structures.
- This 6-band antenna could also be placed **above and parallel to the boom** of a multi-band Yagi, as a side monitoring antenna. (W7TUS proposed).
- This 6-band antenna could be placed outside on a pole with a rotator, but tracking 90 degrees from direction of a multi-band Yagi on a tower. This provides for a 6-band side monitoring antenna system. (W7TUS proposed)
- In the future, a band scanner could be combined with this XOR antenna system, allowing all 6 bands to be scanned sequentially, (band to band switching time is < 20 mS) to produce a 6 band almost real time scans on a monitor.
- **NOTE: These Last 2 items require future development.**

19 LIMITED PRODUCT WARRANTY

XOR ANTENNA SYSTEMS LLC

3 YEAR LIMITED PRODUCT WARRANTY

7/25/25

Our products have a Limited Product Warranty (Warranty) against manufacturing defects in materials or construction for THREE (3) years from date of shipment. Any modification of our products, in any way, will void this Warranty, unless authorized by XOR Antenna Systems.

This Warranty will be automatically void if ANY of the following conditions occur: unauthorized modification, improper installation, physical abuse, customer misuse, damage from natural disaster or weather-related events, which exceeded the product's wind and ice survivability specifications. Evidential proof of either weather-related event must be provided under this Warranty. Damage due to lightning or near-lightning events are also not covered under this Warranty.

XOR Antenna Systems' responsibility is strictly limited to repair or replacement of defective components, at XOR Antenna Systems' discretion. XOR Antenna Systems 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 Return Authorization can be obtained at www.xorantennas.com. Shipping instructions will be issued to the buyer for defective components. Shipping charges to the XOR factory will be paid for by the buyer. XOR Antenna Systems will pay for standard shipping back to the buyer.

The XOR Antenna Systems LLC assumes no further liability beyond repair or replacement under this Limited Product Warranty. This Warranty is NOT transferable.